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Indigestion AND Biliousness,

BY

J. MILNER FOTHERGILL, M. D.,

MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS, LONDON; SENIOR ASSISTANT
PHYSICIAN TO THE CITY OF LONDON HOSPITAL FOR DISEASES OF THE
CHEST; LATE ASSISTANT PHYSICIAN TO THE WEST LONDON
HOSPITAL; ASSOCIATE FELLOW OF THE COLLEGE OF
PHYSICIANS OF PHILADELPHIA.

“What is one man's meat is another man's poison.”



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MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON; SENIOR ASSISTANT
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PREFACE.

THE study of chronic disease has compelled the writer to pay minute attention to the subject of assimilation and its disturbances.

Research in the deadhouse, even when aided by the microscope, can never supply more than the anatomical factors of disease. It is important to instruct us as to disturbance of function. Physiology—an acquaintance with function in health, can alone guide us to a knowledge of disordered function.

The following book is written from a physiological standpoint.

The history of normal digestion precedes and introduces the subject of indigestion; first in the alimentary canal, then, secondly, in the liver. By such study the management of in-

digestion, in its various forms, becomes intelligible. Chaos "without form and void" thus becomes "dry land and waters."

The disturbances of the digestion are terribly on the increase in the present day; and a chapter is appended on "The Failure of the Digestive Organs at the Present Time."

For a contribution to this subject, as well as other favors, I here acknowledge my indebtedness to Duncan Bulkeley, M. D., of New York.

For aid in revising the proof-sheets I have to express my thanks to David J. Johnson, Esq., M. B.

23 Somerset Street, Portman Square, W
June 21st, 1881.

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INDIGESTION AND BILIOUSNESS.

CHAPTER I.

INTRODUCTION.

THERE are many ailments, many disturbances of health, which embitter our existence, and limit our power of labor, that are not illumined by any side-light from the dead-house. They are essentially the maladies of the living!

It is not disputed that in certain cases changes are found in the dead-house, enabling the cases to be classed as chronic gastritis, gastric ulcer, gastric cancer, or gastric dilatation; but then, these are the ultimate changes at the end of the case. Before these pathological conditions have been developed, there has been a long preceding history of functional disturbance; and even when they are fully developed, the stomach retains some of its functional powers until the last; or until very near the last. Such mere anatomical division of the maladies of the stomach is useful diagnostically, and prognostically; even more so in the deadhouse; but for all purposes of rational treatment such division is as sterile as a Vestal virgin.

To be of practical avail to the patient, the stomach must be looked on from the standpoint of its physiological function; which is not abolished by the particular form of the disease. In all those myriads of cases where there is no gross disease, but where there is only decided dyspepsia, any classification founded on pathological changes is powerless to help us.

Nor are we correct in thinking that the greatest activity of the digestive act, is to be found in the stomach; really, the seat of greatest activity is beyond the pyloric ring, in the duodenum. The stomach is specially the seat of the digestion of albuminoids in an acid medium; consequently the morbid changes in the coats of the stomach are not the anatomical substrata of all disordered function. In certain morbid conditions of the stomach, the mucous coat is found diseased, and the gastric follicles more or less mutilated; but what would this tell us even if we could see it with the eye in life? It would demonstrate the necessity for encouraging other parts of the digestive system than the stomach! How this can be done, will be shown further on. We will never understand digestion, its disturbances, and how to meet them, by poring over the morbid changes found in the post-mortem room; even when aided by the microscope. We might as well attempt to study the construction of a building from the examination of it in ruin, and by minute inspection of the material of which it consisted. It is this study of the digestive canal after life has fled, which has led us astray from the real study of the digestion as a physiological process; how it comes to be deranged, or defective; and how to remedy the different disorders, according to their na-

ture. If digestion were merely a deficiency of gastric juice due to disease of the walls of the stomach, its treatment would be rendered very simple; it would consist in giving after a meal so much gastric juice derived from our omnivorous congener—the pig. In many cases, doubtless, this is enough to achieve what is required; but this is not the whole, nor even the main part of the rational treatment of the various forms of indigestion.

Starch, albuminoids, and fats; each of these has its own digestion, its own portion of the digestive act; which must be allowed for in our diagnosis, and in the selection of our remedial measures. The treatment of indigestion is like the fitting of a suit; there are the three component parts of the suit—coat, waist-coat, and trousers—to be seen to. Two may fit; but the third does not. So in dyspepsia! Or the whole may be badly made, or ill-fitting. The treatment of a complex malady, is like the making of a suit; it has got to fit the individual exactly. Some persons can go into a ready-made shop, and buy an article which may fit very fairly. So some dyspeptics only require pepsin wine for their cure. But this is not the rule; rather is it the exception. Some people are "bad to fit," in tailor's phrase; and tailors differ in their capacity. Some people are not "easy to treat;" and perhaps all medical men are not alike in their capacity. Then again, there are some persons, whom even very competent tailors cannot fit; only one tailor can manage to fit them. So there are a proportion of persons who find out that one medical man alone can prescribe satisfactorily for them. With tailors and doctors alike this last class, fortunately a very small one, really is unpopular; nor is there any difficulty in conceiving that this should be so.

Then again, "biliousness," is connected with disturbance of the digestive process in the liver; a matter we now do know something about. Until recently, yea very recently, we really did know nothing, or little more, than nothing of the function of this huge viscus. But lately, thanks to such physiologists as the late Claude Bernard, Ludwig, and Pavy, and Lauder Brunton, in our own country; our knowledge has of late made giant strides; and enlarged physiological knowledge has led the way and broken a path for a rational comprehension and treatment of the disturbances of the liver. The chemical composition of the bile-acids tells of their albuminoid origin; and speaks with no indistinct utterance of the dietic management of biliousness, as well as the remedial measures to be employed.

The chemical composition of the urine solids has long years ago cleared up the genealogy of gout; but we recognize nevertheless, that gout does not take its genesis solely in port wine and gluttony. Certainly these two can, in the course of time, provoke gout, if

sufficiently persisted in; even in the healthiest systems.

Consequently it is only in acquaintance with the digestive act, and the disturbances thereof, first intelligently comprehended, and then carefully reasoned upon in the consideration of assimilation as a physiological process, that we can lay the foundation of a rational comprehension of the maladies—indigestion, biliousness, and gout; and of a treatment which is successful, except by a lucky guess. But lucky guesses do not run thirteen to the dozen. Systematic study, leading to the fulness of knowledge, may be a laborious, toilsome way of acquiring the requisite and desired skill; but it is infinitely surer, as a rule, and more to be relied upon, than those flashes of inspiration whose occasional occurrence is not denied; but whose appearance cannot be calculated upon with any approach to certainty. Sap and mine is a slow but sure way of gaining a fortress; escalade may carry it by storm, but it is notably a hazardous measure, often ending in failure, sometimes in grave disaster.

It is the systematic study of assimilation, as a normal process, and, by its light, mal-assimilation, or the derangement thereof, which alone can enable us to grapple successfully with maladies which are the bane of many an existence; which usually do not kill directly, but which often induce consequential changes incompatible with the continuance of life. The albuminuria which heralds the advent of the final change in old gouty kidneys, is but the outcome of a morbid process which has been established for years. It tells of the end of the case; but directly, it throws no ray of light upon the origin of these morbid modifications of nutrition, in which the gouty kidney takes its origin. It is but the thunder of the storm; not the electric and atmospheric disturbances which bring the thunder-storm about. To understand the thunder-cloud, we do not confine ourselves to observations of the lightning and the thunder; we go further back into the genesis of the storm, and strive to comprehend the forces which brought it about. In practice, it is not enough to test for albumen, or examine the excreted urine solids; it is necessary to examine the digestive processes themselves, in order to comprehend the malady properly.

In order then, to rationally understand the nature of indigestion, biliousness, and gout, we must commence with a clear comprehension of the digestive act in health. After that, and after that only, we may hope to form some fair conception of its disturbances.

NATURAL DIGESTION—STARCH—ALBUMINOIDS—FAT.

It may be well to first take a bird's-eye view of the digestive act; and then, after that, to examine each part piece-meal and minutely. By this means the reader will be enabled to grasp the subject as a whole; and then to

become familiar with each section of the whole.

Our knowledge of the digestive act, as said in the Introduction, is very recent; consequently medical teaching, until the last decade, had little to say on the matter. Now physiology has acquired articulate speech; and can talk sufficiently well to tell us much, of the greatest importance, on subjects which interest the medical practitioner in almost every case which comes under his notice in his every day round of professional duty—much that adds most materially to his power to be of service to his suffering patients.

The subject has received a distinct stimulus by the delivery of the Lumsian Lectures before the Royal College of Physicians, last year, (1880) by Dr. William Roberts, F.R.S., of Manchester. To this able physician and his lucid lectures on "The Digestive Ferments," and "Artificial Digestion," I owe much for further information on a subject which has long interested me in the treatment of chronic disease. I shall avail myself (by his permission, most generously and gracefully granted) of his lectures in these pages very fully; nor will it be possible, I fear, by the mechanism of inverted commas, always to indicate every piece of indebtedness; especially when the subject does not permit of verbatim quotation. By the study of the action of the ferments out of the body, much has been learnt of their action within the living organism.

A "ferment" is a body which works changes in other substances, altering their chemical constitution somewhat. Thus yeast is a ferment, used in the making of bread. In the saliva we find a ferment; in the gastric juice another ferment; in the pancreatic secretion a third—the most complete of all.

Now let us consider the digestive act in outline.

First, the starch of our food is acted upon by the saliva, which converts it into sugar; as soluble sugar in the stomach, it is absorbed into the blood. Then the albuminoid constituents of our food are acted upon by the stomach in two ways. By the movements of the stomach, the mechanical disintegration commenced by mastication, is completed; and the food is reduced to minute fragments, upon which the gastric juice, can operate successfully. Thus muscular fibre, the type of albuminoid food, is crushed by the teeth, and then rolled over in the stomach until the minute fibres fall asunder. So disintegrated, every fibre can be acted upon by the solvent juice, and digested. The removal of a portion of the starch as soluble sugar, leaves the albuminoids more freely exposed to the action of the gastric juice.

During this time fat has undergone no change. The saliva does not exercise any influence upon fatty matters; neither does the gastric juice. But when the partially digested food passes the pyloric ring, then intestinal digestion commences; and the activity of the digestive act reaches its height.

The saliva ferment is only operative in an alkaline medium; consequently, when the

stomach, or rather its contents, becomes acid in the digestive act, the digestion of starch ceases. When the acid contents pass the pyloric ring, they meet with the alkaline bile-salts, which at once arrest the action of the gastric juice, which is only operative in the presence of an acid. But the scene only changes; not the act. In this alkaline medium the secretion of the pancreas comes into play. This complex secretion continues the digestion of the albuminoids in an alkaline medium; the conversion of starch into sugar is once more in progress, and the fat is emulsified. We see a totally new process instituted. Hitherto, fat has been untouched by the digestive act. Now it is emulsified, reduced to the tiniest of particles, which are taken up by the villi of the intestine. Each microscopic villus may be seen crammed with fat globules some time after each meal.

In the duodenal or intestinal digestion, the starch converted into sugar finds its way into the intestinal veins; so do the digested albuminoids; while the fat is taken up by the villi, the terminal ends of the lacteals. The non-digested materials pass on to form the fæces.

"In the fæces there are to be found, in the first place, the indigestible and indigested constituents of the meals, shreds of elastic tissue, much cellulose from vegetables, and some connective tissue from animal food, fragments of disintegrated muscular fibre, fat cells, and more unfrequently undigested starch-corpuscles. The amount of each must vary very largely, according to the nature of the food, and the digestive powers, temporary or permanent, of the individual. In the second place, to these must be added substances not introduced as food, but arising as part of, or as products of, the digestive secretions" (Michael Foster). We see in the fæces the remnants of a feast. The uneatable gristle, the bones, fragments of meat and bread—the debris which remain, and have to be cleared away. The rest disappears, carried away by the guests. So all the nutrient part of our food, or most of it, is carried away in the digestive act; the offal only remains.

Such then is a bird's eye view of the digestive act. We now can profitably examine each step in it in detail; bit by bit. We can understand how "the nature of the food" and "the digestive powers, temporary or permanent, of the individual" influence the process, and its results: see how the diet can be modified with advantage to meet the powers of the individual: how improvement in the digestive powers of the individual can be made operative in securing more perfect digestion of the food.

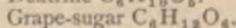
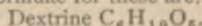
Starch. Starch is a hydro-carbonaceous material found in the seeds of plants, especially the cerealia, in palm-pith as sago, as tapioca from the cassava, and as arrowroot from other tubers, or as potato starch. Its chemical formula is $C_{12}H_{20}O_{10}$. It is the material upon which the young plant feeds until it can get its own nutriment; except as sago.

Like animals, vegetables have an early in-

fant period, when the food is found for them by their parents. Just as the chick in the egg lives upon the material stored up within the shell; so the seed lives upon the starch and the fat, also stored up within the husk. These stores of material for the life of the young plant are garnered for human food. The digestion of starch within the body is allied in nature to that process by which the infant plant feeds upon the starch within the husk. The seed undoes the material built up by the adult parent plant, by means of a ferment contained within its tissues. In malting barley the ferment within the grain of barley changes the starch in the transformation into malt, just as it does in germination within the earth. When the subject of artificial digestion is considered, we shall see how this ferment of barley, *diastase*, is utilized to transform the starchy matter of our food, when the natural digestion of starch is defective. The plant pulls the starch granules to pieces and renders the insoluble starch soluble; and that is just what happens in human digestion.

For digestion is solution; disintegration precedes solution; the insoluble starch must be converted into soluble grape sugar, to pass from the digestive canal into the blood. While the teeth are crushing the food, and the tongue is rolling the mass over and over, it is being mixed and inter-penetrated with saliva. Saliva contains a ferment identical in its properties with the diastase of barley. The saliva of man possesses more of this diastatic power than any other animal. For long centuries now, man has cooked the starchy material of his food; and so the salivary glands of man have become functionally very active. In the form of the ground cereals, we find the action of the teeth supplemented. Disintegration is largely performed for us. Then by cooking, the starch granule is prepared by the action of the digestive ferment, by having its capsule ruptured. When bread, a biscuit, or pastry is chewed, the saliva is mixed with the farinaceous particles, and the transformation of starch into grape-sugar is instituted. The insoluble starch is liquefied by hydration, that is by the addition of a molecule of water, into dextrine and grape-sugar.

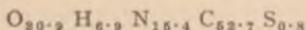
The formulae for these are:



Food could not be stored in a soluble form; it would be washed away. So the digestive act is the dissolving of food, till, in fluid form, it can pass through the walls of the digestive canal into the blood. There it is turned back, dehydrated by the removal of the added molecule of water, and stored up in the body. When the digested starch in the form of dextrine, the soluble or grape-sugar, is taken into the blood of the portal vein, and reaches the liver, it is dehydrated back into glycogen or "animal starch." As rapidly as the starch is liquefied into soluble sugar it passes through the walls of the stomach; and so does not interfere with the digestion of albuminoids going on therein. This diastatic action can only go on in an al-

kaline or neutral medium; as soon as the contents of the stomach become acid, the diastatic digestion of starch is arrested. What starch is left over from the salivary digestion, remains unaffected by the gastric digestion. When the food passes the pyloric ring, and is mixed with the alkaline bile, then the digestion of starch is once more resumed under the influence of the amylolytic ferment in the pancreatic secretion.

Albuminoids. From the albumen in the egg, the tissues of the embryonic chick are formed. From the albumen in the seed of the plant, the tissues of the germinating seedling are fashioned. Tissues are formed from albuminoids, with some auxiliary assistance from hydrocarbons. Liebig long ago pointed out how the presence of nitrogen in combination with hydrogen and carbon, interfered with their ready union with oxygen. Albumen has the formula according to Hoppe Seyler, quoted by M. Foster :



to 23.5 to 7.3 to 16.5 to 54.5 to 2.0

Containing nitrogen, albuminoids do not readily oxidize; and thus the body-tissues are formed of albuminoid materials. The hydrocarbons, or fuel food essentially, burn by oxidation in the system, while the tissues themselves do not burn. It is like the coal burning in the steam-engine, while the iron-work does not burn. Nevertheless the iron-work wears out by a slower process of oxidation, known as "rusting." So it is with the albuminoid tissues of the body they do not burn properly, but they slowly oxidize, or rust as they wear away.

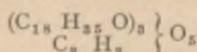
Albuminoids are not affected by the saliva; the gastric juice is their solvent. On the digestion of starch the gastric juice exercises no effect; except to arrest the action of the saliva upon it. "When digestion is proceeding comfortably and normally, a certain interval elapses before the acidity of the stomach becomes considerable, and during the interval, the salivary diastase continues active and has time to accomplish a good deal of work." It is upon albuminoids that "pepsin," the gastric ferment, exercises its sole action. The gastric juice contains pepsin and hydrochloric acid. "In one important respect pepsin, the ferment of gastric juice differs from ptyalin, the ferment of saliva. Though saliva is most active in a faintly alkaline medicine, there seems to be no special connection between the ferment and any alkali. In gastric juice, however, there is a strong tie between the acid and the ferment, so strong that some writers speak of pepsin and hydrochloric acid as forming together a compound pepto-hydrochloric acid." (M. Foster). Before digestion an albuminoid is termed a "proteid;" the digested proteids are termed "peptones." As peptones, albuminoids readily pass through the walls of the digestive canal into the blood. The change is caused by adding a molecule of water; "judging from the analogy with the action of saliva on starch, we may fairly suppose that

the process is at the bottom one of hydration." (M. Foster). The solvent action of the gastric juice is greatly aided by the muscular movements of the stomach; as the contents are rolled over and over thereby, they are brought into immediate contact with the digestive pepsin and the acid. Muscular fibres fall asunder, and gradually disappear in the stomach as the digestive act progresses; so other proteids are rendered soluble in this acid solvent medium. The whole of the proteids are not digested in the stomach, but are passed through the pyloric ring, when it relaxes towards the termination of gastric digestion. The two rings, the one at the foot of the gullet, the cardiac orifice, as well as the pyloric ring at the intestinal outgoing orifice of the stomach, are contracted during the time of its activity; and as the contents become disintegrated, the pyloric ring relaxes. The food has fallen to pieces in the stomach, such of it as will, little bits of gristle and vegetable fibre being left *en masse*; and so is prepared for further intestinal digestion. The fat is stored in the body in areolar tissue, in the connective tissue, or packing material, and as such consists of fat in an albuminous envelope. In normal digestion that envelope is dissolved, and the fat set free. But fat itself hitherto has undergone no change whatever. "On fats gastric juice is powerless. They undergo, by reason of it, no change whatever in themselves; when adipose tissue is eaten, all that happens is that the proteid and gelatinogenous envelopes of the fat-cells are dissolved, and the fats are set free; the fat itself undergoes no change except the very slightest emulsion." At times the liberation of fat interferes with gastric digestion.

Fat.—It is only after the food has passed the pyloric ring that the digestion of fat commences. Some decomposition at times takes place, and a fatty acid is formed, which irritates the stomach, and constitutes one form of dyspepsia. "The digestive change undergone by fatty matters in the small intestine, consists mainly in their reduction into a state of emulsion, or division into infinitely minute particles. In addition to this purely physical change, a small portion undergoes a chemical change whereby the glycerine and fatty acids are dissociated. The fatty acids thus liberated then combine with the alkaline bases of the bile and pancreatic juice, and form soaps. The main or principal change is undoubtedly an emulsifying process, and nearly all the fat taken up by the lacteals is simply in a state of emulsion, and not of saponification." Bile exercises some influence upon fats. "It has a slight, but only slight, emulsifying power. A mixture of oil and bile separate after shaking, less rapidly than a mixture of oil and water; this action is probably due to the alkaline nature of bile. Oil passes with considerable ease through a filter-paper kept wet with a solution of bile salts in company with one kept constantly wet with distilled water. Bile therefore must be said to have a slight action even on fats. It is probable, however, that it is more useful when combined with pan-

creatic juice than when acting by itself." (M. Foster).

A fat is a hydro-carbon, containing a small proportion of oxygen. It is formed when the assimilation of hydro-carbon is in excess of the body needs; the surplusage is stored as fat or adipose tissue. The reserve is consumed when the food is insufficient in supply, and disappears on starvation. This is the formula of stearin, the firmest of the fats.



The others, oleine and margarine, are much the same chemically. Oleine is the most fluid and then comes margarine. Speaking broadly the digestibility of a fat is in proportion to its stiffness when cold. The best cod liver oil is frozen at a low temperature, to freeze out the margarine and stearine, and is nearly pure oleine. Cod liver oil is most digestible on account of its fluidity, as well some bile in it. Then comes the fluid fat of bacon, butter and then cream, oils and animal fats.

Intestinal digestion. When the food, now known as *chyme*, rendered fluid or semi-fluid in the stomach, passes the pyloric ring, it meets the alkaline bile and becomes alkaline. Then the digestion of pepsin stops. Just as the acid gastric juice arrests the salivary digestion of starch, so the alkaline bile kills the action of pepsine.

To this alkaline mass is poured out the secretion of the pancreas. This is a most potent solvent fluid. It contains (1), a diastase, digesting starch; (2), trypsin, a ferment digesting proteids in an alkaline medium; and (3), an emulsive ferment which acts upon fats. Like the gastric secretion it contains a ferment which curdles milk—an action necessary to the digestion of milk. Under its influence the digestion of the starch left in the stomach after the salivary action is arrested, is resumed. The proteids are converted by the trypsin into peptones. The fat is emulsionized in the presence of bile. The soluble sugar, and the soluble peptones pass into the blood of the portal vein. The fat is taken up by the lacteals in the intestinal villi and carried into the thoracic duct. The waste is passed on to be voided; being still acted on to some extent by the succus entericus, or intestinal juice.

Such, then, is the digestive act.

After being made soluble, to pass through the walls of the digestive canal, sugar and peptones are turned back by dehydration, into starch and proteids. They have been dissolved so as to pass readily through organic membranes; now they are to be stored up, so they are changed back; otherwise they would escape out of the blood as easily as they got into it. When the liver is unequal to dehydrating the sugar of the portal vein into glycogen as rapidly as the sugar is formed, the sugar passes out by the kidneys, constituting glycosuria. This may be produced in any one by excess of sugar, at once. When the disturbance is pronounced, it constitutes "Diabetes." As glycogen or animal starch,

the amyloids of our food, are stored for the needs of the body, and given off as required.

The after history of peptones is very interesting, as far as it is known. They disappear in the blood, and are not found in it, "neither in the portal blood, nor in the chyle, nor in the general blood during digestion, is there any appreciable quantity of peptones." (M. Foster). In a recent article, "The Practitioner," October and November, 1880, Dr. Lauder Brunton, F. R. S., discusses the possibility of peptones escaping the dehydrating process, and thinks "that the liver, to some extent at least, serves the purpose of preventing any peptones from getting into the general circulation, which may have escaped transformation in the portal blood before meeting it." Indeed, from the time the peptones disappear, to the time of their final change and appearance as excreta, as bile acids and urine solids, we, as yet, do not know their history; yet it is what we would most certainly like to know. From the albumen in the liquor sanguinis the tissues are fed. This is termed "Interstitial Nutrition." Finally, there are the salts of the blood to be considered. We do not know of any digestion of the salts of the body beyond mere solution of them in fluids. Conditions of spanæmia are produced from their deficiency, either from the food not containing a sufficiency of them, or their disappearance, as in profuse night-sweats. They are useful in digestion somehow; for I have noticed again and again at the City of London Hospital for Diseases of the Chest, how the appetite of the consumptive patient improves within two or three days of the arrest of severe night-sweats. Prof. M. Foster, F. R. S., writes—

"THE EFFECTS OF SALT AS FOOD.—All food contains, besides the potential substances which we have just studied, certain saline matters, organic and inorganic, having in themselves little latent energy, but yet either absolutely necessary, or highly beneficial to the body. These must have important functions in directing the metabolism of the body; the striking distribution of them in the tissues, the preponderance of sodium and chlorides in blood-serum, and of potassium, and phosphates in the red corpuscles, for instance, must have some meaning; but at present we are in the dark concerning it. The element phosphorus seems no less important, from a biological point of view, than carbon or nitrogen. It is as absolutely essential for the growth of a living being like *Penicillium* as for man himself. We find it probably playing an important part as the conspicuous constituent of lecithin, we find it peculiarly associated with proteids, apparently in the form of phosphates; but we cannot explain its role. The element sulphur, again, is only second to phosphorus, and we find it as a constituent of nearly all proteids; but we cannot tell what exactly would happen to the economy, if all the sulphur of the food were withdrawn. We know that the various saline matters are essential to health; that when they are not

present in proper proportions nutrition is affected, as is shown by certain forms of scurvy; we are aware of the peculiar dependence of proteid qualities on the presence of salines; but beyond this we know very little."

Lecithin is a "complex nitrogenized fat, with the formula $C_{44}H_{92}N_2PO_9$ occurs widely spread throughout the body. Blood, gall, and serous fluids contain it in small quantities, while it is a conspicuous component of the brain, nerves, yolk of egg, semen, pus, white blood-corpuscles, and the electrical organs of the ray" (M. Foster).

Iron is a necessary component of hæmoglobin, a most complex substance, containing— $C_{53}H_7N_{16}O_{21}S_4F_4$.

"Hæmoglobin is a so-called ozone carrier" (M. Foster). Here is a very complex body in the red corpuscles, upon which depends the giving off of carbonic acid, and the taking up of oxygen.

Lecithin is a phosphorized fact which seems to be the food of the nervous system *par excellence*.

Where these infinitely complex bodies are formed we do not know. Yet we clinically recognize that there is anæmia in which the absence of iron in the food plays a part. It seems possible that the imperfect formation of "lecithin" may be the cause of much lack of nervous energy associated with impaired nutrition. The failure of the assimilative processes to build up these complex bodies may coexist with power to form the ordinary products of digestion. We are beginning to see, albeit "through a glass darkly," the clinical value of a good knowledge of digestion, in its power to aid us in the treatment of many maladies, which take their origin in failure of the digestive processes.

CHAPTER III.

PRIMARY INDIGESTION.

ALL digestion, then, is a process of solution for which previous disintegration is essential. Indigestion then may be due to, (1) imperfect disintegration; and (2) defective solvent power. Of course, if the food taken be of an unsuitable nature, be indigestible in itself, then indigestion follows; for which the digestive processes are not to blame.

Imperfect disintegration. This is mainly due to insufficient mastication. Certainly, when uncooked seeds are eaten the disintegration is never sufficient; but most of our food requiring thorough disintegration, is prepared for us by first grinding, and then cooking. The defect lies either in the bad practice of eating hurriedly; or, in a growing cause of indigestion, bad teeth. As to the practice of eating too hastily it is to be condemned without extenuating circumstances. The habit of eating in company and chatting, is conducive to good digestion, by prolonging the meals; and allowing the disintegrating action of mastication to go on efficiently. It is not merely that the effect of saliva upon starch is lost, or largely so (that might be

made up for and compensated by the later digestion of pancreatic diastase), but the food is insufficiently chewed; and is therefore swallowed in an unprepared state for the disintegrating action of the stomach. To grudge time for the proper mastication of food is as irrational as was the revolt of the members against the belly. If the digestion be not perfect, then the rest of the body will suffer from want of pabulum. The food should be slowly taken and thoroughly chewed: if the teeth will permit. Even when a glass of milk is swallowed, or a cup of beef-tea, containing some baked flower, it is all the better for being taken slowly, and being to some extent mixed with saliva previous to being swallowed. When farmers' wives and daughters fed calves "off the finger," so that they got their milk slowly; they did better and had less diarrhoea than now when the calves are allowed to take their milk greedily, so that it curdles too firmly in the stomach. The admixture of some form of ground farina to prevent the formation of too firm a curd would be desirable; if the demands of modern agricultural life can no longer afford the time for feeding calves "off the finger." Too firm curdling of milk is a common cause of diarrhoea both in human and bovine infants. The curd is indigestible, so it is got rid of as readily as possible by ejection from the bowels. In all cases where a milk diet is required, this too firm curdling should be looked to; it is the equivalent of imperfect disintegration.

Bad teeth are a fertile cause of indigestion. They not only forbid perfect mastication, but the pain of mastication often causes the food to be bolted; even when the individuals know full well they will have to suffer for it. The present grave increase in the spread of dental caries is matter for the most serious thought, as regards the next and ensuing generations. If this spreads as it is doing at the present time, such a thing as a natural tooth will scarcely ever be seen. As soon as the crowns protrude from the gum they will require the care of the dentist; maybe it will become necessary to nip off the crowns almost as soon as fully developed, in hopeless despair of their remaining fairly sound.

Bad teeth lead to impaired digestion in two ways, (1) they interfere with the proper admixture of saliva with the starchy matters of the food, by which the amylolytic action of salivary diastase is lost or thrown away; and (2) by imperfect mastication the food is not prepared for the further disintegrating action of the stomach, and so great and abnormal muscular movements of that viscus are required in order to carry on the disintegration of the unchewed, or imperfectly chewed food. In all cases of indigestion then, the teeth ought to be critically examined, and if found defective put in working order; after which the troublesome symptoms may pass away without requiring further medical attention.

Imperfect disintegration may be due to defective action in the stomach. There the atrophy of the muscular coat impairs the energy of the movements of the stomach; as is

notably seen in gastric dilatation; or there may be an abnormal quantity of gastric mucus thrown off, in which the food is rolled over and over, until a thick mucus layer is formed which most effectually resists the solvent action of the gastric juice, so that the action of the salivary diastase alone goes on, and the food is passed into the intestines in no way advanced by gastric digestion; or an ulcer on the walls of the stomach may arrest the muscular movements of this viscus, and so lead to impaired disintegration. In all these cases there is lessened disintegrating power in the stomach, and consequent indigestion.

Now in all cases of indigestion due to impaired disintegrating action, the sole remedy is to modify the diet accordingly; if the cause of the impaired disintegration be not, as is often the case, removable. Bolting the food may be remedied; bad teeth may be supplemented by the skill of the dentist; imperfect muscular movements in the stomach may be improved by the administration of strychnine. But in the bulk of cases the treatment lies in suitable food. It must be prepared so as not to require disintegration. In mild cases it is sufficient to avoid pastry, veal, pork and other things which are not easily disintegrated; and to adopt a dietary of fish, white meat, milk puddings, and stewed fruit. But when the case is one of gastric catarrh, ulcer, dilatation, or cancer, then a strict regimen is absolutely necessary. The food must be in fluid, or semi-fluid form; and consist of such materials as require neither mastication nor the exercise of much muscular movement in the stomach; if there be gastric catarrh such as can not well be rolled up into a mass, and covered with tenacious mucus. It does not matter what the gastric lesion, the digestive act is the same; and requires identical management. It must then consist of milk, or milk-gruel; or beef-tea, or mutton broth with some baked flour added. Such then briefly is the management of indigestion due to imperfect disintegration.

Imperfect solvent action. This may be due to impairment in the saliva, the gastric juice, or the pancreatic secretion. The first will give us impaired digestion of all amyloid materials; the second impaired digestion of albuminoids; while the third will render the assimilation of fat imperfect. Deficiency in the first two may be met by increasing the activity of the last by appropriate measures. But deficiency of fat-digestion by impaired pancreatic secretion cannot be compensated. In each case before us, it is necessary to arrive at clear views as to what it is we wish to remedy. It will not be found either successful or satisfactory to prescribe at a venture either medicine or artificial digestive agents, in a hap-hazard way. To give bitters, hydrochloric acid, or even pepsin wine, when it is the digestion of starch and fat which is defective. Nor preparations of malt diastase when it is the digestion of albuminoids which is impaired. There must be a precision in diagnosis preceding the therapeutic efforts, guiding and giving aim to

them, for the latter to be successful. Precision in diagnosis as to anatomical change has been insisted upon *usque ad nauseam*, considering the barrenness of results attained thereby. But precision in diagnosis from observation of physiological functions, and its disturbances, has yet to be attained; but when attained it will be most fertile in result.

For the stimulation of the salivary glands we possess few agents, little if ever resorted to for the purpose of stimulating the salivary glands. The chief of these are mercury, jaborandi and pellitory. Some persons chew ginger or cinchona bark; but such measures are of comparatively little service, contrasted with the resort of vegetable diastase to supplement the digestion of starch by the salivary diastase.

This matter will receive attention in the next chapter, devoted to the consideration of the Artificial Digestive Ferments.

For the stimulation of the gastric secretion we possess several agents. There are a number of articles of our pharmacopœia which increase the flow of gastric juice. Among them are agents which produce severe inflammatory symptoms in the stomach if taken in large quantity, of which arsenic is the type. Alcohol possesses the same power. In small doses both these agents produce a flow of blood to the lining membrane of the stomach, which increases the flow of juice. When empty the mucous coat of the stomach is pale and bloodless. When food is taken it becomes red, turgid with blood, and bedewed with secretion exuding from the orifices of the gastric tubules. Consequently the glass of sherry, or even gin and bitters, is not out of place, or out of time, in all cases. Where it is undesirable to resort to alcoholic stimulants the old-fashioned dinner-pill of ipecacuanha, cinchona and aloes and myrrh pill is indicated. Ipecacuanha in small doses excites the mucous membrane of the stomach; in larger doses it excites vomiting. Further, it is a powerful stimulant to the liver. Consequently it is indicated as a constituent of primary importance in the dinner-pill. Then there are bitters of world-wide reputation both to whip the appetite and to increase the digestive power of the stomach. Ringer has found that the contact of an alkali to the lining membrane of the stomach induces a subsequent flow of gastric juice if taken before a meal. By the judicious fitting of such measures to each case, good results may often be obtained without further measures being required. These other measures are the utilizing of the gastric secretion of our omnivorous congener, the pig, to help to do the digestion for us.

So long as the stomach was supposed to be the sole, or almost sole seat of the digestive act, measures intended to act upon it were alone sought for, and enquired after. But when physiological research discovered that the stomach only played a part, a comparatively subordinate part in the digestive act, other means were searched for, and found; viz., measures which stimulate the secretion

of the pancreas and the liver. How the action of this last large viscus has so long remained shrouded in Stygian darkness, it is impossible to say. Practical medicine has gleaned a scrap or two of empirical lore about it. But science was dumb, or scarcely articulate, until this sneer was justifiable, "it was taught by physiologists, sixteen hundred years ago, that the urine was formed by the liver and separated by the kidneys; and those who come after us may judge whether the nineteenth century have made any real progress in this matter compared with Galen." Certainly it was not till late in the nineteenth century that any real advance was made in our knowledge of the physiology of the liver and pancreas; such as is of practical use to us in our essays to aid, or remedy disturbed assimilation.

For the stimulation of the pancreas we possess only one agent of whose properties we are at all assured; and that is sulphuric ether. Dr. Balthazar Foster, of Birmingham, first used ether to stimulate the pancreas to increased secretion in cases where cod-liver oil, taken alone, disagreed, or was not assimilated. The addition of ether led to satisfactory results. Dr. Foster's expressions of opinion and practice led to a Commission being formed in the United States to investigate the subject. Their results corroborated Dr. Foster's views.

Instead, however, of stimulating the pancreas in some cases, it is more convenient to employ a preparation containing the different pancreatic ferments, as the *Liquor Pancreaticus*, giving it according to the directions furnished in the next chapter.

For the stimulation of the liver we can use a variety of agents whose actions have been much elucidated by the work of Prof. Rutherford of Edinburgh, who investigated the action of drugs upon the liver. These agents are ipecacuanha, iridin, and euonymin, as vegetables; and the sulphate of soda as a saline laxative or purgative, according to the dose. By the use of these agents the liver is stimulated; a fact quite corroborated by clinical observation. Sulphate of magnesia is a stimulant to the intestinal glands and a purgative; but it will not clean the tongue and unload the liver like the sulphate of soda. It is this fact which led me to substitute "*Sodæ Sulphat.*" for "*Mag. Sulphat.*" in so many prescriptions in the second edition of my "*Practitioner's Handbook of Treatment, or the Principles of Therapeutics*" (1880). Especially when there are deposits in the urine, and pale stools, with a furred tongue, and a bad taste in the mouth in the morning, is the use of these hepatic stimulants to be resorted to: and the results so attained are satisfactory when a proper dietary is added thereto. As to the efficacy of hepatic stimulants there can be no more doubt than that these are stimulants to other glands. Mercury is especially indicated in some cases; chiefly when the blood is surcharged with nitrogenized waste, whether bile acids or urine solids.

Some Concomitants of Indigestion. It may

be well now to consider some concomitant states which require attention, before proceeding to review the matter of the inability to digest fats; often a very grave affair, especially when found with profuse night-sweats.

In *gastric catarrh* not only must the food be fluid or semi-fluid, and utterly free from perceptible particles, such as may be rolled into a ball and enveloped in a covering of catarrhal mucus; but means must be used to check the catarrh. Compound kino powder is a great favorite in the treatment of gastric catarrh; the pill of sulphate of copper and opium is often useful. Other combinations of opium and astringents may be used. T. King Chambers has pointed out that in gastric catarrh these combinations do not produce constipation to the extent that might be anticipated; their astringent action apparently being spent upon the morbid mucous lining of the stomach.

In *gastric ulcer* it is well to give an opiate an hour before food is taken. This lessens the pain, and diminishes the movements of the stomach, so that vomiting is prevented to a great extent. It allows the food to pass through the stomach into the duodenum, especially when it consists of milk-gruel already partially digested. Bismuth is also very useful.

In *gastric cancer* an opiate is equally indicated. Both in ulcer and in cancer, when the surface is raw, the acid of the gastric juice causes acute pain, so the food should be "sheathed with an alkali."

In *gastric dilatation* it is desirable to empty the stomach artificially from time to time, and then wash it out with a solution of the sulphites. The diet always to be most carefully attended to in each case.

In *diarrhœa*, especially when it comes on immediately after food, the contents of the small intestine are swept along too rapidly for absorption to go on properly; and therefore the system is badly nourished. Here opium and bismuth are especially indicated, together with a strict milk dietary. Often there is acidity, especially with infants, and then lime water, prepared chalk, or light magnesia—some or other of the fixed alkalies, should be added to the milk.

Astringents containing tannin, or the mineral astringents, as sulphate of copper, and opium are indicated in true ordinary diarrhœa. Sometimes larger doses are required than those in ordinary use. When the diarrhœa is frequent, teasing, and the amount small in quantity and no relief is obtained, then it is well to give a full dose of castor oil, or rhubarb. If it persist after this the rectum should be explored, for a mass will probably be found in the colon, preventing the passage of solid feces.

In *constipation* it is well to give a pill at bedtime, and if necessary a saline purgative next morning. The pill may consist of Pil. Al. et Myrh, Pil. Col. Co., according as a mild or a more powerful laxative is required. Then next morning a dose of effervescent citrate of magnesia, or a purgative water, or

some black draught; or, better still, some soda sulphate, with Rochelle salts in a bitter infusion containing a carminative, taken warm. A morning laxative taken warm acts at once, more promptly, (a great matter for business men), and more efficiently. At other times Trousseau's plan of a suppository of hardened honey, or soap may be tried; or it may be enough to resort to an enema. In very severe constipation it is well to give potent cathartics, scammony, podophyllin, or gamboge at night, and a saline purgative in the morning. But the case must be followed up actively, and the constipation relieved somehow; else the indigestion cannot be remedied. (Dyspeptics with confirmed constipation are very difficult patients to manage, and require a medical adviser of determined will, as well as considerable skill in the wielding of remedial agents.)

When there is *pruritus ani* (itching of the fundament) also present, then hepatic stimulants are required for relief. This may be due, however, to the presence of "Seat Worms," which require sharp cathartics and injections of infusion of quassia.

Anal fissures, ulcers, piles, fistulae, &c., require treatment that cannot be described here. The regulation of the bowels by an appropriate dietary will be given in Chap. VIII. But laxatives are commonly required as well in cases.

At other times there is *gastric irritability* to be dealt with. Then the tongue, our only index of the state of the intestinal canal, is raw, and denuded of epithelium, either in a broad furrow up the middle, or over the surface generally. When this condition obtains, whether alone, or along with pulmonary consumption, or other malady, it claims our attention exclusively; at least all other matters must only be subordinate. This imperative-ness is too commonly not fully recognized, with disastrous results. But experience tells that it must be the chief object of our solicitude. "Needs must when the devil drives," and this condition of denuded, or but partially grown epithelium, cannot be relegated to a second place in our remedial measures, with due regard to the patient's safety. As a skilful general changes his front according to his enemies' tactics, so the wary physician, when he sees this change coming on, changes his line, when the malady puts on this new aspect. Bismuth and alkalies, a milk diet, with the alkaline sheath; firmness, patience, and perseverance, are all required to see the patient safely through "the valley of the shadow of death;" when aphthae appear the efforts must be redoubled. When the tongue recovers its normal aspect, and the epithelium is no longer half-grown, but quite matured, then the treatment may advance to mineral acids; but so long as the bareness remains, so long must the treatment be directed, if not exclusively, still mainly, to the state of the lining membrane of the digestive tract.

Then there is "*the furred tongue*" where there is a perfect layer of debris of food and dead epithelial scales, indicative of the state of the lining membrane of the digestive ca-

nal. Not uncommonly purgatives have been taken by the patient, once or oftener, to remove it. If mercury have been no part of the remedies employed, no effect has followed, as regards improvement in the condition of the tongue. A mercurial will usually make the desired alteration; but not always. In some cases, however, the relief is not so readily furnished; and the mercurial must be repeated, and a mixture containing nitro-hydrochloric acid and small doses of sulphate of soda, is requisite for a week or even more, before the digestive organs are restored to their normal working condition.

In some cases the tongue looks normal till placed in a side light, and then by looking across the tongue a brown shade can be observed. Here the same line of treatment is required; and, however anæmic the patient may be, it is useless, worse than useless, to give chalybeates; for when the liver is disturbed, iron never agrees.

There are certain states of the digestive organs when the patient complains that the sight of fat produces repugnance and loathing; but where there are no decided objective symptoms. But they cannot digest fat, at least in its ordinary forms. Whether it is the fat interferes with gastric digestion, and is intolerable to the stomach; or there is also some inability to digest the albuminous capsule of the fat granules in adipose tissue; or what the particular objection is, is not yet known; the fact remains that fat is most objectionable to them.

What to do with these cases as regards their dietetic management will be given in the next chapter, in the section devoted to the practical measures to be adopted when the assimilation of fat is disturbed.

It is clear from what has so far been written that the old impression of the stomach being the sole seat of the digestive act must be abandoned in favor of views more sound, and in accordance with the teachings of modern physiology; if we are to be exact in our treatment of the disturbances of the assimilative processes.

SYMPTOMS.

A few of the prominent symptoms produced by indigestion may now be given briefly. One of the frequent outcomes of indigestion is the production of an acrid acid in the stomach. This seems to be one of the fatty acids, probably butyric, and is very acrid in its properties. It is usually not produced early, but rather late on in the digestive act. It causes a bitter pungent taste felt at the foot of the gullet. This sensation is termed "cardialgia" or "heart-burn." Another is "pyrosis" or "water-brash." This consists in the eructation of a fluid into the fauces, sometimes acid, sometimes alkaline; at other times acrid, or even feeling "cold." Certain articles of food, notably oatmeal, are apt to produce it. A third is "regurgitation" of the food; sometimes sour, sometimes sweet. With some persons, this act, analogous to "chewing the cud," is habitual; a certain number say it is not disagreeable to them.

Allied to this is the "eructation of wind"

or "belching," to many persons a great source of annoyance. When highly-flavored articles of food are eaten, the taste is often very pronounced in the eructated wind. The cockney phrase for this is an expressive one—their food "repeats," they say. "Flatulency" is another outcome of disordered digestion, and often creates a most uncomfortable sense of distension. Frequently the pressure of this elastic gas in the stomach produces "palpitation." Betwixt the heart and the stomach lies the thin diaphragm only; and gas in the stomach, or transverse colon, presses upon the heart and interferes with its movements; producing either "palpitation" or "intermittency" in its stroke, as the case may be. "Vomiting" is not very common except in acute indigestion; and gives immediate relief, as it does in gastric ulcer. It is most frequent in "gastric catarrh" in the morning; especially where too much alcohol has been taken the previous evening. In acute dyspepsia it is the natural form of attaining relief. It is often followed by sharp diarrhoea, sweeping away such part of the contents of the stomach as have passed into the intestinal tube. At other times "diarrhoea" is provoked by each meal. "Itching at the seat" is found in other cases, and it is a most torturing, distressing affection. When it is due to seat-worms it is readily amenable to treatment in most instances; but not in all.

Then there is "pain" at the pit of the stomach. When due to "gastric ulcer" it is provoked as soon as the stomach has become acid, and is aggravated by the muscular movements dragging on the base of the ulcer; thus vomiting gives immediate relief. So long as the stomach is at rest, and in its alkaline state of quiescence there is no pain. In "gastric cancer" there is also sharp pain not always relieved by vomiting; nor alone provoked by food, but felt at other times at first, and ultimately continuous and persistent. Pain is commonly found along with other evidences of indigestion, and may occur immediately after a meal; or at a later period when the contents of the stomach are passing the pyloric ring; when felt at this time it is duodenal. "Nausea," or a sense of sickness, is a very common symptom either found along with pain, or alone. It may be present almost habitually; but be accompanied by actual vomiting only when the disturbance of the digestive act is unusually great.

"Constipation" is a common concomitant of dyspepsia; not rarely its exciting cause. So long as constipation is permitted to continue, so long will dyspepsia persist. By perseverance, patience, and determination, the most obstinate constipation may be overcome. Too frequently, however, the patient grows indifferent, or tires of the treatment, and as a consequence relapses into the habitual condition. It is the bane of their lives to many persons; still it is much more amenable to treatment than is generally supposed.

The throat often feels sore, or uncomfortable; at other times there is a tendency to

"hawk up phlegm," which gathers on the fauces. In some cases there is a turbid state of the fauces, little dendritic vascular twigs being very visible. Less frequently, there are "purple-like elevations of the mucous membrane," at times even "follicular ulceration;" or the uvula is relaxed and elongated, tickling the throat and producing troublesome cough. "Aphthae" are not usual except in children, or adults the subjects of severe advanced exhaustion.

The tongue should always be carefully inspected. Sometimes it is "swollen," "relaxed," and "indented with the teeth;" at other times it is "raw" or "irritable," being denuded of its epithelium. In other cases it is "foul" or "loaded;" and this "fur" may be yellow, or brown, especially when the liver is disordered. Or there may be a "strawberry" tongue; sometimes like a red strawberry with the papillae like the red seeds; more commonly it resembles a white strawberry, the tongue being generally white with red papillae protruding the fur, closely resembling the red seeds upon a white strawberry. Less commonly the papillae are enlarged, looking like small inflamed warts; these are the large papillae, fifteen to twenty in number, near the root of the tongue. At times a foul streak is seen along the mesial line of the tongue, the edges being very clean; at other times this is reversed, a clean streak running up the middle of the tongue. Sometimes one side of the tongue is fouler than the other; here there is a local cause. "Fissures" of the tongue are not rare; most commonly associated with the practice of drinking hot fluids, especially tea. "Deep sulci" are usually syphilitic, especially when the tongue generally is smooth as if the papillae were shaven cleanly off with a razor. Such a sign is of great importance, as some cases of indigestion have been incurable till an anti-syphilitic treatment has been adopted for some other ailment; and then, presto, the indigestion has disappeared.

"Psoriasis" is also significant. There seems some evidence that the stomach is sometimes the seat of analogues to skin affections; as it certainly is the seat of an eruption in some cases of small pox.

"Skin eruptions" are very frequently linked with digestive disturbances, and only curable by putting the digestive organs in order. Eczema with pruritis of the genitals, or anus, is always associated with dyspepsia in some parts of the digestive tract.

In some cases there is a "taste in the mouth," especially a hot burning taste on awaking in the morning. This is due to some abnormal products of the later part of the digestive act, and is often a troublesome symptom. In certain cases there is a sour taste in the mouth, less commonly a sweet taste, or the saliva may be clammy with a sensation of heat in the mouth; this is commonly found along with constipation.

"Headache" is a very common outcome of dyspepsia. It varies in character from a dull weight to acute agony. It may be confined to the temples, the forehead, or the

occiput; or it may be general. It may be accompanied by "swimming" in the head, or "intolerance" of light or of sound. At times the slightest sound is simply unbearable; in other cases (comparative) ease can only be secured by lying in a dark room like the Rev. Mr. Irwine's sister Anne, in "Adam Bede." Miss Kate was sponging the aching head with fresh vinegar when he went into the room so darkened by blinds and curtains that Miss Kate could not knit at the best. "It was a small face, that of the poor sufferer; perhaps it had once been pretty, but now it was worn and sallow. Miss Kate came towards her brother and whispered—'Don't speak to her; she can't bear to be spoken to to-day.' Annie's eyes were closed, and her brow contracted as if from intense pain." Miss Anne Irwine's headaches were those of indigestion evidently; and very bad headaches they were! They belonged to that variety which comes on the day after the meal which has provoked them; where there are some noxious products of late digestion poisoning the half-starved brain. In such cases the duodenum is found to be the seat of morbid change, when the patient passes into the dead-house. In most cases the headache accompanies other evidences of gastric disturbance, and is felt early or after a meal. The face is often flushed, and the hands and feet are cold. In many cases the headache is distinctly that of anæmia,—the blood being drawn to the abdominal viscera by the digestive act. There is often a sensation of "swimming in the head" felt along with the pain, or "dizziness." The pain in the vertex often experienced is symptomatic of cerebral anæmia.

More distressing than the actual physical pain is the sense of misery experienced by many. The mental discomfort, the sense of wretchedness, of utter unfitness for work, and inability to collect the thoughts, is to many dyspeptics their greatest trouble.

The brain is disabled for the time, no matter what its capacity under favorable circumstances; and the sense of intellectual paralysis is very distressing. Here there is positive toxæmia, from abnormal products of digestion finding their way into the blood; as well as an insufficient supply of blood to the brain. To brain-workers this is a great draw-back; indeed, the dyspeptic is handicapped very heavily in the race of competition to gain a living, or amass a fortune. The dyspeptic can earn less, and must spend more on (suitable) food than others do; and where the income is a small one, the dyspeptic is really to be pitied. Indigestion cuts down the individual far more than is generally credited. In the modern keen struggle for existence the dyspeptic is like a man fighting with one hand tied.

This mental attitude of gloom, apprehension, distrust and incapacity intensifies the physical discomfort, and tends to cause the sufferer to have misgivings that the malady is something more than mere indigestion. A haunting fear that the brain is the seat of disease where there is headache, the heart

where there is palpitation or irregular action, tortures the unhappy sufferer. The remembrance of this impression hangs like a dark cloud over the intervals of comparative health; while the anticipation of another attack is projected like a shadow thrown in front of it, indeed "coming events cast their shadows before." When there is great pulsation of the abdominal aorta the dyspeptic is worried with the apprehension that there may be an aneurism present. There is, indeed, a panphobia, a general sense of dread, of impending evil, which embitters the sufferer's existence, and every uncomfortable sensation is interpreted as an indication of structural disease somewhere.

The physical suffering is aggravated by mental misery, compared with which it is as nothing: for peace of mind is rendered absolutely impossible to the unfortunate dyspeptic; he or she lives with the sword of Damocles hanging overhead.

CHAPTER IV.

SUITABLE FORMS OF FOOD.—ARTIFICIAL DIGESTIVE FERMENTS.

HAVING described the various disturbances of the digestive tract, interfering with the proper and ordinary assimilation of the main constituents of our dietary, starch, albuminoids, and fat; it may be well to review the means of preparing the various forms of our food. Starch in its natural state, raw and uncooked, is scarcely digestible by man. In animals, probably starch is largely digested by the pancreatic diastase. But in man starch is largely digested by the salivary diastase. "It has been noted that the saliva of man possesses more diastatic power than that of almost any other animal. Among the herbivora, which are such large consumers of starch, the saliva has comparatively little diastatic power; and in some, as the horse, it is almost altogether wanting. I apprehend that this is due to the fact that man alone has learnt to cook his starchy food, and that the diastatic power of his saliva has become developed with the opportunity for its exercise. Diastatic power would be thrown away in the saliva of the horse, because he eats his food in the raw or uncooked state, and saliva is almost without action on raw starch." This is a very interesting observation by Wm. Roberts, and as regards the horse, no attempt has been made to cook his food for him. But with the animals the farmer wishes to fatten for market, especially oxen, the cooking of their food is regularly performed by our most advanced agriculturist. Starch is prepared by cooking cereals previous to their being given to cattle; as it is found cheaper to so prepare the starch for fattening cattle, than to leave them to do the whole of their digestion for themselves. The Lincolnshire farmer has solved, in part at least, the problem of the conversion of starch into sugar, or approaches thereto; as well as the scientific physiologist. And one of the most instructive conversations on the means of preparing starch for food, I ever

remember listening to, was down in the Fens one evening, when some farmers were discussing the subject of the cheapest means of fattening stock. It was soon clearly apparent that they were working in precisely the same direction as the physiological physician moves, when he comes to diet a child with a weak digestion; with this difference—the physician desires to feed the child little regardless of the cost; while the farmer's aim is to produce so much fat at the least cost. When inspecting the measures adopted by Collinson Hall, at his large dairy farm in Essex, my attention was arrested by a huge heap in one of the rooms, where crushed oats and partially malted barley, were fermenting the starch into dextrine and maltose.

In cooking starch the granule is cracked, and the starch largely gelatinized, so that the salivary diastase readily liquefies it, and converts it into soluble sugar. During baking, starch, or part of it, is undoubtedly converted into dextrine. The action of yeast converts part of the starch into sugar, and this again into "alcohol and carbonic acid gas; the latter, in its efforts to escape from the dough with which it is mixed, distends it, forming vesicular spaces in its interior, and so causing it to become porous and light. Much of the alcohol is dissipated in the process of baking" (A. Hill Hassall). Consequently we see that intuitively and without the light of science, man has commenced the artificial digestion of starch, when only a savage, and long before the dawn of history. We at the present are emerging out of the early darkness, and stepping forward by the morning light on the path to the artificial digestion of starch; by so doing economizing the body-energy which would otherwise be consumed in the conversion of insoluble starch into a soluble saccharoid, otherwise diastatic digestion. Consequently farinaceous materials are first ground and then cooked; this constitutes the first part of the digestive act.

Now it is a matter of no little importance to understand intelligently how cooking may affect the digestibility of prepared starch. When farina is simply boiled or baked with milk, the preparation is at once simple and digestible, and the saliva is readily mixed therewith in the mouth. But when eggs are added, then the disintegration in the mouth is not nearly so perfect, and much more chewing is required; because the coagulated albumen holds the starch granules together. Consequently milk puddings for invalids are better made without eggs.

Then again, everybody, medical and lay, knows how indigestible is pastry of all kinds. When the farina and fat are closely mixed together in the act of "kneading the dough," the adhesive property of the gluten of flour is somehow so increased, that the act of mastication is rarely equal to efficient disintegration in those whose digestion is feeble. The stomach is incited to active muscular movements to continue the disintegration, and acute pain is experienced. A piece of pie-crust is rank poison to many dyspeptics. So

is toasted cheese, which also resists the disintegrating action of dyspeptic's stomach very effectually. Some persons cannot eat suet pudding, as ordinarily made, without a severe penalty from dyspepsia: but if the cook adds to the flour a certain quantity of bread-crumbs, then the digestion of the pudding is painless. Gluten once cooked remains non-adhesive; so the bread-crumbs cause the masses of pudding to readily fall to pieces in the stomach. Probably some baked flour would do just as well, if added to the ordinary flour. Maize flour is not nearly so adhesive, as its albuminoids are not in the form of tenacious gluten; so much so, that without some wheaten flour it would not make leavened bread. Consequently, for the preparation of puddings, and still more for pastry for delicate children and dyspeptics, it would be well to add some maize flour to the ordinary flour. In precisely the same way we try to prevent milk forming too firm a curd in the stomach, by mixing it with some starch. The presence of the starch granules interferes with the solidity of the curd, and causes it to fall to pieces readily in the stomach. On the other hand, oysters are spoiled in cooking. "Our practice in regard to the oyster is exceptional, and furnishes a striking example of the general correctness of the popular judgment on dietetic questions. The oyster is almost the only animal substance which we eat habitually and by preference, in the raw or uncooked state; and it is interesting to know that there is a sound physiological reason at the bottom of this preference. The fawn-colored mass which constitutes the dainty of the oyster is its liver, and this is little less than a mass of glycogen; associated with the glycogen, but withheld from actual contact with it during life, is its appropriate digestive ferment—the hepatic diastase. The mere crushing of the dainty between the teeth brings these two bodies together, and the glycogen is at once digested, without other help, by its own diastase. The oyster, in the uncooked state, or merely warmed, is, in fact, self-digestive. But the advantage of this provision is wholly lost by cooking, for the heat employed immediately destroys the associated ferment, and a cooked oyster has to be digested, like any other food, by the eater's own digestive power." This graphic description by Dr. Roberts tells us how it is that oysters *au naturel* are so much in vogue for invalids, as they deservedly are. Also, why oysters should not be cooked in oyster sauce, but put into the prepared sauce just as it comes to table. Why, as King Chambers insists, in a beef-steak pudding, the oysters should not be cooked, but a flap of the paste raised, and the oysters popped in, just as the pudding is served. In making oyster pates, the paste is cooked in bread-crumbs, which is then taken out and the oysters put in; after which, the pates are just warmed, and no more, and then brought up to the dinner table. The idea that long cooking increases the digestibility of food, is not always correct.

But "cooking" is essentially a part of the

digestive process, not only in man, but in some domesticated animals as well. The products vary according to the skill of the cook, and the adjustment of the process to what physiological knowledge tells us is correct and sound. When the cook makes a hash of meat already cooked, instead of making the gravy first, and when fully prepared then putting in the slices of meat, and just warming them before serving—the only way by which a hash is tolerable to a delicate stomach—she too often stews it well in the gravy, believing that thereby she increases its digestibility. But ask dyspeptics about meat so cooked a second time, and their tale of woe is most instructive.

Now as to the effects of cooking upon the proteid elements of our food. "It is this well-established fact, the easier digestibility of loosely-aggregated tissue, that has led me to repudiate raw meat in the diet of invalids. Cooking, the action of heat, disassociates organic tissues, destroys the cohesion of muscular fibres, and must, therefore, render all kinds of meat easier to dissolve, to digest. To give meat raw, however finely chopped, is to forego all the advantages gained by judicious cooking, and to force on the digestive organs double work. Moreover, raw, uncooked meat may contain the ova of human entozoa, of the various species of tape-worms, and of the trichina," (James Henry Bennett, "Nutrition in Health and Disease"). Again, Dr. Roberts writes: "With regard to the staple articles of our food, the practice of cooking it beforehand is universal. In the case of farinaceous articles, cooking is indispensable. When men under the stress of circumstances have been compelled to subsist on the uncooked grain of the cereals, they have soon fallen into a state of inanition and disease. By the process of cooking, starch is not merely liberated from its protecting envelopes, but it suffers a chemical change, by which it is transformed into a gelatinous condition, and this enormously facilitates the attack of the diastatic ferments. A change of equal importance seems to be induced in the proteid matter of the grain. I found that the gluten of wheat was incomparably more digestible, by both artificial gastric juice and by pancreatic extract, in the cooked than in the uncooked state. In regard to flesh meat the advantage of cooking consists chiefly in its effects on the connective tissue, and the tendinous and aponeurotic structures associated with muscular fibre. These are not merely softened and disintegrated by cooking, but are chemically converted into the soluble and easily digested form of gelatin. I made some instructive observations on the effects of cooking on the contents of the egg. The change induced by cooking on egg-albumin is very striking. For the purpose of testing this point I employed a solution of egg-albumin, made by mixing white-of-egg with nine times its volume of water. This solution when boiled in the water-bath does not coagulate nor sensibly change its appearance, but its behavior with the digestive ferments is completely

altered. In the raw state this solution is attacked very slowly by pepsin and acid, and pancreatic extract has no effect upon it; but after being cooked in the water-bath, the albumin is rapidly and entirely digested by artificial gastric juice and a moiety of it is rapidly digested by pancreatic extract." The employment of raw meat pounded is therefore not an advantage though advocated by some medical men. Personally I have never seen a case in which raw meat seemed to be indicated. The connective tissue which binds the fibrillæ of muscle together is so acted upon by heat, in cooking, that the fibres fall readily to pieces in the stomach; and so are easily acted upon by the solvent gastric juice. Mastication or chewing breaks down the masses of meat, and their disintegration is completed by the gastric movements.

Mastication, as a disintegrating matter, is separable from the admixture of starch with saliva in the act of chewing. So is the disintegrating action of the stomach separable from the solvent action of the gastric saliva. Mastication exerts no influence upon albuminous matters, of a solvent character; nor does the action of the stomach affect fats, except by the solution of the albuminous envelopes which surround fat as found in the bodies of animals. There is a digestive act in mastication, viz., the conversion of starch into sugar by the salivary diastase: and a preparation of albuminoids, for the action of the gastric juice. In the stomach there is the digestion of proteids, and the preparation of fats for the action of the bile and the pancreatic secretion, by the digestion and solution of the albuminous envelope of animal fat—the connective tissue in which the fat globules are stored in the body. There is then preparation for coming acts, as well as actual solvent action in mastication, and the gastric portion of digestion.

Now, meats differ in their digestibility according to the closeness of fibre, and the firmness with which the fibres are bound together. Pork, veal, beef, mutton, lamb, stand in the inverse order of their digestibility as regards the readiness with which their fibres fall asunder; the effects of cooking upon the fibre itself probably being much the same, viz, the effect of heat upon albumen in rendering it more easily acted upon by pepsin and trypsin. The hare and rabbit are fairly digestible as to disintegration. Then come the flesh of fowls of all kinds; the finer fibre of game being specially digestible. Then comes the flesh of fish; for reptiles are not a part of an ordinary diet. But fish varies—the Tunny fish tribe are hard of digestion. Salmon is often digested with difficulty, and so is fried sole. It is not merely the question of the firmness or looseness of fibre only, there is the method of cooking; where the fibres are soaked in fat, a weak stomach cannot digest them comfortably; there is dyspepsia often with the eructation of a fatty acid. Then, all kinds of white fish are most digestible, especially when boiled. The disintegration of muscular fibre in the preparation of meats for potting is complete; with them the

solvent part of the digestive act is alone required. On thin stale bread, with the butter in limited quantities and well rubbed into the tiny holes and interstices of (stale) bread, and then a little potted meat spread over, a very digestible little meal is obtained. Such sandwiches, with a cupful of beef tea, are specially indicated where the patient cannot take milk.

Then there are the vegetable albuminoids, especially the pulse tribe, or legumes, which are capitally disintegrated by cooking, and best by boiling or baking. Thus beans, haricots and broad, peas, lentils, dahl, etc., are all well broken up by heat. The disintegrated flour can easily be passed through a sieve, and then the disintegration factor of the digestive act is disposed of. There can be no question about the fact that with some persons vegetable albuminoids are much more easily digested than animal albuminoid; and I quite agree with Sir Henry Thompson in his remarks upon this subject. Besides, too, fat spreads easily over the disintegrated particles of cooked vegetable albuminoids, as is well seen in the baked beans and fat pork of New England. Indeed by such means fat can often be taken without offence to a stomach that cannot otherwise tolerate it; and much of the digestibility of fat depends upon the fineness of the particles into which it is subdivided. Haricot beans well boiled, passed through a sieve, and then the floury part mixed with milk, makes an excellent soup; quite equal in food value to any made with meat stock. The ordinary lentil soup is at once a most economical and a most valuable soup for ordinary persons; though scarcely perhaps quite adapted for persons with indigestion. But "the proof of the pudding is in the eating thereof,"—if it does not disagree, there is certainly no objection to its use.

Now a few words as to the digestion of milk caseine. As milk it is the most digestible of proteids, *i. e.*, with those with whom it agrees. It differs in its digestion from other forms of albumen. "Milk is much more easily digested by pancreatic extract than by artificial gastric juice; but in the case of egg-albumen the advantage lies decidedly with the gastric juice." Using the one part in ten of water solution of egg albumen and boiling it in the water bath, Dr. Roberts found with pepsin and hydrochloric acid the transformation went on swiftly and without interruption to its close. Whilst the pancreatic ferment was only able to convert a part of the albumen into peptone. There is one point of the greatest practical moment about the observation, and it is this—when meat or egg digestion is to be artificially aided it is well to use pepsin and hydrochloric acid. But when the digestion of milk is to be practically assisted by a digestive ferment, it is desirable to use trypsin; the pancreatic secretion in an alkaline vehicle. "Tryptic digestion of milk is rapid and leaves only a very slight residue—whereas peptic digestion of milk is slow, and leaves a large residue."

In order to secure exact results it is therefore essential to use precise means, guided by the light physiological observation is throwing upon this hitherto obscure subject of digestion.

And now to the consideration of the third division of the subject, the digestion of fats.

We do not know as yet any change effected upon fat by heat, by the act of cooking, except that of rendering it fluid. Certainly cooking renders fat more toothsome, and in the case of fat exposed directly to great heat, as in the case of the fat of a beef steak, or a mutton chop, the action of the heat upon the albuminous capsule of the adipose tissue, is to make it decidedly tasty. But heat does liquefy fat, and separates (we believe) olein, from stearin and margarin. The liquid portion of fried bacon is digested by many who cannot digest the solid portion of bacon fat. This is a well-known fact. The fluid is the olein. Fats vary in their digestibility. The late Dr. John Hughes Bennett said: "The main causes of tuberculosis were the dearthness of butter and the abundance of pastry cooks; the poor not getting sufficient fat, and the upper classes disordering their digestion by puff paste." Now butter consists of the fat globules of milk removed from their envelopes of caseine by the act of churning; thus getting rid of the albuminous envelope which is one of the difficulties in the digestion of animal fat. How far it is this envelope; how far it is the presence of firm stearin which constitutes the difficulty in the digestion of animal fats, in each case; we cannot always say. Then again to speak broadly, the lower the temperature at which fat ceases to be liquid the easier its digestion. In the best cod-liver oils, the stearin and margarin are taken out by freezing; the liquid olein being poured off. Beef fat and mutton suet are less digestible than lard, bacon dripping, and butter; the latter only becoming firm at a much lower temperature than is sufficient to render beef and mutton suet hard. Cod-liver oil is the most easily digestible of all forms of fat. In that lies its great utility. It can be digested when other fats are beyond the reach of the digestive processes. Some have thought this due to the basyle with which the fatty acids are in union, being propylene, instead of glycerine, like other fats. "Others, again, have attributed it to the minute quantities of iodine; and others to the biliary matters found in the oil; the last seems far the most reasonable supposition" (Lauder Brunton). In addition to this there seems to be something in the presence of a little free fatty acid, as found in certain cod-liver oils. "The different behavior of two specimens of the same oil, one perfectly neutral, and the other containing a little free fatty acid, is exceedingly striking. I have here before me two specimens of cod-liver oil—one of them is a fine and pure pale oil, such as is usually dispensed by the better class of chemists; the other is the brown oil sent out under the name of De Jongh. I put a few drops of each of these into these two

beakers, and pour on them some of this solution, which contains two per cent, of bicarbonate of soda. The pale oil you see is not in the least emulsified; it rises to the top of the water in large clear globules; the brown oil on the contrary yields at once a milky emulsion. The pale oil is a neutral oil, and yields no acid to water when agitated with it—in other words it is quite free from rancidity; but the brown oil when treated in the same way causes the water with which it is shaken to redden litmus paper." (When the inhabitant of Arctic regions prefers his fat rancid, probably he is only following out what experience has taught him is good in his liberal consumption of fat). "The bearing of these observations on the digestion of fat is plain. When the contents of the stomach pass the pylorus they encounter the bile and pancreatic juice, which are alkaline, from the presence in them of carbonate of soda. So that the fatty ingredients of the chyme, if they only contain a small admixture of free fatty acids, are at once placed under favorable circumstances for the production of an emulsion without the help of any soluble ferment, the mere agitation of the contents of the bowels by the peristaltic action being sufficient for the purpose" (Roberts). Possibly some fats containing a large proportion of oleine emulsify more readily than others. But the whole subject is in its infancy so far as our acquaintance with it is concerned. Certainly in some cases of imperfect digestion of fats it seems that a pill containing some dried oxgall and castile soap, taken an hour or so after food, is indicated as likely to be of service.

After this review of the digestion of the different ingredients of our food, we can see the digestion of,

Starch by saliva and pancreatic diastase;

Proteids by pepsin and trypsin;

Fat by pancreatic secretion;

will lead us to the proper and exact use of artificial digestive agents; about which at present the wildest confusion obtains both by the manufacturing chemists and the profession generally. The chemists may take umbrage at this statement, but they will find a difficulty in disposing of it. When malt preparations are directed to be taken after food when the stomach is acid, that is at the time when the salivary diastase, or its vegetable substitute is at once rendered inert; when malt extract is added to cod-liver oil directed to be taken "during or immediately after a meal," an admixture which is certainly palatable; but the vegetable diastase is little likely to be operative in the acid stomach, while the oil is taken too soon to be acted upon; a combination which is certainly not physiological; and when an emulsion of cod-liver oil and pepsin is commended by the *British Medical Journal* in a recent review, dead in the teeth of all that physiology teaches us (March 10th, 1881).*

It may now be well to consider the use of Artificial Digestive Agents in practice.

First it may be desirable to consider their use as additions to the natural digestive ferments; and then to proceed to the use of artificially digested food.

Starch is digested by the salivary diastase while the food is being chewed, and in the stomach before, and until its contents are acid; and afterwards by the diastase of the pancreatic secretion. The latter can best be discussed when artificial pancreatic secretion is spoken of; the salivary diastatic action alone will be reviewed now.

Starch is converted into sugar, is transferred from an insoluble to a soluble matter by the action of diastase of the saliva. It is equally well acted upon by the diastase prepared from cereals, *i. e.*, the digestive diastase of the embryo-plant. Such preparations under different names as "malt extract," "maltine," &c., are now placed upon the market by enterprising manufacturing chemists. They are mainly given to children; though there exists no reason why they should not be more largely given to adults. In their adoption it must be borne in mind they act upon starch solely and exclusively, and have no effect upon other articles of our food. Sugar does not require them; it is soluble without a ferment. But for starch, liquefaction precedes saccharification. Consequently "malt diastase" should be given so that it may be operative before the contents of the stomach become acid. It should then be added to milk-gruel, and milk puddings, before they are taken; or at latest immediately after they are swallowed, and before the other articles of a meal are eaten. Thus with children, their milk porridge, made with oatmeal, hominy, or crushed cereals, should be taken first for breakfast with the malt with them, or immediately afterwards; after an interval a little fat bacon or cold meat (ham is to be preferred) may be added, with bread and a little cocoa, or coffee with cream in it. Such would be a scientific and physiological use of vegetable diastase; which is a treacherous-looking thing as usually seen, of sweet taste, and therefore well adapted to admixture with milk porridge immediately before being supped; or by itself immediately afterwards. While children are suckling there is little natural diastase found, and it is not till the sixth or seventh month that it is found in the saliva in sufficient quantity to be operative. "Until this period it is therefore not advisable to administer farinaceous food to infants." It would seem the irritation set up by the teeth excites more efficient secretion in the salivary glands.

If malt diastase cannot be given as recommended above, it will be well to continue the digestion of starch by resort to artificial pancreatic secretion. At least, that is the con-

* "Peptodyn, a combination of the whole of the digestive secretions—pepsine, pancreatine, diastase or ptyalin, etc., forming a valuable remedy in the treatment of dyspepsia, and diseases arising from imper-

fect nutrition—dose, 3 to 5 grains." This compound, or rather "jumble," to be taken apparently any time the patient prefers, is a marked illustration of what is written above as to disregard of time and place of the portions of the digestive act. (This is advertised in the "British Medical Journal," April 22nd, 1881).

clusion warranted by the present state of our knowledge.

Proteids, or albuminoids, are the matters specially digested in the stomach. "Proteids are attacked by the digestive ferments at two points in the alimentary canal; by pepsin in the stomach, and by trypsin in the small intestine. Between these two acts of digestion there is a complete break in the duodenum, owing to the abrupt change of reaction, from acid to alkaline, which occurs at that point. Gastric digestion is, in all creatures, an essentially acid digestion." At the present the acid gastric digestion of proteids by pepsin is being considered exclusively.

The observations of Dr. Beaumont upon Alexis St. Martin, who had the front wall of the stomach and abdomen blown away by a gunshot wound, were made at a time when our physiological knowledge was too imperfect to be much guide to him. More recently C. Richet had an opportunity of examining the act of gastric digestion in a young man whose stomach was artificially opened for a stricture of the gullet. Thus our knowledge is not confined exclusively to the observations made upon animals. "Richet found that the acidity of the contents of the stomach during digestion, although it varied through considerable limits, had a marked tendency to maintain the normal average. If acid or alkali were added to the digesting mass the mean was presently restored automatically—the stomach in the former case ceasing to secrete acid, and in the latter case secreting an increased quantity of acid." Gastric juice contains a digestive ferment only active in an acid medium. "The reaction is distinctly acid, and the acidity is normally due to free hydrochloric acid. This is proved by the fact that the amount of hydrochloric acid is more than can be neutralized by the bases present. Lactic acid and butyric and other acids when present are secondary products, arising either by their respective fermentations from articles of food, or from decomposition of their alkaline or other salts" (M. Foster).

To aid this portion of the digestive act when defective we give pepsin, with or without an acid—usually with hydrochloric acid.

Pepsin is precipitated by alcohol in great quantity. It is sold as a wine, but it is better prepared with glycerine. It is sold by chemists in various preparations. It is commonly sold or prescribed along with hydrochloric acid. "In gastric juice there is a strong tie between the acid and the ferment, so strong that some writers speak of pepsin and hydrochloric acid as forming a compound pepto-hydrochloric acid" (M. Foster). "The essential property of gastric juice is the power of dissolving proteid matters, and of converting them into peptones" (*Ibid.*).

When then we resort to the use of pepsin as an artificial digestive agent, we must clearly bear in mind that it is the digestion of albuminoids solely, that we can assist by its means. It should be given after a meal has been taken, when the natural gastric solvent is being poured out in order to assist that sol-

vent in its digestive action. It is then useless to add it to cod liver oil; if it be desirable to administer both these agents, let the pepsin be given early after a meal, when it will be serviceable; and then afterwards the oil, when its time arrives. But to combine them is simply to set the lessons of physiology at defiance; to ignore the place and time of the different factors in the digestive act.

We now come at last to the digestion of fat. Hitherto, neither in the diastatic digestion of starch, nor in the gastro-pepsin digestion of albuminoids, has fat been acted upon. The fat of adipose tissue is liberated from its albuminoid envelope in the stomach—that is all.* But when the contents of the stomach pass the pyloric ring into the duodenum, and are mixed with the bile, then fat commences to undergo a transformation. It is not digested by any change, or metabolism in its chemical composition, any hydration by the addition of a molecule of water, as is the case when starch is converted into sugar, and proteids into peptones; it is, so far as we yet know, merely emulsified. This emulsification of fat, by the reduction of it to minute globules, renders it small enough to be taken up by the intestinal villi; without such emulsification fat could not enter the tiny terminal endings of the lacteals in the villi of the intestine. For such emulsification an alkaline medium is essential. The bile renders the food acid in the stomach, alkaline in the intestines. In an alkaline medium the pancreatic secretion is active; and in an alkaline medium only. In this alkaline medium the pancreatic diastase resumes the digestion of starch; trypsin converts proteids into peptones; and fat is further emulsified. So we see that when fat assimilation is defective the use of an artificial pancreatic secretion aids the further digestion of starch and albuminoids, as well as acting upon fat. Consequently when we resort to an artificial pancreatic secretion we must take care to see that it is not killed, or rendered inoperative forever, by some gastric acid remaining in the stomach. It is this "acid gulf" in the stomach which we have to guard against, else our artificial pancreatic secretion is useless, of no earthly avail. It is necessary then to protect the artificial pancreatic secretion by a solution of soda; and soda is unpalatable, to put it mildly. Dr. Roberts therefore advocates ten or fifteen grains of bicarbonate of soda, to be taken with the dose of *Liquor Pancreaticus* at "the tail of the digestive act." This passes it safely through the stomach: just as a guard of soldiers sees a merchant conveyed over an unsettled frontier infested by robbers. Whatever preparation of pancreatine be adopted

* Probably even the digestion of the albuminous envelope goes on in the stomach to a limited extent only. As the envelope is digested, the free fat remains, and so prevents the acid gastric juice from acting upon the centre of the piece of adipose tissue. Thus the periphery only is digested in the stomach. In the alkaline medium, so soon as trypsin dissolves the albuminous corpuscles, the fat, so freed, is emulsified, and thus the trypsin can act upon the internal portion. Thus the digestion of fat, even as adipose tissue, is mainly the work of the pancreas aided by the bile.

there seems nothing for it but the alkaline guard to see it through the stomach. An oil emulsified by the admixture of a small quantity of bile and a small amount of pancreatic secretion would, in all probability, aid the natural pancreatic digestion. On this matter, however, we can only speculate in theory; clinical facts alone can positively determine the matter. The proper time to administer the artificial pancreatic secretion is when the contents of the stomach are finally escaping through the pyloric ring, at least an hour and a half after an ordinary meal. The time varies in different individuals, and how to determine this we do not yet know. But when the gastric digestion is over no more juice is secreted, and what has been secreted has probably spent itself upon the food-contents of the stomach. The alkali neutralizes any remaining acid, and so protects the trypsin from the deadly effects of an acid upon it. Soda is the natural alkali in bile; and therefore the alkaline guard of the trypsin should be a solution of soda.

So used and guarded artificial pancreatic secretion contains the greatest promise in dyspeptic cases. A four ounce bottle of Liquor Pancreaticus contains 32 doses of one teaspoonful (that is an old-fashioned small teaspoon) or rather one drachm each. To give 32 doses of bicarbonate of soda (fifteen grains), involves a solution of one ounce of the soda in sixteen ounces of water; dose, one tablespoonful with each teaspoonful of Liquor Pancreaticus.

In many cases the administration of Liquor Pancreaticus causes the most satisfactory improvement in the patient's condition. The muscles become plump; the subcutaneous fat once more fills out the wrinkled skin; the brain is fed; and with this comes back the lost sense of energy, of fitness for work.

In some cases the disablement of the digestive organs is such that it becomes imperatively necessary to resort to artificially digested food. This is much better than feeding by the bowel, which soon becomes so painful that it is impossible to continue it. Feeding by enemata is a last resource, only to be adopted in critical emergencies, when it is invaluable; but it can only be resorted to for a brief period. In acute gastric disturbance, in catarrh, ulcer, and cancer, it is well to do away with the necessity for movement in the stomach as far as lies in our power, by giving the food already digested to a great extent.

Milk and milk-gruel can readily be digested by the methods advocated by Dr. Roberts, to be given shortly.

Partially digested foods can be purchased; but personally, I have never prescribed them. But milk and milk-gruel digested by the Liquor Pancreaticus, have done me Yeoman service in many an intractable case.

They are prepared as follows, and the enema appended is worthy of careful consideration; when an enema has to be resorted to, it is highly important that it have as high a food value as can be given to it.

In thus giving Dr. Roberts' directions verbatim, I am hopeful that the perusal of

them will incline many readers to order the liquor pancreaticus for their patients, who, without the formulæ, might not see the practical forms in which it may be made useful. If, in doing so, I can incline some to try this preparation who might otherwise have remained unacquainted with it, it will be gratifying; and will make some amends for the loan of them to me for my book. Here the reader will see a great many forms of food which can be peptonized with advantage, and without destroying their toothsome-ness.

For the purposes of general indigestion, the liq. pancreaticus is mainly indicated, and will be found to be of much advantage.

In those cases of imperfect assimilation of albuminoids, where there is a plentiful supply of fat in the body, but the muscles are flabby and ill-nourished; or in those cases where there is pain and discomfort immediately after food,—the cases in which the late Dr. Arthur Leared said there was dyspepsia from "insufficiency of gastric juice;" it may be well to give the liquor pepticus.

I.—FOR THE PREPARATION OF PEPTONIZED FOOD.

In peptonizing or partially-digesting food by means of "Liquor Pancreaticus (Benger)," it is important to remember that the liquor must not be added to food of any kind at a higher temperature than 140° Fah. This temperature can be estimated with sufficient accuracy, should no suitable thermometer be at hand, by tasting. If too hot to sip without burning the mouth, it would entirely destroy the activity of the liquor pancreaticus, and must be allowed to cool before such addition is made.

Peptonized Milk.—A pint of milk is diluted with a quarter of a pint of water, and heated to a temperature of about 140° F. (60° C.), (or the diluted milk may be divided into two equal portions, one of which may be heated to the boiling point and then added to the cold portion, the mixture will then be of the required temperature). Two or three teaspoonfuls of liquor pancreaticus, together with ten or twenty grains of bicarbonate of soda (about half a small teaspoonful) are then mixed therewith. The mixture is then poured into a covered jug, and the jug is placed in a warm situation under a covey, in order to keep up the heat. At the end of an hour, or an hour and a half, the product is boiled for two or three minutes. It can then be used like ordinary milk. The object of diluting the milk is to prevent the curdling which would otherwise occur and greatly delay the peptonizing process. The addition of bicarbonate of soda prevents coagulation during the final boiling, and also hastens the process. The purpose of the final boiling is to put a stop to the ferment action when this has reached the desired degree, and thereby to prevent certain ulterior changes which would render the product less palatable. The degree to which the peptonizing change has advanced is best judged of by the development of the bitter flavor. The point aimed at is to carry the change so far that the bitter taste is distinctly

perceived, but is not unpleasantly pronounced. The extent of the peptonizing action can be regulated either by increasing or diminishing the dose of the liquor pancreaticus or by increasing or diminishing the time during which it is allowed to operate. By skimming the milk beforehand, and restoring the cream after the final boiling, the product is rendered more palatable and more milk-like in appearance.

Peptonized Gruel.—Gruel may be prepared from any of the numerous farinaceous articles which are in common use—wheaten flour, oatmeal, arrowroot, sago, pearl barley, pea or lentil flour. The gruel should be very well boiled, and made thick and strong. It is then poured into a covered jug, and allowed to cool to a temperature of about 140° F. Liquor pancreaticus is then added in the proportion of a tablespoonful to a pint of gruel, and the jug is kept warm under a cosy, as before. At the end of a couple of hours, the product is boiled, and finally strained. The action of the pancreatic extract on gruel is two-fold: the starch of the meal is converted into sugar, and the albuminoid matters are peptonized. The conversion of the starch causes the gruel, however thick it may have been at starting, to become quite thin and watery. Peptonized gruel is not generally, by itself, acceptable food for invalids, but in conjunction with peptonized milk (peptonized milk-gruel), or as a basis for peptonized soups, jellies and blanc-manges it is likely to prove valuable.

Peptonized Milk-Gruel.—This is the preparation of which I have had the most experience in the treatment of the sick, and with which I have obtained the most satisfactory results. It may be regarded as an artificially digested bread and milk, and as forming by itself a complete and highly nutritious food for weak digestions. It is very readily made, and does not require the thermometer. First, a good thick gruel is prepared from any of the farinaceous articles above mentioned. The gruel, while still boiling hot, is added to an equal quantity of cold milk. The mixture will have a temperature of about 125° F. (52° C.). To each pint of this mixture, two or three teaspoonfuls of liquor pancreaticus and twenty grains of bicarbonate of soda (half a small teaspoonful) are added. It is then kept warm in a covered jug under a 'cosy,' for a couple of hours, and then boiled for a few minutes, and strained. The bitterness of the digested milk is almost completely covered in the peptonized milk-gruel; and invalids take this compound, if not with relish, without the least objection.

Peptonized Soups, Jellies, and Blanc-Manges.—I have sought to give variety to peptonized dishes by preparing soups, jellies, and blanc-manges containing peptonized aliments. In this endeavor I have been assisted by a member of my family, who has succeeded beyond my expectations. She has been able to place on my table soups, jellies, and blanc-manges, containing a large amount of digested starch and digested proteids, possessing excellent flavor; and which the most

delicate palate could not accuse of having been tampered with. Soups were prepared in two ways. The first way was to add what cooks call 'stock' to an equal quantity of peptonized gruel or peptonized milk-gruel. A second and better way was to use peptonized gruel, which is quite thin and watery, instead of simple water, for the purpose of extracting shins of beef and other materials employed for the preparation of soup. Jellies were prepared simply by adding the due quantity of gelatine or isinglass to hot peptonized gruel, and flavoring the mixture according to taste. Blanc-manges were made by treating peptonized milk in the same way, and then adding cream. In preparing all these dishes, it is absolutely necessary to complete the operation of peptonizing the gruel or the milk, even to the final boiling, before adding the stiffening ingredient. For, if the liquor pancreaticus be allowed to act on the gelatin, the gelatin itself undergoes a process of digestion, and its power of setting on cooling is utterly abolished.

Peptonized Beef-Tea.—Half a pound of finely minced lean beef is mixed with a pint of water and twenty grains (half a small teaspoonful) of bicarbonate of soda. This is simmered for an hour and a half. When it is cooled down to about 140° Fahr. (60° C.) a tablespoonful of the liquor pancreaticus is added. The mixture is then kept warm under a cosy for two hours, and occasionally shaken. At the end of this time, the liquid portions are decanted and boiled for five minutes. Beef-tea prepared in this way is rich in peptone. It contains about 4.5 per cent. of organic residue, of which more than three-fourths consist of peptone; so that its nutritive value in regard to nitrogenized materials is about equivalent to that of milk. When seasoned with salt, it is scarcely distinguishable in taste from ordinary beef-tea.

Another way.—One pound of finely-minced lean beef is mixed with a pint of water, and simmered for an hour and a half. The resulting beef-tea is then decanted off into a covered jug. The undissolved beef-residue is beaten with a spoon into a pulp or paste, and added to the beef-tea in the covered jug. When the mixture has cooled down to 140° Fahr. (or when it is cool enough to be tolerated in the mouth), a tablespoonful of the liquor pancreaticus is added, and the whole well stirred together. The covered jug is then kept warm under a cosy for two hours; and the end of this time the contents of the jug are boiled briskly for two or three minutes and finally strained; it is then ready for use.

The extreme solubility of digested products, whether of starch or of proteids, detracts from their acceptability to the healthy. To them they appear thin and watery; they miss the sense of substance and solidity which is characteristic of their ordinary food. But to the weak invalid without appetite, this sense of substance or thickening is generally an objection, and they take with more ease an aliment which they can drink like water. The jellies and blanc-manges, on the other hand,

give to invalids of more power that sense of resistance and solidity which is desired by those of stronger appetite. The greater variety which can now be given to this form of food will obviate the monotony sometimes complained of under the continuous use of peptonized milk-gruel.

The Use of Liquor Pancreaticus as an Addition to Food shortly before it is Eaten.—Certain dishes commonly used by invalids—farinaceous gruels, milk, bread and milk, milk flavored with tea, or coffee or cocoa, and soups strengthened with farinaceous matters or with milk—are suitable for this mode of treatment. A teaspoonful or two of the liquor pancreaticus should be stirred up with the warm food as soon as it comes to table. And such is the activity of the preparation that, even as the invalid is engaged in eating—if he eat leisurely, as an invalid should—a change comes over the contents of the cup or basin; the gruel becomes thinner; the milk alters a shade in color, or perhaps curdles softly; and the pieces of bread soften. The transformation thus begun goes on for a time in the stomach; and one may believe that, before the gastric acid puts a stop to the process, the work of digestion is already far advanced.

This mode of administering liquor pancreaticus is simple and convenient. No addition of alkali is required, and of course no final boiling. The only precaution to be observed is that the temperature of the food, when the extract is added, should not exceed 150° F. (65° C.). This point is very easily ascertained; for no liquid can be tolerated in the mouth, even when taken in sips, which has a temperature above 140° (60° C.). If, therefore, the food is sufficiently cool to be borne in the mouth, the liquor pancreaticus may be added to it without any risk of injuring the activity of the ferments.

2.—FOR MEDICINAL ADMINISTRATION.

When given with a view of aiding the digestion of starchy food, one to two teaspoonfuls should be administered in a little warm water *with* meals. Taken in this way it acts in the same manner as Malt Extract, but much more powerfully.

When liquor pancreaticus is given with a view of aiding intestinal digestion, one to two teaspoonfuls, with a pinch of bicarbonate of soda, dissolved in half a wine-glass of water, should be taken two or three hours *after* a meal.

3.—LIQUOR PANCREATICUS AS AN ADDITION TO NUTRITIVE ENEMATA.

Liquor pancreaticus is peculiarly adapted for administration with nutritive enemata. The enema may be prepared in the usual way with milk-gruel and beef-tea; and a dessert-spoonful of liquor pancreaticus should be added to it just before administration. In the warm temperature of the bowel, the ferments find a favorable medium for their action on the nutritive materials with which they are mixed; and there is no acid secretion to interfere with the completion of the digestive

process, or the preparations of pepsin, or of the vegetable papuan, which is a most potent agent in the digestion of albuminoids—vegetable though it be.

CHAPTER V.

TISSUE NUTRITION.

"FROM the food the blood is fed; from the blood the tissues are fed." In the first place, then, we must have healthy blood for the formation and maintenance of healthy tissues. The blood in its ceaseless round carries pabulum to the tissues of the body. The little artery, with its vitalizing fluid, carries a supply of albuminoid material to the tissues in excess of their wants. A large quantity flows on through the capillaries into the corresponding venule, and soon rejoins the bulk of the circulating fluid. A portion of the serum passes through the capillary walls and feeds the tissue; the surplusage being taken up by the lymphatics, and so preserved for future use. It is desirable to have clear views about this matter of tissue-nutrition. The whole of the serum does not flow through the capillaries into the small veins, a part passes into the tissues. In order to maintain a balance betwixt the parts and their supply of pabulum, there is the lymphatic vessel. The surplusage is taken up by this lymphatic, and returned to the blood by the thoracic duct. Thus the surplusage is removed from the tissue and saved from waste, or even being positively harmful. If the surplusage were not removed, there would be over-nutrition of the part with hypertrophy. Thus, when John Hunter placed a cock's spur in a cleft made in the bird's comb, the spur grew to a most abnormal extent. When there is a disturbance in this natural balance betwixt supply and demand, then hypertrophy is the result. The son of a friend of mine wore a high shoe on one foot. But the high shoe was on the sound leg. He had a great enlargement of the other leg from obstruction in the lymphatics, and it grew disproportionately from the excess of nutritive fluid in the tissues; so much so, that he had to wear a high shoe on the foot of the normal limb.

Such elongations of limbs from chronic inflammation in their joints, is a not-uncommon phenomenon. We know that when the venous system is engorged from valvular disease of the heart, we get a development of pathological connective-tissue in the different viscera, especially the liver, spleen, and kidneys; though the lungs, the brain, and the uterus, may be enlarged, or rendered of denser texture, or both. Around a chronic ulcer there is a vascular zone, which produces epidermal scales in excess, and on which the hairs grow to a gigantic size. Some diseases tend to produce local disturbances of nutrition, notably syphilis, and struma. Syphilis produces nodes under the periosteum, and gummata elsewhere,—active proliferation of connective-tissue corpuscles. Cancer is the production of histological elements out of place or out of time. Scirrhous is cartilage

where no cartilage should be. Colloid, so often found in the ovaries, is only the sarcode of the umbilical cord. Osteocephaloma is a growth of cells from the bone identical with the cells of the marrow of the foetal bones. It is then not truly heteromorphic; it is normal tissue, out of place, or out of time. Colloid in the ovaries, marrow cells in the cancer springing from bone; these tell of an association which is certainly not accidental.

Struma is essentially a disease of hyperplasia of connective tissue; a growth, in excess, of cells of inferior quality. The enlarged glands, the thickened epiphyses of the long bones; what are they but hyperplasia of elements found there normally? The neoplasm is an inferior or degraded form of cell-life; nothing strictly new. In tubercle there is a growth of lowly cells along the course of the tiny arteries. These imperfect cells crowd upon each other; and if this crowding goes so far as to press upon the nutrient arterioles, then there is danger of their death, of molecular necrosis. Thus tubercle softens, breaks down, and is expectorated. If the crowding of these imperfect cells in a gland passes a certain point, the gland structure breaks down into a scrofulous abscess. It is the same method of procedure, viz., the development of cell elements about the nutrient vessels, which causes the ripe apple to drop off; which fills up two of the three holes in a cocoa-nut, and then gradually fills up the third, till the fibres can no longer bear the weight, the nut drops off from its attachment, and comes to the ground. So when the abnormal cell elements accumulate till they press on the nutrient arteriole, the part so cut off from its pabulum dies. Thus we find we have disturbances of tissue—nutrition in the direction of excess—of excess of quantity with deterioration of quality.

Then there is atrophy from mal-nutrition, local or general. Phthisis, consumption, or "a wearing," the old vulgar term for wasting disease, is general mal-nutrition from impairment of the digestive and assimilative processes.

Then we see persons, at other times, with flabby ill-fed muscles, yet well clad with fat. Their adipose tissue is sufficiently fed, but not their muscles. Here there is defective assimilation of albuminoids, while the digestion of starch and fat is normal and unaffected. Indeed, as is well seen in chlorotic girls, there is an inverse proportion established, the muscles are flabby, while there is a positive accumulation of fat. They are breathless; partly because they are anæmic, partly because their heart and diaphragm are half-starved. The assimilation of albuminoids is impaired, and especially is the formation of that complex body hæmoglobin interfered with. The red corpuscles are deficient, and oxidation is impaired. When improvement is inaugurated the red corpuscles are increased in number; the muscles fill out, while the fat in the body is diminished. Such are the various steps in the process of the restoration of health.

Then at other times there is a distinct defi-

ciency in the assimilation of fat. One of the difficulties of modern, or rather recent times, is the growing inability to take fat; children now, in a great many instances, simply loathe fat, especially a lump of adipose tissue. They can take cod-liver oil, even like it; they can take the fluid fat of fried bacon; they can take butter; but animal fat *en masse* they turn from with repulsion. Granting that in many instances the objection has no better foundation than a silly notion that it is "vulgar" to eat fat, still there remains an unpleasantly large proportion in whom the repugnance to fat is genuine and unaffected. When this rejection of fat has proceeded a certain length, then phthisis looms up. A certain amount of fat is apparently essential to the formation of perfectly healthy tissue; and when the system is imperfectly supplied with fat, then tissue deterioration is apt to show itself. This holds good of animals as well as man. Tubercle is common in the lungs of sheep and oxen; and it is quite a frequent occurrence to find withering tubercular masses in the animals when fattened—a recovery after the starvation of a previous hard winter. When starved or partially so, these inferior cell-elements are formed; when the nutrition is improved then normal tissues are formed, healthy and sound,—and the lowly histological elements wither. With the consumptive, we try to get them to take fat, the easily assimilable cod-liver oil being the fat mainly used; but, in some cases, other oils or cream will do very well; if they can take it and assimilate it, then recovery takes place. Fat is so furnished for histological elements, and then the tubercular process is stayed; and the patient's life is saved.

It is not asserted that this is all, the complete whole, of the production and cure of tubercle; but it is an important part of the subject, this inability to assimilate fat. Without a sufficiency of fat the cell-elements are imperfect, they are produced in excess with deterioration of quality. In the present state of our knowledge, we are unacquainted with any agents which act directly upon tissue-nutrition. The tissues are fed from the blood; and "deteriorated tissues need for their regeneration the baptism of healthy blood;" to improve the blood is the way to the regeneration of the tissues. We can only feed the body through the blood; the blood is fed from the food we eat. If we can improve the blood we can feed the tissues.

We know that we may have anæmia with fair, indeed good general tissue-nutrition. The assimilative and constructive processes are equal to the commoner tissues; but they cannot build up hæmoglobin. Hæmoglobin has this formidable looking formula:

$C_{82-85}, H_{7-9}, N_{16-17}, O_{21-24}, S_{0-3}, Fe_{.45}$
with some 3 to 4 per cent. of water of crystallization, (M. Foster). We can readily understand how the power to construct less complex bodies may be retained, yet the capacity to build up hæmoglobin may be lost for a time; and require medicinal treatment for its restoration. We see how certain blood-poisons, lead, mercury, malaria, gout, and syph-

ilis, may render a person anæmic; yet their general nutrition may be little, if at all, affected. We know that when there is such a toxic element present iron will not cure the anæmia, however potent in simple anæmia, until the specific in each case be added: and then improvement sets in. With the two mineral poisons it is necessary to eliminate them from the system, to relieve it from their presence, ere blood-formation can proceed. In malaria we give quinine, in gout lithia and potash, in syphilis mercury or iodide of potassium, with iron; and then the iron is operative: without the specific, chalybeates are like an arrow without a head. The clinical relations of anæmia teach us a valuable lesson as to the loss of power in the system to construct the complex substance, hæmoglobin.

Another lesson in the same direction is taught us by the nervous system; the loss of nervous energy, the prostration, the unfitness for toil, necessitating a holiday, now so commonly experienced. Here it would seem, there is impairment of the ability to construct lecithin. Lecithin is complex fat containing phosphorus and nitrogen.

"Lecithin C_{44}, H_{90}, NPO_8 , occurs widely spread through the body. Blood, gall, and serous fluids contain it in small quantities, while it is a conspicuous component of the brain, nerves, yolk of eggs, semen, pus, white blood-corpuscles, and the electrical organs of the ray." This is what Michael Foster says about lecithin. The well-known association betwixt a heavy seminal expenditure and the loss of nervous energy, upon which quacks and charlatans have traded so largely, is thus intelligible and comprehensible. Its presence in the electrical organs of the ray is not devoid of significance. This lecithin is a subject upon which we will have soon to know more than we do at the present time. Just as the complex hæmoglobin is a constituent factor of red blood-corpuscles, so we will find this complex fat—lecithin—a constituent factor of nerve-cells and fibres. We do not know enough of the subtle changes which lie at the foundation of the loss of nervous energy so well or intimately as the associations of anæmia; but there is much pointing in this direction, viz., that it is linked with an insufficiency of lecithin. It is either used up too freely by overwork, or worry, which is still more exhausting; or it is formed imperfectly from some impairment in the assimilative processes. It seems probable that this complex fat is the food *par excellence* of the nervous system. That without it nervous energy cannot be manifested. Further we may not yet affirm.

But it is perfectly legitimate to throw together a few clinical facts bearing on the matter, which speak with a not quite inarticulate sound. When the nervous system has been severely overtaxed for a considerable time, it may give out evidences of exhaustion; while the muscles are well-nourished, and the adipose tissue of the body is not diminished. It is clear that here there is a localized mal-

nutrition, restricted to the nervous system. The serous fluids, including the serum of the blood, contain lecithin in small quantities; therefore exhaustion of this substance in the nervous system would require time for its repair; and if the nervous system is still called upon, it must furnish evidences of exhaustion and diminished capacity, until the normal proportion of lecithin is restored. Rest for the nervous system permits of the re-accumulation of this complex phosphorized fat. Then we find phosphorus advocated for nervous exhaustion and depression. "Ohne phosphor keine gedanke," was Moleschott's dictum now so widely known—"Without phosphorus there is no thought.") But this phosphorus has to be formed into a fat before it can be of service. Not only thought, but motor messages involve the oxidation of this complex fat. Lecithin, cerebrin, and neurin, are complex substances, found in the nervous system; though the two latter are simpler, not containing phosphorus. But the decomposition of these complex bodies is essential to nervous energy. Neuralgia is like most pain, the prayer for healthy blood. "Pain is the prayer of a nerve for healthy blood," wrote Romberg; and most certainly this is true of neuralgic pain. Neuralgia is intimately linked with the presence of poisons in the blood—mineral, malarial, or produced within the body. Neuralgia is at other times the offspring of simple anæmia, mere bloodlessness. Neuralgic pain tells of unhealthy blood; blood either containing a positive poison, or itself deficient in nutrient material. The rest of the body may be fairly well nourished; but neuralgia, and a sense of lethargy or unfitness for work, may tell that the nervous system is underfed—that the organism is unequal to the formation of those complex substances, the food of the nervous system.

So far as we know it is in the preparation of these complex matters for the blood and the nervous system—neither of which exists in plant life—that animal synthesis exhibits itself. Bone is the infiltration of lime into ordinary cartilage: but hæmoglobin and lecithin are complex bodies, built up in the animal organism. Starch, sugar, fat, are built up from carbonic acid and water; albumen from these and free ammonia in the air. All are synthetically built up by vegetable life, and appropriated by animals. Animals evolve energy by the union of these substances with oxygen; they pull to pieces and oxidize the construction of plant life, and in doing so evolve heat and force. But the oxygen-carrying hæmoglobin, the force-liberating lecithin, are essentially the creation of animals themselves; who build them up from less complex substances.

The complexity of these nerve matters are associated somehow with the immense "liberating-power" that they possess. The respiratory centre occupies a little space in the medulla, but its rhythmic discharges set off a large series of muscles; and when its explosions are stimulated by the presence of carbonic acid in excess in the blood, all the

muscles of the body may be more or less thrown into action. No wonder then that at times the system is unequal to the construction of these elaborate compounds; when it can carry on successfully the digestion, assimilation, and transformation of ordinary materials—built up by vegetables originally, and appropriated by animals. No wonder either that when the power to build up these products of animal synthesis is lost, it may require some time before the system can regain it. The conversion of spare hydrocarbons within the system into fat, and even spare proteids, though this is rather fatty histolysis, and the development of adipose tissue is not to be compared to the construction of hæmoglobin and lecithin, the two most complex products of the body; the two which must, and only can be built up by animal synthesis. So much then for the loss of power to construct complex bodies.

At other times there exists a loss of power to assimilate albuminoids, and then the muscles suffer chiefly, and especially the two muscles in constant action,—the heart and the diaphragm. This is a practically important matter, as a heart so weakened is not uncommonly mistaken for a heart undergoing fatty degeneration. In the general evidence of loss of power in the heart the two conditions are almost identical. There is this difference, however, "fatty degeneration" is a condition the gravity of which it is impossible to underrate; while "heart starvation" is a condition carrying with it little cause for apprehension, except in those conditions of acute failure in pyretic states of blood poisoning, where the heart's action becomes exceedingly rapid and fluttering; a condition fraught with extreme danger. But "heart starvation" as ordinarily seen is a condition of some permanency, and not a truly "acute" condition.

When the digestion of albuminoids is defective then the blood cannot furnish to the muscular structures the pabulum required for the maintenance of their integrity; consequently they are ill-nourished and their functional activity is impaired. When the heart is so enfeebled and the diaphragm also half-starved, then there are disturbances in the circulation which closely resemble the symptoms of the fatty heart. The heart-sounds are ill-defined and less audible than normal, while the heart's impulse is lost or nearly so. The pulse is feeble and compressible. There is a tendency to fainting, while the mental operations are confused, the brain being imperfectly supplied with blood. There is a feeling of unsteadiness, or lack of self-reliance, which is very distressing. The patient sighs, and there are seizures when the respiration is arrested. Indeed, the symptoms and sensations are those given by Da Costa, in his admirable work "Medical Diagnosis," as some of the indications of the fatty heart. But "fatty degeneration" as a disease of advanced life is distinctly senile in its aspect, while "heart starvation" is a malady of middle life. One presents the *tout ensemble* of age,—of widespread senile degenerative change; the other is rather an in-

valid, as a person pulled down with dysentery, or tropical fever. At a distance, the tottering gait, the unsteady step, the bowed figure leaning on a stick, may belong to each alike; but on nearer approach, the resemblance fades out, and the points of dissimilarity become obvious. Nevertheless, it is by no means rare to see cases in which "heart-starvation" has been mistaken for the "fatty heart." Indeed, the resemblance is so close, and the general practitioner has so many things to attend to on the one hand; while on the other, our acquaintance with the heart "as a muscle" has not kept pace, or anything like it, with our acquaintance with the valvular diseases of the heart, of which the "murmur" is the indication *par excellence*; that such mistake does not always involve either carelessness or culpable ignorance. But in the absence of the significant murmur, the presence of distinct debility in the heart is mystifying to the ordinary practitioner, and calls up the fear of "fatty degeneration;" and not unnaturally so.

The knowledge which one man acquires by the sweat of his brow, after years of patient toil and painstaking observation, cannot be transferred in its entirety to another; there is no "royal road" to knowledge.

Individual acquired skill cannot be passed from brain to brain, any more than the juggler who can keep six balls in the air at once, can endow an onlooker with like capacity, by merely showing him "how it is done." The muscles, and still more their representatives in the motor area of the brain-hemispheres, require a long training before this manual skill can be acquired. So it is in other matters. It is not difficult to say how the diagnosis between the "fatty heart" and "heart starvation" is to be made; but without individual toil to acquire the requisite capacity, the reader cannot attain it. There is no royal road to the discrimination betwixt two allied conditions, especially when the resemblance is so close as it is betwixt the fatty heart and its double,—heart starvation.

There are in each the same signs on physical examination of the heart; in each the same cold extremities, indicating want of blood in the arteries; in each the evidences of cerebral anæmia; in each the same incapacity for exertion and breathlessness on effort; a whole group of symptoms, indeed, is found present in both. But in the fatty heart there are found evidences of senility all over the body. The skin is degenerate, unnaturally smooth and greasy, or furred with myriads of wrinkles; the eye exhibits an arcus senilis (arcus is a "bow" not a "ring"), seen under the upper eyelid long before it is present in that portion of the eye which is seen, and which is exposed to light; while the temporal artery is seen tortuous and meandering like a brook in a flat meadow. He was a wise man, a keen observer, and an accurate thinker, who said "a man is no younger than his arteries" (S. Wilks); and it is the condition of the arteries which is our trustiest guide in making the diagnosis. In the fatty heart the arteries are usually atheromatous, rigid,

and tortuous. In a well-marked case, the temporal artery may be seen to elongate, as well as to widen on the ventricular systole; the radial artery is felt to undergo the same transient change. The arteries feel like tendons, or even pipe-stems. If, at the same time, the pulse is irregular or intermittent, then the fatty heart is present almost to a positive certainty. But where evidences of age are wanting, then in all probability the condition present is that of heart starvation; it not being denied that fatty degeneration is found in certain rare states even in comparatively young persons. But for once that fatty degeneration is so found, fifty times fatty degeneration is diagnosed when heart starvation is the actual state of matters. The digestion of albuminoids is defective and the capacity of the heart and diaphragm is impaired; furnishing a group of symptoms closely resembling those manifested when the heart is the subject of that molecular decay, known as fatty degeneration, or necrosis. Even when there may be ground for the gravest suspicion as to the integrity of the fibres of the heart, the condition may still be one where "starvation" is also present; that is, there is actual degeneration of some of the fibrillæ, while there is starvation in those fibrillæ remaining structurally sound. Such cases are met with from time to time, (see "Heart Starvation," H. K. Lewis; reprinted from the *Edinburgh Medical and Surgical Journal*, May, 1881).

Here it is most important to remember that a small quantity of albuminoids, properly and completely digested, will furnish more tissue-nutrient than a large meal, none of which is thoroughly digested. A dietary of fish, white meat, eggs, milk puddings, with fruit, will digest and feed up a starved heart and diaphragm; when liberal meals rich in meat fail to do so. It is not the amount swallowed, it is the amount digested, which is to be the measure of the active nutritive material in the blood; and from it the nutrition of the starved tissues. In such cases, it is well to aid the feeble natural digestive powers by the addition of pepsin, or the pancreatic preparations. It is somewhat difficult to induce the friends of the patient to believe that such an apparent insufficient dietary is the one calculated to repair debilitated conditions of muscles; but instances can be accompanied by explanation, and the results convince the doubtful and convert them to conviction.

The recognition of ill-fed muscles from impairment in the power of assimilating albuminoids, as a condition involving the heart and diaphragm, is a matter which must engage the attention of the profession in a little time; indeed, when it is sated with nerve pathology and poison-germs, and can turn its attention to something else.

In pernicious anæmia there is great muscular asthenia, and the heart is the subject of actual "fatty degeneration." There is a growing general malnutrition of the muscular system especially, though, as Addison

observed, there may be an increase in the amount of subcutaneous fat. Indeed, in anæmic states, fat is apt to be deposited. The farmer often bleeds his oxen to make them fatten, when they do not feed satisfactorily.

Tissue-nutrition might not inappropriately be otherwise termed "protoplasmic metabolism or digestion."

CHAPTER VI.

SECONDARY INDIGESTION—NEUROAL.—REFLEX.—CARDIAC.—TOXÆMIC.

WE now come to the consideration of those forms of indigestion and mal-assimilation which are secondary conditions, due to disturbances elsewhere, or to the presence of poisons in the body. These will be found to be a large widespread series.

The first of this group of dyspepsie is that due to disturbance of the nervous system, as overwork, worry, anxiety, suspense, or emotion; where the encephalic disturbance interferes with the digestive act. "How thin you are getting!" we remark to an acquaintance. "Yes, I have been a good deal worried of late; I have a lot of work; and lately I have had a good deal on my mind," is the common response. Such is the effect of mental disturbance persisting for some time. Acute indigestion is the result of sudden perturbation. "That the secretion of gastric juice is affected in a very marked manner by conditions of the nervous system, is indicated by the effect of the mental emotions in putting an immediate stop to the digestive process, when it is going on in full vigor," (Carpenter). We are all only too familiar with the consequences of bad news, or other "upset," when at meals. Unconscious previously of the possession of a stomach, or the process known as the digestive act, we suddenly feel a lump in the epigastrium, and an accompanying conviction that the meal is wasted. This is the effect upon perfectly healthy persons; more marked is the disturbance in those who suffer from indigestion. Vomiting may occur, or diarrhœa; either clearing away the spoiled victuals, but by a process the reverse of pleasing. If neither occur, then the undigested material is the source of disturbance for some time afterwards. The reaction of this upon the nervous system is productive of great discomfort; indeed, in some, acute misery is induced thereby.

Dr. Carpenter, F. R. S., the author of the well-known works on Physiology, has paid considerable attention to the effects of mental conditions upon the organic processes; and it may be well to make several quotations from his writings on the subject. By so doing, the reader will be put in possession of the views of the illustrious physiologist; which may carry with them, too, more weight than my unsupported word. After giving the effects of emotion upon other secretions, he proceeds to speak of those connected with the digestive act.

"The flow of *saliva*, again, is stimulated by the sight, the smell, the taste, or even by

the *thought* of food; especially of such as is of a savory character. On the other hand, violent emotion may suspend the salivary secretion; as is shown by the well-known test, often resorted to in India, for the discovery of a thief amongst the servants of a family—that of compelling all the parties to hold a certain quantity of rice in the mouth during a few minutes, the offender being generally distinguished by the comparative dryness of his mouthful at the end of the experiment. There is much reason to believe that the secretion of the *gastric* fluid is affected, in the same manner as that of the saliva, by the impressions made by food upon the senses; for it has been ascertained by Bidder and Schmidt, that it is copiously effused into the stomach of dogs that have been kept fasting, when flesh or any other attractive food is placed before them. That the secretion, on the other hand, is entirely suspended by powerful mental emotion, seems almost certain, from the well known influence which this has in dissipating the appetite for food, and in suspending the digestive process when in active operation. As a cheerful state of feeling, on the other hand, seems to be decidedly favorable to the performance of the digestive function; it probably exerts a beneficial influence, as to both quantity and quality, in the secretion of gastric fluid, of the influence of mental states, or other secretions concerned in the reduction and appropriation of the food, (such as biliary, pancreatic, and intestinal fluids), neither observation nor experiment has as yet afforded any satisfactory information. It is a prevalent and perhaps not an ill-founded opinion, that melancholy and jealousy have a tendency to increase the quantity and to vitiate the quality, of the *biliary* fluid. Perhaps the disorder of the organic functions is more commonly the source of the former emotion than its consequence: but it is certain that the indulgence of these feelings produces a decidedly morbid effect by disordering the digestive processes, and thus reacts upon the nervous system by impairing its healthy nutrition." This last is a very significant remark, and throws much light upon many cases where there are evidences of mal-nutrition of the nervous system, taking its origin in emotional disturbance. This transient disturbance perturbs the assimilative processes; and these, in turn, lead to persisting mal-nutrition of the nervous system.

Again, "there is abundant evidence that a *sudden* and *violent* excitement, or some depressing emotion, especially terror, may produce a severe and even a fatal disturbance of the organic functions; with general symptoms (as Guislain has remarked), so strongly resembling those of sedative poisoning, as to make it highly probable that the *blood* is *directly* affected by the emotional state, through nervous agency; and, in fact, the emotional alteration of various secretions, just alluded to,* seems much more probably

attributable to some such affection of the blood, than to a primary disturbance of the secreting process itself. Although there can be no doubt that the *habitual* state of the emotional sensibility, has an important influence upon the general activity and perfection of the nutritive processes—as is shown by the well-nourished appearance usually exhibited by those who are free from mental anxiety, as well as from bodily ailment, contrasted with the "lean and hungry look" of those who are a prey to continued disquietude,—yet it is not often that we have the opportunity of observing the production of change in the nutrition of any specific part, by strong emotional excitement. In the two following cases, the correspondence of the effects to their alleged causes *may* have been only casual; and a much larger collection of facts would be need to *establish* the rationale here advanced as probable. But so many analogous though less strongly-marked phenomena are presented in the records of medical experience, and the influence of the emotions upon the products of secretion is so confirmatory, that there does not seem any reasonable ground for hesitation, in admitting that the same explanation may apply here also. The first of these cases, cited by Guislain, from Ridard, is that of a woman, who, after seeing her daughter violently beaten, was seized with great terror, and suddenly became affected with gangrenous erysipelas of the right breast. But a still more remarkable example of local disorder of nutrition, occasioned by powerful emotion, and determined as to its seat by the intense direction of the attention to a particular part of the body, is narrated by Mr. Carter, "On the Pathology and Treatment of Hysteria." "A lady, who was watching her little child at play, saw a heavy window-sash fall upon its hand, cutting off three of its fingers; and she was so much overcome by fright and distress, as to be unable to render any assistance. A surgeon was speedily obtained, who, having dressed the wounds, turned himself to the mother, whom he found seated, moaning and complaining of pain in the hand. On examination, three fingers, corresponding to those injured in the child, were discovered to be swollen and inflamed, although they had ailed nothing prior to the accident. In four-and-twenty hours, incisions were made into them, and pus was evacuated; sloughs were afterwards discharged, and the wounds ultimately healed." The influence of the state of *expectant attention* in modifying the processes of nutrition and secretion, is not less remarkable than we have already seen it to be in the production or modification of muscular movements. It seems certain that the simple *direction of the consciousness* to a part, independently of emotional excitement, but with the *expectation* that some change will take place in its organic activity, is often sufficient to induce such an alteration; and would probably always do so, if the concentration of the attention was sufficient." This last matter will be referred to again in the consideration of hysterical

* The urine, the sexual secretions, the sweat, and more than all, the milk—the secretion of the mammary gland.

dyspepsia, and hypochondriasis. It has certainly much to do with the occurrence, if not the production, of the "mother's marks" so commonly met with.

In considering the question of how emotion affects the digestive process, Dr. Carpenter says experiments have not led to agreement among observers. He writes "Bernard, with many others, considers that the division of these nerves (the pneumogastriacs), instantaneously checks the secretion of the gastric fluid, and therefore, puts a stop to digestion; and he points to the pallor and flaccidity of the stomach which immediately succeed the operation, the slight and superficial digestion of the alimentary mass which takes place, and to the additional circumstance, that in the rabbit there is a sudden change in the reaction of the urine from alkaline to acid, the latter being the normal condition in the fasting state, and therefore, showing that all action on the food must have stopped. He further observes, that in galvanizing the pneumogastriacs, an abundant flow of gastric juice takes place. Longet, however, maintains that division of the pneumogastriacs operates rather in paralyzing the muscular movements of the stomach, than in stopping the secretion of the gastric juice; for he states that if a small quantity of milk were given to the animal, 24 or even 48 hours after the section, and when, therefore, there could be no gastric juice remaining in the stomach, it has invariably clotted after death, or upon making the animal vomit; and *small quantities* of meat or other food were digested readily enough, though large masses were only superficially digested, because the muscular power of the stomach being paralyzed, the food was not properly intermingled with the gastric juice."

These interesting observations point to several matters of clinical moment. They tell that section of the pneumogastric nerves arrests the secretion of gastric juice with "pallor and flaccidity of the stomach;" that is, the arterioles of the stomach dilate in the act of digestion, when the mucus lining at the same time is wet with the flow of the gastric juice. Thus we see that both (1) disintegration by the muscular movements; and (2) the production of the solvent gastric juice, are arrested; no wonder then that the digestion is hindered! Such probably is the effect of fear and depressing emotions. On the other hand, galvanizing the pneumogastriacs produces an abundant flow of gastric juice. This is analogous to pleasant emotions aiding digestion; and may throw some light upon the time-honored practice of taking wine with food. Paul urged upon Timothy to "drink no longer water, but have a little wine for thy stomach's sake and thine often infirmities;" it seems probable that Timothy had indigestion among his "infirmities." Pleasurable emotions of a cheerful, enlivening character, act like a stimulus through the pneumogastriacs, and dilate the gastric arterioles, promoting the secretion of gastric juice; while increasing the energy of

the muscular movements of the stomach. These observations are in perfect accord and harmony with our practice of giving agents, which so act upon the stomach when the digestive act is defective. Persisting emotions act in the same way but less potently, producing the same results through longer and slower operations. Thus worry, anxiety, "carking care," and other depressing influences, cause a persisting loss of flesh, even when no uncomfortable sensations are complained of; while exhilarating conditions lead to more perfect and complete digestion and nutrition. Shakespere wrote:

"Let me have men about me that are fat: sleek-headed men, and such as sleep o' nights. Yond' Cassius has a lean and hungry look; he thinks too much: such men are dangerous. Would he were fatter! But I fear him not!"—

and we all know how persons emaciated by worry and anxiety, "pick up flesh," when their minds are once more at rest after much perturbation.

The observation that "small quantities of meat or other food were digested readily enough, though large masses were only superficially digested" is one pregnant with instruction as to the dietetic requirements of many dyspeptics. It shows that when the digestion is impaired small quantities of food are digested "readily enough;" while larger amounts were only digested on the surface, the interior being untouched. Not only is the secretion of gastric juice diminished notably, but the movements are abolished so that the disintegration is not accomplished, which fits the food for admixture with the bile and the pancreatic secretion, which is so large a part of the function of the stomach; probably more important than even the digestion of albuminoids in an acid medium, because this last may be supplemented by the pancreatic digestion of albuminoids in an alkaline medium. It shows that in enfeebled assimilation to give small quantities of food is to secure complete digestion, while larger meals undergo little digestion, and have therefore little nutritive value; as is insisted upon in the preceding chapter when speaking of the dietary in "heart starvation." Such then is a part of the aid which physiological research can give to practical medicine.

Impaired nutrition is, then, often the direct outcome of mental disturbance. The most pronounced inveterate case of anæmia, I ever met with personally, occurred in a girl of splendid physique and magnificent family history. She was the type of health when her father fell down by her side at market, and died there and then. She immediately became anæmic and remained so, despite most varied treatment.

Pernicious anæmia about which so much has been written lately, is probably a perversion of nutrition due to nervous disorder, rather than a local disease, "atrophy of the gastric glands;" if atrophy of the gastric glands is actually found after death, it is probably the consequence, rather than the cause of the anæmia; instead of being a rational explanation, in the face of the powers of the pancreatic secretion, it seems rather lik

"putting the cart before the horse." It is a case of distinct loss of the power to assimilate albuminoids, a matter discussed in the preceding chapter. It appears that "there is often a considerable amount of subcutaneous fat;" yet "almost without exception the heart is in a state of fatty degeneration; its walls are pale, flaccid and friable; the interior of the ventricles, and especially of the left ventricle, shows irregular whitish striæ running transversely across the muscular bundles, and especially the papillary muscles" (S. Coup-land). It is a disease only observed in recent times; and is one of the increasing number of perversions of nutrition with which we are becoming familiar now-a-days.

The mental associations of diabetes are very interesting in relation to this subject. Talking one day, with Mr. Van Abbott, whose biscuits for diabetics have such a well deserved renown, I asked him,—“Who are your diabetics mostly?” The reply was very significant—“Business men comparatively old and grey for their years; men who look as if they had a deal in their minds.” This was the response. It stands in a suggestive relationship to the fact of acute diabetes being set up by shock, or other mental perturbation; or of its artificial production, by the puncture of the floor of the fourth ventricle.

The direct nervous connection betwixt the brain and the liver has been shown by Cvon and Aladoff. It contrasts with the mere glycosuria, so common in stout men, where the digestion of starch is perfect, and the liver only dehydrates enough into glycogen for the wants of the system; the surplussage running off by the kidneys. Here, if it were not for this “waste pipe,” the individuals would become inordinately fat. Such glycosuria is a totally different matter from the diabetes, which leads to wasting; where either (1) the liver has lost the power of dehydrating the sugar, brought to it by the portal vein, the more probable hypothesis; or (2) the ferments in the liver hydrate the glycogen, or animal starch into sugar again, too swiftly for the wants of the body; and the “fuel-food” escapes unburnt. In either case it becomes necessary to feed the patient on food which is not saccharine, and therefore liable to these perversions of dehydration, and secondary hydration. If food can be taken in sufficient quantity and assimilated, which undergoes no saccharine transformation, the diabetic is preserved; if not he perishes. S. Houghton, F. R. S. tells of the diabetic patient dying of inanition, that in the delirium which preceded the final change, he cried out “Fat! roasted fat from the angels of heaven!”

Such perversion of the assimilative processes which is so marked in its various forms at the present day, will be considered in relation to its rapid increase, and the prospects of the next generation and their successors,—if they have any—in a succeeding chapter. The failure of the teeth it will be seen is but one part, one factor in a wide-spread deterioration of the digestive processes. The terrific demand upon the nervous system in

the present “struggle for existence,” and “fight for a competency” is telling with deadly effect upon the organic processes and their nutritive products. Not only do we recognize mental factors in the production of the disturbance of the digestion, in the digestive act in the stomach—ordinarily spoken of as if it were the whole of the digestive act; but we see the liver may be disordered by mental disquietude. Jaundice has been known to be produced by fright, and more chronic functional disturbance of the liver is linked with persisting mental perturbation. Diabetes is set up actually by mental emotion; chronic overwork leads to a more lasting form of mental taxation. Recently Clifford Allbutt, F. R. S., urged with his wonted able advocacy, the mental relationships of chronic renal disease. In his opinion enduring mental anxiety and worry over business difficulties, is a potent factor in the production of chronic Bright’s disease with albuminuria.

Indeed a huge mass of evidence is being collected to show that excessive toil in that portion of the brain which is devoted to the intellectual processes, leads to deterioration of the functions of the viscera, which form part of the organic life. The viscera which provide the pabulum for the intellectual and motor processes, *i.e.* the brain and muscular system, become affected in time by the demand upon them, and give way under the strain.

More pronounced is this effect when the posterior lobes, which are linked with our subjective states and our emotions, are involved. Loss of appetite, the power of all digestion is the common outcome of acute grief. The production of new matters in the blood is shown by the hair turning grey suddenly; even in a single night, as was the case, it is said, with Marie Antoinette and the Prisoner of Chillon. It is quite common to see the hair acquire a distinct grey hue when the person is subject to acute severe mental trouble, a lawsuit, the death of a loved relative, intense suspense in speculation or business, indeed any cause of profound emotion; and to see it lose this temporarily acquired hue, when the cause of the mental perturbation has either passed away, or the blow has been softened by time. The secretion of milk in woman is profoundly affected by mental emotion, indeed may become a deadly poison. Sir Astley Cooper observed two cases of arrest of the secretion from emotion and wrote—“Those passions which are generally sources of pleasure, and which, when moderately indulged, are conducive to health, when carried to excess, alter, and even entirely check, the secretion of milk.” According to Dr. Carpenter, many observers have noted fits of passions in a suckling mother followed by convulsions and death in the infant after being put to the breast. Thus, in one case a tumult arose between a soldier and a carpenter in whose house he was billeted; the carpenter’s wife rushed in, wrested the sword from the soldier, and broke it in pieces. “While in this strong excitement, the mother took up her child

from the cradle, where it lay playing, and in the most perfect health, never having had a moment's illness; she gave it the breast, and in doing so sealed its fate. In a few minutes the infant left off sucking, became restless, panted, and sank dead upon its mother's breast." It is clear that the disorder in the secretion provoked by mental emotion produces some very active poison, acting rapidly upon the nervous system with deadly effect. Convulsions usually are provoked; nor is this perversion of secretion in emotion confined to human beings. Carpenter writes, "Another case was that of a puppy, which was seized with epileptic convulsions, on sucking its mother after a fit of rage."

Such are the acute perversions which produce toxic matters in the milk of a mother when she is emotionally excited.

The mental disturbance sets up modifications of secretion which result in the formation of a poison acting mainly, if not entirely, upon the nervous system.

So in more chronic and persisting conditions. A mental upset disturbs the nutritive processes, and the changes so induced react upon the nervous system: consequently we can comprehend how persisting depraved nutrition can be traced to a particular period of mental disturbance by the sufferer, with a fair show of reason for what is stated. The most intractable case of dyspepsia with malaise, lethargy, inability for exertion, a disordered state of the bowels, with furred tongue, a hot bitter taste in the mouth on waking; all the evidences indeed of disordered digestion with the production of abnormal "by-products of digestion," which ever came under my notice, was that of a returned East Indian. This gentleman came of a healthy stock, was a well nourished person, took a very high place in the examination for the East Indian Civil Service; continued his labors; took one thing after another, far outstripping all his competitors: with what result? This! His digestive apparatus became so thoroughly disordered that he was compelled to retire from duty, to come home to England, to do nothing. A confirmed dyspeptic, his bodily comfort destroyed, his prospects clouded darkly, crippled in the race for life; he has to sit helplessly looking on, while his old competitors diminish the space betwixt him and them, and then overtake him; after that, see them going onward leaving him hopelessly behind. If he were not a man of high moral principle he would be driven to suicide!

Another more ordinary case was that of a gentleman in a business house in South Wales. He had charge of a branch of the business, was an energetic active man, industrious, persevering, and painstaking. Feeling it would be an advantage to be acquainted with the French language, he sat up at nights to learn it. Under this additional strain his health broke down. He seemed rather surprised when told that he had been, from a medical point of view, guilty of a piece of consummate folly: for, from a business point of view his conduct merited the

highest commendation. He omitted from his calculation the matter of his health. His digestion broke down, he began to sweat at nights, and his left lung was not above suspicion. Fortunately his employers, knowing his value, took alarm and sent him to me at once, before the mischief had gone any length. He was put upon tonics, and advised to go a trip into the Mediterranean in one of their vessels; and then to go to France for a time, so as to acquire the language without overworking. The result of his overwork was a breakdown: a very common matter. He just lost the time which would have enabled him to have acquired French in a less violent hurry. He is now well, and free from any chest ailment.

Such then are examples of a class of cases sadly too numerous at the present time. In this generation men will not be content to move at the leisurely pace of their grandfathers. Mr. Deane, in "the Mill on the Floss," spoke to his nephew Tom Tulliver as follows:—"The world goes on at a smarter pace now than it did when I was a young fellow. Why, sir, forty years ago, when I was much a strapping youngster as you, a man expected to pull between the shafts the best part of his life, before he got the whip in his hand. The loom went slowish, and fashions didn't alter quite so fast; I'd a best suit that lasted me six years! Everything was on a lower scale, sir, in point of expenditure, I mean. It's the steam, you see, that has made the difference; it drives on every wheel double pace, and the wheel of fortune with 'em." And so men push, and strive, and struggle, and attain their end,—or break down in trying. It is the old Anglo-Saxon plan to find out what can be done by overdoing, and so learning the extreme limit. A butcher's boy was spokesman for his race, when summoned before the magistrates at Teddington, for furious driving; the constable stated the mare was going thirteen miles an hour, when the boy triumphantly refuted him by saying,—“She can't do it; she has not got it in her!” He evidently knew to a nicety what she could do, by noting what she could not do. So it is in the present pace of life. It is faster! faster! Our steeplechasers gallop faster than their old-fashioned half-bred predecessors; our fox-hounds run faster than of yore, till our hunters have to be nearly thorough-bred to keep pace with them. It is the pace at which we live that overtaxes our organic processes, and the digestive processes breaking down under the strain. It is the early period at which the pace is put on which is telling. Our racehorses are trained so young, that they soon are unfit for the racecourse; how few horses are there now who are good for anything at six years old! Old Forrester was racing long years after any horse is now put to the stud; but probably he never ran as a two-year old. Eclipse was five years old before he was trained. As with horses, so with men. A man used to be satisfied to have earned a competency at 60; now he strains to retire at 45 with a fortune. As with men, so with racehorses; the

difficulty is to keep up their appetite and digestion. This it is which bothers the trainer. The young horses "go off their feed," and then the training is suspended. Quinine, with acids and gentian, is in vogue in trainers' establishments, to keep up the young scions of a famous stock. In the high-bred racer, the digestive organs give way under the demands upon them, made too early. As the trainer has to whip up the appetite of his two-year-old: so the Lincolnshire grazier finds it pay him to cook a part of the food for his stall-fatted stock. Perhaps in a few years it may be necessary, or anyhow, profitable, to give these oxen tonics. To what, then, are we coming? Tonics, artificial digestive agents, or even artificially digested food, may be palliative as regards the individual, but they cannot be regarded as curative as to the race. For our successors something else is necessary; and what that "something" must be will be seen in a subsequent chapter.

There is another aspect of this subject, of the effect of mental attitudes upon the organic processes, which needs a little consideration, especially for those whom it concerns, viz., the hypochondriac; and those who, though not exactly belonging to the class "malade imaginaire," still give too much attention to their subjective sensations. It may be well again to quote Dr. Carpenter verbatim in this matter:

"The influence of the state of *expectant attention* in modifying the processes of nutrition and secretion, is not less remarkable than we have seen it to be in the production of muscular movements. The volitional *direction of the consciousness* to a part, independently of emotional excitement, suffices to call forth sensations in it, which seem to depend upon a change in its circulation; and if this state be kept up automatically by the *attraction of the attention*, the change may become a source of modification, not only in the functional action, but in the nutrition of the part. Thus, there can be no doubt that real disease often supervenes upon fancied ailment, especially through the indulgence of what is known as *hypochondriacal* tendency to dwell upon uneasy sensations; those sensations being themselves, in many instances, purely 'subjective.' In many individuals, (especially females), whose sympathies are strong, a pain in any part of the body may be produced by witnessing it in another, or even hearing described the sufferings occasioned by disease or injury of that part; and if this pain be attended to, and believed in, as an indication of serious mischief, injurious consequences are very likely to follow. So, again, the self-tormenting hypochondriac will imagine himself the victim of any malady that he may "fancy;" and if this fancy should be sufficiently persistent and engrossing, it is not unlikely to lead to real disease of the organ to which it relates. His persistent direction of the attention has a much greater potency, when combined with the *expectation* of a particular result; and thus it happens that the spells of pretenders

to occult powers, in all ages and nations, often produce the predicted maladies in the subjects who are credulous enough to believe in their efficacy. Such was formerly the case among the negroes of the British West Indies, to such a degree, that it was found necessary to repress what was known as "Obeah practices," by penal legislation; a slow pining away, ending in death, being the not uncommon result of the fixed belief on the part of the victim, that "obi" have been put upon him by some man or woman reported to possess the injurious power. So great, indeed, was the dread of these spells, that the mere threat of one party to a quarrel to "put obi" on the other, was often sufficient to terrify the latter into submission. And there is adequate ground for the assertion, that even amongst the better instructed classes of our own country, a fixed belief that a mortal disease had seized upon their frame, or that a particular operation or system of treatment would prove unsuccessful, has been in numerous instances, the real occasion of a fatal result."

I introduce this paragraph verbatim, to put the dyspeptic on his guard about the study of his subjective sensations; as much as to warn the hypochondriac that it is well to try to put away his, or her, morbid dwelling on ideal conditions. It is clear that it is desirable the dyspeptic be cured as soon as may be; not only for his, or her, comfort or well being, but in order to obviate the danger of disordered function leading to structural change from the direction of the attention thereto. There is no imaginary danger, as Dr. Carpenter shows. Even when the sensations of discomfort are present, it is well not to let them absorb the attention; the sufferers should turn their thoughts in other directions, or have them distracted for them. Certainly it is within my personal experience that persons who have long been troubled with indigestion, have died of cancer of the stomach. Nor do I regard these as accidental relationships, or mere coincidences. Long gastric trouble culminated in cancer of the pyloric ring, not that such is a common occurrence; but certainly in a number of cases either gastric cancer had a far reaching history of indigestion preceding it; or long-standing functional disorder led to structural change; whichever way the reader chooses to put it.

It is most desirable then that such sensations as arise from disordered function, are put away as much as possible by actual sufferers; while those whose maladies are centric, and due rather to disturbance within the posterior lobes of the cerebral hemispheres, than to actual disorder in the viscera, will be wise to attend as little as they can to their abnormal feelings. Dr. Hughlings Jackson, F.R.C.P., holds that the liver, indeed, each of the viscera, has its representative area in the brain, just as much as the arm or leg is represented in a distinct and localized area. The hypochondriac feels his sensations in the part to which he refers them; just as other sensations are experienced

which are unreal. The lunatic is not the only individual who has what others regard as hallucinations. What each one feels is known to himself. A patient of mine once felt hairs in his mouth; there were no such hairs. But the impression lasted the remainder of his lifetime. In such a case there must have been a centric disturbance referred to a peripheral cause, in accordance with our common experience. "Phantom limbs" are a not uncommon phenomena; and a man will feel the little finger ache with cold in an arm amputated years before. So in hypochondriasis, probably the disturbance is the primitive sensation in the cerebral area, not the part to which it is referred; but the persistent direction of the attention to the said viscus may in time lead to actual functional disorder, which in its turn may set up structural change in the course of time.

The relations betwixt the brain and the digestive organs are intimate and interesting. Disturbances in the viscera disorder the brain directly, as well as by the abnormal products which reach it through the blood. Disturbance in the posterior lobes, those portions of the hemispheres connected with our internal sensations, may lead in time to disorder in the viscera associated therewith. The direction of the attention operates banefully upon the organs to which it is turned. There are actions and reactions within the complex microcosm; and the organic nervous system has not been denominated "the sympathetic" without good and sufficient reasons. This is an aspect of the subject which must be considered and reflected upon. Its consideration may be disturbing to sundry nervous persons; but that is simply unavoidable, however undesirable. It is all very well for certain enthusiastic individuals to deny themselves wine, which would do them good, in order to set an example of abstinence to those who yield to alcoholic temptation; but the bulk of humanity do not carry their "altruism" to such lengths. Such a way of regarding the linked intimacy of mental states and morbid digestive processes may be alarming to sundry invalids and valetudinarians, but its consideration will be beneficial to a large class, and after all Jeremy Bentham was right when he insisted upon "the happiness of the greatest number" being the thing to be aimed at; for, on the other hand, a mental state may operate beneficially.

Dr. Carpenter continues—

"But, on the other hand, the same mental state may operate beneficially in checking a morbid action and restoring the healthy state. That the *confident expectation of a cure* is the most potent means of bringing it about, doing that which no medical treatment can accomplish, may be affirmed as the generalized result of experiences of the most varied kind, extending through a long series of ages." He then instances cases of "cures" effected by faith and says,— "For although there can be no doubt that in a great number of cases the patients have *believed themselves* to be cured when *no real amelioration* of their condition had taken place, yet there is a large body of

trustworthy evidence that permanent amendment of a kind perfectly obvious to others has shown itself in a great variety of local maladies when the patients have been sufficiently possessed by the *expectation* of benefit, and by *faith* in the efficacy of the means employed." It is quite clear in this matter, that the confidence of the patients will rest upon the confidence with which they are told that they will be cured. If the curer, or thaumaturgus, believe not in the cure, he cannot inspire the patient with faith. If the medical man speak to the patient with doubtful accents and hesitating utterances, he does not inspire confidence; he really sows distrust. This is the explanation of the successful treatment of a case by one man, where another has failed; the remedial measures being much the same. The one carries the patient with him to the restoration of health; the other intensifies a morbid state, and tends to make it permanent.

This is a matter too little thought about. Just as a weak-willed medical man fails to do certain patients good; and lack of decision of character unfits a medical man for dealing with emergencies, where the judgment must be prompt and the action energetic; so the therapeutic nihilist, who doubts the efficacy of drugs, and leaves the patient to nature, disheartens many patients, and leaves them chronic valetudinarians, when in the hands of an enthusiast, the cases would soon move onward to a satisfactory termination. There are some men who are "doubting Thomases": there are others who decry what they do not understand, and depreciate remedies with whose potency they are unacquainted, who do infinite, immeasurable harm to their patients. An eclipse of faith in medicines has now existed some time; but the darkness is beginning to move away, and a return of faith, stronger, firmer, more capable of giving a *raison d'être* for its existence, than in the past, is dawning,—the day-break of happier times for those who are stricken down with illness, or crippled in their working power by incapacity in their viscera. This therapeutic nihilism is a passing wave of opinion, a temporary mental state, the end of which is at hand; and the sooner it is over the better for all. The patient's prospects will be all the brighter; the medical man all the happier for feeling that the patient has got some "value received" in return for his outlay. A healthier condition of thought on matters medical will generally obtain; for quacks, charlatans, and irregular practitioners of all kinds, are to a great extent fostered by the recent want of faith in the medical profession. When a man is sick, what he wishes is to get well; the means is to him a matter of comparative indifference. If he gets his health again, he reckons little whether it is by the means of a notorious quack, or by those of some one possessed of the "hall-mark" of the venerable College of Physicians.

This is a moral aspect of the question which that ancient institution has been rather

nodding over for some years past; and it is quite time that it awakened up to a proper consideration of the subject. The public will not rest patiently quiet till its slumbers are completed; and the sooner the period of awakening arrives the better for all. Stronger faith in the profession as a body, will lead to more belief in the individual units of it; and this in turn will inspire the public. Perhaps those acrid personages who have a distinct line of faith, or rather the want of it, those individuals who believe in Homœopathy, and talk flippantly of "Allopaths," who deny the utility of the Contagious Diseases Act (Human), who are anti-vaccinators; who are blended compounds of scepticism and credulousness; those who are utterly unteachable from prejudice and ignorance "vaunting itself as knowledge," cannot be benefited; not even if their chief diurnal instructor, their "guide, philosopher, and friend," the *Daily News*, was to modify its attitude, and show a livelier interest in matters affecting the public health, and a little more decent respect for the observations of "the natural man." They are an unhelpful class, the obstructionists of all progress in matters sanitary and hygienic; whose self-satisfaction in their ignorance on matters medical, is simply as aggressive and impertinent, as that ignorance is appalling. They are blinded guides in their self-appointed mission of directing the opinions of mankind; but their faith in themselves is unbounded!

Such then are the cerebral relations of disturbances in the digestive processes. They do not necessarily involve a disordered tongue, or constipation, or diarrhœa; or manifest those evidences of dyspepsia, found when the indigestion is primary.

There is another form of indigestion due to nervous disturbance elsewhere, which also carries with it obvious signs of the digestive tract being the sole seat of trouble, as a bare, or raw, or a foul, or furred tongue; but where constipation is commonly found. This is due to a tender ovary, mostly the left. This lies near the rectum, and the passage of fœces causes pain; the pain inhibits the movements of the bowel, and constipation is the result. The accumulated fœces keep up the ovarian tenderness, and the voiding of them produces still more pain. And so the action and reaction work in a downward direction. Such indigestion is properly termed "reflex." It is a very common malady which has been overlooked. It is mentioned by Negrier, Robert Barnes, and Lombe Atthill. I had to learn to decipher it for myself, and first described it in an article on "Ovarian Dyspepsia," in the *American Journal of Obstetrics and Diseases of Women and Children*, Jan., 1878, though it may have been delineated elsewhere; but if so, I am not acquainted with the article.

"The reproductive organs of women are the source of most of her troubles during that period of her life when they are functionally active. Often will far-away irritation in the womb, or ovary, be found to be the cause of the most prominent objective and subjective

phenomena manifested elsewhere. Irritation is not always felt where it arises; the pain is very commonly in the knee when the disease is in the hip-joint; in the right shoulder when the liver is involved. We know that the pregnant uterus, especially in the early months before it has escaped from the pelvis, commonly produces very troublesome vomiting; or it may produce a persisting cough, known in Scotland as "a cradle cough." Vomiting is a common outcome of injury to, or acute mischief in the testicle, as it is a pronounced symptom of a calculus in the kidney. The old term "the sympathetic nerve" was founded on the appreciation of the fact that one part was influenced by, or sympathized with, another through the fibrils of this nerve. Currents may arise in the ovary and be felt—not there when they arise—but at some far-distant point, where they run out. If a number of ivory balls be suspended in a row, touching each other, and a tap be given to either terminal ball, it is the one at the other end which flies from its place. Consequently waves of nerve-perturbation, arising in the ovary, manifest themselves by disturbances elsewhere. The glittering flash which glances out from some female irides is the external indication of ovarian irritation, and "the ovarian gleam" has features quite its own. The most marked instance which ever came under my notice was due to irritation in the ovaries, which had been forced down in front of the uterus and been fixed there by adhesions. Here there was little sexual proclivity, but the eyes were very remarkable. They flashed and glittered unceasingly, and at times perfect lightning bolts shot from them. Usually there is a bright glittering sheen in them which contrasts with the dead look in the irides of sexual excess, or profuse uterine discharges. Cough, palpitation, faceache, usually on the right side, inframammary pain, usually in the left or sixth or seventh intercostal nerves, and gastric irritation are the ordinary outcomes of uterine flexion, or ovarian disturbance. The most important matters clinically are the gastric symptoms reflexly excited by pelvic irritation.

So important and so common are these maladies, and so utterly unsatisfactory their treatment under the usual remedies—as bismuth, hydrocyanic acid, oxide of silver, etc.—that they deserve to be treated at some length. In the first place the stomach has different nerve-fibrils—those from the vagus, and those from the sympathetic. Claude Bernard observed that the application of a galvanic stimulus to the vagus fibres caused free secretion of the gastric juice; while the same stimulus applied to the sympathetic fibrils issuing from the semi-lunar ganglia, caused a diminution and complete arrest of the secretion. The action of sympathetic nerve fibrils is to excite contraction in the arteries and arterioles; that of the pneumogastric fibrils to dilate these vessels. Consequently we can readily understand how currents coming in by the sympathetic tracts from pelvic, or other irritation, may contract

the gastric arterioles and arrest the flow of gastric juice. If the irritation be sufficiently powerful then vomiting is set up. In ordinary digestion the gastric blood-vessels are dilated and there is a free flow of gastric juice. The irritation coming in from without checks both these processes, and then imperfect digestion with pain, or nausea is the result. This may not proceed farther than loss of appetite, dyspepsia, and nausea: or there may be severe persistent vomiting set up by the introduction of food into the stomach, till a very serious condition may be reached. In either case the tongue is clean, and there are no evidences of disturbance in the gastro-intestinal canal, as in primary gastric indigestion. Such is the dyspepsia so common in women. Primary dyspepsia is no more frequent in women than in men, and presents the same features in both sexes. But reflex dyspepsia has other and quite different associations. In both forms of dyspepsia there may be constipation, or diarrhoea, excited by the undigested food irritating the intestines, but these are incidental or coincident collaterals. In reflex dyspepsia there are usually the intercostal neuralgia, with the three tender spots of Valleix, one under the mamma, the second at the base of the left scapula, the third at the exit of the posterior rootlet of the sixth or seventh intercostal nerve from the spinal column; and palpitation. Less commonly faceache or cough, and in middle-aged women flushings. Then there are the uterine out-comes of the ovarian mischief—leucorrhoea, with or without menorrhagia, while at times the menstrual flux is lost, or all but lost, in the profuse leucorrhoea. The generative organs of women become turgid with blood during sexual excitement, approaching the erectile condition of the male organ under excitement. Ovarian irritation sets up vascular turgescence in the female parts which continues more or less persistently. The consequence is that there is profuse secretion, often with excessive catamenial losses. Frequently, too, there are erotic dreams, recurrent orgasms, during sleep. "the period *par excellence* of reflex excitability." In more pronounced cases, these discharges take place in the waking state, without any reference to psychical conditions, being found alike in married women cohabiting with their husbands, and in spinsters and widows. That sexual excitement may be produced, or kept up by lewd thought may not be denied; but this is not necessarily the psychical attitude here. The uterine centres in the cord and the centres presiding over the bladder lie in close proximity to each other. The irritable condition of the lumbar centres of the reproductive organs is communicated to the vesical centres, and then a very distressing condition results, viz., a state of weakness and irritability in the bladder, and the call to make water is sudden and imperative, and must be attended to at once, or a certain penalty be paid for non-attention. Such are the objective and subjective phenomena exhibited in a complete case of "reflex dyspepsia" of ova-

rian origin; and it is by the study of such well-marked cases that the student will learn to recognize the less marked or imperfect cases. Nor does it necessarily follow that the symptoms shall stand in a definite proportion to each other in each and every case. Sometimes the chief disturbance is uterine, at other times mainly gastric. When the latter, the case often runs as follows—a girl, usually of the neurosal diathesis, betwixt nineteen and twenty-four years of age, becomes the subject of intractable vomiting. This goes on till such weakness is produced that the patient is confined to bed, and her life apparently endangered. The least particle of food is immediately rejected, more or less completely. All sorts of combinations of drugs are tried, and fail to procure any alleviation of the condition. The medical attendant is nearly worried out of his life, consultants are called in without avail; the friends of the patient are worked up to a state of feverish anxiety; the sufferings of the patient are not inconsiderable; and so the case wears on for weeks. Bismuth, hydrocyanic acid, opium, effervescing mixtures, champagne, milk and seltzer water, beef tea, hot and cold, raw meat, pounded, maltine, all are tried and fail; sometimes enough is retained to support life; at other times it becomes necessary to resort to nutritive enemata. All who have seen much practice are familiar with such cases, which are very trying to all parties concerned, and which are unaffected by the different remedial measures resorted to; and which seem at last to wear themselves out, and are followed by long and tedious convalescence. A year or two afterwards the patient is in good health, often a happy mother. Here the absence of local indication throws the medical man off the scent as to the real nature of the malady with which he is brought in contact, and the ovaries are unsuspected. All the remedies are futile and inoperative, because not directed to the origin of the trouble. The case lingers on till it would seem the general mal-nutrition starves down the congested ovary into quietude, and then the reflex disturbances cease. Were the true origin of the case known or discovered, then the successful treatment would soon be forthcoming. As a case in point I may mention a girl who came under my care some time ago at the West London Hospital. For many months she had been under medical treatment for persistent retching and vomiting. The girl was pale and anæmic, with lack-lustre eyes, and a peculiar but characteristic expression, which may be observed but cannot be described, indicative of ovarian trouble. The left ovary was found congested and exquisitely tender, pressure over it almost producing syncope, and exciting acute nausea. The ovary was treated, and in ten days the girl left the hospital—well, but I doubt if permanently cured.

What is the treatment of these cases? It consists of several factors, each essential and complementary to the others. The bowels should be unloaded, so that there shall be no pelvic congestion. A small quantity of sul-

phate of magnesia in each dose of medicine will usually attain this end. If not quite sufficient an aloetic pill at bed-time is indicated. In small doses, as said before aloes excites the hemorrhoidal vessels; in fuller doses it depletes them. The bowels should be emptied at bed-time. A load in the bowels during sleep produces vascular turgescence in females whose reproductive organs are out of health, just as it produces chordee in a man with gonorrhoea. Then comes the other factor—the reflex manifestations. Instead of treating the stomach an agent must be given which will influence the nerve tracts over which the perturbatory waves travel. Bromide of potassium deadens the nerve fibrils along their course and at their peripheral endings. Both at the periphery in the ovary and at the terminus, the stomach, is its influence felt. It blunts the nerve endings while it deadens the conductive power of nerve fibrils. Consequently a combination like the following is useful:

Mag. Sulph. $\mathfrak{D}\text{i}$.
Potass. Bromidi $\mathfrak{D}\text{i}$.
Mist. Camphoræ, $\mathfrak{z}\text{i}$, ter in die.

If the stomach reject this a hypodermic injection of half, or a third, of a grain of morphia will usually produce such effects that the stomach will tolerate the medicines. Nutritive enemata may be needed for a day or two. As soon as the bromide is tolerated and retained, matters improve. Sometimes it is well to substitute infusions of gentian for the camphor mixture as a vehicle; it acts beneficially upon the stomach, as do all bitters, and renders it more tolerant of the medicines. Local treatment in the shape of a blister over the tender ovary is of much value; not only does it produce a mental impression, but we have reason to suppose that nerve-waves can meet and neutralize each other—like rays of light—under certain circumstances. The ordinary Emplastrum Cantharidis 2×2 applied over the offending ovary on going to bed will usually be found to produce vesication by the morning. Some slight soreness follows, but the relief afforded to the internal pain far outweighs this. In some rare instances a crop of boils follows the blister; but so rarely as not to militate against its use. By these measures combined, the reflex gastric disturbance is effectually removed.

There remains the leucorrhoeal loss to be considered. Higginson's syringe, or the common enema syringe for infants, are preferable to the glass syringe, which is brittle, and accidents sometimes occur. First an injection of plain water to remove all discharge, and then of a little alum water, not stronger than an ounce to two quarts of water, will usually soon reduce the loss. If there also be menorrhagia the usual measures must be adopted." (*The Practitioner's Handbook of Treatment*, 2nd edition.)

Another form of "secondary indigestion," is that due to venous fulness from valvular disease of the heart. Its chief indication is that "sense of fullness" experienced by the patient, even when the stomach is empty of

food. This is rarely absent in cases of cardiac failure in elderly persons, indeed, it is in old persons that it is mainly felt; though it is not uncommon in young persons with severe mitral disease. It arises from obstruction to the circulation, due to some lesion in the heart—usually a valvular lesion; but at times occasioned by the yielding of the muscular wall. This obstruction causes a damming of the blood at the point, which works backwards into the veins and venules.

"Sooner or later, the right heart yields, either by the tricuspid ostium becoming so large as the muscular walls dilate, that the valves become insufficient; or by secondary implication of the tricuspid valves rendering them no longer equal to the closure of the normal ostium; or, by a combination of both. Then the venæ cavæ become distended, and the jugular veins are seen to pulsate. Some jugular pulsation may be seen before the tricuspid becomes insufficient; it is caused by the reflux of blood through the tricuspid before its flaps are driven together on the ventricular contraction. All the branches of the venæ cavæ become distended; and especially is this the case with the portal circulation, which is not provided with valves. Splitting up as it does in the liver, the portal vein is partially protected by minute divisions in the liver, otherwise great disturbance would be occasioned by the want of valves in it, on tricuspid regurgitation. But, in consequence of this sub-division in the liver, that viscus becomes gorged with blood in tricuspid regurgitation, and pulsates with the regurgitating current driven backwards by the hypertrophied right ventricle. Liver-pulsation is a distinct symptom of diagnostic value; while the venous fulness of the liver leads to a development of connective tissue corpuscles in the inter-lobular areolar tissue; first there is increase of bulk in the liver, then cirrhosis or atrophy as the connective tissue contracts; the liver tissue becoming more firmer and harder than normal. The liver is easily deranged by an excess of food when so affected, and great care in diet is requisite for the proper performance of its functions. There is serous effusion from the gorged venules into the bile-passages attending it, so that Oppolzer has given to this condition the term "albuminicholi," and he further states that in this condition there is congestion of the mucous lining of the bile ducts with jaundice, and that both these conditions are readily affected by a common cold. The disturbances and changes in the liver are much more marked in some persons with tricuspid failure than in others.

The spleen is implicated in this congestion of the portal circulation; it becomes enlarged from the development of connective tissue in it, larger than normal, and of firmer consistence, resembling a beefsteak in appearance when cut open. We know, as yet, nothing of the symptoms or disturbance of the functions of the spleen.

The stomach and intestinal canal are also deranged, and the disturbances set up in them by tricuspid failure are distinct and pronounce-

ed. There is fulness of the venules of the stomach, and from that springs catarrh, with its pathogomonic indication, "sense of fulness," even when the stomach is empty. The feeling of being constantly "too full" is a very common outcome of advanced cardiac failure. The secretion of gastric juice is impaired, and it is diluted with a serous fluid. Consequently its digestive power is impaired. The catarrhal mucus is readily folded over any solid food, which so covered cannot be acted upon by the solvent juices, themselves impaired in power. Dyspepsia is the result of taking any but liquid food; and this condition of the stomach should ever be borne in mind in the treatment of cases where the tricuspid has begun to leak. In this condition of the mucous membrane, gas is often disengaged very freely in many elderly persons, and the eructations are persistent, and often very loud. The patient's condition is very distressing; and the pressure on the diaphragm, and on the right ventricle, causes much disturbance of the respiration and dyspnoea, with very unpleasant palpitation. This altered mucous membrane also causes morbid sensations and cravings for highly-spiced or unsuitable food; and this may lead to differences of opinion betwixt patient and doctor.

The intestinal canal is involved, and may be disturbed in two directions. There may be irregular and defective action of the bowels from imperfect nutrition of the muscular fibre of the bowels, calling for warm aperient medicines,—(for here the aperients must be warm and contain carminatives as much as in the case of the menopause)—enemata, or soap suppositories (Trousseau). Or the congestion of the venules of the intestinal canal may lead to diarrhoea, which often furnishes great relief, and should never be interfered with without good reason, nor until becoming unquestionably excessive. King Chambers says, that in conditions of gastric and intestinal catarrhs, the use of compound kino powder is indicated, and that under these circumstances, especially gastric catarrh, it rarely constipates. Alterations of constipation and purging may occur. Bleeding piles, or hemorrhoids, are frequent in the subjects of cardiac failure. Hemorrhage from these piles often gives great relief, and should not be rashly checked. When no bleeding has occurred for some time a flow of blood from some other organ may take place, as hæmoptysis, for instance, and be followed by distinct relief.

If there also be old-standing kidney disease, there may be found old, small, contracted granular casts alongside the dark recent casts; or, according to Basham, casts in a state of fatty degeneration. The kidneys are found enlarged, swollen, injected with blood, and from the venous congestion a growth of young connective-tissue corpuscles is set up in them. While attending the Pathological Institute at Vienna, it was quite common to see these recent changes from heart failure alongside the evidences of old standing renal mischief. The two were quite distinct. This subject will be treated more

at length in the Chapter on the Gouty Heart.

The genito-urinary system is disturbed by the venous congestion. There may be vesical catarrh, prostatic fulness, or urethral catarrh, or even hydrocele from congestion of the pampiniform plexus (Oppolzer).

In women, there are catarrhal and menorrhagic troubles from congestion of the veins of the uterus and vagina. Oppolzer thought that profuse menses often accompanied the arterial fulness of aortic regurgitation, and regarded it as a symptom of some value in that form of cardiac disease. My own observations have not been numerous enough to enable me to corroborate this statement.

Dr. Angus Macdonald has recently published a work on the "Bearings of Chronic Disease of the Heart upon Pregnancy, Parturition, and Childbed," which is of the greatest interest; but unfortunately he does not discuss the questions of whether leucorrhœa is common in women with heart-disease, or what is the effect upon the amount of the menstrual flux. So far as my impressions go, for I have no exact data on the subject, these outcomes of fulness of the pelvic veins are not so influenced by disease of the heart as might *a priori* have been expected."

When this condition of venous fulness is the cause of indigestion, it is obvious that the therapeutic measures must be directed to the improvement of the circulation. If the circulation can be relieved, the uncomfortable sensations will pass away along with the catarrh with which they are casually related. Astringents, as compound kino powder, are very efficacious in simple primary gastric catarrh; but in those cases where the circulation is the cause of the catarrh, they are also useful, but to a much less extent. It is better practice to put the patient in bed, so as to give the heart as little work as possible to do; to improve its condition by giving agents like digitalis and strychnia, which act directly upon the heart and increase the vigor of its contractions, so that the heart fills the arteries by emptying the veins—for that is really the function of this "blood-pump;" and to relieve the fulness of the venous radicles by evacuants, as hydragogue cathartics, and diaphoresis produced by the application of heat. When the blood is relieved of a quantity of water by these measures, then the venous fulness is relieved, and with it the catarrh which is its consequence. Strict dietary is indispensable to the relief of such cases. An error in diet is fraught with mischief which may persist for a long time. Indeed, the correct regulation of the dietary will tax the resources of the physician to the utmost. But the results to the patient are very grateful and agreeable, as well, too, as to the doctor's self-pride.

There is still another form of "secondary indigestion" which remains to be described; and that is, the "toxæmic" form.

Mal-nutrition, the result of a poison in the blood, is far from an uncommon occurrence. The presence of the poison interferes with assimilation generally, and the formation of the complex body—hæmoglobin, in particular.

Consequently anæmia is a common feature in the case of mineral poisons, as mercury and lead; in miasmatic poisons, like that of malaria; in poisons acquired or produced, as syphilis or gout. These two latter poisons commonly interfere largely with the assimilative organs and their functions. As gout will be dealt with in extenso in the second part of this work, nothing more need be said about its effects upon nutrition here. But it is necessary to say something about syphilis. Young persons with congenital syphilis often present conditions of mal-nutrition and anæmia, especially the latter, where the ordinary measures, including the administration of chalybeates, are impotent to initiate improvement; but where the addition of mercury or iodide of potassium acts like a charm. The syphilitic infant is a sorry spectacle. Its puny limbs, the skin either hanging in folds, or dry, harsh, and dirty; its wasted muscles; its withered face, approaching the wrinkled face of age; its sore eyes, often with a discharge; the characteristic "snuffles;" its whining, moaning, feeble cry; the presence of a coppery-tinted blush upon its nates and around its anus, sometimes with condylomata, sometimes with a general rash more or less developed. It is, indeed, an object in more senses than one. It is pitiable for its own sake, from pure humanity; it is pitiable morally, as an illustration that the sins of the father are undoubtedly visited upon the children; it is pitiable to see the fond mother's love given to so sorry a babe. Ordinary measures are impotent here to affect any good. Mercury is the specific. When this is added the child fattens, its little wasted limbs grow plump; the rash disappears; the "snuffles" vanish; the eyes recover their normal aspect; it is the difference betwixt a changling, an elfish goblin, and a human baby.

But it is not in children only that such "toxæmic" mal-assimilation is found. The following case illustrates this form of indigestion. A friend of mine wrote to me in the spring of 1880 a most dolorous account of his sufferings from indigestion, which had proved most intractable, indeed, had defied all the resources of a careful, painstaking, provincial physician. I wrote to him, sketching out a dietary, to be strictly adhered to, in addition to the medical treatment, which was all that could be desired. No improvement took place, the indigestion being as unpleasant as ever. Late in the autumn he presented himself with a local malady, a persistent pain, which was found to be due to a periosteal thickening, nipping a sensory nerve. I found out a history of syphilis long years ago, which had been forgotten, until cross-examination brought it to mind, so little indication of its presence had it given. In order to be quite sure about the diagnosis, on which hung both the prognosis and the treatment, I took him to Jonathan Hutchinson for his opinion. He quite coincided with the view taken. The patient was put upon iodide of potassium with immediate improvement as to the pain; not only that, but the indigestion has disappeared. I had told him that it was pos-

sible it might be found to do so. That the underlying factor was the unrecognized syphilis, in all probability, and that the specific treatment might cure the indigestion as well as the pain. He improved much after this treatment was adopted.

Doubtless there are many such cases if they were only recognized. We are beginning to be familiar with "visceral syphilis," in the form of structural changes set up by it in the viscera; but as a cause of functional derangement, its influence has scarcely yet been recognized. In time, probably, this will generally be admitted.

Such then are some of the relations of indigestion, which are not described in our ordinary text-books; but of which the practitioner must know something, in his own interests as well as those of his patients. They require for their recognition that careful interpretation of subjective phenomena which has been largely lost sight of in recent years, in the too exclusive devotion to the signs furnished by physical examination. Indeed, it is the individual which must be studied; not a diseased entity, described by a word or a phrase, presenting certain objective indications. Further, the successful treatment of these secondary forms of indigestion, involves something more and outside mere dietary, however indispensable; and the administration of the usual remedial agents; it comprises attention to the exciting cause and measures strictly adapted thereto. When made thus comprehensive, the treatment contains the elements of success—at least potentially.

CHAPTER VII.

INDIGESTION AS AN INTERCURRENT AFFECTION.

THIS is a very important matter for the patient, and not insignificant for the practitioner. The aspect of a case may suddenly be clouded, like a bright April day may suddenly alter with the swift oncome of a dark rain-cloud, racing up with the wind. It may show at first "like a man's hand" arising out of the sea, as did that which caused Elijah to send word to Ahab, yet "it came to pass in the meanwhile, that the heaven was black with clouds and wind, and there was a great rain." So the prospects of a case may be suddenly obscured; and almost before danger is scented, the aspect may be profoundly changed. A little nausea, the surface of the tongue altering, a rise of temperature, and the case doing well, may be suddenly endangered; as the Eurydice, sailing with her stunsails set, was sunk bodily by a squall coming up unnoticed behind Shanklin Downs.

The wary and experienced practitioner knows the import of such threatenings; a rise in the temperature is as significant, and ominous withal, as a sudden fall of the barometer tells of a coming storm. Just as the seaman furls his topsails, and puts the ship under bare poles, unless it be a storm-jib, when the barometer suddenly falls for a typhoon; so when the medical man sees the thermometer suddenly rise, he is on the alert

as to the other indicia of coming storm. But there are other semeia of threatening danger even earlier than this palpable change, like the stormy petrel that precedes the gale, the tongue grows irritable, red, angry-looking, or abnormally bare and smooth; there is restlessness, some nausea, the appetite is lost or very capricious, the sleep is disturbed; such are the symptoms which immediately arrest our attention, or ought to do so. The rise of temperature converts suspicion into certainty; but usually it is well not to wait for this corroboration, but to act promptly on the first suspicion. The case may be one of pneumonia, it may be of surgical operation, or of typhoid fever. No matter what the form of disease, when these indications of acute disturbance in the digestive tract show themselves, it behooves the practitioner to put the hands on deck; the craft is in danger, more or less imminent. The coming risk must be faced. To use another simile, when a general sees that he is being threatened with a flank movement, he make his disposition accordingly; he changes his front so as to face his new foe.

So it must be with the medical practitioner. He must meet the new danger; and many a patient is needlessly lost for want of this rapid change of front. If the new intercurrent attack proceed to vomiting, then the prospect becomes vastly grave, indeed. If food cannot be retained, the patient will sink. Nutritive enemata may keep the case floating a while; but only a little while, not for long. In many cases, the change is due to pushing alcoholic stimulants too freely; in others, alcohol is urgently called for. All depends upon the precise facts of each case. The medicines previously given are often to be withheld; however strong the necessity for resort to them may seem. The usual mixture of bismuth and soda in calumba, with a drop or two of hydrocyanic acid, or a few grains of bromide of potassium, alone is permissible. The blandest of food, a little white-wine whey, or milk and lime-water; if the milk is at all likely to be curdled, a few grains of prepared chalk, or light carbonate of magnesia, may be stirred into it, or a little baked flour to lessen the firmness of the curd. If beef-tea be given, let it contain some baked flour, to give it some more actual food value, compared to what it possesses alone.

Let whatever be taken, be small in quantity at once: little and often! If the outlook be very clouded, it may be well to resort to the partially digested milk, or milk-gruel of Dr. Wm. Roberts. If there be tympanitis, a turpentine stupes, or a liniment of chloroform on a few folds of lint, covered with an overlapping piece of oil-silk are good. If vomiting actually set in, give a hypodermic injection of morphia at once, sufficient to "quiet" the stomach. If there co-exist danger of paralyzing the respiration or the heart by the dose of morphia, give with it a little sulphate of atropia, (morphia gr. $\frac{1}{4}$, liq. atropia sulph. gtt. ii.); this obviates any danger arising from the morphia. Before the days of the hypodermic injection, opium or

morphia had to be given per rectum. In a case of intense vomiting seen when a youth, I remember my father giving a dram of laudanum in a starch enema, with excellent effects. In a couple of hours the stomach tolerated a morphia draught, which acted topically upon the stomach as well as systemically; after the crisis was passed, the management of the case was comparatively simple. Now the hypodermic syringe has diminished the difficulties materially, and in the hands of a man at once wary and courageous is simply invaluable in emergencies. Sometimes, when the symptoms are not quite so threatening, or the case so urgent, it is sufficient to give a tiny mite of a pill, as a grain of the extract. opii. at bedtime, or to add to it gr. $\frac{1}{4}$ of morphia. So small a thing does not irritate the stomach by its presence, a matter of the very highest importance. If there be great thirst, and the patient gulps fluid down eagerly, it will be up again immediately, having done no good, and only furthered the exhaustion. Let a chip of ice slowly dissolve in the mouth and cool the fauces, the local seat of thirst. A little cream ice is at once cooling and nutritive; or iced milk may slowly be sipped, or sucked through a straw, or a glass tube.

But a little at once: or it is an instance of "the more haste the less speed." Patience and watchfulness must be combined with promptness of action, when the time for action arrives. Judicious nurses, whose muscles of expression are under complete control, so not to betray their inward anxiety, are to be desired. All injudicious and emotional friends are to be banished, energetically and remorselessly; it is no time for folly, no matter how near the tie, how close the relationship! The link of blood does not justify culpable homicide in the interests of the individual dangerously ill. A darkened room; perfect quiet; no disturbing element must be allowed to enter by eye or ear. Brain and stomach alike must have absolute rest. A cool, clear-headed pilot at the helm, and a capable crew tendering willing obedience, and the craft may be steered through the peril into smooth water. A wrong move at the critical moment, and all is swiftly over; and regret is unavailing. To meet a grave emergency coming on swiftly, taxes all the resources, all the capacity, of the medical attendant; and is a sharp test of the man, as well as the practitioner. Wealth of resource, fertility of thought, the moral courage to accept the responsibility of energetic action; all are required in these times of extreme peril.

When the stomach is irritable it must be compromised with; there is no alternative. So long as it is patient and tolerant medicine to affect other parts may be given, but when the stomach itself is out of order its moods must be met; it must be humored and conciliated. It is no good to attempt to master it! Just as Mahomet had to go to the mountain, when the mountain did not go to him, so when the stomach is in active revolt it must be compromised with and soothed. High-handed measures are out of the ques-

tion. Conciliation alone is feasible; and it must be practiced. The stomach is the suffering slave of humanity ordinarily, but when it is in revolt it must be compromised with and coaxed into submission. Certainly the hypodermic syringe has worked a marvelous improvement in our measures of dealing with the stomach in emergencies; but the difficulties are great enough which still remain. We cannot be high-handed with the stomach!

In attacks of typhoid fever, when the tongue goes red and irritable, the aspect of the case grows dark like the night-fall with rain and a shrinking barometer. The dietary of the patient becomes everything, or almost everything; the medicinal part of the treatment being modified at the same time. The patient may have been under no treatment, or merely some hydrochloric, phosphoric, or, still better, hydrobromic acid may have been given in syrup and water every few hours; but when the tongue changes, it is time to examine the stools for the curd of milk. This is far too little attended to by the practitioner, even if familiar with typhoid cases. At the Fever Hospital, Islington, under Drs. Broadbent and Mahomet, such watchful inspection is constantly practiced. When the undigested curds tell that the assimilative powers are upset, then it is well at once to add some baked flour to the milk, or to mix it in equal quantities with lime-water; or to give instead some rice-water, or thin arrowroot. The Americans are fond of a sliced lemon and two ounces of sugar being placed in a jug and a quart of boiling-water poured upon them; after that to add the white of an egg, and froth it up. Such is a pleasant drink. Always be it remembered, that sugar requires very little digestion, it soon finds its way into the blood, and next to alcohol is the easiest digested food we have. (This matter will be referred to again in the ensuing chapter). A little beef-tea, or white wine whey may be desirable, until the digestive tract is once more fit to assimilate milk: and then it is well to begin again with milk in small quantities, and not alone, or un-mixed with alkalies or diluents. Such must be the method of procedure—or disaster will not be far ahead.

Then again there are more persisting disturbances of digestion which manifest themselves in the course of more chronic disorders. There is a weak spot in the organism, say a consolidated lung-apex, quiescent, doing no harm: strictly latent, merely impairing a little the thoracic capacity. Such a state is a very common occurrence. But let the digestion become disturbed and with it the nutrition: and what then? When a regiment of soldiers do a long march, who falls out first? Those who are not strong; those who have been enfeebled and thereby unfitted for such demand upon them! So it is with the body; when the nutrition is impaired it is the "weak spot," that feels it first, and most intensely. The lung-apex from a static condition, free from danger, commences to break down; its nutrition is lowered beyond the point when it can maintain its existence, and it commences to die piece-meal by molecular necrosis. It un-

dergoes fatty histolysis, it softens; around its periphery is a zone of ulceration, which sets up hectic fever; and in its death it may involve the fate of the organism. Comparatively unimportant, its existence is transformed into a grave matter when the tissue-nutrition is impaired by disturbance in the assimilative processes.

In the quiescent static condition the area of lung which has undergone consolidation is a matter for little if any anxiety, further than as a potential element of danger; but when breaking down it is transformed into a very grave matter indeed, the danger is tangible and present; the potential has been realized.

In the same way we see individuals the subject of chronic valvular disease of the heart. A certain injury of a permanent incurable character has been done to the valvular mechanism; this is compensated by muscular growth known as hypertrophy. As long as the compensatory growth is maintained the case goes on well. If the valvulitis is of the progressive order then the muscular compensation must go on *pari passu*, else the compensating power becomes insufficient, and the case moves on down hill; as too many do. But in many instances the injury to the valve is done and over; it is like a mutilated hand, which is not what it was in its pristine integrity, it is crippled—but there is no tendency in the mutilation to proceed further. So in many cases of valvular disease of the heart, the mischief is done—the mutilation, such as it is, is worked; but the condition is that of a cicatrix or scar, it is a static and has no tendency to progression. In these cases, which are far from uncommon, so long as the muscular hypertrophy is maintained so long is the compensation perfect. But when the digestion fails, when the nutritive pabulum to this hypertrophied muscle is insufficient, the prospect changes. From a static condition, downward progress is instituted; which if not quickly stayed, will bring the organism to wreck and ruin. It is like progressing over a level plateau, and then coming to a precipitous declivity.

Again the bright sky is suddenly clouded. A patient with aortic regurgitation, a very clever artist, knows this as well as I do; and speaks as feelingly. So long as his nutrition is good, he is unconscious of his heart, and feels well subjectively; but when indigestion is provoked then he becomes acutely conscious of his heart, and of its impaired power. He realises that if his digestion was to be greatly disturbed, his static heart condition would soon take an undesirable movement in a downward direction.

This matter of possible loss of assimilation in an individual who has a weak spot, whose weakness renders perfect nutrition a necessity, is one which must have more attention given to it in the future than it has had in the past. A consumptive man gets engrossed in business, for which he is quite fit physically, if and provided he takes proper care of himself; but he gets carried away by overwork, cannot spare a sufficient time for his meals; and what then ensues? His diges-

tion becomes impaired, and the blood is insufficiently fed. The tissues are ill-nourished by the poverty-stricken blood. The healthy tissues get on fairly well on these half-rations, but the weakened piece of lung breaks down; and in its necrosis all but carries off the rest of the organism—indeed the individual swims for his life; and survives with a cavity where that deteriorated piece of consolidated lung once was. It has been a very near thing, a close shave! Or a woman has a static mitral lesion, which has lasted for years without progress of any kind. She marries, becomes pregnant, has a difficult parturition, her health is further impaired by suckling; this occurs once or oftener. The muscular hypertrophy which compensates the lesion begins to suffer from the general mal-nutrition; the muscle yields, and a downward course swift and certain, is set up. It is just the company of soldiers over again; under a severe demand the weakest break down first. On in famine the healthy members survive having been hardly tested; but poor Tom! whose lungs were bad to start with; he succumbed. A tombstone tells of him.

Unfortunately in the body-family one member cannot die out, and leave the rest. He must live with them; or they must die with him!

Hence the terrible necessity for seeing that the "poor Tom" of the tissues does not die, when the evil day of famine allowances arrives. Many a person in apparent health, but really possessed of one of these latent sources of danger, is laid prostrate by severe disease as typhoid fever, and ague; he survives the storm but a weak lung-apex breaks down in the mal-nutrition which follows in its wake. Or he undertakes a hard life—goes out to Manitoba, to farm, or to Colorado, New Mexico, or Texas, as a cattle stockman, turns consumptive and just lives to get home to die. Or he manifests some lung mischief and is sent out to Australia, finds it suits him, and settles on a sheep-farm. The fresh air and outdoor life agree with him; and for a while all is well. But the food taken at irregular intervals and prepared anyhow, or no how; the resort to strong tea as an invigorating beverage is baneful; after a while the assimilation becomes decidedly impaired, the blood is ill fed; the weak bit of lung is starved and breaks down. And the individual goes down with it; or survives a wreck, a dismantled hulk, fit for no more active service.

It is this relation of the "weak spot" to intercurrent indigestion which demands such careful consideration when determining upon a rough life abroad.

CHAPTER VIII.

DIET AND DRINK.

THESE two practical matters require a few words to themselves. Of course what is written here only admits of a general application to cases of indigestion; each case requires to have the treatment fitted to it, just as a tailor fits a suit. Nevertheless some generalizations may be useful; chiefly in the di-

rection of what is to be avoided. And first and foremost comes the question of the albuminoids. Hydrocarbons once assimilated give no trouble in their metabolism within the body. Certain it is that glycosuria may be a disease, and a very serious one; but it is not the appearance of the sugar in the urine which is the initial disturbance, it is the outcome thereof—the outward visible sign of inward disorder. It is not the origin of the thunder-cloud it is the outcome of it, the thunder and the lightning. Fat may be deposited until it becomes a trouble, to say the least of it, impeding the heart's action when accumulated under the pericardium. Sugar and fat lead to biliousness, but not directly. A rich meal, in good old Saxon—a "surfeit," upsets the liver; but it is the albuminoids which are the real source of trouble. The hydrocarbons burn up readily; to invert this, we may say that the respired oxygen is consumed or engaged with the easily oxidizable hydrocarbons; leaving the less oxidizable albuminoids, which unite unwillingly with oxygen, over, *i.e.* little affected. These, it is really, which are the source of trouble. It is these albuminoid elements of our food which cause the disturbance after "surfeit." It is the "luxus consumption" of albuminoids which is the initial cause of disturbance, whether in "biliousness" or in "gout." As to the latter, this is generally admitted. It is the excess of albuminoid material beyond our tissue-requirements, which we eat, that is the source of all our woes. In the present meat-eating wave of fashion this excess, or "luxus consumption," is the cause of many maladies. We overload the assimilative processes and they break down under the strain. None of the meal is properly digested; but there is the waste to be got rid of. The excretory emunctories are taxed to eliminate the excessive amount of waste matter, and various maladies spring therefrom. To eat food and to digest it, are not one and the same thing. Bulimia leads to mal-nutrition. The old expression, "the wolf at the stomach," was applied to cases where voracity was associated with leanness. The ill-fed blood causes the sensation of hunger to be felt acutely; and then the voracity induced by the bulimia is great, but unsatisfying. This is often well seen after measles in children, they are hungry all day long. They eat and eat unceasingly to appease the pangs of hunger; but in vain. The more they eat the worse they thrive, because they digest little or none; and unless they are restricted to proper meals they virtually eat themselves to death. They die of hunger—an actual starvation—in the midst of unlimited food, and everlasting eating. To eat and to digest are not, then, one and the same thing.

Let me here quote a sentence from Dr. Lauder Brunton. He describes the man who is "run down" and needs a holiday. "Not only does the brain seem exhausted, but the whole system appears to be languid and weak; instead of the man being able for a twenty or thirty miles walk, one or two miles produce fatigue, and sometimes an in-

tense languor is felt without any exertion at all. And yet all this time he may have been trying to keep up his strength. He takes butcher's meat three times a day, perhaps also strong soups, to say nothing of wine, or brandy and soda to pick him up. His tissues ought to be getting sufficient nourishment to enable them to do their work, and yet it is evident that they are not in a condition to do so. The man, and very likely his friends also, wonder at his condition, and when he goes to his medical attendant to describe his case he says—'I take all sorts of strengthening things, and yet I feel so weak.' If instead of using these words, he were to say, 'Because I take all sorts of strengthening things I feel so weak,' he would express a part, at least, of the truth." Dr. Brunton holds that the mal-products of digestion are positive depressant poisons. The subject will be referred to again more at length further on. Enough here to show that "strong food does not necessarily involve strength;" rather the opposite when the digestion is impaired. A little, well digested, feeds the blood, and from it again, the tissues, better than a large meal, none of which, or very little indeed, is properly digested.

Strong beef tea, made from almost fabulous amounts of beef, on which the housewife proudly dilates—well, it is the fashion, so it must be spoken of with circumspection—is a fraud! or something akin thereto. Its food value has yet to be demonstrated! Not long ago calves-foot jelly was indispensable in conditions of debility; its day is now over, it is little heard of. Strong beef-tea, meat essences, meat juice, are pleasant; and certainly patients think they are proper things for the debilitated. Well they may be so; if and provided they take something else as well. But to give the starving patient, starving in the midst of plenty, these things to feed him, is giving him a stone when he asks for bread. A little light food which can be digested is infinitely better for him.

This is something like what should be arrived at.

Breakfast; porridge, oatmeal or hominy, with milk, to start with; to set the children a good example! Then a little cold meat, or bacon, or fish; with a cup of coffee, tea or cocoa. Some fruit.

Lunch; some potatoes mashed with plenty of milk and butter, better still cream, peppered and salted, and browned before the fire. A little cold minced meat in a thin layer, not to be further cooked but only to be made hot, may be added. Some cold milk pudding, left over from the dinner of the day before, and some stewed fruit. A glass of milk, a glass of carlowitz, claret, or sherry, may be permissible; with others only a little brandy, or whiskey and water agrees. Let it be little.

No glasses of wine betwixt meals to "whip one up." Such habit is bad, very bad!

Dinner; a little light soup, some boiled fish, very little joint, or some game, or entree like sweetbread, or spinach and a poached egg; some milk pudding, and stewed fruit.

Wine, two glasses of the wines mentioned, or a glass of Buccellas; or perhaps, if the patient be very sure that it does good, and suits better than anything else—one glass of port wine; or a little spirits and water. Aerated waters are objectionable, they are too gaseous; while alkaline waters are not good at meal times, they reduce the acidity of the stomach, which is essential to the digestive action in the said stomach.

Now as to dessert. Perhaps I am going to be heretical; perhaps only "a little advanced." Nuts are certainly not to be advocated for the dyspeptic. Oranges, pomeles and shaddocks, are like grapes, unobjectionable if the juice only be swallowed; apples, pears, plums, gooseberries, cherries, strawberries, each and all are good. The salts, potash and others, of sub-acid fruits are good for "the blood." Often these fruits are forbidden unnecessarily. If they disagree let them be avoided; experience must be the sole judge of their admissibility. Only they need not be eschewed wholesale, as is too much the rule.

Bananas, figs, pine-apples, raisins (Sir W. Gull, Bart., stated his partiality for raisins before a Royal Commission, therefore there can be no doubt about their value), preserved peaches and apricots, when the fresh fruit cannot be obtained, are also good; candied fruits perhaps are not as a rule admissible. We eat far too little fruit in Great Britain to our meals.

Supper; a draught of milk and an arrow-root biscuit is the best and lightest. It is rarely required except after an early dinner. Some persons, however, must take their food at short intervals, because they can only digest little at a once.

When the fast betwixt supper and breakfast is too long a little milk and a biscuit in the small hours of the morning may be taken; or a tumbler of milk, with a teaspoonful of rum or brandy in it, may be taken on getting out of bed to dress. With some persons this enables them to take a fair breakfast.

* Some persons can eat no breakfast. Not uncommonly "they eat their breakfast before they go to bed;" they make a good supper this is very common with business people who work hard all the day and have no rest till supper time. The mistress of a business requiring much personal attention is apt to do this. She commonly becomes a dyspeptic; if her digestion can stand this outrage, usually she ultimately becomes the subject of gout, in some or other of its many forms.

Some dyspeptics find that they must take no fluids with their food, and have to live on a very dry dietary, an Arab dietary. Others require more fluids than they allow themselves.

Others require a biscuit, or some light article of food, "betwixt meals." When this is made an excuse for a glass of sherry it is to be closely criticized as a questionable habit, "more honored in the breach than the observance." To take some fruit would be better in every way. Some succulent fruit would satisfy the craving "for something,"

and would not require the beverage "to get it down." Such use of fruit ought to be more general than it is at present. In all households where the expense does not forbid it a large dish of picked fruit of various kinds, when the season permits of it, should be placed on the side-board every morning, with a label "Help yourself" on it, (as is found in the waiting rooms of several London consultants). Children would soon cease to overeat themselves, just as do the assistants in confectioners' shops, when they realize that it is to be a constant affair, not an occasional treat to be made the most of. Such an idea is well worthy of adoption. If the "temperance" section of society would set the example it would soon be followed by others, to the benefit of the digestive organs of many, while it would be agreeable to all. Fresh gathered fruit out of the garden and orchard ought to be placed on the breakfast-table every morning. For those who experience a bitter or hot taste in the morning on awakening such addition to the breakfast-table would be most acceptable.

And now a few words as to the beverages to be taken. Americans are a dyspeptic people; they drink much iced water at meals, *ergo*, iced drinks at meal-times are bad! They may be, when carried to excess; this is not denied. But iced drinks are not the cause of the wide-spread dyspepsia in the U. S. A. There are other potent factors in action. Iced drinks are very grateful to the thirsty, but too much indulgence therein produces a torturing thirst; as the person who indulges in eating snow in the Arctic regions discovers quickly. Just as snow-balling causes the hands first to feel cold and then to glow with heat, if continued, so the constant application of an iced fluid to the fauces, at first grateful, becomes a source of intense discomfort; for the blood-vessels are first contracted and ultimately paralyzed, and then the fauces glow with warm blood, like the skin of the snow-baller's hands.

Iced fluids are not desirable for dyspeptics, to say the least of it. Ordinarily at dinner, the ice-pudding is followed by a glass of liquor—"to correct it." A certain temperature is requisite for digestion, and too much cold is undesirable.

So too, the stomach is acid after a meal, for the gastric digestion is acid; therefore alkaline waters are contra-indicated at meal-times. They should be taken before meals, properly, when the stomach is alkaline. The milder effervescing waters are comparatively unobjectionable.

Then as to the medicated "temperance" drinks. The "zones and zones!" They mostly contain phosphorus and iron, and other medicinal matters; and therefore, may not be taken indiscriminately, or with impunity. For well-nourished persons, and still more, stout, florid, plethoric individuals, they are unsuited. For the pallid, "limp," listless beings, they are well adapted, but too much fluid, even a "beverage free from alcohol," is not without its drawbacks.

As to alcoholic beverages, they are good or harmful according to the use made of them.

As to the mischievousness of alcoholic indulgence, all, "the total abstainer," and his less rigid brothers and sisters, are agreed. It is bad physically, intellectually, and morally! But what would be decided excess in one person is not "excess" in another. Also this varies in the individual. There are times of debility when generous wine may be freely drunk, not only without injury but with benefit; but the desire for them passes away as the indications for them disappear. (It is not forgotten that careless medical instructions to drink wine freely, have led to sorrowful results; nor that a patient may interpret medical instructions liberally, so as to make an excuse for alcoholic indulgence). So long as alcoholic drinks improve the appetite, do not heat the patient, and do not disturb the tongue, it is impossible to say they are doing harm; and it is certain they are doing good and agreeing. The physician must speak out with a distinct utterance, *i. e.*, if his ideas are well-defined and chiselled-out. He must neither pander to a popular taste for alcoholic beverages; nor be afraid of the strictures of "The Temperance Record," or "The Alliance News;" and my friends, the editors of these two earnest publications, must excuse me, if I thus take up a position distasteful to them. They must allow for others what they claim for themselves,—*i. e.*, "the courage of their convictions." There is a certain unstable temperament in certain persons, perhaps a part of the neurosal tendency of the age which must be taken into consideration. Alike in rural Devonshire, in the manufacturing districts of Lancashire and Yorkshire, the magistrates are aghast at the amount of Asylum accommodation they are called upon now-a-days to provide; so great is the spread of lunacy. All nervous affections are on the increase. Consequently there is a growing class for which it is more or less undesirable to advise stimulants, especially alcohol. We cannot now order a glass or two of wine daily with the carelessness of yore. It is growing yearly more and more unsafe to do so. Each case must be the subject of conscientious thought in this matter. It is this "unstable temperament," against which the medical man must be on his guard when recommending alcoholic beverages.

Remembering then that he is using an "edged tool" that may cut both ways, and in full consciousness of what he is doing, the medical man may order alcoholic beverages. And now I will say what I personally think—dogmatism would be improper.

The use of a light wine is not undesirable with many persons, from Timothy downwards. "Wine which maketh glad the heart of man," sang the Psalmist, in a hymn of praise and thankfulness; and it is the use of wine, not the abuse of it, which is being considered here. The emotional temperament may be drunk with other excitement than that set up by alcohol. "They are drunken, but not with wine; they stagger, but not with strong drink." Excess, or indulgence in wine is bad, as is excess in anything else—medicated non-alcoholic beverages not excepted!

But it should be drunk with meals; "to eat," as they say in France and elsewhere.

A little light white or red French wine is admissible; Hock is more apt to be a manufactured wine. Hungarian wine, white or "Carlowitz," and Australian wines are making good their claim to the confidence of the public; some Italian wines are very palatable; Greek wines also, for those who do not dislike the flavor of resin in them. The wines of Spain and Portugal are too potent for ordinary use, still a glass of sound sherry or port is often very good; albeit, more money, that can ill be spared, is thrown away upon port-wine, than is pleasant to think of. A glass of good ripe port, or of Bucellas, in season, and in the right time, towards the close of a meal, is not to be branded as a malefactor, and banished from society. Marsala is usually a trustworthy wine, and its bitter flavor is in its favor as a wine for invalids.

With others, again, a little plain spirit, brandy or whiskey—Scotch, Irish, or Bourbon, even "old rye" not absolutely forbidden, is their best beverage, diluted with some water.

With others plain water—"Adam's ale"—is the best beverage.

Malt liquors are scarcely suited to the dyspeptic; and a little sound bitter ale alone of the series may be permitted to the sufferer from indigestion.

But for the dyspeptic no rule "absolute" can be laid down in beverages any more than in food. Each case requires its own regimen all through. Many cases of dyspepsia, especially when there is morning sickness, some catarrh, excessive flatulence, a foul tongue, and an unsteady eye, are due to alcohol wholly and solely; and no reliance, whatever, can be placed on the word, statement, affirmation, or assertion corroborated by solemn oaths, of a drunkard; for "a drunkard is a liar!" And this holds good of both sexes, and all ages; everywhere and ever.

Moderation is food, especially albuminoids; a little, properly digested, is more nutritive than a feast, none of which is properly or completely digested.

Moderation in drinks, especially alcoholic; the *via media*, neither total abstinence nor excess.

These are two grand rules to be observed.

Whey, when it can be procured fresh, or skimmed milk, is a splendid beverage for dyspeptics. There is a quantity of nutritive sugar of milk in it, while it contains all the salts of milk.

This leads up to a matter not altogether unimportant; yet rarely remembered; it is this,—sugar is a very easily digested hydrocarbon. Though it disagrees with many, with most dyspeptics it can be taken in greater or less quantity, in their tea or coffee; or with their spirit and water. When the appetite is very defective, if the alcohol be given with hot water and sugar, its food-value is greatly enhanced. Unfortunately, it cannot always be so taken: and alone with cold water, plain or aerated, must it be drunk.

Finally, tea and coffee are more or less objectionable and disturbing to dyspeptics. Cocoa, not too full of fat, but thin, is better: or a glass of milk: or the tumblerful of syrup of the continent, for breakfast. The cup of tea before getting up is utterly uncalled for, and unmitigatedly bad. Kettledrum is as well let alone; while the cup of strong tea or coffee after dinner should be avoided scrupulously.

The incubus of fashion and conventionality is a heavy burden for most dyspeptics. They should not even bathe before breakfast, if they have sufficient strength of mind to brave the strictures of Mrs. Grundy. If they have not, I am sorry for them; nor do I think the position of their medical adviser one to be coveted. Neither the doctor nor the patient has then a fair field, if there be lack of courage moral, or other, on either side!

CHAPTER IX.

THE FUNCTIONS OF THE LIVER.

The liver is the largest gland in the body; indeed, is *facile princeps* among these organs, both as regards its size and the importance of its function. To many readers, then, especially the junior members of the profession and students, to whom the works of M. Foster and other physiologists are familiar, it will seem strange, that up to a recent period, the liver was spoken of as a mysterious terra incognita, a sort of Central Africa in the map of the organism. Much had been learned empirically as to disorders and disturbances of health referred, not inaccurately, to the liver; and their appropriate treatment had been determined with much clinical acumen; still it was an empiricism unilluminated by scientific knowledge.

The shrewd practitioner shook his head sagaciously in certain cases, and oracularly pronounced the word "liver;" ordered slops and a light diet; the patient followed his instructions, and felt the better for the treatment. The bulk of empirical testimony, so accumulated, was such as to carry with it conviction in most minds; to entitle it to respect from all! But the wave of disbelief, which is now beginning to break, swept many minds away with it; and because infant physiology could not speak accurately as to the function of the liver, and could only lisp out a few limping utterances, the store of empirical lore had to be thrown aside as lumber,—without value or claim to any consideration. To such a humiliating end then the observation of centuries had to be relegated; according to a scepticism as conceded as it was unwarranted. A few of the harder-hearted practitioners clung tenaciously to what experience had taught them; and are now rewarded for their constancy by seeing modern physiology testifying to the accuracy of the lessons of this experience of their own and of observant predecessors. When the old practitioner classed "liver and kidney" together, when speaking of maladies where the urine was altered in its appearance and reaction, he spoke from an experience which

dated back as far as Galen at the least. That historic physician knew that the urine solids came from the liver; how he knew, how he or some one else arrived at such a conclusion, with the means they then possessed, it is simply impossible to say. They were keen observers, these old physicians, and could sum up the evidence before them with minds eminently judicial. When scientific knowledge did not exist in any form such observations were all that medicine had to rely upon.

When chemistry began to break a path for a truly scientific knowledge of the physiology of the body the matters easiest to examine were taken first. The urine naturally tempted the curiosity of chemists, and the presence of nitrogen in the urine solids disclosed their descent from the albuminoids of our food. The kidneys were exalted to honor. In old-standing gout the kidneys were found to be extensively diseased. The imagination then bounded to the conclusion that the kidneys formed uric acid and urea, from pre-existing products of retrograde nitrogenized metamorphosis in the blood. I can well remember when the statement that urea was formed in and by the liver, and only excreted by the kidneys, was received as the latest utterance of a school not entitled to the confidence of the student-mind. The promulgators of that view were regarded by the steady old-fashioned teachers such as Melancthon and Luther were regarded by the court of Rome, viz., as unsound heretics. "There is no pain like the pain of a new idea," said the late Mr. Bagehot; and to many minds a new idea, unsettling the old-established notions, is excessively painful. Unless, at the same time that it brings down the old edifice, it is prepared with a new erection to take its place, they will have none of it. They wilfully shut themselves up in a shell, and, having once assumed this attitude, nothing can coax them out of it. The storm of controversy, the intense interest in the agonosphere, affect them not. In the language of the late Lord Beaconsfield, once applied to a political opponent, about a measure he disapproved, they "passionately embraced a corpse." They hugged their defunct impression till the odor of putrescence compelled them to cast it away. Such is the present position of the generation of medical men who are beginning to pass from us.

The Croonian Lectures of that accomplished physician the late Charles Murchison, delivered before the Royal College of Physicians in 1874, took the medical world by surprise. By those prepared for and seeking a new faith they were hailed with the utmost delight, as bringing within their reach the scientific knowledge they thirsted for; to such they were as welcome as a well to the traveler in the desert.

In the present and following chapters I shall avail myself as largely of the work of Murchison, as I did of that of W. Roberts, in the preceding section of the work; and accordingly do now make full acknowledgment of my indebtedness to Dr. Murchison for all that he told us in these said lectures on "The Functional Derangements of the Liver."

Not that Dr. Murchison did not owe much to others, as he himself readily and generously acknowledged; but the array and order into which he cast a huge series of isolated facts and observations, entitle him to be regarded as the preacher of the new faith to the medical profession in England.

Of course there were many others working in the same direction as Dr. Murchison, less ably and less enthusiastically, and to whom his work came as a perfect boon. Slowly something was being learned about the liver. Chemistry told us that the great condiment of our food, chloride of sodium, was split up in the body into hydrochloric acid for the gastric juice, and soda for the bile. The utility of common salt in the organism and the universal craving for it, were alike demonstrated. The long travel alike of African tribes and American buffaloes for salt "licks," became intelligible; and the wickedness of the salt tax in India dawned upon the mind. The liver secreted bile; that much was certain; and bile was not merely an excrementitious matter, but fulfilled a useful purpose. The liver then had a *raison d'être* in scientific medicine. Perhaps to give the views of the late Dr. Kirkes as expressed in his well-known "Handbook of Physiology" in the very zenith of its fame, still edited by the accomplished author and therefore representing the views of that erudite physician and physiologist; in the fourth edition published in 1860, will demonstrate most conclusively the advances made in very recent years. He places the secretion of bile first, as might be expected from that time of day. He recognized the presence of glycocholic and taurocholic acids in union with soda; but no account of their chemical composition is given to throw light upon their origin. He gives the process of secreting bile, which he regards as "constantly secreted for the purification of the blood;" a vague phrase, in harmony with the general vagueness of the knowledge of that time. He recognizes bile to be *excrementitious and digestive*, and that, as the latter,—"bile is a light elaborated fluid, formed of materials which do not pre-exist in the same condition in the blood, and secreted by cells in a highly organized gland;" nevertheless, he writes—"The general tendency, however, of modern observation is to the effect, that bile has very little influence on the process of digestion." He adds—"The bile, however, like the gastric fluid, has a strongly antiseptic power, and may serve to prevent decomposition of the food during the time of its sojourn in the intestines." He says—"Respecting the nature of the influence exercised by the bile in digestion, there is, however, very little at present known. It is supposed by some, that the bile assists in converting the chyme into chyle, especially by emulsifying the fat, and thus rendering it capable of being absorbed by the lacteals." So much for the bile. The light is little yet.

He goes on—"The secretion of bile, as already observed, is only one of the purposes fulfilled by the liver. Another very important function appears to be that of so acting

upon certain constituents of the blood passing through it, as to render some of them capable of assimilation with the blood generally, and to prepare others for being duly eliminated in the process of respiration. From the labors of M. Bernard, to whom we owe most of what we know on the subject, it appears that the low form of albuminous matter, or albuminose, conveyed from the alimentary canal by the blood of the portal vein, requires to be submitted to the influence of the liver before it can be assimilated by the blood." This is the beginning of a most important matter in physiology, or rather the beginning of the recognition of the matter, viz.: that imperfectly assimilated albuminoid matter, the product of digestion in the gastro-intestinal canal, is further elaborated by the liver, so that the tissues may be fed therefrom. The liver was recognized by M. Claude Bernard as being connected with the higher elaboration of the albuminoid constituents of our food; by it the peptones, produced by the digestive act in the stomach and small intestines, are further fitted to feed the blood, and from it, again, the tissues. So far! so good!

Dr. Kirkes also recognized the relation of the liver to the saccharine materials of our food. "The saccharine principles of the food undergo, in their passage through the liver, some transformation necessary to the subsequent purpose they have to fulfil in relation to the respiratory process, and without which, such purpose could not be properly accomplished, and the substances themselves would be eliminated as foreign matters by the kidneys." Thanks again to M. Bernard, some light was breaking upon "glycogen," or "hepatic," or "animal starch," as it was variously termed; and its utility in the economy of the body. They have also begun to note "that the liver possesses the remarkable property of forming sugar out of principles in the blood, which contain no traces of saccharine or amylose matter." This was a step forward. It was seen that the liver in the Carnivora, constructs sugar out of the materials of their food. The utility of sugar as the respiratory food is beginning to be seen; as also its storage in the liver from intermittent meals for constant use. Like the granary into which we pour our corn after the annual harvest, and from which we take it again for our daily wants! He says of the glycogen—"It manifests a remarkable tendency to pass into sugar in the presence of an animal ferment." He sums up thus—"The liver may be regarded as an organ engaged in forming two kinds of secretion, namely bile and sugar, or rather the glycogenic substance readily convertible into sugar. The experiments of Lehmann led him to believe that the liver-sugar is converted into lactic-acid, previous to being finally disposed of in respiration."

From this we see that in 1860 our ideas as to the function of the liver were beginning to take shape; that chaos was coming into some approach to order. We will next see how Dr. Murchison arranged the order of the different functions of the liver; and how much a

few more years had taught us upon this subject. The gigantic stride made between 1860 and 1874 will tell in no indistinct language the light modern physiology has thrown upon the digestive processes; and with that the service it has rendered to practical medicine.

We see how the grand physiologist Claude Bernard was opening up for us, knowledge of incalculable value as to digestion; as one of the numerous subjects he was investigating. His range was a wide one; his grip was as tight as his grasp was extensive. He it was, above all others, who has forced nature to reveal some of her most important secrets; and we must all be grateful to him accordingly—grateful in proportion to what we have received from him. In a few more years his views were clearer, more precise, more advanced. Not only this: but they were accepted by the leading physiologists, especially by Ludwig of Leipsic, and the school of which he is the illustrious and honored head.

We may summarize the matter as standing in 1860, something near this.

1. The bile was not merely excrementitious as regards the blood; it was useful in the digestive act, emulsifying fat.

2. The crude albuminoid products of digestion in the gastro-intestinal canal were further elaborated in the liver, and fitted for the nutrition of the tissues of the organism.

3. The saccharine elements of our food underwent some change in the liver, being converted into glycogen, or animal starch; and this again, in the presence of an animal ferment, was once more transformed into sugar, which was burnt in the blood.

Further that the liver in the carnivora could form this glycogen from the albuminoid elements of their food.

The physiologist was on a scent which he ran upon rapidly and swiftly, until in 1874, Dr. Murchison placed the matter as follows. We will note the day-break passing into morning light, in further acquaintance with the utility of bile; the relation of the liver to albuminoid matters, both constructively and destructively: and in the matter of storage of glycogen. The importance of some knowledge on these subjects to the physician in his every day walk in life, it is simply impossible to over-estimate.

The first thing to be noted is the change in the arrangement. Instead of the secretion of bile it is the "glycogenic function of the liver" which stands first.

"The most valuable contributions towards our knowledge of this matter have been the researches of Claude Bernard and other observers, who have shown that the liver has the power of making and storing up for a time within its cells glycogen ($C_6 H_{10} O_5$) a substance resembling dextrine ($C_6 H_{10} O_5$), in its chemical composition and reaction, and like it capable of conversion into sugar by the action of albuminoid ferments. This substance always exists in the liver in larger amounts during digestion, than during fasting, attaining its maximum usually about four

or five hours after a meal." He then proceeds to show that glycogen when present in excess in the liver may be converted into fat. We are all familiar with the huge fatty liver of the goose which furnishes *pate de foie gras*. Also that glycogen can be formed by the liver in a dog fed on albuminoid matters alone, and that the decomposition of a peptone produces glycogen and the nitrogenous matters leucin ($C_6 H_{12} NO_2$) and tyrosin ($C_9 H_{11} NO_3$) which are ultimately resolved into urea ($CH_4 N_2 O$). Not only does this glycogenic function of the liver supply an easily oxidizable matter readily converted into carbonic acid and water, producing heat; but there are good grounds for believing that it assists in cell-growth. Sugar is found in the cells of the placenta, in foetal tissues, in the inflammatory products of pneumonia, and in new growth whenever cell-formation is active. Nor is this confined to animals; the same occurs in plant-life."

Further—"In the early stages of foetal life the blood-cells multiply throughout the entire mass of blood; but when the liver begins to be formed, this process ceases, and a very active formation of colorless blood-cells is set up in the liver, these colorless cells undergoing a gradual change by the development of coloring matter in their interior into red corpuscles. According to Kolliker, this new formation of blood-corpuscles in the liver continues during the whole of the foetal life of the mammalia. The observations quoted above make it probable that the liver in the adult continues to perform the functions which pertain to many different tissues of the foetus, the glycogen secreted in its cells combining with nitrogen and forming an azotized protoplasm, which maintains the nutrition of the blood and tissues." Further—"The process of assimilation may soon go on to the production of fat in the liver, or it may stop short at the formation of another principle which escapes from the liver, and is elsewhere transformed into fat. Lastly, there are good grounds for thinking that both glycogen and sugar serve some purpose in muscular action; at all events, it has been found that the quantity of sugar in the blood becomes greatly diminished in passing through the vessels of contracting muscles. According to Bernard this destruction of sugar in muscles is due to lactic fermentation." It is as lactic acid that sugar is probably burnt in the organism.

Galen held that the liver was engaged in sanguification. Dr. Murchison holds that Galen was right; and proceeds—"But modern research has made it probable that the liver is endowed with a function not suspected by Galen, and which from a pathological point of view is even more important than that which we have been considering. Many observations, pathological as well as physiological, point to the conclusion that the liver is not only a blood-forming but a blood-destroying or purifying organ, and that it contributes in a great degree to the destruction of albuminous matter derived from the food and textures, and the formation of urea and lithic acid, which are subsequently elim-

inated by the kidneys. First, there seems to be little doubt that the albumen and fibrin of the blood become largely disintegrated in the liver. Lehmann and Bernard have shown that while the portal blood contains much fibrin, blood from the hepatic vein contains little or none." Further he writes—"Moreover, there are grounds for believing that, while white-blood corpuscles take their origin in the liver, the red-corpuscles are destroyed there, and that the nitrogenous coloring matters of the urine are partly the result of the destructive process."

There is strong evidence of the destruction of albuminoid matters in the liver. It is the grave of the red blood-corpuscles; further it is, in all probability, the furnace in which all forms of albuminoid waste are oxidized into the ultimate product urea, which is cast out by the kidneys.

He then gives observations from various authorities, and writes: "It is important to add, that the formation of urea in the liver is always greatly increased after food. Lithic acid has also been found repeatedly in the liver of man and mammalia, but always in small quantity; whereas, in birds, in which lithic acid takes the place of urea, as the great eliminator of nitrogen, it also takes the place of urea in the liver, as it probably does in the human liver under certain pathological conditions. All these observations point to the liver as being largely concerned in the destructive metamorphosis of albuminoid matter, the products of which are eliminated by the kidneys; although it is not improbable that other glandular organs, and even the corpuscles in the circulating blood, as believed by H. Ludwig and Fuhrer, may contribute to the process." A certain amount of body-heat is formed by these processes going on in the liver. Again, Galen is corroborated in his opinion, "that the liver is a great centre of animal heat."

This second function of the liver, namely, the oxidation of waste and surplus nitrogenized material, is one of the greatest moment in the treatment of liver-derangements. It is in the metabolism of albuminoids that we find the origin of many maladies.

Dr. Murchison writes: "The third function of the liver is the secretion of the bile. The composition of this substance is complex, and its uses are not yet sufficiently known." The coloring matter of bile is formed from hæmoglobin "by the hepatic cells, in the passage of the blood through the liver." Then again, "There are, on the other hand, grounds for believing that bile-pigment is in its turn converted into urinary pigment. It is also a well-known clinical fact, that nothing influences so much the characters of the urinary pigment as functional or structural disease of the liver." Blood-pigment is first converted into bile-pigment, and finally into urinary pigment.

The important matters of bile are the two bile acids in union with soda. "The bile-acids in human bile are two—glycocholic acid ($C_{26}H_{42}NO_6$), and taurocholic acid ($C_{26}H_{42}NO_6S$). Both acids are derivatives of albu-

men and contain nitrogen; and taurocholic acid, to which the bitter taste of the bile is due, contains all the sulphur of the bile. Both are in bile combined with soda, and both are what are called conjugate acids; that is to say, they are composed of cholic acid ($C_{24}H_{40}O_2$), which contains neither nitrogen nor sulphur, in combination with taurin ($C_2H_7NO^2S$) which contains both nitrogen and sulphur, and glycocin ($C_2H_5NO_2$) which contains nitrogen, but no sulphur." In the bile is found also a fatty substance cholesterol ($C^{26}H_{44}O$), the main constituent of gallstones. "The amount of bile secreted by the liver has been shown experimentally to increase suddenly after a meal, reach its maximum in about two hours, and then gradually decline; while by abstinence it is greatly lessened." Of this, but a very small portion is expelled by the bowels. "A large proportion of the bile secreted by the liver is again absorbed, either by the biliary passages, or by the mucous membrane of the bowels. From what is now known of the diffusibility of fluids through animal membranes, it is impossible to conceive bile long in contact with the lining membrane of the gall-bladder, bile ducts and intestines, without a large portion of it passing into the circulating blood. The constant secretion and reabsorption of bile is, in fact, merely part of that osmotic circulation constantly taking place between the fluid contents of the bowel and the blood, the existence of which is too little heeded in our pathological speculations and in therapeutics." Further, "How many times this cycle of movement is repeated before the bile is extruded from the system we have no means of knowing; but in the course of the osmotic circulation much of the bile appears to become transformed into products which are eliminated by the lungs and kidneys, while at the same time this circulation assists in the assimilation of the nutritive materials derived from the food. In the first place it assists in the absorption of fat. It is a well-known clinical fact that when the common bile-duct becomes obstructed from any cause in man the fat throughout the body wastes." It is also excrementitious, in that it contains materials which by conversion are cast out of the body as excrementitious matter. Further, bile stimulates the peristaltic action of the bowel and prevents putrefaction in the intestines.

Dr. Murchison sums up thus:

"From what has been stated it follows that the functions of the liver may be summed up under three heads, viz.:

"1. The formation of glycogen, which contributes to the maintenance of animal heat and to the nutrition of the blood and tissues, and the development of white corpuscles.

"2. The destructive metamorphosis of albuminoid matter, and the formation of urea and other nitrogenous products, which are subsequently eliminated by the kidneys, these chemical interchanges also contributing to the development of animal heat.

"3. The secretion of bile, the greater part of which is reabsorbed, assisting in the assimilation of fat and peptones, and probably in those

chemical changes which go on in the liver and portal circulation; while part is excrementitious, and, in passing along the bowel, stimulates peristalsis and arrests decomposition."

Such is where Dr. Murchison leaves the subject in 1874. The advance made during these fourteen years from 1860 to 1874 was mainly due to the labors of Claude Bernard, whose death has for a time checked the inquiry. Others are making themselves certain about the facts and then progressing.

This summary throws much light upon many matters of great clinical interest. Certainly derangement in the glycogenic function of the liver gives us diabetes; but the derangements of the liver are mainly connected with the metabolism of albuminoids. And this fact is a matter the practical physician must keep clearly in his mind's eye, well focused and distinct, in his plan of treatment, in the interests alike of the patient and himself.

Such summary brings us up pretty well to our time, and gives the reader the results of years of patient investigation, in a condensed form, convenient for his use. We recognize then that the liver is the storehouse of our fuel food, in the form of glycogen. This is converted into sugar as is required for the wants of the organism, by a ferment in the liver itself. It is the same process in the body as in the plant. The plant digests its stored starch as it requires, by first converting it into sugar. The liver takes from its store of glycogen as it requires for the wants of the body. By such means a regular supply of sugar is furnished to the blood. Upon this subject our information is fairly explicit.

As to the second function of the liver we have much to learn. We recognize its action in the destruction of waste and surplus albuminoids; we see that urea is formed by the liver, not by the kidneys; we begin to see that lithiasis, or lithæmia, is primarily a derangement of the liver, and that the waste matter in the blood produces in time structural changes in the kidney; we can see that when oxidation is imperfect the nitrogenous matters suffer most. All this we discern. But what we do sincerely desire to know more about is, the further elaboration of the proteid matters which have been converted into peptones in the digestive canal. The liver has to do with this matter. A further elaboration goes on in the liver, and disturbance in the liver leads to malnutrition. Further, it seems very probable that the huge gland is a filter, allowing certain nutritive matters to pass onward, while arresting other matters whose presence in the blood is deleterious. Dr. Lauder Brunton, F.R.S., wrote (Oct., 1880): "It seems not at all unlikely, then, that the liver has got another function besides those usually assigned to it, viz., that of preventing the digestive ferments from reaching the general circulation so as to act upon the tissues." This is a very interesting subject—this capacity of the liver to confine the digestive ferments to their own proper domain where they are eminently useful; and preventing their emergence therefrom into the general circulation

where they would in all probability be distinctly harmful.

It would appear also that peptones when escaping into the general circulation are depressant agents. I will quote Dr. Brunton again—"Professor Albertoni has found that peptones have a most remarkable action upon the blood, completely destroying the coagulability in dogs, while they have little power in this respect over the blood of rabbits and sheep. He and Dr. Schmidt-Muhlheim independently made the discovery that peptones prevented the coagulation of the blood in dogs, and the latter, under Ludwig's direction, has also investigated their action upon the circulation. He finds that when injected into the veins, they greatly depress the circulation, so that the blood-pressure falls very considerably; and when the quantity injected is large, they produce a soporose condition, complete arrest of the secretion by the kidneys, convulsions and death. From these experiments it is evident that the normal products of digestion are poisons of no inconsiderable power, and that if they reach the general circulation in large quantities they may produce very alarming, if not dangerous symptoms." It would appear that in certain conditions, as a consequence of disturbance in the working of the liver, the organism is not only ill-fed from the absence of normal products of assimilation, but is actually poisoned by the presence of products which are positively harmful. Here there are blended the evidences of anæmia and toxæmia. No wonder then that nervous depression is found along with indigestion.

"The action of digestive ferments is just beginning to find a practical application in medicine, and sometimes undoubtedly they are of very great service; but unless their action is investigated more thoroughly than it has been up to the present, it is just possible that we may find that the digestive ferments, like all other powerful agents, may do much harm as well as good." This is a useful hint from Dr. Brunton to the effect that "children should not play with edged tools." The indiscriminate use of artificial digestive ferments may do for them what indiscriminate use has done for many a useful agent, viz. bring them into disrepute. We must use these agents with all the knowledge and skill we can bring to bear upon them—wielding them discreetly. It seems possible that in some cases and under certain conditions, they might act injuriously. By granting this, we must not be deterred from resort to them for the relief of evils we know, by the possible existence of hypothetical drawbacks. It is well, however, to bear the matter in mind so far as not to forget such a possibility.

But to return to the more strictly proper subject matter here, and follow Dr. Brunton a little further:—"And now comes the question. How is it that in healthy conditions of the intestine, peptones do not pass into the general circulation, and are therefore unable to exert any poisonous action upon the nerve-centres? This question is one we cannot at present answer quite satisfactorily. Usually

the peptones disappear from the portal blood before it reaches the general circulation. Indeed, Ludwig and Schmidt-Muhlheim found that even in the portal blood, before it reaches the liver, very little if any peptone is to be found. They have not succeeded in discovering where the peptone undergoes change. Plosz and Gergyai, and also Drosdorff, have discovered peptone in the blood of the portal vein; and Plosz and Gergyai have been led by their experiments, to regard the liver as the seat of the transformation of peptones. In consideration of the more recent experiments of Ludwig and Schmidt-Muhlheim, we cannot entirely adopt the views of these authors, though it is nevertheless possible that they are to a certain extent right, and that the liver, to some extent at least, serves the purpose of preventing any peptones from getting into the general circulation, which may have escaped transformation in the portal blood before reaching it." Such then is our very latest information on the matter. There is digestion, there is also a filtering process in health. We may suffer that form of indigestion known as "biliousness," either from imperfection in the elaboration of the products of digestion in the gastro-intestinal canal, or from imperfection in the filtering process. In either case the system is ill-fed, and at the same time poisoned by the want of certain constituents, and the presence of others in the blood. The liver then is a most important organ in the elaboration of the products of digestion, as well as in the destruction by oxidation of waste and surplus albuminoid material. Disorder of the liver then will give us maladies, of which some account will be furnished in the ensuing chapter.

CHAPTER X.

THE PHENOMENA OF LIVER DISTURBANCE. BILIOUSNESS.

FROM what has been said in the preceding chapter as to the function of the liver, the reader will be prepared for an explanation of certain well known, and equally well-marked clinical phenomena.

It is quite a common experience, with children especially, to see an acute "bilious attack" follow free indulgence in rich food. Some children are "upset" by what are quite ordinary meals with other children. Even a little rich cake is sufficient in some to disturb the digestive system, to produce nausea with headache, followed by actual vomiting, giving great relief, and sometimes by purging; after which the child resumes its wonted state of health. Every medical man of any experience at all has seen this over and over again. About the clinical facts no doubt or difference of opinion obtains. But about the explanation a wide difference will be noted in the opinions founded upon these data. I mean the more remote, not the obvious explanation. The mother of the child will tell you, with the most unhesitating confidence, that—"it was the sweets, and the rich cake. Anything too rich, either with sugar or butter, always upsets that child!" The old family doctor nods his venerable head in complaisant

harmony; and "that child" is carefully watched in the future as to its eating, especially with reference to saccharine and fatty food, in anything like excess.

Yet this theory, however widely accepted, contains a fallacy; and it is important in the interest of that child, of other children similarly circumstanced, and indeed in the interest of a number of adults, that this matter be thrashed out. The fallacy is one which only revealed itself when chemistry explained the composition of bile; previous to that epoch, the fallacy lay too well-concealed to be suspected to be a fallacy. The relations of cause and effect were too clear for a scintilla of doubt to suggest itself. Nevertheless a fallacy does underlie these familiar clinical phenomena.

From what was said in the last chapter, it is abundantly clear that it is the metabolism of albuminoids in the liver which caused these disturbances. The readily oxidizable hydrocarbons burn up quickly without trouble, unless it is the heart-burn excited by some fatty acid in the stomach. As said before, Liebig pointed out that the union of nitrogen with other elements, interfered with the ready oxidation of the compound so formed. The albuminoid tissues of the body do not themselves burn, while the fuel-food burns in them; just as the works of a steam engine do not burn with the coals burning in the furnace. It is the albuminoids, which in their underground hidden career, from peptones to bile acids and uride solids, which cause the troubles of the liver. The filtering of peptones, the elaboration of albuminoids, the construction of white corpuscles, the relations of the liver to matters of histogenesis on the one hand; its relations to histolysis on the other; its being the furnace in which waste and surplus nitrogenized material, old effete blood-corpuscles, are burnt; and the luxus consumption of albuminoids which are split up into fat and urea; these are the matters which cause those disturbances of health, which we recognize as associated with "the liver." In the form of the acute bilious attack here described, it is the second part of the function of the liver which is involved, viz. the oxidation of waste and surplus nitrogenized matters. The attack is the old fashioned "surfeit," that is, a meal where the palate is followed regardless of the wants of the body; in other words the individual eats more than is good for him, or her, as it is in delicate girls this trouble is most frequently seen; while it is boys, rather, who are given to eating to excess. An excessive quantity of food is taken and the assimilative organs are upset thereby. Unless a portion of the inordinate meal be got rid of by vomiting, or by purging, it is by oxidation that it must be removed. All are familiar with the very sharp pyrexia, the sudden and marked rise of body temperature which accompanies acute indigestion. The system is holding a bonfire to the great discomfort of the child, the dismay of its mother and nurse, and the benefit of the family doctor! An emetic, a dose of laxative medicine, containing a mercurial, and the attack is,

usually, soon over without any future consequences. In a few instances the liver remains irritable, and is easily upset by any error in diet for some time afterwards; a condition to which the term "bilious fever" was applied by a past generation.

Now this acute bilious attack is undoubtedly preceded by indulgence in rich food, by which is usually meant sugar and butter; but it will not do to overlook the eggs used in the preparation of "good things" in which the youthful appetite delights.

This view of the maternal parent and the family doctor is quite in harmony with the views held by persons more widely, and more specially informed than they were, or professed to be. Even Liebig thought that bile was formed from the hydro-carbonaceous elements of our food; following the formula for cholic acid ($C_{24}H_{40}O_2$). Von Gorup-Bessanez held the same view; "and it was a favorite theory, some five and thirty years ago, that the bile was derived chiefly from the decomposition of the fats; in fact, to return to a much older belief that the bile was a kind of soap." In 1852, in an article published by "Bidder and Schmidt, doubts were cast on this hypothesis. "Bidder and Schmidt however, noticed that upon an exclusive diet of fat, the secretion of bile at once fell to the level of that in an animal from whom all food was withdrawn; so that they think that the nitrogenous elements of the food must be looked on as the chief source of the bile." To follow the subject further—"H. Nasse in his earlier work saw, however, a great increase of the secretion of bile, when with fat nitrogenous foods were also given. Ritter found that in a dog fed only on potatoes, or on potatoes and fat only, the amount of bile daily excreted fell very low." These are important observations pregnant with information as to the dietary which excites "biliousness." These quotations are made from the learned treatise of Dr. Wickham Legg on "Bile, Jaundice and Bilious Diseases," 1880; a perfect storehouse of information and research, to which reference will frequently be made in this chapter. One further quotation will illustrate even more clearly the point I am driving at, as to the source of the bile. "The amount of nitrogen in glycocoll, and of nitrogen and sulphur in taurin would certainly seem to point to an origin in the albuminous bodies of the blood or food. Some part of these bodies is thought to be split up in the liver into taurin and glycocoll, while another part goes to form leucin, tyrosin, xanthin and hypoxanthin-bodies containing nitrogen. Meisner would probably go a step further, and say that urea also was formed abundantly in the liver. Do the peptones at once furnish these nitrogenous bodies, or are they derived from the products of the decomposition of the tissues? Karl Voit would answer that the bile acids, are derived, like the urea, from the tissues, while the great dependence of the bile-making functions upon the glycogenetic function would seem rather to suggest that they come immediately from the splitting up of the peptones."

We may make bricks without straw, but we cannot make them without mortar! The nitrogenized elements in the bile-acids, to say nothing of the sulphur in taurin, point conclusively to their origin from the albuminoids of our food. There is no evading that conclusion; unless we assume that the animal body builds up, by synthesis, complex substances containing nitrogen, from hydro-carbons; an hypothesis which will not hold water for one moment. The complex hæmoglobin and lecithin are necessarily built up in the animal body; but as regards the ordinary matters there is "metabolism" not "construction;" and this metabolism results in destructive metamorphosis by oxidation.

The explanation should stand so:—(1) There is an over-abundance of food taken; (2) the more readily oxidizable hydrocarbons burn first; (3) leaving the less readily combustible albuminoids to be burnt as best may be. It is this residuum of nitrogenized material which produces the excess of bile, with the general disturbances produced therefrom. The rich food is the cause of the bile, but not "directly," only "indirectly." The importance of this distinction is this, erroneous hypothesis leads to an improper dietary; the correct theory suggests the appropriate dietary. "Ritter found that in a dog only fed on potatoes, or on potatoes and fat only, the amount of bile daily secreted fell very low." Yes; that is it! On a non-nitrogenized dietary, or one containing very little nitrogen indeed, the amount of bile produced was very small. This is the secret of the successful treatment of Biliousness. In the *Philadelphia Medical Times* for June 23rd, 1877, is an article on "Biliousness and its Management" by the writer. As a more extended experience merely corroborates what is there stated, it may be well to quote from this article, which shows that the views expounded here have not been hastily seized upon, but are the outcome of protracted thought; and are sustained by an experience extending over a number of years. "The next matter is to see what bearing the details given above have upon the right treatment of the condition of biliousness. I am of opinion that they throw a whole flood of light upon the treatment, both dietetic and medicinal. They lead to conclusions somewhat different from what are generally held, especially about the ordinary bilious attack—that is where the bile acids are the chief matter. It has been held, and is yet too much held in reference to these persons, that: 'as a rule those articles of diet are most apt to disagree which contain much saccharine or oleaginous matter, and not, as might perhaps have been expected, nitrogenous food; plainly cooked.' On this matter I am at issue with Dr. Murchison. I have seen bilious individuals who asserted that they could only take a little lean meat, bread, and tea, getting no better, but worse, on this dietary; who were all the better for a dietary exclusively hydro-carbonaceous. Of course they commenced with the full expectation of being much worse, but were agreeably surprised to find themselves better. In reali-

ty these people had worked in a wrong direction, and took the things they should have avoided, and avoided the things they should have taken. Of course it is true that any indulgence in saccharine or oleaginous food in addition to their ordinary food made them worse; but how that is brought about has been explained above. They never tried to do without their albuminoid food, and that is the point." What was written as my experience in 1877 remains my experience still in 1881.

The chemical composition of the bile acids points to their origin in the albuminoids; the application of this to practical medicine gives satisfactory results. I discussed the matter with some of our best authorities, including Dr. Murchison, who recognized the importance of the subject, at that time; and their agreement with my own view was almost complete. The lessons taught us by the liver disorders of hot climates is eminently suggestive. To quote again from the article above:—"And again the subject of indulgence in nitrogenized food crops up. If in the tropics, fruit, vegetables, oils, and other hydrocarbonaceous food alone be taken, the liver is not so disordered as when meat is added. It is the second function of the liver which is so serious a matter in hot climates; and there and elsewhere the best way to give physiological rest to a disturbed liver, is to relieve it as far as possible from the labor of disintegrating albuminoid matter. It apparently taxes the liver little to store up glycogen and give it out again; but the breaking up of nitrogenized bodies is the labor which tests it most severely. In tropical climates, then, hydrocarbonaceous food should form the staple of diet; and that, too, only in stinted quantities by those whose livers are unequal to high functional activity."

If this was made the rule, then, the amount of bile would be reduced, as in the case of Ritter's dog. There would be just that amount of bile which is required for the emulsification of the fat, enough, that is; and no surplusage to disorder the system. Those Europeans who follow the habits of the natives as to the avoidance of meat and alcohol, know comparatively little of bilious disorder; and do not develop that bronzed look which used to be associated with a Nabob, *i. e.*, that individual of marvellous constitution and vitality, who survived an Indian experience and returned to his native shores, a curiosity in every way. The returned East Indian now is not distinguishable from the ordinary Briton. What one man may do with impunity is forbidden to others. Some persons can eat meat and drink bottled beer, to say nothing of "pegs" of brandy and soda, and yet live and work in Bengal; but they do not run thirteen to the dozen. While most of those who try to do this are overtaken by a Nemesis in the shape of a liver disorder, which interferes most materially with their bodily comfort and their power of work. So it is at home: there are individuals, adults as well as children, who are upset by what would not be regarded as indulgence by others,

and which can be taken by them with impunity. After reviewing the production of bilious attacks the article proceeds: "From this consideration of the production of an ordinary bilious attack in a fairly healthy person, it is comparatively easy to proceed to the consideration of the production of allied bilious attacks in those who are abnormally liable to them. Dr. Murchison repeats the thoughtful suggestion that 'most persons have more liver, just as they have more lung, than is absolutely necessary for the due performance of its function. But in others, not unfrequently the offspring of gouty parents, the organ in its natural condition seems only just capable of performing its healthy functions under the most favorable circumstances, and functional derangement is at once induced by articles of diet which most persons digest with facility.' In those persons with livers which if not abnormally small in size are of limited functional power bilious disturbances are readily produced, just as they are in persons whose livers are crippled by organic disease." All are familiar with instances of individuals who have suffered from bilious disturbance in India, who come home and are fairly well; but if they venture back to India with the disabled liver they are quickly ill again. This is well seen in cases where liver-abscess has existed and been survived. It is those individuals with the maimed liver of abnormally low functional activity who must be so watchful about their dietary, so scrupulous to avoid any indulgence approaching excess. They must never forget what H. Nasse found, "a great increase of the secretion of bile, when with fat nitrogenous foods were also given."

It is "high tea," as well as dinners and suppers, which upset these beings with the congenitally incapable, or with maimed livers. Tea, with cream and sugar, tongue or potted meat with bread and butter, or buttered toast, or muffins; then these last with jam or marmalade, followed by cheese-cakes, jam-puffs, and a good slice of pound-cake or plum-cake to finish up with this is the sort of meal to properly upset a child whose liver is not all it might be. Such a "feed" is well enough for healthy children, with an appetite of a polar bear and the digestion of an ostrich; but for the bilious child or adult it is an instance that "one man's meat is another man's poison." After this "party-tea" the child goes home to bed, and awakens sick and feverish. It vomits freely, and gets relief. Or it is not so quickly relieved. It is in high fever, 105° or so in an hour or two; a cold is suspected, not a "surfeit," and it goes on until it vomits a quantity of pure bile, usually followed by purging; and then it gets relief. Or an emetic, accompanied by a purgative (some calomel and ipecacuan is the common compound) is given, and these processes instituted artificially, with the effect of procuring relief and a fall of the temperature. At other times, more usually in adults, the attack is less acute. There is headache, a foul tongue, with a bitter taste in the mouth a vitiated

state of the stools, and a loss of all appetite. Here the last, by leading to the rejection of all food, permits of the system recovering itself. The surplus of albuminoid material is burnt up by oxidation into urea; and so the system clears itself by this starvation. It is Dame Nature's plan of striking a new equilibrium! and, as such, ought to be treated with respect, and not with recipes to restore the appetite, which, if successful, would only further embarrass the organism.

Now it is the prevention, rather than the treatment, of such cases that calls for our attention. The avoidance of the surfeit is too palpably called for, to need a word about it. But it is the fallacy as to the precise causation of the excess of bile, which renders it necessary to lay stress upon the form of food which produces bile. So long as the fat and the sugar are held to blame, so long will the child be erroneously fed. It will be allowed albuminoids, and be restricted in the matter of hydrocarbons; and so the tendency to be bilious will be directly fostered. Adult or child, the ordinary dietary is a little lean meat, dry bread, and tea or coffee without sugar or cream. You will be told, milk is "bilious," eggs are "bilious," butter is "bilious," porridge is distasteful! Yes, this is a story with which one has long been familiar; is familiar at the present time, and likely to be "acquainted with" for some time to come—probably the rest of one's lifetime; as I do not belong to a family of centenarians, but only of fair longevity. The proper dietary is thus studiously avoided, and the evil perpetuated.

What is the appropriate treatment dietetic and medicinal of this state of affairs? Dietetically it is the avoidance of albuminoids (see p. 137) in all forms, in any quantity. The food should consist of farinaceous matters, fruit natural or stewed, vegetables, fish, or a little white meat. Butter, cream, oil, or fat are not forbidden, if and provided nitrogenous material be not taken too freely therewith. Medicinally, an hepatic stimulant of some kind, in a dinner-pill, or at bedtime with a vegetable laxative, and next morning a saline purgative. Many a chimney does not draw properly because the flues are not well swept. So it is with the bilious; it is necessary "to sweep the flues," *i. e.*, to keep the bowels open. When this is done certain desirable foods are no longer found to be "bilious." They agree, instead of disagreeing as before. Exercise, plenty of exercise to increase the oxidizing processes, is most desirable. By the union of these measures the "bilious" individual is usually much benefited. But infinite care is required, incessantly and unintermittingly. Occasional lapses upset the individual for some time afterwards. The congenitally inefficient liver is only equal to the most moderate demands upon it; consequently it must be compromised with. It is a case of Mahomet and the mountain; it would not come to him so he had to go to it! So the liver not being equal to what an ordinary normal liver can do, it becomes necessary to reduce

the food taken to what it can dispose of. There is no alternative. There is no getting another liver; the individual will have to remain content, or discontent as the case may be, with the viscous dame Nature has given him; and he must just accommodate himself, or herself, to the inevitable. It is, no doubt, very hard that such watchful care is imperatively necessary, and socially very irritating; but there it is.

Other individuals there are who cannot take certain wines without suffering for their indiscretion. Some persons can get through a good dinner very fairly provided they are not tempted to taste the port wine. But if indiscreet enough "to try a glass of port," at the solicitation of their host, next day their liver resents the indiscretion. In others it is champagne which alone must not be touched on any consideration. While with others this is the only wine which they can take without consequential suffering. Why one wine alone should disagree with certain livers is a refinement which physiology is not yet able to explain. The alcohol, the ethers, the salts are much the same; what is then the minute matter which constitutes the difference? We must answer that in the present state of our knowledge; we do not know. The clinical fact remaining all the same!

Now it is time to consider in some detail two kinds of "Liver Disturbance." (1) Biliousness proper; (2) lithiasis or lithæmia, which takes the form of indigestion, rather than that which is known as gout. In the first, bile-acids are the offending matter. In the second, the formation of lithates by the liver is the malady par excellence.

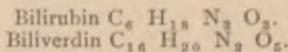
1. Biliousness (proper) is the form of hepatic disturbance found in persons naturally "bilious." Such persons are ordinarily dark, often swarthy; but by no means necessarily so. The typical bilious individual is dark, with black hair. The skin is thick, wanting in transparency even if not actually "muddy," there is a large development of pigment. The eyes are dark, the conjunctivæ have a distinctly yellow hue. When very marked the individual looks "steeped" in bile; the yellow stain showing itself everywhere. The dark skin not uncommonly presents a number of freckles on the face. The hands are dark, and never white; indeed the hue is that of the lighter colored of the dark races. Why there should be this development of pigment, the black hair, the darkly pigmented irides, it is impossible to say, as we do not know the relations of pigment to the coloring matters of bile. But there is some association, that is clear enough.

These bilious individuals may be active, may be lethargic, may be circumspect in their living, or may be careless, but they suffer for their indiscretions!

Their digestive canal is their bane in life. Their appetite is capricious; and that is an advantage, as the loss of appetite lessens the amount of food taken, and, therewith the demand upon the liver. Their bowels are rarely regular; commonly they are constipated, ordinarily with diarrhœa when the

"bilious attack" is passing away. They commonly have headache, and usually their temper is irritable. They are not, as a rule, lively people; rather they are gloomy, or morose. The dark, swarthy Stuarts were a bilious people. After reproaching the Duke of Grafton on his descent from Charles the Second, Junius says: "There are some hereditary strokes of character by which a family may be as clearly distinguished as by the blackest features of the human face. Sullen and severe without religion, profligate without gaiety you live like Charles the Second, without being an amiable companion; and for aught I know, may die as his father did, without the reputation of a martyr." The swarthy skin, the peculiar turn of mind, are each a part of the bilious temperament; alike the outcome of something which is causal to both. The old Greeks used the word "melancholia" for mental depression; "black bile," as it means, was they held the physical cause of a state of mental depression. When under the influence of a bilious attack this mental attitude is aggravated, and the irritability and depression are pronounced. The character of James the Second is in harmony with a persisting biliousness.

Now the bile acids and the coloring matter of bile are not the same thing; just as the coloring matter of the urine and the urine solids (proper) are not the same thing. But a high-colored urine is usually a urine of high specific gravity. And an icteric hue is usually found with biliary disturbance. Both the coloring matters of bile are nitrogenized matters.



tell of their derivation from albuminoid material originally, if immediately the products of the destruction of hæmoglobin. Glycogen which unites with cholic acid to form glycocholic acid has the formula $C_{24} H_{42} NO_3$; and taurin $C_2 H_7 NO_3 S$.

The bile coloring matter and the bile acids go together. Where the one is the other is not far away. Taurocholic acid is the material which gives the bitter taste in the mouth in biliary disturbance; it does not give the yellow hue to the fur on the tongue, but the two go together clinically. The tongue is usually furred, the fur being yellow or even brown, first thing in the morning; if persisting all day, worse then. Along with this is experienced a bitter taste in the mouth. Sometimes the tongue looks quite clean when a bitter taste is complained of; but if the patient be placed in the light and then the eye is brought near to a level with the tongue so as to look along it, then the yellow or brown hue is perceptible, which was unnoticeable before; just as a dyer holds up a skein of silk sideways to the eye when he wishes to be very certain about the shade of color. Where there is co-existing old standing debility the tongue is swollen, pale, flabby and showing the indentations of the teeth at its edges, while its surface is whitish and its papillæ are long. "If the liver be somewhat con-

gested with these appearances we may often observe the fungiform papillæ on the tip and edges larger and redder than natural. In other cases, and especially when there is at the same time more or less gastric catarrh, the whole surface of the tongue is uniformly covered with a thick fur, sometimes whitish, but occasionally of a yellowish or brownish tint. According to Sir James Paget, psoriasis of the tongue, difficult to distinguish from syphilitic psoriasis, occasionally results from gout," (Murchison). The tongue is worthy of careful study and minute inspection, in all cases of disturbance of the chylipoietic viscera.

Disorder of the bowels is common. There is torpor often with flatulence. The bowels are irregular; either constipated always, or constipation alternates with looseness. Often acidity is complained of in the intestines, with a headache of its own. Prout, in his well-known work on "Stomach and Urinary Diseases," says of this trouble—"When acidity prevails in the lower portion of the intestinal canal, and particularly in the cœcum, the treatment must be modified to meet the circumstances. The soluble antacids in this case have comparatively little effect, from their being neutralized and absorbed before they reach the seat of the affection; hence the insoluble antacids, and particularly magnesia, will in general be found most useful in such cases. The shortest mode, however, of getting rid of the immediate inconvenience of acidity in the lower bowels, is usually to inject a pint or two of warm water (or of soap and water), and thus of removing the offending cause. By this simple remedy I have often seen the severe nervous headache, and other unpleasant symptoms usually accompanying acidity in the lower bowels, immediately removed. Those who suffer from such causes usually require the aid of purgatives, which in general are better taken at bedtime. Purgatives of a mild but effectual kind, such as the *Decoct. Aloes Comp.* with magnesia often suit well; as do pills taken at a late dinner if duly adjusted to the circumstances of the case. Drastic purgatives in general should be avoided; for though they sometimes give immediate relief, they usually leave the patient more inveterately disposed to the disease. Neither this class of diseases, nor the remedies adopted to remove them, have been so carefully studied as they deserve to be." What Prout complains of in the concluding sentence, still continues to hold good. Matters requiring "careful study" never have been, never will be, properly attended to, unless humanity undergoes some prepared modification affecting the multitude, and disposing it favorably to earnest thought; which will be about the advent of the Millennium!

The stools are sometimes pale, "wanting in bile," we say; and this is common when there is a deposit of lithates in the urine. Commonly they possess a very offensive odor. At other times the stools are pale and putty-like, while the urine possesses a very offensive odor immediately

when passed. This condition I have met with in elderly women with anæmia and large livers; it is common to hear them complain of the offensive character of their urine: "I can't abide myself," is a frequent expression with them. It would seem that there is present in the urine some substance possessing the properties, to the nose at least, of skatol or indol. Certain it is there is some perversion of assimilation, or metabolism, or oxidation which shows how closely the liver and the urine are linked together. At other times they are lumpy, dark-colored, and offensive, as if too long in contact with the intestinal secretions. Such stools often alternate with diarrhoea, when the stools are charged with bile producing the sensation of scalding at the vent, as if the motion consisted of "red-hot sand;" leaving behind it a good deal of irritation. Chronic conditions of anal itching are always the concomitant of biliary disturbance in persisting indigestion. These stools, black and offensive, have a term for them, viz. "vitiated," an expressive, old-fashioned phrase. The urine is usually high-colored, but clear; at other times it contains a deposit, which may vary—may be white, fawn-colored, or "brick-dust" in hue. Indeed, the whole phenomena are those of excess of bile, poisoning the whole system, and chiefly disturbing the digestive canal. The bile-acids here are the disturbing agents, in all probability at least.

The following is Murchison's summary.—"The symptoms, usually associated with a deficient excretion of bile, are an irregular, usually costive state of the bowels, the stools being insufficiently colored with bile, and of a pale yellow drab, or whitish color; loss of appetite, a white or yellowish tongue; a disagreeable, often bitter taste in the mouth, especially in the morning; flatulence; a yellow or muddy tint of skin (indicating, unless there be concurrent hyperæmia of the liver, anæmia rather than jaundice); dingy conjunctivæ; languor and disinclination for exertion; frontal headache; dulness and heaviness, drowsiness after meals; great depression of spirits, and sometimes hypochondriasis; and frequent deposit of lithates in the urine on cooling. These symptoms are very apt to be induced, especially towards middle life, by sedentary and indolent habits, the habitual use of rich or indigestible food, neglect of the bowels, great, or protracted anxiety of mind, or by a general want of vigor, consequent upon disease of the heart or of some other organ; and the tendency to them is, in many cases, inherited. They are commonly, and perhaps correctly, ascribed to what is called "torpidity of the liver," but the non-excretion of bile may possibly be merely one of the symptoms, rather than the cause of the morbid state; the real cause being the retention in the system, not of bile, but of those products of disintegration which it is the purpose of the kidneys to eliminate. At the same time, it is very probable that engorgements of the liver with bile interfere with the normal processes of disintegration of albumen which takes place in the gland."

And it certainly is probable that there is a surplusage of bile in those cases. Useful in normal amount in the assimilation of fat, freely poured out and freely absorbed more than once, a large quantity of bile may be accumulated, that portion normally cast out by the bowels being reabsorbed; why, we cannot tell in the present state of our knowledge, the clinical fact remaining all the same. The purgatives which are operative in such cases are those which act upon the upper part of the intestine, and sweep away a quantity of bile too swiftly for its absorption by the bowel lower down. Such are notably mercury, rhubarb, aloes (as well as acting on the colon), and podophyllin, or gamboge. The utter inability of purgatives like sulphate of magnesia and castor oil to relieve conditions of biliousness is well known. The patient with the furred tongue, bad taste in the mouth, and general languor and malaise, states that the bowels have been freely opened by these agents; yet no sense of relief is experienced therefrom. A laxative containing mercury brings away some bile-laden stools, and the sense of relief is marked; while the tongue cleans, and the bitter taste in the mouth disappears. Such a remedial agent a by-past generation called an "alterative," a term justified by the clinical facts; but not to be explained satisfactorily otherwise in the present state of our knowledge. When the surplusage of bile is swept away, the system feels relieved, the appetite returns, and assimilation is restored. It is clear from this that a certain amount of bile only is required for the purpose of digestion, and the overplus can truly be regarded as excrementitious. In this matter we must still look to the utterances of clinical medicine, as physiology, just yet, is not in the position to speak authoritatively. Probably, ere many years have passed away, it will have much to tell us that we will be very glad to hear; as in the past so probably in the future, our clinical observations will be corroborated as well as explained by advancing physiological knowledge. At least there is every reason to believe so from the lessons of the past.

In the meantime it is not unwarrantable, nor yet out of place, to throw together a few matters which will at least be suggestive in the aggregate; if nothing more can be claimed for them. The bile is a fluid which passes very easily through animal membranes; not only that, but when such membranes are wetted with bile, oil easily passes through them. It is easy then to comprehend how bile may very readily escape out of the bowels into the portal venules, if allowed to remain in contact with the bowel. It is secreted under a very low pressure, a fact, the importance of which we scarcely are yet in a position to fully realize. It is a fluid evidently which is freely poured out and readily absorbed, and may circulate in the chylipoietic viscera in abnormal quantities some time, before being cast out of the system by the act of spontaneous purgation; sometimes accompanied by vomiting.

When such an accumulation of bile exists,

sooner or later, the natural eliminating action comes into play, giving relief. The diarrhoea, of which the patient complains, and asks for a remedy, is the natural means of restoring an equilibrium once more. It is the thunder-storm which clears the air; and therefore the patient should be grateful for it. But it is not in humanity, in this subliminary state anyhow, to be grateful for what is unpleasant.

Now a very interesting question suggests itself, but does not bring with it a complete or satisfactory answer; and it is this. Is it the excess of bile-acids which produces the lethargy, the depression, the "melancholy," of the bilious attack; or is it that in a bile-laden state the liver is impaired in its filtering power, and allows peptones, or other crude matters of gastro-intestinal digestion, to pass through it into the general current of the blood?

The question is one which at least is worthy of consideration, even if a positive answer cannot be given to it. Such consideration will enlarge our acquaintance with the subject; and that is good, even if but imperfect good. One part of the subject is clear enough anyhow, and it is this. The normal products of digestion give us agreeable sensations, a part of which is a sense of energy. But this varies. A small meal is more apt to give the sense of energy and well-being; while a full meal gives a very pleasant sense of well-being combined with a feeling of *dolce far niente*, of disinclination to exertion. But that the mental associations of normal digestion are pleasant, there can be no doubt. Charity dinners demonstrate the belief in the effects of a good meal upon the generous impulses. Young ladies talk to their papas after dinner about their lovers, when they know that some objections exist to them in the paternal mind. Mammams know this too. "A hungry man is an angry man;" when a man's stomach is full he is inclined to be amiable. That is a well-recognized fact. But when the products of digestion are abnormal, then a very different mental state is produced. There is depression, with irritability; no matter whether the state is one of ordinary "biliousness," or one of "lithæmia." Whether lithates or bile-salts are the offending matter, the mental state is not one of well-being, but the opposite. Nor is it the posterior sensory lobes of the hemispheres alone which are involved. We know that Cyon and Aladoff have traced a direct nervous communication betwixt the liver and the posterior lobes of the brain, that portion of the cerebrum, indeed, which is linked with our subjective sensations. There is this matter of nerve-communication by fibres of the sympathetic to be borne in mind; this "sympathy," as well as the direct effect upon the sensorium of the abnormal matters—abnormal in character or in amount, circulating in the blood. Such poisoned blood, too, produces modifications of sensation.

There is the general cutaneous itching of jaundice, well-recognized; and the itching of lithiasis, the general prurigo of inefficient

renal action, seen in the subjects of chronic Bright's disease. There are burning or scalding patches, and sometimes "lightning flashes" of acute pain, and hyperæsthesia in those who are the subjects of lithiasis; as sudden sometimes as the pains of locomotor ataxy. There is neuralgia. Also severe cramps. While headache is almost invariably present. It may be "megrin," or it may be "frontal," through both temples; or it may be "vertical," or "occipital," or even it may be general. Usually it is accompanied by a sense of nausea and anæmia.

Alterations of vision, dimness of sight, etc., or modifications of hearing, sounds in the ears, buzzing, or ringing, may be experienced. One eye may be more affected than the other, or one ear; or there may be vertigo, or a sense of dizziness, or swimming experienced. Even convulsions are not unknown as the result of such toxæmia.

More striking still is the cardiac disturbance set up by this poisoning by bile in the blood. Bile has been found experimentally to have "a direct paralyzing action on muscles" by Ranke, and Wickham Legg agrees with him as to the action. Röhrig first clearly showed that it is the bile-acids, and not the bile-pigment or cholesterol which causes the slow pulse. At other times there is a lowering of the blood-pressure, with that rapidity of the pulse which is linked therewith; and this slow pulse, or rapid pulse, depends upon the condition of the sympathetic system, according to Traube. It appears, too, that bile acids in any quantity in the blood are destructive to the red corpuscles.

There is then another factor in the depression produced beyond that (1) of the direct action of the bile laden blood upon the brain; and (2) the sympathy betwixt the liver and the posterior lobes, by their direct nerve-communication; there is (3) the effect upon the circulation, lowering the blood pressure in the brain as well as elsewhere. No wonder then that there is depression linked with irritability; the depression of brain actually ill-fed, with the irritability caused by the positive presence of a blood-poison. "The influence of the liver upon the animal spirits has been recognized by medical writers in all ages. To the belief in the existence of such an influence may be traced the origin of such terms as *hypochondriasis* and *melancholia*. Although it is not contended that the morbid states of mind, to which at the present day we apply these terms, have their origin in the liver, they are unquestionably, in many instances, accompanied and aggravated by derangement of the organ; and it is equally true that, independently of either hypochondriasis or melancholia, persons with functional derangement or structural disease of the liver are subject to fits of great depression of spirits, and often groundless fears of impending danger, which cease when the liver is restored to its normal state. *Irritability of temper* is another common symptom of functional derangement of the liver, and is sometimes the first indication of anything

wrong. A man who has previously borne the crosses of life with equanimity, and been amiable to those about him, gradually becomes disconcerted by trifles; his mind broods upon them, and he makes all around him unhappy, and himself the most miserable of all. His relatives perceiving no other sign of indisposition, and failing to recognize the true cause, too often put down the ebullitions of temper to something mentally or morally wrong; to moral depravity, or failure to make any mental effort, but remedial measures calculated to restore the liver to healthy action, if resorted to in time, will often remove the irritability, and either the patient's improvement under such treatment, or an attack of gout, reveals the cause of the patient's bad temper." So writes Dr. Murchison. And there is no doubt much of what Americans call "pure cursedness" is due to a toxæmic state of the blood, containing as it does "bile-poison." The subjective sensations of the individual are unenviable, to put it as mildly as possible. I remember a lady of very fine sentiments and strong religious feeling, who became quite alarmed at what she regarded as her own perversity and innate wickedness, and the inefficacy of prayer—who recovered her normal state of mind on a line of treatment which filled her brain with healthy blood. In some cases the second factor—the direct sympathy betwixt the liver and the posterior lobes of the brain, exercises a distinct influence; and the sensory portion of the brain is more affected than the rest of it, *i. e.*, the posterior portion supplied by the vertebral arteries* which is related to the subjective sensations, is more affected than the intellectual or motor areas. Consequently we find a peculiar state of mind. There is perverted emotion with a distinct perception of the perversion. Thus Jean Jacques Rousseau wrote, "I feel bitterly my wrong conduct and the baseness of my suspicions; but if anything can excuse me it is my mournful state, my loneliness." The intellect here was perfectly conscious that there was a morbid condition of the emotions which it was evidently unable to control. The late Thos. Carlyle knew what this horrible feeling was—"The accursed hag dyspepsia had got me bitted and bridled, and was ever striving to make my living-day a thing of ghastly night mares; I resisted what I could, never did yield or surrender to her; but she kept my heart right heavy, my battle being sore and hopeless." Yet he strove on under the infliction; his experience fully bearing out what is written in the initial sentence of this book. There is little real difference betwixt the action of bile-acids or lithates in their toxic effect upon the brain-cells. Both act potently. It is scarcely, however, a complete consideration of the subject to leave it here. To revert to Dr. Brunton's paper, it would seem that there are gases evolved in

*Not only is the blood supply special, but the sympathetic nerve supply to the vertebral arteries is derived from the lower cervical ganglia; that of the internal carotids from the superior cervical ganglia.

certain states of disorder of the assimilative organs which are distinctly toxic in their effects. He follows Dumarquay as to the absorption of sulphuretted hydrogen from the intestine. "In cases of indigestion this gas seems to be not unfrequently found, because persons often complain of the taste of rotten eggs in the mouth, or in the eructations. Even in such small quantities it is not improbable that it may exert a deleterious influence both upon the nervous system, and upon the blood, for it is a powerful poison, in its action somewhat resembling hydrocyanic acid, though not so strong." In some cases the production of sulphuretted hydrogen may be a factor in the nervous depression produced.

He writes:—"The greatest care appears to have been taken in the construction of the liver to prevent the bile from coming in contact with the blood; the ultimate radicles of the bile-ducts or biliary capillaries being placed as far from the blood capillaries as the structure of the liver will allow. Notwithstanding this care, the distance between the blood and the bile capillaries is small, though it is sufficient under ordinary circumstances to prevent the absorption of bile into the blood. But, whenever an obstruction takes place to the exit of bile, and the pressure of bile in the biliary capillaries increases, an absorption of this secretion occurs. Bile is secreted under a very low pressure, and a very slight increase in this is sufficient to cause reabsorption."

He goes on:—"But bile is not the only substance which produces a depressing effect upon the circulation, when absorbed into it from the portal circulation. In many cases of nervous depression we find a feeling of weakness and prostration coming on during digestion, and becoming so very marked about the second hour after a meal has been taken, and at the very time when absorption is going on, that we can hardly do otherwise than ascribe it to actual poisoning by digestive products absorbed into the circulation. From the observation of a number of cases, I came to the conclusion that the languor and faintness of which many patients complained, and which occurred about eleven and four o'clock, was due to actual poisoning by the products of digestion of breakfast and lunch; but at the time when I arrived at this conclusion I had no experimental data to show that the products of digestion were actually poisonous in themselves, and only within the last few months have I seen the conclusions, to which I had arrived by clinical observations, confirmed by experiments made in the laboratory. Such experiments have been made by Professor Albertoni of Genoa, and by Dr. Schmidt-Muhlheim, in Professor Ludwig's laboratory at Leipsic." (What these observations were is given at p. 164). We thus see that there are many factors in the production of the nervous depression, and disturbance linked with normal action in the liver. If the nervous system strongly affects the liver when perturbed (Chap. ix), it is also abundantly clear that the liver, when disordered, produces a potent ef-

fect upon the cerebral hemispheres. These two halves of the subject are well worth keeping in mind and contrasting.

So much for the consideration of the nervous phenomena provoked, or set up by disturbance of the function of the liver.

We may now consider the effect of the bile-laden blood upon the heart. In using here the term "bile-laden," it is intended it shall embrace these other products which may co-operate with the bile in producing nerve-disturbances. We saw at p. 53 that bile is a poison acting upon the heart. We saw further, that its action was not alike in all cases; and that Traube held this difference to be due to the condition of the sympathetic system. What actually occurs in practice bears out the views of Traube. At times patients present themselves with deep depression of the nervous system, while the heart's action is slow and feeble. Here there is direct action upon the cardiac ventricles through the inhibitory fibres of the vagus. The depressing effect of the bile-laden blood upon the cerebral hemispheres is intensified by the comparative anæmia of the brain, consequent upon the arrested action of the heart. The defective blood-supply produces the symptoms of cerebral anæmia, and blends them with those of biliary toxæmia. The pulse is slow, frequently unequal, corresponding to the stroke of the ventricle. This irregular action of the heart alarms the patient, already depressed by the effects of the bile upon the brain, and causes the impression of "something wrong with the heart" to take possession of the patient's imagination, and to cause him or her much needless alarm. But it is not easy to convince them that the alarm is needless, and without real foundation. Impressions founded on subjective sensations are not easily laid at rest; they raise their hydra-headed front again and again, in spite of all the efforts made to keep them in subjection. The horrible sensations and the irregular action of the heart will range themselves together in a most suggestive manner. Just as the Hydra grew another head as fast as one was cut off, so the disordered imagination will yield to the suggestive associated facts, and put its own interpretation on the linked phenomena. Assure them that there is no actual disease of the heart, they depart comforted; for the time. But in a little while the impression comes back, with a rebound as it were; and the apprehensions of organic disease are as dominant and dominating as ever. Yet when the function of the liver is restored, and the blood is once more freed from bile, and its kith and kin, the mind escapes from the incubus which bestrode it; and the reason once more resumes its wonted sway. The condition passes away, like a bad dream, leaving behind it for a time a painful feeling, which haunts the sufferer like the refrain of mournful music—a melancholy symphony!

At other times the symptoms are those of a low blood pressure, with a rapid pulse. Here there is palpitation at times; often severe, and alarming the patient. It is well

known that with a low blood pressure in the arteries the heart's action is rapid. The roots of the vagus are not freely supplied with blood, and then the accelerator fibres of "that rope of varied strands," the vagus, are thrown into action. At times this leads to positive palpitation, the contraction of the ventricle being so quick and vigorous. It is indeed a true form of neural palpitation, not influenced by effort. It also disappears when the functional activity of the liver is regained under appropriate measures: the first step being to get rid of superfluous bile-products, and other albuminoid matters, and to so feed the patient as to give the liver but little to do. A dietary containing little albuminoids is the one most suitable, as taxing the liver little in the metabolism of nitrogenized matters.

Sleeplessness is another symptom much complained of by these bilious patients, and it is linked with the cardiac disturbances very closely. The patient complains of inability to sleep; in vain it is courted for hours; it will not be wooed. The sleepless hours are in themselves barely tolerable; but when, in addition to this, the disturbed cardiac action is present, the condition becomes almost unbearable. The sleepless patient feels at times as if the heart would really stop, its pulsations become so slow and feeble. Depressed before, this deepens the gloom; and a sense of misery is intensified by apprehensions of approaching dissolution. When there is palpitation the case is different. In the silent watches of the night the sufferer is suddenly wakened out of sleep by a violent paroxysm of palpitation. This is alarming enough; but when the violent beats are succeeded by apparent sudden stoppage then the dread indeed is acute. So long as the heart is violently beating the sufferer is comparatively easy in mind, but when the sense of stoppage comes then the sensation is that of dying. The evil effects of this are not immediate only, the shock upsets the patient for sometime afterwards, and is only slowly and not rarely imperfectly recovered from. Dr. Murchison writes: "Sleeplessness may, of course, arise from many different causes, but one of its causes is that derangement of the liver which produces lithæmia. When this is the case the patient is often heavy and drowsy after a full meal, and he may fall asleep at once on retiring to rest; but after one, two, three or four hours he awakes, and then he either lies awake for hours, or he is constantly falling asleep, dreaming, or having the nightmare, and awaking four or five times, or even oftener, in the course of one hour, until the morning comes, when he drops into a quiet sleep of an hour or more, or he is obliged to get up tired and irritable. This sleeplessness, like the vertigo we have already considered, is often induced by particular articles of diet, or by some unwholesome combination of them. What will excite headache, giddiness, or disorders of the circulation in some patients, will in another cause sleeplessness. Sometimes, however, this symptom will occur when the patient is

most careful as to diet. What is important also to note is, that in most of these cases there are no obvious symptoms of gastric dyspepsia; the appetite may be good, too good in fact; the bowels may be regular; and there may be no pain, flatulence, or other discomfort, after meals; but there will be found an unusual tendency to the deposit of lithates in the urine, and very often other phenomena of a so-called gouty diathesis." Such is a brief summary of the phenomena associated with sleeplessness, when the patient is not otherwise ill; in the less grave cases indeed.

Such are then the disturbances of a neural nature, which belong alike to biliousness, and to lithæmia, or lithiasis. Whether it is bile-acids, or lithates, which are the disturbing matter, the phenomena are much alike as regards the subjective sensations; instead of the buoyant sensations, the sense of energy given by the normal products of digestion, there is depression and pnanphobia, the outcome of a blood laden with abnormal products, or with natural products of albuminoid metabolism in excess. As they will be referred to in the next section, it will not be necessary to write them here. Such then is a bird's eye view of the symptoms produced, when the liver is embarrassed or hindered in its working, either by too much to do from too many albuminoids being taken in the food, or by some cause of disturbance to its functional activity. It fails to elaborate the products of gastro-intestinal digestion as it ought normally to do; while it produces bile-acids in excess, or it conducts the metabolism of the digested proteids on a downward course, splitting them up into uric acid and urates. It is a deeply entrancing subject this, of how the liver acts upon the digested proteids, instead of further elaborating them, so as to furnish pabulum to the tissues; it arrests their further progress and sends them prematurely upon a retrograde career, splitting them up into bile or urine solids. It is like a batch of bread spoiled in the baker's oven. The flour and water have been well mixed, the yeast incorporated therewith; the fermenting action of the yeast is operating on the starch granules; the dough is rising nicely; it is cut into loaves and placed in the oven. But the oven is too hot or too cold, and instead of wholesome nutritious bread, we get a sodden, or burnt mass, unfit for food, and only so much good material converted into waste; we all know the stout-hearted determination of the youth "to make a spoon or spoil a horn!" In this case it is a promising horn spoiled and no spoon made! The peptones are wasted; instead of tissue-pabulum, they are turned aside to undergo a retrograde metamorphosis by a premature oxidation. The aborted proteids only furnish so much waste matter, which the system must get rid of as excrementitious material. Instead of so much pabulum to the tissues, there is only so much waste matter to be eliminated.

The management, medicinal and dietetic, of this condition will be given in the next chapter.

A less pronounced condition than this just described, has been commonly seen in the recent east winds, which proved so disastrous to the late Lord Beaconsfield; and in the persistent north-east wind which prevailed throughout May, 1880.

They found out every person who "had a liver," without respect to persons. Patient after patient at the hospital had to have the plan of treatment arrested for the time, in favor of one adapted to the intercurrent state of liver disturbance. Private patients required the same "change of front." The east wind finds out the liver, albeit it lies snugly ensconced under the diaphragm and protected by the abdominal walls; and the expression "a bilious chill," extends from an acute condition, resembling a cold in duration, to a more persisting state. Nor is the expression an undesirable one, though it has been sharply criticised by some. The patient complains of malaise, of incapacity for exertion; bodily toil is taxing, mental work is irksome; they are unfitted too for their usual occupation. The bowels are more or less disturbed, loose or constipated, there is a bad taste in the mouth, and the tongue has more or less a brown-hued fur upon it. The urine is either high-colored and dense, or laden with lithates, according as the liver is capable of converting the nitrogenized waste into urea, or only splitting up the peptones into uric acid and urates.

Here again the nutrition was affected and the peptones diverted from their normal course and turned to destruction—wrecked on the way, indeed. In all cases iron and tonics had to be withdrawn, and hepatic stimulants and laxatives, with a restricted dietary substituted therefor. It was clear the liver was incapacitated for the time from taking any part in the elaboration of the crude products produced in the digestive canal. In some cases, but not in all, there was some pain and distension experienced in the region of the liver. In all, without exception, there was more or less of that cerebral irritation, that mental disquietude, which has been described earlier on as being the outcome of disturbance in the function of the liver.

CHAPTER XI.

PHENOMENA OF LIVER DISTURBANCE (*Continued*).—LIVER INDIGESTION.

WHEN Dr. Murchison delivered his Croonian Lectures before the Royal College of Physicians, and came to the subject of "Abnormal Disintegration," he said:—"I need not remind an audience such as that which I have the honor to address, that deposits in the urine of lithic acid, or lithates, are not due to any morbid condition of the kidneys. What I wish to insist is, that the frequent occurrence of these deposits in the urine ought always to be regarded as a sign of functional derangement of the liver, arising from causes, sometimes temporary, at other times more or less permanent." This is a

positive expression of opinion, clear and decisive.

These deposits in the urine are, then, significant of disordered functions in the liver. They belong to indigestion proper. They were held, are perhaps held still by some, to be the evidences of kidney disease. "Gravel" of course indicated kidney mischief, and "sand" was a form of gravel! Diuretics and potash gave relief, and these agents acted upon the kidneys; could the evidence be more complete? Yes, it is true that to give potash is to give relief. With potash uric acid makes a most soluble salt, and in such combination uric acid is readily drained out of the blood.

To illustrate the action of potash, it is enough to add some liquor potassæ to a specimen of urine turbid from lithates; it quickly clears. The stronger base potash ousts the soda and ammonia from their union with the uric acid, forms with it a soluble salt; and the turbid urine becomes clear. Could anything be more delightfully simple!

But it is not the mere excretion of uric acid that we have to deal with; it is the more important as well as more remote matter, its formation in the system, which we wish to influence. To go back to our analogy of the thunder-storm, it is not enough to study the lightning and the thunder; we must proceed to investigate the genesis of the storm, to consider the forces which brought it about. To dissolve out the offending uric acid by potash, is like putting up a lightning conductor—a very useful thing in its way; the utility of which I have no wish to underestimate. But no simile runs on all-fours; and though the administration of potash may be analogous to the lightning-rod, we can influence the genesis of the lithiasis; if we cannot yet, in the present state of our knowledge, exercise any control over the production of the thunder-storm. A little while ago, we knew no more how to do this, than we yet know how to abort a thunder-storm.

It has long been held that uric acid is the poison of gout; and Prof. Garrod has demonstrated that it is "gout poison," *par excellence*. But while granting this, there is a form of indigestion of which the abnormal formation of lithic acid and lithates is a prominent symptom, which should rather be classed under the head of "liver indigestion" than that of "gout." The two overlap, and the old phrase "liver and kidneys," if vague, was certainly not inaccurate. To formulate "what is gout?" I should make the essay to this effect:—Gout is due primarily to functional derangement of the liver in the splitting up of albuminoids; the blood is surcharged with nitrogenized waste, and this in time leads to structural changes in the kidneys! But there is a form of lithiasis, which is more properly to be considered a liver derangement than gout. "Gout" is a term which will be made to embrace a wide area in Part II.; and it need not be unduly extended by including "liver indigestion" under that heading. When gout is described, it will be necessary to revert to this matter, but

it need not further engage our attention at the present stage of the inquiry.

In speaking of uric acid, M. Foster says:—"This, like urea, is a normal constituent of urine, and, like urea, has been found in the blood, and in the liver and spleen. By oxidation, a molecule of uric acid can be split up into two molecules of urea, and a molecule of mesoxalic acid. It may, therefore, be spoken of as a less oxidized form of a proteid metabolite than urea; but there is no evidence whatever to show that the former is a necessary antecedent of the latter; on the contrary, all the facts known go to show that the appearance of uric acid is the result of a metabolism slightly diverging from that leading to urea." It must, then, be regarded as the product of perverted metabolism in the liver. Prout held uric acid to have another source than urea, to be formed largely from the gelatinous forms of our albuminoid food, while urea was held to be derived from ordinary albuminoid matters. This view was soon abandoned, and it was thought uric acid was a normal product, viz., a sort of nitrogenized waste preceding urea and converted into urea by further oxidation, or by a splitting up into urea and oxalic acid. Now we regard it as a product of perverted metabolism in the liver. The appearance of lithates in abundance in the urine about the time when the liver is actively engaged in the digestive process, renders it highly probable that certain peptones, instead of undergoing further elaboration are turned aside, and broken up prematurely into lithic acid and lithates. That these lithates do not in any way represent tissue waste, for they have never been tissue! They stand in the same relations to the tissues that a still-born child bears to an estate that it would have inherited had it been born living and viable. So the material which forms uric acid might have been tissue under more favorable circumstances. Such is the position, to put it broadly.

Now as to the clinical relations of these lithates, the outcomes of perverted metabolism in the liver, in other words, the products of "liver indigestion." In the article on "biliousness," referred to before in the earlier section of this article, is written: "Biliousness may take one of two directions. In some persons there is the regular bilious attack—headache, furred tongue, disturbance of the alimentary canal, vitiated stools, and fullness over the hepatic region, the urine being merely high colored. In others, again, there is rather a dyspeptic condition, with the appearance of lithates in the water, especially two or three hours after a meal. There is no essential difference between the two; in each there is defective oxidation. But in the one the bile acids seem to preponderate, while in the other the urinary products of nitrogenized waste take the leading place. The first is rather the condition of the congenitally bilious, the latter of the congenitally gouty." This division, further experience corroborates, and it seems really a fairly correct one. It may be

questioned, however, whether the expression—"in each there is defective oxidation"—does not require a little explanation. "Defective oxidation" is found in both states, but the conditions do not depend for their production on defective oxidation solely; there is the perverted metabolism as well. But both are outcomes of liver disturbance, linked with defective oxidation; and the offending matters are alike of albuminoid origin and descent.

Uric acid, as has often been pointed out, is found alike in birds of a high temperature, and in cold-blooded reptiles; and, therefore, is not due to defective oxidation merely. It is rather the form of excreted urine solids suited to "solid" urine; while urea is the form found in "fluid" urine (M. Foster). Dr. Henry Bennett, in his valuable work on "Nutrition in Health and Disease," 2d Edit., 1876, writes: "I have repeatedly alluded to the presence of morbid salts in the urine as a result and an evidence of imperfect digestion. I believe their presence to be the most delicate and most easily recognized test that we can bring to bear in the diagnosis of defective digestion; and I am also of opinion that its value, though recognized, has not been fully appreciated by the profession. They consist principally of uric acid, urate of ammonia, purpurine or coloring matter, oxalate of lime, the triple phosphates, the neutral phosphate of lime, pus or blood globules, epithelial scales, and fibrinous casts of the uriniferous tubules of the kidney." Thus we see uric, or lithic acid, alone, or combined with ammonia, stands first, and after that the phosphates. "Phosphatic deposits are principally observed in those persons in whom the nervous system has been too greatly and too continuously used, and the general vitality thereby lowered. When this is the case, there is of course a more rapid disintegration of the phosphatic salts which enter so largely into the structure of the brain, and of the nervous system generally. The acid phosphate, which, by its reaction on the triple phosphate and the phosphate of lime in the healthy urine, secures its solution, is no longer in sufficient quantity to prevent the precipitation of the abnormally abundant phosphates, and they are thus more or less copiously deposited." It is not yet possible to say very much on this subject, but the relation of phosphatic deposits to disturbance in the nervous system stands in a most suggestive relationship to the formation of lecithin, the phosphorus of which is normally derived from the phosphates of our food. Further than this may not be affirmed.

He proceeds in this matter by making the observations: "Sufficient time, also, must be allowed to pass for the processes of digestion to be accomplished and for the chyle to reach the blood. As soon as the chyle has reached the circulation the kidneys commence their functions of filtration and elimination if it is unfit for assimilation. This elimination they continue until the blood is thoroughly

purified. Thus, for some hours after the ingestion of food by a dyspeptic patient, the urine will remain clear, because the chyle has not reached the circulating fluid. Then for a longer or shorter time it becomes turbid, and throws down in cooling a deposit of pinkish, or pale hue owing to its being loaded with urate of ammonia. In the same specimen will constantly be found, on microscopical examination, uric acid, oxalate of lime, or phosphatic salts. After this it again becomes clear, because the blood has been purified of the impure chyle, and the urine has reverted to its normal character." Here we see Dr. Bennett speak of the higher processes of digestion, viz., when the matters rendered soluble by the digestion in the alimentary canal, have entered the blood as "chyle." A younger man would probably use a more modern nomenclature. He goes on: "Such being the case, to test the digestion of food by the state of the urine, we must examine that which is secreted by the kidney during the hour or two which follows the completion of digestion, and the entrance of the chyle into the blood. This period varies, of course, according to the length of time that the food ingested takes to digest, which itself varies, as we have seen, according to the nature of the food and according to individual peculiarities. Milk, eggs, vegetables, fish, etc., take about two hours, so the urine should be examined two or three hours after their ingestion. Fowl, game, beef, veal, etc., take from two to three or four hours. With some persons the stomach and intestinal digestion is so slow that a much longer time elapses before the chyle reaches the blood, and is thus abnormally eliminated by the kidneys. In others the digestive processes, on the contrary, are very rapid, and the morbid deposits must be sought for at an earlier period."

It will now be clear and intelligible to the reader why I did not discuss the urine and its modifications earlier on under ordinary indigestion. Urine deposits belong to that part of the digestive act which goes on after the soluble matters have entered the blood; not with that part which relates to rendering the food soluble. They have entered the blood, and here the digestive act in the alimentary canal has performed its part, and is over and past. It is with the metabolism after the products of digestion have entered the portal circulation that urinary deposits are concerned. Therefore they do not belong to the first forms of indigestion, but to the latter, or "liver indigestion;" and must be considered in the section devoted to this last matter and its disturbances. Consequently, as Dr. Bennett insists, a certain time must be allowed to elapse after a meal before the urine is examined for the malproducts of disordered assimilation. He holds that even in pyrexia the deposits of lithates, so well known at the breaking of a common cold, "is in a great measure owing to the imperfect indigestion and assimilation of the food given, and not to the retrograde metamorphosis of the nitrogenized tissues."

A view which has much to recommend it to the attention of the profession.

He proceeds—"Uric acid crystals are found more or less abundantly under the same circumstances as the double urates, and often in the same patients. I have in vain endeavored, in some cases, to find a distinct cause or reason for their absence, as also their appearance and disappearance in the same person. Their constant existence undoubtedly indicates a more decidedly depraved state of the digestive functions, and a more debilitated, broken-down condition of the general health than is shown by the presence of urate of ammonia alone. It is frequently observed in persons presenting the gouty or rheumatic diathesis or constitution." We will follow Dr. Bennett to his conclusion: "I am thus disposed to think that the presence of uric acid and of lithates in the urine in such abnormal quantities as to constitute a deposit is very much more frequently the result of defective digestion than defective metamorphosis of tissue, especially in dyspeptic individuals. This is not the generally received opinion, but that it is really the case appears to me evident, from the circumstances that I am able, in the majority of such cases, to trace them to the food digested a few hours previously, and that they disappear from the urine secreted after a long fast." Dr. Bennett has made such careful study of the modifications produced in the urine by indigestion that I put his views before the reader at some length, believing them to be worthy of all attention.

Dr. Murchison delivers himself as follows, and the production of uric, or lithic acid, and lithates.

"Excluding those cases in which deposits of lithic acid or lithates are thrown down in the urine, not until twelve or twenty hours after its emission, as the result of spontaneous changes, to which Scherer has given the name of acid urinary fermentation, and those which are due to a marked deficiency of urinary water, deposits of lithic acid, lithates and abnormal pigments, which appear in the urine as soon as it cools, are chiefly met with under the following conditions:

1. In febrile diseases, in which we know that the liver becomes enlarged and congested, and its gland-cells loaded with minute granules, and in which there is always an increased disintegration of albuminous matter. Every one, for example, is familiar with the copious deposits of lithates, which are so common during an attack of ordinary febrile catarrh.

2. In many structural diseases of the liver, and particularly in those which are characterized by an increased amount of blood in the organ, such as inflammation, cirrhosis, cancer, and simple hyperæmia, whether mechanical or active.

3. In functional derangement of the liver, either temporary or persistent.

Lithuria, like glycosuria, is very often due to a functional disease of the liver, although even glycosuria is still ranged in some textbooks with albuminuria and diseases of the

kidney. In other words, abnormal disintegration of albuminous matter in the liver may lead to a morbid condition of the blood and of the entire system, which often manifests itself in lithuria."

Now a very well marked instance of the second division of Dr. Murchison, including "simple hyperæmia, whether mechanical or active," is seen in the urine in cardiac dropsy.

As the heart fails in power the bulk of urine falls *pari passu*. The bulk of urine is in strict proportion to the blood pressure in the arteries; and this, again, to the vigor with which the heart pumps the blood into the arterial system. When the heart begins to fail the blood is less vigorously pumped into the arteries, the blood pressure then falls, in the kidneys as elsewhere, and with it the bulk of the urine—in other words the amount of water passed. This morbid change may proceed a considerable length without the urine being otherwise altered than being scanty and dense or concentrated. But when the liver becomes involved in the venous fulness and begins to enlarge from passive congestion then the urine changes. It now contains lithates in abundance, fawn-colored or pink, sometimes more than pink. The congestion of the liver interferes with its functional activity and then lithates appear in the water, the proof of the derangement of the liver.

This is the more liable to happen when the plan of treatment adopted is a very "sustaining" one. The patient is encouraged to take the most strengthening "things," that is, albuminoids in as great quantity as possible, and then the crippled liver is unequal to carrying on the ordinary metabolism and lithates make their appearance. The association of such lithates with the disablement (more or less) of the liver ought to be made a point of importance in the dietetic management of the case. In the face of such evidence it is of the most questionable utility to force albuminoids upon the patients when the liver is thus evidently unequal to dealing with them, and the dietary should be modified and made proportionate to the reduced power of the liver gorged with venous blood.

Of course a dense urine is apt to deposit urates after being passed sometime, especially in cold weather. But still there is the difference betwixt the dense, high-colored urine, which remains clear for a considerable time, and the urine which becomes turbid with urates shortly after being passed. The latter tells clearly of functional embarrassment of the liver.

As regards the color of the urates thrown down much might be said. "The frequent or constant occurrence of a brownish or red urate deposit without or with only a feeble degree of pyrexia is a circumstance to awaken suspicions of some serious organic disease; but the indication is more general than special. Organic disease of the lungs, heart, liver, spleen or other part attended with emaciation and waste of the tissues is usually accompanied with abundant deep-colored

urate deposit. Functional derangement of the digestive organs are also generally accompanied by pale urate deposits in the urine." (W. Roberts.) This is an observation not without much clinical value. Many old practitioners observe the color of the urine deposits very carefully. There is a general consensus of opinion that the pale-colored, chalky-looking deposits are found along with indigestion, especially those deposits found from two to five hours after a meal, as described by Dr. Henry Bennett. On the other hand, deep-colored pink, or even crimson deposits are rather found usually in old gouty subjects, at least, in my experience. Nor is the matter to be dismissed as of little or no practical importance. The production of bilirubin, or the non-production of it, may depend upon states of the liver which differ considerably. While not wishing to be too precise, it may be said that in acute liver indigestion there is little bilirubin found from which the urine coloring matter is derived; in old gouty cases it is freely produced. This may indicate a difference in the metabolism going on in the liver. Again we approach the border lands, the frontier of the agonosphere—the unknown which possesses so much interest for us. Uric acid is generally regarded as indicating another state of affairs though Dr. Bennett thinks it a difference of degree indicating a more pronounced morbid state; while Roberts remarks as follows: "There is this difference between the conditions favorable to the deposit of free uric acid and the amorphous urates—that a high density (or concentration) favors the latter and a low density (or dilution) favors the former," thus making it largely a matter of solution or density. This difference of opinion illustrates that the subject is as yet far from being settled definitely.

Connected with the relations of the urine to conditions of functional disorder of the liver stands azoturia or baruria, as it has been termed by various writers, in which there is an excess of urea in the urine. Prout first described it and Willis followed him. Prout divided these cases into "excess of urea without diuresis and excess of urea with diuresis." In the first, though there is great susceptibility to derangement, as well as to actual disease of the assimilating and other functions, I am not aware that any one derangement of any one organ can with certainty be pronounced to be characteristic of an excess of urea in the urine. In the second, modifications of the disease, in which the quantity passed is excessive; besides most of the symptoms above enumerated in an aggravated form there exists, in addition, more or less of thirst and morbid craving after food. The patient likewise complains of general coldness and great bodily weakness. In some instances also there is considerable emaciation, though not to the same remarkable extent as in diabetes. The causes predisposing to an excess of urea in the urine seem to be nearly allied to those predisposing to diabetes. Most of the subjects of the dis-

ease in the forms above described have been middle-aged men of spare, thin habit, with a sort of hollow-eyed anxiety of expression on their countenance, unusually nervous and susceptible, but by no means always hypochondriacal; and also free from gout, and, as far as could be ascertained, from structural disease of the urinary or any other organs. With respect to the proximate cause or intimate nature of the disease, I have been long of the opinion that it depends upon derangements of the secondary assimilating processes, rather than the primary." Having related a case at some length, where the patient so largely recovered as to be practically well, he goes on: "The second case I shall recite is one that occurred to Dr. Elliottson, at St. Thomas's Hospital; who furnished me with the urine for examination every week, so as to enable me to ascertain the effects of the remedies employed. March 5th, 1819. Rodman, aged fifty-five. Symptoms resembling diabetes. There is a constant craving for food, a sense of cold over the whole body, and a frequent desire of passing urine, which, in twenty-four hours, amounts to sixteen pints. The urine of this man was pale-colored; its specific gravity was 1.020; and it contained a very large proportion of urea; but not the least particle of saccharine matter. On standing, it also deposited crystals of lithic acid. Ordered opii, gr. 1½ bis die, (opium in this case was ordered by Dr. E., on the supposition the disease was diabetes). March 20th.—Feels much better. Urine reduced to two pints in twenty-four hours. *Pergat.* The urine was now somewhat deeper colored; and deposited a copious sediment consisting partly of lithic acid crystals, and partly of lateritious sediment. Its specific gravity was increased to 1.034; evidently from its having become more concentrated than natural. The quantity of urea was abundant, but not in the proportion in which the urine was concentrated.

The man became so well shortly after the above date, that he did not return to the hospital till August 10th. Disease returned six weeks ago. Feels as ill as ever—very weak. Bowels costive. Quantity of urine in twenty-four hours, about four pints. Ordered *opium*, as before. The urine was now transparent. Its specific gravity was 1.023, and urea was abundant. Under the above plan he speedily became better, and soon afterwards ceased to attend the hospital."—(On the Nature and Treatment of Stomach and Urinary Diseases; being an Enquiry into the Connection of Diabetes, Calculus, and other Affections of the Kidney and Bladder, with Indigestion, 3rd Edit., 1840"), Wm. Roberts thinks, "precise facts in support of Prout's view are wanting;" but refers to a case recorded by the late Dr. Parkes, (On the Composition of the Urine, p. 374), where a man, on the ordinary diet of University College Hospital, passed 1130 grains of urea daily, and concludes thus:—"In my own experience, I have usually found that cases which at first sight appeared to belong to this category—cases exhibiting a dense urine and

a train of nervous symptoms,—turned out, on more exact investigation, to want a special feature indicated by Prout as the essential one; namely, an absolute increase in the daily discharge of urea. Nevertheless, some facts, rarely observed, have left an impression on my mind that Prout's description is not altogether fanciful." He then gives notes of a case, where more than 500 grains of urea were passed daily. In this case, as in Parkes', there was a trace of sugar present. As to the causation of these cases, Dr. Roberts says:—"In the case just related, the cause of the complaint was mental anxiety; and in all the instances which I have been inclined to pass in this group, the origin of the disorder could always be traced to some kind of mental emotion."

Perhaps Prout was not far astray in regarding such cases as pathologically related to diabetes; and Roberts admits:—"That there is some relation between the two conditions seems not improbable." Dr. Handfield Jones has described six cases of like disease under the head of Baruria, *Brit. Med. Jour.*, Oct 12th, 1861. While the late Dr. Fuller, without acquaintance with what had been done by Prout and others, brought before the Medico-Chirurgical Society, papers "on Excess of the Urea in the Urine as a Guide to Diagnosis and Treatment of Certain forms of Dyspepsia," (Trans., Vol. 40, 42, and 51); in which he described similar cases. Passing through all of them was, then, a history of nervous trouble, which gave them a certain character and generic resemblance. They stand in an interesting and suggestive relationship to the excessive quantity of urea found in the urine in the early stages of chorea.

In connection with this subject, closely linked thereto indeed, stands albuminuria. The presence of albumen in the urine is usually regarded as the evidence of disease of the kidney. It is not necessary to discuss the whole subject here; it is enough to say that it is much easier to detect the presence of albumen in the urine than to know what it means, or what its significance is when it is found. The student is taught the various means by which a trace of albumen may be demonstrated in the urine; but he is not taught, and in the present state of our knowledge, there is no one who can teach him what its precise significance is when found. We know that in certain conditions its presence is of the most sinister omen; we have learned that at other times it is devoid of significance. I shall here review merely its relation to disturbance of the digestive organs. Such relation of albuminuria was entertained by the late Dr. Parkes, who "inclined to the opinion that the liver plays an important part in the development of albuminuria; he thinks, through some failure in preparation, either by the stomach or the liver, albumen enters the right side of the heart, still in a crude state, and in a condition similar to that introduced into the jugular vein in Bernard's experiment." (Claude Bernard found that crude albumen injected into the jugular vein

produced temporary albuminuria.) It is well known that if two or three raw eggs are eaten at once, albumen makes its appearance in the urine. It would seem that here the quantity of crude albumen passing from the alimentary canal into the blood, overruns the power of the liver to deal with it, and a certain portion passes through the liver in its crude state, and as such escapes through the kidneys. The late Dr. Basham, in discussing the presence of albumen in the urine, wrote :

"There is yet another subject of interest connected with the long continuance of albumen in the urine ; associated as it universally is with a diminution of the urea, the leading characteristic of healthy urine. Can it be said in these cases that the albumen is the pathological substitute for urea ? The fact cannot here escape notice, that cases frequently occur in which the urine continues for months, and even years, persistently albuminous. I know two cases of near four years duration, the patients' health being fairly re-established ; all the chief functions being performed with undeviating regularity, and with no obvious disorder, except in the composition of the urine. The character of this being the presence of albumen, with diminution of urea. Although we are as yet without proof, yet it has appeared to me probable, that the albumen in the urine (in these long standing cases) must, in some way, take the place of urea, and become, as it were, its pathological substitute."

The remarks of the late Dr. Murchison are so replete with knowledge, and given with such judgment, that it appears better to give them verbatim than to attempt to condense them. "There are also reasons for believing that albuminuria may be induced by hepatic derangement independently of structural disease of the kidneys. It is now generally acknowledged that albuminuria, even when copious, and in the absence of any acute febrile disorder, does not necessarily indicate renal disease. Very often, in these cases, the albuminuria is intermittent or remittent, and the albumen has peculiar chemical characters; the previous addition, for example, of a few drops of mineral acid, preventing to an unusual extent the subsequent coagulability by heat. Errors in diet are one of the most common causes. In some persons, peculiarly constituted, temporary albuminuria is a constant result of certain articles of food, such as uncooked eggs. In several instances I have known the urine passed at night to contain albumen, often associated with lithates and a high specific gravity, whereas the morning urine was clear, of low specific gravity, and contained no albumen. Again, in certain cases of ex-phthaltic goitre the urine, at some hours of the day, usually after food, is loaded with albumen, whereas at others it contains none; and this state of matters may last for many months, and then completely disappear. Now, it is not contended that in all these cases the liver is the organ primarily at fault, but certainly in some

there is good reason for believing it to be so; the albuminuria being unattended by any other symptom of renal disease, varying greatly in quantity and sometimes absent; and the urine being of normal quantity, of high specific gravity, and habitually loaded with lithates, lithic acid, oxalates, and pigments; and there being very often cutaneous eruptions, dyspepsia, and other evidence of hepatic derangement. I have met with several instances of this sort, where the patient was subject to severe attacks of what at first seemed to be hepatic colic, but where there was no jaundice, and the paroxysm was followed by a temporary yet extraordinary increase of lithates and albumen in the urine. Lastly, so often have I observed albuminuria, associated with hepatic disorder which has disappeared completely and permanently when this has been set to rights, that I have little doubt that we have in the liver a cause of albuminuria, to which attention has not yet been sufficiently directed. The pathology of the albuminuria in these cases, may be similar to that of certain cases of diabetes already referred to, the liver having too much work to do, and permitting some albumen to pass through in a form which cannot be assimilated; or possibly there may be some defect in the destructive functions of the liver, in consequence of which the albuminous matter, instead of being converted into urea, does not even reach the stage of lithic acid. It is possible that in many of the cases now referred to, the albuminuria may indicate an early stage, not yet described, of the contracted or gouty kidney; yet it is certain that the symptom may persist or recur, during many years, without any symptom of renal disease, and with but little impairment of the general health."

What Dr. Murchison says here, should be well weighed by every practitioner. I entirely agree with what is said; and for some time past I have treated certain cases of albuminuria by a farinaceous non-nitrogenized dietary, with the best effects; the patient feeling better, along with a corresponding diminution of the amount of albumen in the urine. It will not do in practice to run away with the idea that albuminuria is pathognomonic of renal disease; to do so is to alarm the patient unnecessarily, and when time has disproved the doctor's vaticinations, to bring him individually and the profession generally into disrepute. Nor is it possible to plead that the present views of the infallibility of the test tube are justified by our experience; laziness and indifference are too large factors in the present attitude of slothful satisfaction and blind confidence in the chemical test to enable it to be said that the position is excusable.

Having often elsewhere entered my opinion on this subject in writing, and protesting against the abject attitude of the profession at large, to objecting to reason on the phenomena, but accepting the presence or absence of albuminuria as full, ample and complete proof of the state of the kidneys—

of the presence or absence of disease in them—I feel it desirable here to transcribe the views of others, men whose opinions are entitled to the greatest respect. One word more: "Usually the whole albuminous constituents of our food are so transformed in the stomach, intestines and liver that no albuminous substances of the kind which can pass through the kidneys get into the general circulation. But if one takes such a quantity of eggs as to completely overtask the digestive powers the egg-albumen will pass unchanged into the blood and be excreted by the kidneys. Other albuminous substances, the products of intestinal digestion, and peptones also, occasionally make their appearance in the urine as egg-albumen" (Lauder Brunton).

From what has been said above it will be abundantly clear to the reader that the perversions of the metabolism of albuminoids in the liver are very interesting in relation to the presence of lithic acid and lithates, of excess of urea, and even of crude albumen in the urine. All, separate or combined, may be so produced without kidney disease necessarily being present, or even being the consequential result for a very considerable time. (1.) Crude albumen may pass unchanged in the liver into the general circulation and pass out by the kidneys. (2.) The metabolism may take the direction of an excess of urea. Or (3.) the splitting up of albuminoids may result in the production of a large quantity of lithic acid, usually in combination with ammonia or soda. Such conditions may be temporary, as the result of "acute liver-indigestion;" or they may be less pronounced, but permanent, and then, in the language of George Johnson, "*renal degeneration is a consequence of the long-continued elimination of products of faulty digestion through the kidneys.*"

Such then is the production of lithiasis. But in the full consideration of this subject we must include the disturbances which this "waste-laden" blood produces in its wake. In Part II. the matter of consequential renal changes will be discussed at length, together with the changes in the heart, arteries and other organs, *i. e.*, the phenomena of gout or lithiasis. Here it will be sufficient to review the symptoms and disturbances which belong to acute conditions of lithiasis, or lithæmia (Murchison's term), provoked by "liver-indigestion;" or perversion of metabolism in the latter portion of the digestive act, as seen in persons who are not the subjects of confirmed gout.

Asthma.—This is one of the outcomes of nitrogenized waste being present in excess in the blood; especially nocturnal asthma. This is not to be confounded with the asthma which is set up by some irritation with swelling of the bronchial lining membrane, often the result of a cold. It comes on suddenly in sleep, after a late meal. Dr. Todd thought that there was a *materies morbi* which acted through the pneumogastrics upon the respiratory centre in the medulla. Dr. Hyde Salter was of opinion that the at-

tack was set up by "the actual presence in the vessels of the lungs of the materials taken up from the stomach and intestines." He pointed out how an attack provoked by a full meal taken late in the day, could be averted; if the sufferer would sit up instead of going to bed until the hour of attack was passed. By so doing, the respiratory centre could better and more successfully resist the irritation set up by the irritant material. The fact that if a certain hour or period could be so passed, the attack did not come on, is suggestive. It was not postponed; it was averted. Awake, the poison was inoperative, asleep, it certainly set up an asthmatic paroxysm. This certainly connects it with the latter portion of the digestive act; while its association with a full meal renders its connection with the digestive act all the more certain. Dr. Murchison says:—"Asthma, like gout, is an hereditary disease; it is common among persons springing from a gouty stock; it is not unfrequently associated with gout, gall-stones, or other hepatic derangements in the same individual; and attacks of asthma have been known to alternate periodically with attacks of gout. Moreover, an asthmatic paroxysm, like an attack of gout, of vertigo, or of sleeplessness, is often excited by a fit of indigestion, and by the use of particular articles of diet."

They are related to those attacks of what Basham called "inexplicable dyspnœa," found in the subjects of chronic gouty kidneys. It may, however, be questioned whether any irritation is conveyed up the pneumogastric nerves to the medulla,—an hypothesis which has been violently stretched to explain a variety of respiratory affections; but rather by a direct action of the products of abnormal digestion in the blood, upon the respiratory centre. At other times, bronchitis seems to be induced; while chronic bronchitis is a very common occurrence in chronic gout; at times, not unfrequently, an attack of acute bronchitis takes the place of a gouty paroxysm.

Disturbances in the Heart are very common. There is palpitation, which is not that form excited by gas in the stomach, or transverse colon, pressing up the thin diaphragm against the heart, and by its "elastic pressure" interfering with the heart's movements; a well-known form of palpitation. The palpitation of lithæmia is not always felt along with flatulence, but irregularly, as regards its connection with meals. It is casually linked with imperfect assimilation and evidences of waste in the blood; with a high arterial tension, and at times, with an ill-fed or half-starved heart; and its origin is the same as that of the imperfect angina pectoris vasomotoria, to be spoken of a little later on. Then there is irregularity in the heart's action, allied to that spoken of in p. 190, in which the heart's action is depressed; in other cases there is irregularity in the volume as well as the rhythm of the pulse; or there may be intermissions, with or without fluttering of the heart's action. In others, again, there is pulsation of the abdominal

aorta. Dr. Baillie drew attention to this subject long ago, in a paper entitled "Upon a Strong Pulsation of the Aorta in the Epigastric Region," and Sir Charles Scudamore in his work on "Gout and Gravel, and General Observations on Morbid States of the Digestive Organs, 4th Edit., 1823," wrote: "The pulsation in the epigastric region, which is sometimes felt to an alarming degree, by dyspeptic persons, is seldom met with in persons who are subject to acute gout." It is frequently found during the time of the digestive act, mostly in persons of a highly developed nervous system; and is unaccompanied by any severe disturbance of the general health. "The undue pulsation in these cases is often subdued by treatment directed against the liver," (Murchison).

Angina Pectoris.—This is quite a common malady with those who suffer from "liver indigestion," and is not unfrequently met with in the sons of fathers who have died of angina, and who may themselves die of angina in advanced life, when their heart-walls become the seat of fatty degeneration. From the researches and observations of Eulenberg, Nothnagel, Lauder Brunton and others, we have learned that angina pectoris is not a neuralgia of the heart, as thought by Heberden and those who have followed him, so frequently as a vaso-motor affection. It is due to spasm of the small arteries, excited by the irritant presence of nitrogenized waste in the blood in excess. This causes a high blood-pressure in the arteries which may provoke an attack of palpitation or of angina pectoris vaso-motoria, as the case may be. As chronic states, hypertrophy of the left ventricle and atheroma of the arteries are set up by this spasm. When the gouty heart passes into the stage of failing hypertrophy from fatty degeneration, these attacks become very serious. The rotten heart-walls fail, and angina is as grave then, as it is comparatively free from danger while the heart-walls are structurally sound. If the reader wishes to pursue this matter further, he will find it discussed in a chapter of its own, in my work *On the Heart and Its Diseases* (2nd edit., 1879).

The tendency to arteriole spasm is evidenced by the hands "dying" at times, or the feet being painfully cold in the subjects of lithiasis.

The tendency of vitiated states of the blood, when laden with lithic acid and lithates, to produce inflammation of the veins, is recognized by Sir James Paget (on gouty and some other forms of phlebitis). It is, however, rather found in acute paroxysms in those who suffer from gout. When the urine is laden with these products of perverted metabolism, it possesses irritant qualities. Gouty urethritis simulating gonorrhœa, is no rare affection; or chordec, or even orchitis may be so excited. Stone in the kidney or bladder is often found in persons generally well, entailing their own symptoms; or as Dr. Bennett writes: "I have met with some patients so extremely sensitive in this respect that even in health, if the

ingestion of food is followed by the formation of lithates, they become aware of their presence as soon as the urine reaches the bladder, owing to the sudden pain they occasion. I have attended many patients suffering from irritable bladder from this cause, who have been erroneously thought to labor under stone, stricture of the urethra, or inflammation of the neck of the bladder." He says that fibrinous casts of the kidney tubules are sometimes found. "Their presence is generally considered to indicate severe irritation or even disease of the kidney. Mere fibrinous casts, however, not containing oil corpuscles or epithelial casts, are constantly present in simple cases of dyspepsia, in which the kidneys are evidently neither the seat of great irritation, nor of actual disease." He concludes: "When morbid deposits in the urine, the result of defective nutrition, are thus the cause of irritability of the urinary organs, it is vain to hope for relief until the digestive functions have been restored to a more healthy state, and until the urine has ceased to be loaded with the lithatic salts. The latter keep up constant irritation in the bladder and urinary passages, in the same way as sand constantly thrown into the eye would keep up irritation or inflammation of the conjunctiva."

Lithic acid teases the whole urinary tract from the tubules of the kidney, which are not rarely found blocked with small calculi of lithic acid, to the meatus itself. This irritant urine often excites pruritus vulvæ, or even an eczematous condition of the genitals. Such is the direct effect of the presence of lithic acid.

Skin Affections are common; and pruritus ani, with or without eczema, is sadly common in liver indigestion. General pruritus, or itching, is found in jaundice, or in lithæmia, and is an outcome of blood-poisoning by the products of indigestion. Urticaria is so associated, as is eczema, some other skin affections, and also boils and carbuncles. Diabetes is also accompanied by phlegmonous or carbuncular inflammations. A suggestive relationship!

Nervous Symptoms.—Upon no tissue does the lithic acid exert a more irritant influence than upon the brain cells, and of this the most prominent is disturbance of temper. The most constant symptom, in my mind, is irritability of temper, in conditions of lithæmia. Even naturally good-tempered persons get cross, irritable, peevish, and waspish, when their blood is so poisoned. With some who are indolent, this toxæmia may spur them into activity, if the blood is at the same time well-fed; and these are usually stout, well-nourished persons. But in others, where the brain is ill-fed, as well as poisoned by lithates, the results are far from pleasing. In the first edition of my work *On the Diseases of the Heart* (1872) is written: "It would often be satisfactory and agreeable to explain anomalous and indefensible acts by this theory, and to lay some of human frailty to the charge of uric acid." To this is appended a foot-note, evidently inspired by

some recent experiences, the memory of which yet remains sharply defined. "It may seem somewhat out of place to allude to impressions formed by the writer as to the effect of retained urine salts on mental processes here, even in a foot-note; but this excess of urine salts does seem to have a stimulant effect upon the brain, and gouty people are usually possessed of some talent. The conclusions, so far, seem to indicate that many persons of good brains, but lacking in energy and inclination to think, are stimulated by retained uric acid into excellent thinking, and attain a reputation late in life. While in others, with small, irritable, 'foxy' brains, the disturbing effect of these retained excreta makes the cares of business, etc., quite intolerable. Retirement from business at first gives relief; but soon this irritability excites them to have something to do, and this too commonly is effected by becoming members of boards and committees, when this mental irritability takes the form of mischievous perversity, of ill-controlled interference with everything and everybody. In this condition they remind the writer of nothing so much as a cancerous gland—no longer fulfilling any useful purpose, but merely a source of irritation to everything around them." A further experience only endorses this opinion; and such persons are "social nuisances;" they "cannot agree with themselves," and of course, it is needless to say, they cannot agree with anybody else. A relative of the writer used to say that "she felt as if she could fight with a feather," when her brain was teased with these lithates. Irritability of temper is pronounced, and little things put the sufferer out to an extent quite disproportionate to the exciting cause; while the positive mental suffering and annoyance is aggravated by the consciousness that there is unreasonableness in it, a something wrong within themselves. Often there is a sleepless night, the patient not getting off to sleep till late in the morning; he, or she, awakes not feeling refreshed, but irritable and cross to a degree, ready to take offense at anything or nothing at times, the dread of the household if in authority. If the head of a business firm, the underlings are apt to have a bad time of it; for however reasonable and considerate ordinarily, at these times he is simply unbearable.

The ordinary explanation, "he got out of the wrong side of the bed," is strictly applicable to these cases, *Minutiæ* are criticised or quarreled with, and the objections raised certainly come often under the heading "frivolous and vexatious." Nor is it only others who have to suffer; the subjective sensations of the individual are far from enviable. They know they are misbehaving themselves, yet cannot exercise sufficient inhibition to control their morbid impulses. There is irritability blended with depression; that is the mental attitude. Life is a discord, not a musical note! Yet they do not receive the sympathy and consideration fairly due them. When the cripple halts in his walk, we do not blame him; we readily recognize his

mained condition; but when individuals manifest impaired mental action, instead of recognizing an infirmity we at once accuse them of "giving way to their temper," or "not exercising proper self-control," or in some other recognized phrase blame them morally. But to do so is to act without rational self-control on our own part. Perhaps they exercise all the control in their power, only it is unequal to completely subduing the irascibility excited by the toxic matters in the blood circulating in the brain. They often merit a consideration and a sympathy which is not exhibited towards them by most persons. They have claims to our charity, much stronger than they get credit for.

The causes of such Functional Derangement of the Liver, may now be considered by the light of what has been said before.

It is quite clear that first and foremost stands an excess of albuminoid food. About this there can exist no scintilla of doubt, or question. When albuminoid food is taken in excess of the tissue needs, the surplusage, or *luxus* consumption, is split up in the liver; and it is in this function of the liver we find the disturbance which leads to the excessive production of lithic acid and lithates. It is not necessary to review the subject again here, but, to speak broadly, instead of urea we find the liver producing the less oxidized and less soluble uric, or lithic acid. There is a vicious habit formed which tends to perpetuate itself. The vice persists, until the gouty habit, or *cachexia* is engendered: and then this condition of the production of lithic by perverted metabolism in the liver is rivetted on it. Not only then must albuminoids be given in sparing quantities, but it does not seem a matter of indifference which form of albuminoid material is taken as food. Clinical observations tend to point in the direction of the avoidance of meat-albuminoids; especially the flesh of beasts, as compared with that of birds and fishes. While caseine seems indicated as the form least liable to be split up into lithic acid; either as milk, the well recognized milk dietary; or as the vegetable legume, of which *Revalenta Arabica* is the best known type. We are not as yet in a position to be very dogmatic on this subject, but such conclusion seems suggested; like the shadow of the coming reality projected forward, in front of it. But to this we will revert in the next chapter. Here the great matter to insist upon is the avoidance of the too free indulgence in the toothsome and palatable albuminoids, especially flesh.

The next matter is a sufficiency of oxygen, which involves fresh air and exercise. The liver-indigestion of the city-man is often the consequence of an insufficiency of oxygen to expedite the metabolism and splitting up of albuminoids in the liver. The amount taken as food and digested by the gastric juice and trypsin of the pancreas may not be excessive; but from want of a sufficiency of oxygen the liver cannot deal efficiently with the proteids borne to it in the blood of the portal vein.

Consequently we find the products of suboxidation, to use the language of the late Bence Jones, formed instead of the normal urea. The air of many business places is not calculated to provide the active oxygen required for the oxidation of albuminoids. The improvement which follows upon a day or two in the country tells at once its own tale, as to what is requisite in this class of case.

Long ago Mr. Alexander Shaw pointed out (*Medical Times and Gazette*, July and September 1842) how the movements of the diaphragm facilitate the flow of blood through the liver, brought to it by the valveless portal vein. A deep inspiration sucks the blood into the liver, while expiration expels it with a jet. Exercise, especially horseback exercise, that time-honored remedy, is then indicated in these cases of liver-indigestion due to an imperfect supply of oxygen. In all cases where there is a tendency to the formation of the vicious habit of the production of lithic acid in excess, in persons much confined indoors in ill-ventilated chambers, it is desirable that fresh air in the country, and best by the seaside, should be obtained if possible.

The deficiency of oxygen in tropical temperatures has a marked effect in the production of the bilious maladies, the disorders of the liver, so commonly seen in returned East Indians. Ny doubt their indulgence in animal food has much to do with it. Those races who live on rice and dahl (a legume) or other of the *leguminosæ* suffer little from biliary derangement. Experimentation has corroborated this view founded upon clinical observation, extending over centuries; and animals which are exposed to a high temperature are found to have degenerative changes instituted in their livers. This is a division of the subject which recommends itself to those who meditate a residence in tropical climates.

Then there is no doubt about the effect of alcohol in producing liver derangement. We all know how enlargement of the liver, followed by subsequent contraction, is induced by the abuse of alcohol. About this no one entertains any doubt. But alcohol taken even sparingly disagrees with some persons whose livers are easily upset, and they have scrupulously to avoid it; for it is, indeed, a poison to them. Even the form of alcohol is not unimportant. With one a glass of champagne, with another a single glass of port is sufficient to upset the liver; and a recurring experience tells unmistakably the relations being those of cause and effect, and not mere coincidence. To speak broadly, it would seem that alcohol stimulates the liver to give off some of its stored glycogen, and thus unlocks a quantity of heat-giving material, possibly, perhaps probably, by increasing the amount of blood in the hepatic artery, a recognized cause of the liberation of glycogen or animal starch; and its conversion by the hepatic ferment into sugar. This is in accordance with the fact that a glass of wine, or its equivalent, will often excite a glow and a feeling of warmth, not commensurate with

the heat-producing capacity of the mere hydrocarbon of the alcohol itself. When the habit of taking alcohol to excess has been formed, and especially taking it in large quantities on an empty stomach, the liver begins to enlarge; and soon a quantity of pathological connective-tissue is formed, which gives it greater firmness and density of texture; at the same time, its functional capacity is impaired, especially its power of dealing with albuminoids, as seen by the presence of lithates in the urine. The subjective phenomena of indigestion are commonly seen in drunkards. The addition of alcohol to a dietary rich in all material, especially albuminoids, is a fertile factor in the production of liver indigestion; and of all the alcoholic beverages, those prepared from malt act most potently for evil.

Before proceeding to discuss two matters of great, indeed, cardinal importance, in this perverted metabolism in the liver, which leads to the production of lithic acid in abnormal quantities, it may be well to say a few words on some other factors.

Disease of the heart, and to a lesser extent disease of the lungs, may lead to embarrassment of the liver functionally, by gorging it with venous blood; as a consequence of the *ruckwirkung*, or "back-working" from the obstruction offered to the blood flow. When there is such a lesion as impedes the flow of blood through the lungs, the right ventricle becomes enlarged, and so the driving power is increased.

But the enlargement usually entails a certain amount of regurgitation through the tricuspid valve, and then the veins from the liver become enlarged, and the flow through the liver is obstructed. The liver becomes enlarged in turn, and can be felt to pulsate with the impact of the venous blood driven backwards through the insufficient tricuspid valve, each time the big right ventricle strikes. This "liver-pulsation" is often a diagnostic sign of the greatest value in certain cases. The liver so engorged with this regurgitating venous blood, is embarrassed, maimed, or crippled in its functional working, and a free production of lithates is the consequence. In the consideration of this matter it must not be forgotten that, whether disease of heart or lung, the oxidizing processes are impaired by defective chemical interchanges in the thorax; and so a deficiency of oxygen is an operating factor, not to be overlooked.

Then all structural disease of the liver mutilates the organ and limits its functional capacity. When an abscess of the liver has destroyed a great portion of the viscus, it leaves the remainder scarcely equal to the demand upon it. This is seen by the diminution in the amount of urea formed when the liver is the seat of extensive disease. Dr. Parkes found in examining the urine of cases of liver-disease from India, the amount of urea varied greatly. When the injury was extensive, so as to have destroyed a large area of the liver structure, the amount was lessened in a degree in strict proportion to the

extent of the destruction worked: while in other cases, where there was no destruction of the liver structure but engorgement of it with blood, increasing the activity of the liver-cells, the amount of urea was increased as was also that of lithic acid. In acute yellow atrophy the amount of urea is largely decreased while that of leucin and tyrosin is largely increased. In cirrhosis also, the amount of urea is diminished and the same occurs in cancer of the liver as seen in cases quoted by several authorities. When the structure of the liver is destroyed its functional power is lessened in a corresponding degree. Consequently, the causes which derange the liver usually, are specially operative upon persons whose livers are the seat of structural changes.

Derangements of the liver may be consequent upon primary and preceding disorder of the gastric or intestinal organs of digestion. Crude or abnormal or partially digested matters absorbed into the blood of the portal vein from the alimentary canal may, in the course of time, lead to secondary disorder of the liver. This, however, it must be admitted, is founded a good deal on *a priori* reasoning, and though the features of cases often suggest this, it can scarcely be regarded as demonstrated to a conviction. There remain two matters connected with functional derangement of the liver, still to be considered, of the greatest interest. The one is the effect of nervous influences; and the other is that of what may be termed congenital insufficiency in the liver.

As to nervous influences they have been very fully considered in Chap. vi., pp. 86-109. It was there pointed out that mental disturbance exercises a profound influence over the digestive organs, and very specially the liver. The extent to which such influence affects the liver is almost inconceivable, until the literature of the subject is examined. For centuries we have been more or less familiar with the effects of indigestion and mal-nutrition upon the brain and nervous system; but the converse, the effect of nervous disturbance upon the liver and alimentary canal, is one with which our acquaintance is more recent. Dr. Murchison sums up the matter very completely and tersely, and as his views will give corroboration to what I have written elsewhere, I will give them verbatim: "Many facts show the great influence of the nervous system upon the secreting organs. Sudden fear, or other severe mental emotion, has been known to arrest the secretion of milk and saliva; and we have already seen how injuries and diseases of nerve-tissue may produce diabetes by deranging the glycogen function of the liver. But many other ailments of the liver besides diabetes have a nervous origin. Prolonged mental anxiety, worry, and incessant mental exertion not only interfere with the proper secretion of bile, but too often derange the processes of sanguification and blood-change, in which the liver is so deeply concerned, and induce lithæmia, with many of the symptoms already described. Gravel and gout are acknowledged to be the frequent lot of those who live more by nerve

than by muscle-work. Such results are all the more likely to ensue if the diet has been such as favors hepatic derangement—if, for example, to drown grief the patient has indulged in stimulants—and the habits have been sedentary. There is also good evidence that nervous agencies may not only cause functional derangement, but even structural disease of the liver. Acute atrophy, in which the secreting cells are rapidly disintegrated, and the functions of the organ arrested, appears in many instances to have a purely nervous origin; very often the first symptoms of the disease have occurred immediately after a severe fright or an outburst of passion, in a person previously healthy. An impression made upon the brain appears to be reflected to the liver and deranges its nutrition. Many observations have satisfied me that the extrusion of gall-stones from the gall-bladder, as well as their formation, may be traced to nervous agency. Dr. Budd has also observed that mental anxiety or trouble has great influence in the production of gall-stones; and I have repeatedly known attacks of biliary colic from gall-stones, excited by some sudden emotion. Lastly, even cancer of the liver appears sometimes to result from the functional derangement induced in the first instance by mental trouble. I have been surprised at the frequency with which patients suffering from primary cancer of the liver have traced the commencement of their ill-health to indigestion, following protracted grief or anxiety. The cases have been far too numerous to be accounted for on the supposition that the mental distress and the cancer have been mere coincidences. A similar observation has, I believe, been made by Sir Robert Christison, and by other eminent authorities." These are very definite and equally strong and decided expressions of opinion.

Dr. Budd wrote ("Diseases of the Liver," third edition, 1857): "Another condition that seems to me to have great influence on the production of gall-stones, or at least of biliary gravel, is mental anxiety or trouble."

It is indeed abundantly shown that mental disquietude disturbs the functions of the liver, one and all, "stock, lock and barrel;" and, not only that, but may set up even structural disease, to the extent of cancer itself.

"Congenital insufficiency" of the liver is, there is every reason to believe, the cause of much of the trouble to which "bilious" persons are liable. Dr. Budd, a keen observer, one of a large family of medical men, all of whom were remarkable for their acumen and their incisive thought, expressed himself on this subject as follows:

"In most persons, perhaps, a portion of the liver may waste or become less active, without sensible derangement of health. They have more liver, as they have more lung, than is absolutely necessary. In others, on the contrary, the liver, from natural conformation, seems only just capable of effecting its purpose in favorable circumstances. They are born with a tendency to bilious derangements. This innate defect of power in the

liver has its counterpart in the deficient respiratory power in persons with vesicular emphysema of the lungs, and, like the latter defect, and most other peculiarities of physical structure, is no doubt frequently inherited. Persons who inherit this feebleness of the liver, if we may so term it, or in whom, in consequence of disease, a portion of the liver has atrophied, or the secreting element of the liver has been damaged, may suffer little inconvenience as long as they are placed in favorable circumstances, and observe those rules which such a condition requires; but whenever from any cause—as a hot climate, gross living, indolent habits, constipation—a more abundant secretion of bile is requisite to purify the blood, the liver is inadequate to its office, and they become bilious and sallow." Such, then, is a very shrewd observation and explicit expression of opinion in one of our most trustworthy authorities, none the less deserving of confidence because he used the phraseology of his day and did not know that the liver was largely engaged with the albuminoid material of our food. Had he been aware of this he would have employed a more comprehensive expression than that of "a more abundant secretion of bile is requisite to purify the blood." He would have grasped the subject more efficiently, as Dr. Murchison, possessed of more recent and more extended knowledge, has done. He quotes Dr. Budd, and adds: "The person is born with a tendency to biliary derangements. Gout and diabetes, which we have found to originate in hepatic derangement, are hereditary diseases; and the liver is always very readily disordered in persons who inherit a tendency to gout. This constitutional tendency to hepatic derangement is too often lost sight of by patients, and perhaps sometimes by their medical advisers. The habitual use of alcohol is often recommended for various ailments, without due regard to the tendency of the individual to hepatic derangement, and thus serious consequences may ultimately arise from alcohol taken with a medicinal object. Again, a patient often argues that his liver troubles cannot be due to what he eats or drinks because he is most careful as compared with friends who indulge largely and suffer nothing forgetting the adage: 'One man's food is another man's poison.' One man, for instance, may drink a bottle of wine and be none the worse, whereas another has his liver deranged by a single glass." Doubtless the explanation offered above is a reasonable one and tells us fairly satisfactorily why one man cannot eat and drink without suffering for it, what would be quite a moderate amount for another person, who can habitually take that much, and more, without any inconvenience supervening thereupon.

The subject has not escaped the observation of other authorities and Dr. J. Henry Bennett writes: "The gouty diathesis when it is the result of hereditary taint has proved in my experience the cause of some of the most intractable forms of dyspepsia, both in male and female, that I have met with. Indeed, I believe that dyspepsia, recognizing

this cause, is in some instances quite incurable and can only be palliated. It is a sad legacy that the gouty from self-indulgence often leave to their children, even when they themselves are free from it. Singularly enough it does not show itself necessarily in all the children of a gouty father or mother, but only in one or more of the number. The children of gouty parents ought more especially to follow the hygienic and dietetic laws laid down in these pages if they wish to escape much suffering. As a rule they ought to be all but water-drinkers throughout life; they have to pay the penalty of their progenitor's excesses or dietetic errors. If the gouty diathesis is strongly marked they should be most moderate and abstemious in their food habits and lead as active and muscular a life as possible. Indeed they should never lose sight of the fact that a miserable, gouty old age may be their fate should their life be prolonged unless they make many sacrifices to ward off the impending danger." This relation of indigestion with the gouty diathesis, *i. e.*, a constitution which is gouty by inheritance, is one which is the more extensively recognized as the subject is more investigated. There is a well-known story which may be quoted in proof thereof. An old clergyman once ejaculated, "I have been a dyspeptic for fifty years. Thank God for it!" The reason of his satisfaction, expressed so devoutly, was the fact that all his brothers were dead and buried, cut off by gouty affections; he alone remained of the family. Dyspepsia had saved him from the fate which overtook the rest. The dyspeptic then is under certain circumstances a better life, in insurance phrase, than those who are free therefrom. But is longevity worth the price, many will be tempted to ask?

Dr. Leared commences his little work "On Imperfect Digestion" as follows: "The digestive power may be compared to the physical strength. Every individual can, without inconvenience, carry a certain weight, while any addition to it is accompanied by a proportionate sense of oppression. In the same way, what is called indigestion, is often simply a result of excess. The amount of food which each man is capable of digesting with ease has always a limit." Quoting Cicero's gratitude that his advancing years had diminished his inclination to eat and drink, he points out that: "At all stages of adult life, but particularly during its decline, the appetite is over-stimulated by condiments, and tempted to excess by culinary refinements. Dyspepsia is not the worst result of this. Gout, and still more serious maladies connected with an impure state of the blood, closely follow. Infringements of the laws of digestion are constantly, and in many cases unconsciously, committed. One man digests with ease an amount of food which would be fatal to another. Animal food is easily digested by some persons twice or even three times daily, while, if taken by others more than once, it is sure to induce suffering. Nevertheless, the diet of persons associated together is apt to be the same, and

sufficient individuality in matters of eating and drinking is seldom observed."

There is much force in the way in which Dr. Leared here points out the diversity of individuals in their digestive capacity, like any other capacity; and also that the power is not always the same in the same individual, but is diminished with age. That we are apt to eat alike, whatever our individual capacities, is certain; and the dyspeptic who moves much in society, or "goes out at all," is always being tempted, inveigled, or goaded by jeers and jibes, into eating a great deal infinitely better avoided; with the person who suffers from "liver-insufficiency," any indiscretion is swiftly punished, and suffering follows closely on the heels of the offense.

This congenital incapacity in the liver deserves an attention it does not receive either from the patients who suffer or the medical men who advise them, as a rule. Just as we see poor wretches with flat, narrow chests, and we recognize that in consequence of their badly developed chests they will readily succumb to disease of the respiratory organs; because at the best they only possess as much lung as will barely carry them on in a makeshift way. So we should learn to recognize the other fact—that of the congenitally incompetent liver. If such recognition were more general it would be well for those so born imperfect. They must eat in proportion to the capacity, or rather the want of it, in their livers; not according to their appetite or the habits of society, if they wish to exist in (comparative) comfort. I remember well a gentleman of good descent, in my early experience in Westmoreland when I took my father's practice, who was embarrassed by one of these incapable livers. Straitness of means and a waxing family compelled him to live very sparingly and economically; and partly by that, partly by long hours every day in the open air, in the garden, or on the roads with a rake, a life of industry comparing favorably with that of many field-hands, he managed to keep himself in health and comfort. But the slightest omission or relaxation of his dietetic or hygienic arrangements was followed by retribution, swift and sufficient to keep him at his round of self-denial and self-imposed toil for a considerable time to come afterwards; and occasionally, but rarely in fact, he went away to visit a more affluent brother for a week, with the invariable result of well-marked articular gout being established in him. For many long years this went on, and this poor gentleman taught me much about congenital impairment of the assimilative organs. Probably this is a well-marked instance, a very well-defined instance indeed, of the influence of descent in impairing the digestive processes. The plebeian alderman eats (or is reputed to do so), vigorously with undiminished zest and appetite, free from gout or dyspepsia, into good old age; giving the lie to the statement that "of all carnal pleasures cometh satiety at the last." While the well descended gentleman gets gout on the slightest provocation; eats as daintily as

a lady, when his means will permit it, drinks most abstemiously, and yet his enemy has him on the slightest provocation. There must be a reason for this, surely! And probably the explanation lies, as Dr. Budd wisely suggested, in some congenital impairment in the functional capacity of the liver. The fact that the children of the alderman who could perform such gastronomic feats, do not possess their progenitor's capacity, is one well recognized. Indeed it is simply impossible to avoid the conclusion, that there exists a section of society who are hereditarily feeble in the liver, either actually bilious by bile-acids, or the subject of lithiasis, from the liver being unequal to the normal transformations of albuminoids. Such persons step into their inheritance, whether they like it or not. Some persons inherit unstable nervous systems, others weak lungs, while indubitably others inherit incapable livers; and the sooner the fact of "liver-insufficiency" is generally recognized, the better for those who suffer (potentially) therefrom.

After this rather lengthy consideration of "Biliousness" and "Liver Indigestion," we can approach all the more satisfactorily the subject of the treatment of these allied conditions; and comprehend all the more clearly the why and wherefore of what will be recommended in the ensuing chapter.

CHAPTER XII.

THE TREATMENT OF LIVER DISTURBANCE— MEDICINAL AND DIETETIC.

THE reader will now be fully prepared to enter upon the question of how to improve the condition of persons who labor under hepatic derangement. For a certain class of readers this section of the subject will possess little interest, and a languid curiosity is all that it will arouse. But I venture to think there is a much larger class who will eagerly read this chapter; viz., that portion of the medical profession who not only are sincerely desirous of doing what good they can to their fellow creatures; but who feel that they would be glad to give their patients something like "value received" for their money. A valid excuse may be tendered for simply watching a case of uncomplicated pneumonia, or typhoid fever, running its course; prepared to take the requisite active steps when the necessity for them arises. But such mere observation of cases of derangement of the liver is what no one would attempt in the possession of his reasoning faculties, be the same more or less; and if it were essayed, the patient would soon express his opinion on the subject—and emphatically, I expect.

And in doing so he would be held justified by all: when we think how important it is that a man be enabled to work in comfort, or an approach to it; and not only that, but also to have his health as long as possible. We all know how, as age advances, the digestive and assimilative organs begin to fail. Gout is a disease of middle age and advanced life. The work which the liver has to do day

by day tells upon it, and instead of the ordinary normal metabolism in it, disturbances and perversions arise. The arrangements which change grape-sugar into glycogen, and glycogen back again into grape-sugar, become disturbed, and then diabetes is the consequence. Or the splitting up of albuminoids is perverted, and then lithic acid is largely formed, instead and in lieu of urea, and then gout is the result. Now it behoves the medical man to keep well in view the future, as well as to recognize the present necessities, in cases of liver derangement. It is not only desirable to give relief at the time; but it is well to include the future in the therapeutic scheme. It is not only the immediate trouble of the patient, it is what is looming in the distance which must be calculated for in the estimate. This factor it was, which, being omitted from the calculation, ultimately brought such discredit on the "blue-pill and black-draught" treatment. Such means gave immediate relief; about that there can exist no question. But what was the consequence? Possessing a ready means of procuring relief, our predecessors went on their way rejoicing—ate, drank and were merry, as in the day before the flood, "and knew not till the flood came and swept them all away." So it was with them. They set no bounds to their indulgence, and fell back on the blue-pill and black-draught when inclined, until an unremediable condition was established. Instead of righting itself, the system became accustomed to this artificial means of restoring the equilibrium, until the power of self-restoration of the balance became irretrievably lost; and then a permanent cachexia settled down upon the remainder of their days. So conspicuous did the evil become, that the stream set in in the opposite direction so effectually that now many peasons, yes, and many medical men too, look upon the mercurial pill as if it were "possessed of a devil." The reaction came and swept reason away in its current as it often does; and one extreme begat the other. I remember well, not many months ago, reading a paper before a large suburban society upon the desirability of sweeping the accumulated nitrogenized waste out of the blood, in certain cases of dilated heart with enlarged liver; when, in the discussion which followed, several gentlemen of various ages asked if I thought a mercurial at times permissible in such cases, as timidly as if they felt themselves liable to be suspected of wishing to resuscitate the Druidical faith, or exhibiting a latent belief in the old notion that "nine live lice upon a piece of bread and butter" were the most appropriate and effectual treatment of an attack of jaundice. And on assuring them that I not only thought such remedial agent permissible and lawful, but even approved thereof, they seemed immensely relieved; while several and sundry others present interchanged a significant glance, as if they thought I was the subject of incipient general paralysis; indicating, too, that my utterances in future would receive no regard or countenance from them. They clearly would have none of this renewal of an ex-

ploded doctrine; they would as soon think of reverting to the Pythagorean teaching of the transmigration of souls. But, perhaps, they will find after a while that a mercurial pill, succeeded by a smart purgative, is a very good plan of treatment in certain cases; provided that they follow it up by a rational dietary, so as to prevent future accumulation of waste matter in the blood.

It was the neglect of this latter which brought the mercurial remedy into disrepute. By attention to it in the future, the mercurial pill, followed by a saline laxative will have its day again; liable, however, to be again discarded if abused! Colchicum has been in and out of the pharmacopœia some half-dozen times at least, according to the ebb and flow of medical belief and the fashion of the times. Unbounded faith is often the precursor of an equally blind, irrational unbelief, as history tells us. Such oscillations of belief simulate at first the overthrow of a superstition, and by some are thought to be such a movement until time disproves it. The trying for witchcraft, and the general belief in witches, their wholesome detection and cruel punishment, culminated in a reaction as swift as it was complete; and the belief of one generation was the scoff and scorn of the next immediately succeeding it. Sir Thomas Browne, the renowned author of *Religio Medici*, believed in witches, and once as a witness swore in court "that he was clearly of opinion that the persons were bewitched." Yet the men who believed in witches and the judicial punishment of witchcraft were, as Lecky points out, quite as capable of forming an accurate opinion on other matters of life as other people have been. So the men who practised medicine with the use of the blue pill and black draught were in the possession of their senses; only abuse led to reaction. Now the dread and horror of a mercurial in any case, and under all circumstances, is leading a large section of men to the opposite extreme—of its avoidance in season and out of season; and that portion of my audience looked upon me as if I were a nineteenth century would-be imitator of Julian "the apostate." The heroic plan of treatment, the lancet and the blue pill, has been followed by a reaction which has extended to Nihilism with many as regards drugs; while an unbounded faith in beef-tea, and the sustaining plan of treatment now generally obtains with them. Nevertheless, in many cases a mercurial and a saline afterwards form a very good plan of therapeutic attack in emergencies. Admitting, at the same time, that the natural loss of appetite leading to abstinence, is much better in many cases. Nor does this confession of faith in mercurials as a cholagogue involve a retrograde movement which will extend to a resuscitation of a belief in witchcraft, or the tenets of Druidism. To advocate the proper use of mercury as a cholagogue is not, then, the revival of an exploded superstition. Still it is now acknowledged that it is not well to resort to the habitual use of mercury as a cholagogue; for it is found that once accustomed thereto, the liver does

not respond to other less potent stimulants; like the toper who, familiar with brandy and a split seltzer cares little for a draught of hock and soda-water.

The subject will be reverted to a little further on.

But our choice of remedial agents should be profoundly influenced by the fact that, as age proceeds, the assimilating organs lose some of their pristine energy. Nor does the mature organism require the material which is essential to the building of the tissues in growth, and in that consolidation of the system which follows growth of stature. The energy of manhood will enable the system to burn up much food, perhaps not absolutely demanded, but which is, at least, not harmful. But when advancing years limit the energies, then such consumption becomes baneful; while a less liberal supply of oxygen renders the task of oxidizing albuminoids more difficult than it once was. A natural failure of the appetite follows; which should be respected, and not struggled with. There is then, in the first place, what to avoid; when this spontaneous anorexia, or loss of appetite manifests itself—its lesson is to leave it alone: lessened body-wants no longer require an active, keen appetite; and attempts to whip up the appetite by bitters are to be discouraged. The appetites vary with advancing years. The mistress gives way to the cook; and the skill of the latter, like the charms of the former, is fraught with an element of danger to the owner. The temptation to eat more than either is required or good for him, to which the middle-aged man of means is exposed, the natural weakness or lack of strength to resist temptation, should induce him, if reason ruled the roost, to discharge his cook for one of less, instead of more skill, when the natural decay of the appetite begins to manifest itself. Such, however, is not the case, and is not likely to be the case for a long time to come. So the cook, the more skillful the more dangerous, is the first matter to be decided. He or she must, or ought to be, discharged; or handed over to the possessor of a more youthful appetite and vigorous set of digestive organs. Then the family medical attendant should pledge himself, by solemn oath and covenant, never to prescribe bitters when the appetite is defective, or capricious; the patient equally binding himself never to whip or flog the jaded appetite by bitters, either hop bitters or Angostura with a little gin, or dry sherry before dinner. If such compact were made and kept faithfully, many a liver would be able to hold its own, and fulfill its functions fairly well, which, under the present arrangement, is prematurely worn out years before its potential exhaustion. It is but human to sacrifice the future to the present; and an appetite which is waning ought to be conserved, its owner thinks! Certainly; the question is how best can it be conserved? It is not preserved by stimulating the appetite and the stomach to consume more food than the liver can dispose of. Rather the judicious plan is to follow the indications of the appetite, and when it flags to eat accordingly.

But whether this plan will obtain or not till the millennium is reached, is a subject which cannot be settled out of hand. It may safely be said, that it ought to obtain.

Especially should such rule be observed by persons who have resided in tropical climates, or been the subject of hepatic disorders. Dr. Budd makes a remark which may profitably be quoted here, viz.: "In persons who die of yellow fever, the liver presents various morbid appearances, which have been minutely described by Louis; that depend not on the products of inflammation, or on the state of the vessels, but on the condition of the cells. The damage done to the liver in this way may last for years. It is probable that the bilious disorders of many men on their return to this country from India, and other hot climates, are, in great measure, owing to permanent injury done to the secreting element of the liver." This remark is pregnant with suggestiveness, that in many cases the secreting cells of the liver, by which the metabolism and splitting up of albuminoids by oxidation are carried on, become impaired functionally; if not always structurally. Such modifications should be remembered when the patient's dietary is being laid down; nor need such consideration be restricted to returned East Indians; it might quite well be extended to those who, though they may not have resided in tropical countries, nevertheless have suffered from biliary and hepatic disturbances. It may be well to proceed to the consideration of acute bilious congestion of the liver. In such cases in children, it may be well to administer an emetic of ipecacuanha, with a small dose of a mercurial, followed by a purgative. But this should not be resorted to habitually in consequence of unrestricted indulgence in food. It should only be a *dernier resort* in emergencies. Very often the loss of appetite and languor lead to spontaneous restoration of the health: and, even at the risk of shocking some anxious mothers, or impulsive practitioners, it may be said that such is, with delicate children, much better for them in every way; educating the system to take care of itself, and proving a very good lesson for future guidance. Still, the emetic and purgative may, at times, be indicated.

In acute congestion of the liver of warm climates, I may quote Sir Joseph Fayrer, K.-C.S.I., F.R.S.L. and E., written for me for my *Practitioner's Handbook of Treatment*:—"In reference to the treatment of the functional derangements of the liver which arise from congestion, and I think more especially that form in which it is accompanied by anæmia, such a condition, in short, as is so frequently seen in persons who have lived long in hot malarious climates like India, the West Indies, and the Coast of Africa, I may say this. Beyond mere swelling of the liver from engorgement with blood, other changes—fatty or amyloid—will no doubt supervene, and it is often difficult to determine how far the functional is due to the structural change. The treatment I generally find most effective, is attention to diet and drinks. Avoid much

fatty, sugary, and alcoholic fluids. No beer. Claret and water for drink. Warm clothing, so as to keep the skin moist. An occasional dose of colocynth or calomel, or blue pill, and every morning, or every other morning, a dose of saline aperient, such as sulphate of magnesia, with quinine and gentian, sufficient each time to produce two or three loose motions. Counter-irritation by tincture of iodine over the loins. *When the portal circulation is relieved*, some preparation of iron may be very useful. The urine is a good test of the hepatic condition; it will improve under the above treatment, but it is well to give the patient some alkaline waters—Vichy, Vals, or Carlsbad. Albuminuria, will be present at times, when the kidneys, like other abdominal viscera, are congested, or are irritated by lithic acid. In my opinion, too much importance is attached to this symptom in some cases. Indeed, I think the subject of albuminuria would bear rewriting. Albuminuria may be functional in such cases, and pass away like the other symptoms." Certainly looked at by our most recent light, such albuminuria may be but a part of the hepatic derangement, and pass away with it accordingly. Now is it unfriendly criticism of Sir Joseph Fayrer's practice to say, that in his line of treatment, the matter of albuminoids is omitted? Yet to withhold them is in all probability also very desirable, and would be accompanied by improvement in the symptoms. The patient should be kept upon rice-water, or other simple starchy matter, which gives the liver the least labor. Or a little beef-tea with baked flour in some form might be sparingly; where procurable, a milk dietary might be substituted, or whey, where there is anorexia with much thirst. Probably a liberal supply of subacid fruit is always desirable, as well as grateful to the patient.

As regards permanent biliousness as seen in England, my practice has been modified by the light of advancing physiology, with advantage, I firmly believe, to my patients. I no longer allow them to consume albuminoids in any quantity; but instruct them in this, as in other elements of their food. But this is the dietetic management to be discussed further on.

It is well to give them a pill containing a hepatic stimulant, to be followed by a mineral saline next morning. Two copious motions, one before, the other after breakfast, furnish much sense of comfort in cases where the bowels are sluggish; that is in the bulk of cases. By such treatment they are greatly improved; even in cases where "congenital insufficiency of the liver" is presumably present.

At this point, it may be well to review those medicinal agents which act upon the liver.

Soda and its salts are found to act potently upon the liver. Consequently while sulphate of magnesia is a capital purgative when the intestinal glands alone require stimulating this salt acts little, if at all, upon the liver; and when it is desirable to "rouse the liver," as the phrase runs, sulphate of soda, its bitter taste

notwithstanding, should be prescribed. The experiments of Rutherford countenance and corroborate the conclusions at which clinical empiricism had arrived. Potash for the kidney, ammonia for the lungs, soda for the liver: these are the bases of the salts to be used, according to the circumstances of cases. Sulphate of soda is best taken in the morning, first thing on getting out of bed. Then some bicarbonate of soda, or Rochelle salts, must be added; with a carminative of some kind, in a bitter infusion, warm. Such a draught, first thing, is of the greatest service.

The carminative not only covers the objectionable taste of the salts, but is itself useful. Dr. Budd wrote: "Pepper, ginger and other hot spices are also supposed, and perhaps justly, to render the liver more active and increase the secretion of bile." It is well to bear this in mind in prescribing for hepatic derangement under all circumstances.

Chloride of ammonium has always had warm advocates for its utility as a cholagogue.

Mercury in all its forms and preparation has been in use for centuries in liver derangements. Sad and disastrous are the consequences of the abuse of this powerful medicine. The indiscriminate and inordinate resort to mercury has brought the treatment of the services into well-deserved disrepute. Potent for good, still more potent for evil when abused, mercury has fallen from its high estate into comparative disgrace or neglect. Its claims, however, must be considered rationally. Highly as it was once extolled, it is now equally abused and depreciated. Nor can we wonder at this, when we think how it has come about. The terrible consequences of the administration of mercury till free salivation was produced formed a lesson which many took to heart, in some cases too earnestly. The zealots who ordered patients to be salivated to so many pints a day simply dethroned their idol in public opinion. Then followed the quack-salvers, with their patent medicines, who announced with all the flourish of trumpets at their command, that their pills "contain no mercury." The reaction actually extended to the point of abandoning mercury in the treatment of syphilis. Slowly the tide of indignation against the use of mercury has ebbed, until its use in syphilis is once more universal.

The late Prof. John Hughes Bennett hated mercury with a virulence scarcely conceivable by those who did not know him. He denounced it, he inveighed against it, he poured all the power of ridicule he possessed, and that was no slight amount, upon it; he shot every arrow of sarcasm in his quiver, and it was a pretty full one, at the misguided, wicked persons who dared to advocate the administration of a single grain of calomel. Peace to his ashes! An iconoclast, he did a good service in his way. Still, the crusader is an enthusiast, and an enthusiast is not a person of a judicial frame of mind. The crusade against mercury is now passing away, having played a useful part; the tendency at present is the other way, and the cautious and rational use of mercury is once

more finding numerous advocates. In speaking of mercury Dr. Budd wrote: "The marked temporary benefit often resulting from mercury given for this effect has, from the difficulty of distinguishing the various diseases of the liver, and the consequent indiscriminate use of the drug led to great evils. This medicine was at one time, by English practitioners, given almost indiscriminately and long persevered in for disorders of digestion, many of which did not depend on fault of the liver at all, but on local disease of the stomach or intestines or on faulty assimilation, the result of debility which the prolonged use of the mercury but too often increased." This is a judicial expression of opinion by a man whose opinion is entitled to every respect. The way in which the German writers have condemned the English use of mercury has done much to help on the growing disuse of the drug; their condemnation has been wholesale, thorough-going and indiscriminate itself; and has been sometimes the blatant utterance of ignorance as well as at times genuine honest criticism.

Dr. Murchison has put the position of mercury very pointedly. After giving the results of numerous experiments he proceeds: "Mercury and allied purgatives produce bilious stools by irritating the upper part of the bowel and sweeping on the bile before there is time for its reabsorption. The fault of mercury standing at the bottom of the scale of cholagogues of Röhrig's experiments is accounted for by its surpassing other cholagogues in this property; for of course the larger the quantity of bile that is swept down the bowel the less is reabsorbed and the less escapes from a biliary fistula. It would appear that mercury by increasing the elimination of bile and lessening the amount of bile and of other products of disintegrated albumen circulating with it in the portal blood is after all a true cholagogue, relieving a loaded liver far more effectively than if it acted by merely stimulating the liver to increased secretion as was formerly believed and as some authorities yet maintain; for in this case it might be expected to increase instead of diminishing hepatic congestion." This is very judicial. But Dr. Murchison propounds another view very essentially his own. After describing that patients of undoubted intelligence are certain about the benefit they derive from mercurials, he writes: "It is not impossible that the good effects of mercury on the liver, and in some forms of inflammation, may be due to its property of promoting disintegration. It seems not improbable that mercury, which we know from experience to reach the liver, may under certain circumstances act beneficially by promoting or in some way influencing the disintegration of albumen. The remarkable effect of mercury on constitutional syphilis perhaps admits of a similar explanation. But in whatever way it is to be explained, the clinical proofs of efficacy of mercury in certain derangements of the liver are to my mind overwhelming. I say so the more advisedly because I was taught to regard mercury as a

remedy worse than useless, not only in hepatic diseases but in syphilis; it cannot, therefore, be that the convictions forced upon me by experience are the result of preconceived opinion." Dr. Murchison was a pupil of the late J. Hughes Bennett. So was I; and I can also plead that my belief in mercury has been "forced upon me by experience," for Bennett's thundering diatribes dominated my mind for a long time, and the impression made by him upon my youthful mental processes was only ground out by the restless action of an accumulating experience.

When the kidneys are extensively diseased a marked intolerance of mercury is often manifested; and, like opium, it must be given with much caution then—though its utility with red and pink lithates is incontestable. In the white deposits of true liver-indigestion it is not indicated. A broad rule may be struck to this effect, when there is atony and asthenia mercury is contra-indicated, but when there is fair power without anæmia it may be given. Always bearing in mind that broad rules do not apply to every case, and where individual experience has demonstrated that mercury does not agree scrupulously avoid it. The old-fashioned plan of six or eight grains of calomel for acute indigestion may suit some strong persons; but it is within my own personal experience, not of my own prescribing it is almost needless to say, that such reckless practice has done immense harm to a delicate patient. Mercury is one of those "edged tools" which must be handled with care and judgment. When the patient has found opium to disagree, whether you find any albumen in the urine or not, my youthful readers, just hold your hand about mercury; it is not necessary to insist upon this for old readers—they have found it out for themselves. Another broad rule may be put thus: persons of the gouty, sanguine or arthritic diathesis bear mercury much better than do those of the strumous diathesis. With the first the action of mercury in disintegrating albuminoids acts beneficially as a rule, but upon the defective constitutions of the strumous, with their imperfect tissue building (page —), mercury acts too energetically and in a very undesirable manner.

When to give a dose of mercury in conditions of lithiasis and albuminuria, where it will do good; and when to avoid it, as you would a Cobra-di-Capello, is a problem, in each case to be solved, which will task the natural powers and the acquired skill of the practitioner to the utmost. Consequently I think it well to quote a passage from the second edition of the "Practitioners' Hand-Book"; "Dr. Broadbent informs me that in the numerous cases of albuminuria in the London Fever Hospital towards the decline of the affection, when only small quantities of albumen remain, mercury in limited doses usually leads to the entire disappearance of the albumen. It is a remedy, however, which should be resorted to cautiously; while quite a safe measure in the hands of so careful a physician as Dr. Broadbent, it may be a very dangerous agent in the hands of some practitioners."

So in certain cases of albuminuria, not consequential upon acute fever, a little mercurial may be very beneficial; but in every instance it should not be given until the case has been made the subject of patient thought. Given carelessly most deplorable results may follow. A tense pulse is usually a fair indication for it. The whole subject is one on which we desire more precise information.

Aloes is an agent long recognized as having an effect upon the liver. So is rhubarb. "Many persons have succeeded in warding off bilious attacks to which they are subject, by taking habitually, before dinner, a few grains of rhubarb. A rhubarb pill will often relieve a slight bilious disorder, even before it has purged" (Budd).

Taraxacum is a reputed liver stimulant, much in vogue with the world at large, and with herbalists; but little used by regular medical practitioners.

Jalap, colocynth, and senna, are also cholagogues of some potency.

Ipecacuan is an hepatic stimulant, not only of time-honored repute, but the observations of clinical medicine are borne out by the physiological experimentalist. Rutherford found it to be one of the most potent of cholagogues. Personally, I am very fond of giving ipecacuan, especially in a "dinner-pill;" in that, following a practice which has been all but obsolete for a long time, but which seems likely to be revived. It seems to obviate the action of opium upon the liver, when combined with that drug, as Dover's powder.

To the same class of hepatic stimulants belong "Iridin," extracted from the root of the Iris Versicolor, now much in vogue. Still more popular is "Euonymin," derived from the bark of *Euonymus Atropurpureus*; a drug now much used in the United States as well as in Great Britain. "Hydrastin," from the root of the *Hydrastis Canadensis*, possesses allied properties; and so does "Juglandin," a resin from the root of the butternut (*Juglans Cinerea*). It is officinal in the U. S. A. "Baptisin" from the root of the Wild Indigo (*Baptisia Tincturia*) also possesses a moderate stimulant action on the liver.

Where a powerful cathartic is required, as well as a liver stimulant, then it is well to prescribe podophyllin; a drug entitled to be ranked as a potent cholagogue, as well as a purgative. Of allied character is a croton-oil, popular a generation ago for the treatment of lumbago connected with lithiasis.

These agents are all useful according to the indications in each case in liver trouble, biliousness, or lithiasis; and may be used with advantage, as cholagogues and hepatic stimulants.

Of a totally opposite character in its action is opium. We cannot separate one action of a drug from its other actions, except by blocking out the objectionable action, by combining an agent of antagonistic properties. Thus, I systematically use belladonna with opium in the severe cough of phthisis, to keep off the night sweats induced by it. The co-administration of ipecacuan largely prevents the action of opium upon the liver; a laxative its

action upon the bowels. But this action of opium is useful when the liver-ferment converts glycogen too freely into sugar; and so is useful in the treatment of diabetes. In azoturia, or baruria, where there is a neurosis of the liver splitting up the albuminoids into urea, and therewith a certain amount of bulimia, opium also is useful. It puts a check upon the activity of the liver; and this, though it constitutes a drawback to its administration ordinarily, is useful in some cases of excessive action of the liver cells.

In the liver disturbance due to pyrexia, quinine lessens the morbid activity of the viscera.

Then there are mineral remedies to be considered. Nitro-muriatic acid taken by the mouth, is often useful when an attack of jaundice is passing away. Some like foot-baths containing it; others, a lotion of it upon lint over the liver. The free chlorine in this acid is generally regarded as the potent factor. Chloride of ammonium is often given therewith. "It goes with either acids or alkalis" (Murchison).

Acids, Murchison thinks, may not act directly upon the liver, but may do good indirectly by improving gastric digestion. In some cases, he holds, both acids and alkalis may be given advantageously—the alkalis before, the acids after a meal. This is in accordance with what Ringer advocates; the alkalis taken when the gastric mucous membrane is alkaline excite a better flow of gastric juice. The acids given during the period of gastric digestion probably aid therein.

Alkalis are more in favor as a rule than acids, in the treatment of hepatic affections. Where the alkaline bile is insufficient to counteract intestinal acidity, fixed alkalis are indicated as Prout held (p. 183).

Soda is the alkali for the liver *par excellence*. Of the common condiment of our food, the hydrochloric acid goes to the gastric juice; the soda to the bile.

The alkalis are good, especially potash, in rendering lithates soluble. According to Bence Jones, alkalis are of great service in aiding the oxidizing processes which go on in the body. Some persons, however, cannot take alkalis without extreme depression. I know a stalwart Yorkshireman who could not take a teaspoonful of effervescent citrate of potash for three mornings consecutively, without experiencing such prostration, produced thereby, that he was unfitted for business. Others again can take large quantities, not only with impunity, but with positive benefit. Murchison recommends that alkalis should be suspended for a time, as they may, when long-continued, interfere with gastric digestion. This must depend upon the evidences of each case. The acid bi-phosphate of soda is an excellent solvent of lithic acid, according to Ritter von Schroff, and might be substituted for the ordinary alkali. When alkalis, and especially potash, depress it is well to give them with a tonic. Potash is a muscle poison, often acting powerfully upon the heart. It is easy to counteract this action by giving with it an agent

which increases the vigor of the cardiac contractions. When alkalis are indicated, they should not be taken with meals, or during the time of the gastric digestion. This is too obvious to require much insistence. Even alkaline waters, as Vichy, Vals, Seltzer, or Bath water, should not be drunk at meals; neither should potass, or lithia, or artificial seltzer water be taken with wine or milk then; as alkalis neutralize the acidity and therewith the activity of the gastric juice. The waters of Carlsbad, Marienbad, Tarasp, etc., may be drunk early in the morning; as may the more potent waters of Pullna, Friedrichshall, Hunyadi Janos, Estill (Ky.), or Bedford (Pa.) springs; all the more efficacious with a little warm water.

Sulphur springs are useful in some cases of biliousness and the crowds at Harrogate, drinking the waters and "clearing the system," as they term it, of the vestigia of persistent over-eating and drinking, tell how the inhabitants of the manufacturing towns which line each side of the slopes of the back-bone of England, believe in periodical purgation as a means of warding off the evil consequences of over-indulgence of the palate.

Homberg has a like story to tell, and so have other watering places. As the subject of mineral waters will be discussed fully in the succeeding Part II., when gout is being specially considered, it is unnecessary to go into the subject further here.

Chalybeates, either as natural waters or in more strictly medicinal form, are contra-indicated in all cases where the action of the liver is embarrassed, and never should be prescribed until the tongue is perfectly clean and the digestion and assimilation restored by appropriate measures. Iron may increase the activity of the oxidizing processes under certain circumstances, but when there are active symptoms of hepatic disturbance present it does harm and not good. About that I have long been certain. If the reader wish to know more about this matter he can consult the article "When not to give Iron," *The Practitioner*, Sept. 1877, or the second edition of my *Practitioner's Handbook*. Murchison says: "In simple lithæmia I have constantly known iron to increase the tendency to deposits of lithates in the urine, constipate the bowels and aggravate any symptoms from which the patient may have previously suffered." Dr. Garrod writes: "It is important that great attention should be paid to the condition of the bowels and liver during the exhibition of iron preparations, which he thinks "are for the most part contra-indicated" in conditions of lithiasis. The wish to hasten the patient's convalescence is a laudable one, but to give iron prematurely is often to illustrate the adage "the more haste the less speed."

Tonics generally are of questionable value until their appropriate time has arrived, viz., after a certain progress has been made. The lighter bitters as quassia, gentian, chiretta or cascarilla suit better than cinchona or quinine as a rule at first. Strychnia or nuxvomica is a capital tonic, stimulating the liver as well as

the peristaltic movements of the bowels, especially indicated where there is flatulence. Phosphorus was often of service in lithæmia according to Murchison. Arsenic he thinks often useful when chalybeates disagree—a statement corroborated by my own experience.

Now the junior section of my readers may feel as if they could like some more precise indications about the use of the agents just mentioned. Under what circumstances to prefer one agent, and why at other times another should be selected. This is very natural, and as far as the subject permits of such handling I will try to tell them. But unfortunately only very broad rules can be laid down, and each case requires its own individual treatment just as each man requires his clothes to fit him, as differentiated from some one else. It may then be said that hepatic stimulants are indicated for permanent use, to "give a fillip" to the liver, as the common phrase runs. These are, ipecacuan, hydrastin, euonymin, iridin, and baptisin, and their congeners, with aloes, rhubarb, colocynth, jalap, or senna, as laxatives, with carminatives in pill, combined as required; or the more potent podophyllin, croton oil, or gamboge, where there is stubborn constipation. To these may be added arsenic or strychnia, according to the phenomena exhibited by certain cases. Such may be termed the permanent treatment of the disorder; to be continued for some time.

Then for conditions of aggravation, or acute disturbance, it is well to give a pill containing some mercurial at bedtime; and next morning some sulphate of soda with an alkali. Twice or thrice a week this may be done with decided advantage to the case: the dietary at the same time being carefully regulated and adapted to the patient.

In some cases warm baths seem to have an excellent effect both upon the liver and the skin; while at other times a large hot poultice over the liver stimulates it most satisfactorily. A poultice is clearly indicated with those persons who either cannot take much medicine by the mouth, or who are disinclined to try. In cases of "bilious chill," such a measure, in addition to the medicine appropriate thereto, is often of service. But "the acquired experience of the individual," won by the sweat of his brow, can no more be transferred bodily to another, than can how to wield a stethoscope, or see correctly through a microscope; or the apparently simpler matter, alluded to before, of keeping six balls in the air at once, a common juggler's feat, or Mr. Maskelyne's skill in keeping his numerous plates spinning. The aspirant may be told "how to do" each of these; but to "do" them he must learn for himself; there is no "royal road" to it, nor can a "crammer" do it for him.

Beyond the medicinal treatment lies the dietary, on which it is not now necessary to be diffuse after what has been said in the two preceding chapters. The great fact there insisted upon, and reiterated, is, that it is not the hydro-carbons of our food, but the albumi-

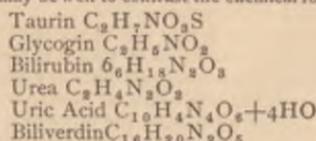
noids which are the source of trouble; alike in "biliousness" and in "liver-indigestion." The readily oxidizable hydro-carbons, when an excess of food is taken, are burnt up first; or in other words, upon the hydro-carbons the respired oxygen is expended, leaving the less readily oxidizable albuminoids imperfectly acted upon. In such manner is a certain portion of disturbance in the metabolism of albuminoids brought about. This, indeed, is the explanation of the derangement set up by a "surfeit" by over-indulgence in food. This must be clearly differentiated from the perversion of metabolism which is a vicious habit, the albuminoids being split up into uric acid rather than urea. The reader must distinguish betwixt these two forms of hepatic derangement, else his practice and treatment will be unsatisfactory. For the first, more discretion is indicated in the future, especially with those who possess a congenitally incompetent liver. Nevertheless, with all children drench it is well to avoid excess in eating. Probably the children of the present are not any more addicted to over-eating than their predecessors; but it is probable they cannot do it with the same impunity. The digestive organs are not in "these degenerate days" equal to those tremendous displays of capacity with which our ancestors, in their juvenile years, have been credited: on the other hand juvenile parties, the increasing use of sugar—due to its comparatively low price—and the prevalence of rich cakes at the present time, constitute a species of temptation to the present generation which they cannot always successfully resist. That a bilious attack is a corrective as well as a curative agent must be admitted; and the memory of the suffering helps the future resistance to temptation. Still, children are but children, and a superintendence by their seniors is requisite and necessary. Most children can be controlled; but there are some unwholesome children who will, fully conscious of the consequences, gorge themselves when a supply of "good things" is available, and will not practice moderation. Such children are usually the offspring of foolish parents, who will not look ahead in the matter of consequences; and upon whom all warnings fall unheeded. Maudsley says that the difficulty of dealing with the insane lies chiefly in their half-cracked relatives. So with these foolish children the difficulty lies in their silly parents; who do not see, or will not be made to see, what the future consequences will be, that the child will grow up the subject of biliary disorder which will cripple its working power and embitter its existence. For such children, some one interested in them, who has their welfare at heart, must exercise for them, and in their behalf, the control in which they themselves are deficient. With adults the case is different; and they individually know better, if they only will try to exercise self-restraint. Yet often such persons are willful, arguing that they "may as well have a good rue (regret) as a bad one," *i. e.*, if they are going to make themselves ill they might as well do it thoroughly; balancing the

enjoyment of the eating against the pains of the "bilious attack." In such cases little can be done; for there are some persons whom even experience cannot teach. Still, counsel and warning may do some good if persisted in. These are the persons who, instead of practicing moderation when their Nemesis overtakes them, or even when they apprehend that punishment is in pursuit of indulgence, fly to the anti-bilious pill and the morning draught, either black draught, Hunyadi Janos, or effervescent citrate of magnesia. By so doing they educate, or cultivate a vicious habit, and like other foolish people "reap as they have sown," and become, in time, the subjects of well-established hepatic derangement. Such "bilious" individuals, lacking in discretion, are usually to be found amongst the female sex, but not exclusively so; and are usually comparatively young.

This brings up the matter of clinical observation that such "bilious" individuals become, in middle-age, dyspeptic or gouty. This is a very interesting matter for consideration; the explanation, however, not yet being cleared up. The liver seems to become further disordered, and instead of an excess of bile acids, produces an excess of lithates. It would appear, for it would not be judicious to put the matter more strongly, that in the system, while young, any excess takes the direction of biliary disturbance, the bowels being chiefly implicated, and the urine high colored, and of high specific gravity, but not otherwise altered in character; while in more advanced life there is indigestion with the production of quantities of lithates, usually of pale color, when any indiscretion in diet has been committed. While the explanation is not yet forthcoming, still it is well to bear the association in mind, as throwing a strong light upon the function of the liver, and the relations, clinical as well as chemical, betwixt the bile-acids and the urine solids.*

This matter tells very articulately that the dietary adapted to lithiasis is also that suited to biliousness, *viz.*, a non-nitrogenized dietary. If I seem to insist on this matter, *usque ad nauseam*, my apology must be that the impression that it is the hydrocarbons of our food which are at fault is so universal, so deep-rooted, that it is necessary to be explicit. It is not "flogging a dead horse" to speak dogmatically on this matter, for multitudes of persons are making themselves ill, destroying their prospect of future comfort and physical well-being, by erroneous impressions leading to injurious practices. They live upon the lean of a chop, some dry bread, and tea or coffee without sugar or cream, with much self-denial, in the vain and delusive search after

* It may be well to contrast the chemical formulae:



There is a generic resemblance, nothing more or closer.

health, or an approach thereto: instead of a farinaceous dietary, with stewed fruit. This is open heresy flaunting itself, I am quite aware, in their eyes. Further, I am also quite aware that such a meal as has just been described is more digestible at the time it is taken; will admit it is perhaps the only sort or kind of meal which can be taken without discomfort. Nevertheless, it distinctly tends to perpetuate the trouble; while the other dietary, less attractive at first, perhaps even repulsive and provocative of repugnance, is the one calculated to produce an improvement ultimately. It is the question of the future *versus* the present. Present comfort and future discomfort; or present self-denial with future improvement. It is the old, old story of resisting temptation, or giving way to it, with future rewards and punishments meted out accordingly.

In great matters so in small, to resist present temptation is to secure future happiness—to merit a future reward; and in this case the certainty of the reward is such, while not too far distant, as to make it blind folly not to practice the present self-denial which is requisite for its ultimate attainment. As in theology, so in hygiene, the whole question is whether the faith is a living faith—vital and capable of inspiring confidence—or not. A faith that is not equal to inspiring confidence is a hollow gourd, a delusion and a snare, if not indeed a sham.

Another matter there is about which something may be appropriately said at this point, just as well as anywhere else, which is connected with the liver, on which an erroneous opinion is prevalent. We have seen that urea is a product of the liver. We know that the liver is the furnace in which effete blood-corpuses and tissue-debris are burnt; there is no question about that. But, while acknowledging all this, it does not follow that all the urea has once been tissue. That is an assumption not warranted by the facts. We know that the liver also disposes of the *luxus* consumption of the albuminoid materials of our food. Let us see what Prof. M. Foster says:—"In dealing with the statistics of nutrition, our attention will be drawn to the fact that the introduction of proteid matter into the alimentary canal is followed by a large and rapid excretion of urea, suggesting the idea that a certain part of the total quantity of urea normally secreted comes from a direct metabolism of the proteids of our food, without these really forming a part of the tissues of the body" (3rd edit., p. 404). Yet for some years back we have been told of the amount of urea passed by fever-patients, as representing so much tissue-waste. It was assumed, quite gratuitously it would appear, that urea was the final stage of what was once tissue, whether ordinary muscular fibre or blood-corpuse; and on this hypothesis rested one side of the arch. The fact that in fever the muscles waste, and that at a high temperature the albuminoid tissues melt down, constituted the base of the other half of the arch. The complete arch was this—the amount of urea found in the urine is the measure of the tis-

sue-waste! It is not necessary to refute this at length. If not a "dead horse," it certainly ought to be. Such an idea should be as extinct as the dodo.

This is a digression, but not a waste of time, I venture to think. It helps to introduce what I am about to say as to the dietary in conditions of "biliousness" and of "liver indigestion."

A certain portion of the albuminoid elements of our food passes into the albumen of the liquor sanguinis; another portion passes into the bile-acids; while a third passes into urea. This is solid ground. The liver performs the work of elaboration in the first case; of destructive metamorphosis in the second, and third. Has the liver a selective function? Does anything go on in the liver such as goes on in human manufactories, namely, a selection of the fit, with a rejection of the unfit? In Messrs. Rogers' Cutlery establishment at Sheffield, bones and ivory are cut up for knife handles: of these only some pieces are fit to be used. The fit pieces are passed on to the knife-handle maker, to be made into the hafts of knives: the rejected pieces are passed on to the refuse heap, to be ground up into bone-duet used to clean plate. Is there any analogous action in the liver; any selective choice by which certain proteid matter is selected for further elaboration; while other proteid matter is rejected and either burned up into urea, or utilized in a lowlier form as the bile-acids? We do not know; we may never know. It is not likely anyhow that this can be ascertained in the life-time of the present generation. We can only see through a glass darkly. Our successors may be able to see all in the bright light of noon-day. Some such selective action seems probable. Is this the smoke which precedes the flash; as is said on the Russian steppes? Is this the shadow projected forward of a future solid something; of what physiology may some day in the far distance make solid ground for us? We cannot say. This much may be averred, that some such "notion" would make "a good working hypothesis," which would be a useful guide to us in our daily practice.

It would help to clear our views, that of the proteid elements of our food, a portion only passes on into tissue. That much of the remainder is either burnt as so much fuel, a fuel leaving a tremendous residuum of ash; or is utilized in a lowlier form. The ash is the urea. The lowlier form is the bile acid, which emulsionizes fats in the duodenum. The matter must be left here; and our curiosity must pause unsatisfied, nay dissatisfied, led up to the gate of the promised land—and left there.

From this vision, mirage, or reality, who can tell, we may now turn, and scrutinize the reality of clinical facts. These facts we know, recognize, and are familiar with in practice; albeit a bit muddled from erroneous explanation. The theory that bile comes from the hydrocarbons of our food, is an *ignis fatuus*, which led our predecessors into a morass. It underlay the dietary spoken of recently, (p. 172), which though acceptable to

the palate and perhaps to the alimentary canal,—the solvent portion of the digestive act, is nevertheless the perpetuating factor of the hepatic derangements. Such at least I hold it to be. Too exclusively albuminoid, it maintains and keeps up the morbid condition. It throws too much work upon the liver, if easy of digestion in the alimentary canal. Starch may be hard of digestion as regards its solution and progress to grape-sugar in the portal vein; but then it gives no further trouble in its future history. The lean of a chop may neither cause pain nor flatulence, on its way to being converted into peptones; but its after history is less satisfactory. The advocates of raw meat for the treatment of indigestion may claim that it is acceptable to the stomach: but the liver may not be pleased therewith. A young man may find favor in a girl's eyes, but her parent may not be satisfied with him. Acceptable enough to her; the very qualities which weigh favorably with her, may be those on which her father specially finds his objections. That food which is acceptable to the stomach may be the very matter which disturbs the liver. Indeed it is these very albuminoids which are the subjects of gastric peptic digestion, and which sit easily upon the stomach, that we suspect as most readily "taking to evil ways" in the liver; and instead of proper metabolism or elaboration, proceeding downwards to bile acids or urine solids. They are the suspected any how! In practice it is necessary to discriminate betwixt the immediate present and that which lies outside and beyond it. A patient may truthfully affirm that the lean of a chop, a little dry bread, with a cup of tea without milk or sugar, is the meal which causes the least suffering; and agrees the best. But it does not follow, I assert, that this is the food therefore indicated for the patient, or really best suited to the requirements of the case. Physiology must be our guide and interpreter; and not the subjective sensations of the patient during the digestive act. Not that these latter are to be utterly disregarded: but they must not dominate us, or be allowed to silence all other voices in their own assertive tones. They must be listened to, but only so far; no further.

Having thus differentiated clearly betwixt what is agreeable and what is good; what is acceptable at the time, and what is clearly desirable in the future interests of the patient; it may be well to lay down rules for the dietary in conformity with what physiology teaches. When the patient is advised to make stewed fruit and cream, or a milk-pudding, a staple article of diet; to have it prepared always for dinner, and to have what is left over at dinner for breakfast next morning; dismay spreads over the features. There is something so utterly un-English in such a breakfast, that the patient looks horrified. Yet a great variety of fruit, and of dishes of milk and farinaceous matters are available for the purpose; and this does not involve monotony, a thing most carefully to be avoided in all dietaries. Nothing preju-

dices a patient against a dietary more powerfully than poverty in the number of dishes available. A short list is distinctly deterrent. So it is well to point out that in addition to the fruits which are indigenous, and which are readily available each according to their season, there are a large variety now to be procured at any time, put up in tins. For instance there are grapes, cherries, strawberries, raspberries, figs, peaches, apricots, pineapples, apples, pears, plums, pumpkins, melons, cranberries, guavas, and others. Or the dried fruits, Normandy pippins, apple rings, dried peaches, prunellos, French plums, figs; all of which are excellent stewed. Then the mile pudding can be made with corn flour, hominy, rice, tapioca, sago, crushed cereals, and other farinaceous matter, so as to furnish variety. With a little exercise of her ingenuity, the housewife can make a number of combinations rendering anything like monotony out of the question. That is if she will try! One thing it is well to bear in mind, that in these cases where it is desirable to avoid albuminoids, it is well to make these milk puddings without eggs. They are almost as toothsome without, and suit much better. Then there are blanchmanges, made without Isinglass, which may be utilized. Or there are various fruit creams, which can be had according to the season. Strawberries, gooseberries, (gooseberry fool is also good), black-currants, wine-currants, red and white, which may be made with creams, or eaten as they are. The dread of sweets which has obtained will interfere to prevent the adoption of such a dietary; but I ask the patient to give it a fair trial. When this is done I venture to think the results will please them; as they have proved satisfactory to me. The salts in fruits may not be great in quantity, but they are certainly operative, as we see in the prevention of scurvy. A recent expedition in the Arctic regions found under the snow a little sour redberry which they gathered and preserved in barrels for use in their sledge expeditions, and so prevented scurvy; their conduct in this respect contrasting favorably with the contemptuous disregard of such well-known facts as the efficacy of the sub-acid fruits, especially of all vegetables, in staving off scurvy, exhibited by the English under Captain Clements Markham. These salts are good: while the use of fruit regulates the bowels, a matter of importance in all derangements of the liver; whether bile-acids or lithates are involved. In consequence of the amount of egg in it, custard is objectionable. The yolk of an egg added to the milk, however, is permissible. This combination of fruit with milk and farinaceous matters should be made one of the cardinal points of the dietary. If the patient feel "bilious" under this regimen, a morning laxative once or twice a-week will be found to carry off any superfluity which is disagreeing in the dietary. Then there are vegetables to be considered. Potatoes boiled, steamed, mashed, or passed through a sieve, eaten with milk and butter, are good for lunch or dinner—provided always that they be thoroughly disintegrated.

Few things offend a stomach more than a piece of hard, unchewed potato, upon which the stomach can exercise no influence whatever. The same applies to greens generally, broccoli, Brussels sprouts, cabbages and cauliflowers; and holds good of vegetable marrow. This last, like cauliflower, may be cooked, *au gratin*, but should be eaten with care and sparingly. Peas and beans, French beans, and scarlet runners, are all admissible, in limited quantities only—as containing a large proportion of albuminoid matter, caseine. Then there are carrots, turnips, parsnips, beet, asparagus, sea-kale, boiled celery, onions and leeks. All these are permissible, as regards their chemical composition, and do not tax the liver; but there is the stomach to be consulted, and that is a matter not to be forgotten. In each case, therefore, it must be made a matter of experience, what agrees and what does not; and this, and not any rule of thumb, must be made the guide for the future in the dietary. The same must be said of salads in their various forms. They are not to be prohibited, provided they do not disagree.

Now of fishes, salmon certainly is objectionable, least so plain boiled, hot or cold, and it is well to avoid cucumber with it. Then fried sole is very indigestible; plain boiled it is permissible. Mackerel and herring are undesirable, unless plain boiled. The flesh of the turbot, brill, halibut, skate, or plaice, is admissible, and so is that of the gurnet, and John Dory, what there is of it. Cod-fish is very well suited, whether fried, boiled, or *au gratin*, or as a fish pudding with mashed potatoes. Ling is unobjectionable, so is the haddock. Whiting, "the chicken of the sea," is excellent. So is red mullet; less so grey mullet. Trout are good in limited quantities. Eels are apt to disagree with the stomach. Shrimps and prawns are good, so are crayfish. The lobster and crab are apt to upset the stomach, otherwise they may be eaten in moderation. Oysters are good, and so are mussels, for those who like them.

Of fowls fair quantities may be taken; but their flesh is rich in albuminoids, be it remembered. First comes the chicken, boiled; cold, with or without salad, if the stomach approves. Then the pigeon, the pheasant, and the partridge, grouse, black-game, capercaillie, prairie fowls, quails, snipe; all in limited quantities are permissible. The duck and the goose, and the turkey, unless it be a little of the breast, are to be avoided.

Of "flesh-meat" pork is poison. Beef is less objectionable, and so is mutton. A little of either, cold, may be taken at lunch. Veal is to be avoided, unless it be in the form of sweet-bread. Lambs-fry is permissible, or lamb's head boiled is often nice for a weak stomach.

Of potted meats they offer no difficulties in the way of disintegration; any may be taken sparingly as sandwiches, made with thin slices of stale bread, with the butter rubbed well into the bread, and spread not too thick.

Bread may be eaten, best stale, or as wholemeal bread; then biscuits are digestible,

Toast tempts some. Farinaceous matter may be cooked with milk, as oatmeal-porridge, hominy, steam-crushed cereals, "Cerealine," a delightful combination, good in many ways. Boiled with milk and poured into a pie-dish to stand over night; and, next morning, cut in slices and fried, it looks like the most tempting white fish, and is delicious. Hominy, so treated also, is good. Indeed, if farinaceous foods agree with the patient, a large variety of simple dishes can be prepared, especially with milk.

Soups are contra-indicated, unless it be a little gravy soup, the poorer the better.

Pastry is objectionable on account of its indigestibility in the stomach. But with those with whom it does not disagree, there is no objection to its use.

For further information as to dishes and their preparation, the reader is referred to, *Food for the Invalid, the Convalescent, the Dyspeptic, and the Gouty*, by the writer, published by Messrs. Macmillan & Co.

(Each dish requiring such indication, is marked with certain initials; the interpretation of which is given therein at pp. 26-27. It is well to follow what is written there, and all dishes containing meat should be taken in moderation.)

The sort of daily dietary to be arrived at has been sketched out in Chap. viii., as suited for indigestion; and to this the reader may return, and peruse it, and re-peruse it with advantage.

Then as to drinks. Alcohol is undesirable except in limited quantities. Alcohol is a powerful stimulant to the liver. When taken fasting, it often produces an amount of heat out of proportion to that evolved in its combustion. It seems to liberate so much of the liver-glycogen, by dilating the branches of the hepatic artery; and so converting so much glycogen into grape sugar. When this is carried beyond a certain amount, then the vascularity of the liver is increased, and it becomes enlarged in size; subsequent contraction follows, with ascites and dropsy in its wake. It is then to be taken sparingly. A little claret, Carlowitz, Graves, or Hock, may be taken by those who feel that some such beverage is required to enable them to eat, and enjoy their food. Others find a little simple spirit, as brandy or whiskey, in plain or aerated water, agree best with them. Potent wines, and all malt liquors, are to be avoided.

Aerated water alone, or with a little milk, or some syrup are also indicated. If also alkaline, it is well not to take them during gastric digestion at least.

Beyond the dietetic and medicinal treatment of conditions of hepatic derangement, lie the matters of change of air, and mineral springs. It may be laid down as an axiom that "bilious persons are always worse in a low-lying, and warm locality; and are the better for being in a fairly bracing atmosphere." For instance, to take London, such persons are never well in the basin of the Thames, and are always improved by getting to the hills that skirt the valley. In Brixton

they feel good for nothing, and are always ailing. On the slopes of Hampstead and Highgate they are comparatively well; or on the Surrey hills around the Crystal Palace. This illustration will serve for other neighborhoods. The oxidizing processes are much favored by a bracing locality. Consequently they should not return to India or the tropics, if there be any reason to suppose that the secreting structures of the liver have received any permanent damage. A liver which may suffice, with care, to carry on its function in Great Britain may be quite unfit for a life in India. The injury inflicted upon the liver by one residence in India, the West Indies, Guiana, or Guinea, incapacitates the organ for another such experience—which, therefore, should not be adventured. And whatever applies to a liver unaltered in size and free from any mutilation of structure, as that caused by an abscess, applies even more stringently to a liver which has been crippled by disease. To speak broadly, then, in hepatic derangement it is well to avoid warm, damp, low-lying localities, either as temporary or permanent residences; unless it be when an east wind is blowing. This disturbing element upsets all ordinary calculations, and when in action must be allowed for. Consequently in summer the east coast is to be preferred to the south or west. Again, Ilfracombe is to be selected rather than Torquay or Dawlish. The Welsh resorts must be classed by the same rule, and so must all others over the face of the globe. For such as are fortunate enough to be able to afford it it would be well to change their residence in winter and summer.

Then, as regards watering-places, the same rule will obtain, viz., a bracing locality, except when the east wind is blowing. Sulphur springs, with a laxative in the water, suit biliousness; alkaline waters are adapted for the treatment of lithiasis. But periodical excursions to such watering-places must not be made an excuse for indulgence in the interval, as is the case with ordinary individuals. The patients "with a liver" will soon find that this is a practice not adapted to their individual requirements, nor calculated to improve their condition. Abstinence and self-denial must rule them in their every-day walk in life. But all are human, and as such liable to err—to slip on the narrow path; and if a family festival, or an important celebration, should lead to some departure from the beaten track, a mercurial pill and mineral laxative are permissible; but they should be resorted to with distinct sense of failing, of weakness—like the conviction of sin experienced by a penitent at the altar.

When at the sea-side it is not advisable for persons who suffer from any form of hepatic derangement to bathe much in the sea, especially in the early morning. The "dip" should be brief and far short of any chill. It should be taken about 11 a. m., and be followed by a walk. The warm bath, followed by an hour or two in bed, to keep up the action of the skin, is a measure which has much to be said for it, and agrees with many very well.

But each case requires its own management adapted to the patient's wants, requirements and exigencies. The attempt has here been made to describe the digestive act in the alimentary canal first and then after that the function of the liver; to give the readers the broad lines upon which to proceed. Sometimes the track is clear and distinct, sometimes broken and indistinct, despite the light which advancing physiology is throwing upon it. The liver is the largest of all the glands—has a function proportioned to its size. Up to a recent period we knew nothing of its functions except the production of bile. Now, however, we recognize that it possesses a most important action, on the one hand—(1) upon the further elaboration of the crude products of digestion in the alimentary canal; and, on the other hand, (2) upon the destructive metamorphosis of albuminoids. It is then intimately related on one side with indigestion and mal-assimilation; and on the other with lithiasis, or gout in its widest sense. Its relations with the first have been given: in Part II. I will strive to describe its relations with the second; and, therewith, the disturbances and diseases to which such lithiasis gives rise in its turn.

The fat of our food does not, as do sugar and albuminoids, pass into the venules of the portal vein, and thence to the liver; but is taken up by the lacteals. The liver, then, takes no part in the assimilation of fats; except that its bile aids in the emulsifying of fat in the upper bowel.

(While these sheets have been passing through the press, a copy of "Observations on the Constitutional Origin and Treatment of Local Diseases," by the famous John Abernethy, F.R.S., dated 1809, has been lent me by a patient, who was re-arranging his library; and coming upon the volume, opened it, read some of it, and was struck by what was written there, as being almost the very remarks made by myself about his regimen. It is gratifying to find myself in accord with so capable a man. Medicine has forgotten a good deal, as well as learnt much this century!)

APPENDIX.

THE FAILURE OF THE DIGESTIVE ORGANS AT THE PRESENT TIME.

THE perusal of the foregoing chapters will have shown the reader that there actually exists, or at least I hold there exists, a strong tendency to failure in the organic processes at the present day. These organic processes furnish the elaborated pabulum for the organs of active life:—albumen for the tissues generally, hæmoglobin for the red blood corpuscles, and lecithin for the nervous system. The tremendous demands made upon the nervous system at the present time is believed, by others as well as myself, to be the cause of this failure. The effects of mental worry, and emotion upon the digestive and secretory functions is given in Chap. vi.,

The increased demand upon the nervous system, and especially the cerebral hemispheres in the present day, is telling upon the whole of the digestive organs, and especially upon the liver; which carries on the further elaboration of the crude products of digestion in the alimentary canal. As we saw, glycogen is stored by the de-hydration of the grape sugar in the portal vein; and from these stores regular rations are given off by hydration, under the action of the liver ferment, to the blood for the production of body-heat and force. Then the liver not only elaborates the products of the gastro-intestinal digestion of proteids; but it is the furnace in which effete, waste, and surplus albuminoids are burnt. The bile aids the pancreatic secretion in the emulsifying of fats.

Now it was abundantly shown that mental states profoundly modify these processes, as temporary conditions. Not only that; but there is much pointing in the direction that the pace at which we live nowadays, is exercising a persisting effect upon the digestive organs, of a deteriorating character. The dental caries, so prevalent, indeed universal at the present day, is but a part of the general widespread failure of the digestive organs. Our grand-parents hardly ever heard the word "dentist," but the present generation know him well; and if they do not regard him with affection, at least recognize his utility. The increase in the demand for laxative medicines is demonstrated by the perpetual advertisements which meet the eye, from natural waters, through an almost endless series, to Holloway's pills. Constipation is not claimed to be a modern malady; what is asserted is, that it is on the increase. Up to the days of our parents, children had porridge and milk for breakfast, took them well, digested them (for "porridge" always requires the plural with it), and thrived on them. The American on the boundless prairie is "raised upon hominy," and in his physique is a contrast to the product of the Eastern States—the advantage not lying with the New Englander. The diastase of the cerealia has only of late years been pressed into the service of man, to supplement the failure in the natural diastase of the salivary secretion. Our predecessors knew as little of diastase and its functions, practically, as did the chemist, scientifically. Pepsin derived from animals, or even a plant—the papua, is also of recent date. The pancreatic secretion, scientifically and practically, is a matter strictly of our own times.

Whence comes the profound modification of the organic processes, the commissariat of the active or animal part of the body? It is the effect of modern demand upon the nervous system, it is believed; and not without a good amount of evidence for the belief. We know that the body is influenced in the direction of deterioration by subtle forces. The inability of the Anglo-Saxon to inhabit India is a well-recognized fact. The children of Anglo-Saxon parents, born and reared in India, deteriorate so markedly, that

it is now quite usual to send the young Anglo-Indian to Europe to be reared and educated. It is said that in the third generation the Anglo-Indian dies. Be this the exact truth, or only an approach to it, it is a fact of grim significance.

The same fatality has been found to attach itself to the aborigines of large towns. It appears that without regular and repeated infusions of new blood by incomers from the country, the town-dweller would perish off the face of the earth. A deterioration is wrought by a protracted residence in a large town. What said Lugol, the great French authority, about the inhabitants of Paris:—"Scrofula shows itself in the third generation of those whose ancestors entered Paris full of health and vigor, and from the third generation the malady rages even to the utter extermination of the family name." This is a very frank statement, without reserve, by an eminent authority; and its frankness is quite equalled by its gravity. "To the utter extinction of the family name," *i. e.*, to complete extermination. From this it would seem town-dwellers are a doomed race.

The population of towns is now in excess of the country in Great Britain. The food of town-dwellers is inferior to that of the peasant population, as all familiar with the subject only know too well. The revelations of the Factory Commission amidst the toiling millions of our manufacturing towns, especially those where spinning mills are common, are as instructive as they are appalling. The evidence of Dr. Ferguson, of Bolton, before the Commission, told a terrible tale as to the infant mortality, and the deterioration of the physique of the young mill-hands when appearing to be certified for work in the mills. Dwarfing was on the increase in spite of the Factory Acts. (And the improvement which resulted from these beneficent acts is readily admitted by those who knew the mill districts on each side of the slopes of the backbone of England, before and after the passing of these acts.) One bright spot alone was visible amidst the darkness and the gloom, and that was the good effects of a certain amount of milk in the dietary, in the improvement of the physique. Those who feel interested in this matter can consult *The Sanitary Record* for July 17th and Sept. 25th, 1875.

A dietary of tea and bread and butter was much improved when a certain amount of milk was added to it. Now the steady increase of the population of towns is a fact; that the increase will go on further and further is as certain as that to-morrow's sun will rise. The subject is one of the gravest importance to us; of even greater importance to succeeding generations. Of course, for the toiling millions, little can be done beyond the building of airy and comparatively healthy suburbs, and the establishment of workman's trains, night and morning, into the larger towns; and the inculcation of broad principles about food and drink, fresh air, pure water, and effective drainage. The poor have a hard lot indeed!

But for those whose means permit of their consulting the health of their little ones, something more may profitably be said. Unpalatable much of what is to be written will be to many. Impossible, perhaps, to a few. But as children owe a duty to parents, so parents owe a duty to those children whom they call into being. The State now takes care that the children shall have at least the rudiments of an education; it protects them from small-pox by compulsory vaccination, one of the most beneficent of all discoveries. It guards their dietary by the Food Adulteration Act. Then milk is brought in tins from the mountain pastures of Switzerland, in unlimited quantities; about the purity of which no doubt can reasonably be entertained. The fat-containing maize is brought to us in numerous forms. There is no difficulty in providing milk and a farinaceous dietary for our town infants. Much can be done for them; but more must be done still. Artificial digestive agents may be given with suitable food, to aid in and perfect the natural digestion. But something more is desirable.

For our animals, and more especially valuable stock like race-horses, breeding stations in healthy localities are provided. Surely the offspring of cultured human beings are as valuable, and worthy of as much care as the descendants of "Stockwell" and of "West Australian!" Something similar is desirable in the shape of institutions, placed in suitable localities and under proper supervision; where town-born children could be received in tender years, and reared. Plenty of exercise, in the open air, would secure an appetite for simple food, as well as the perfect oxidation of all waste matter; and the child placed under such favorable circumstances, would be as free from deterioration as is the racehorse. For, though much has been said about the deterioration of the racehorse, it does not appear that any falling off actually exists. Certainly the practice of training them so early, as is now the fashion, is not good for these immature scions of a noble race; but from personal enquiries made of Mr. John Day, the well-known trainer at Danebury, and his neighbor, Mr. Tom Cannon, the equally well-known jockey and trainer, no falling off is discernable in the racing stock of the present. Indeed, in the opinion of the latter authority, the young stock of the present is actually an improvement upon anything which has preceded it. This came out casually during an enquiry into the feeding of racehorses, and their training; which is very severe and trying. One of the greatest sources of anxiety to the trainer is the failure of the appetite. This entails the suspension of the training. It was said before, that the use of tonics and bitters is not unknown among the training establishments for racehorses; but in neither of these Hampshire training stables are these adjuncts adopted. Indeed, in Mr. Cannon's opinion, simple loss of appetite in a healthy young racehorse, never occurs; he holds that when the young horse is "off his feed," it

indicates something wrong with it elsewhere. The air of these Hampshire downs is very bracing, and whets the appetite of the human beings as well as racehorses who reside on, or near them.

My enquiries were directed to the matter of any possible failure of the digestive organs in the racehorses of the present, due to the excitement and mental tension of their mode of life. This may seem somewhat whimsical to some readers; but the racehorse, I am credibly informed in the absence of any personal knowledge, lives a life of much excitement and full of incident. Some enjoy the race; others dislike and dread the event, or, to use the precise expression for it for which we have no equivalent in ordinary English, "funk" immensely when being got ready for the race. It seemed, therefore, desirable, in order to make my observations on the matter of the nervous relations of indigestion as complete as possible, to extend my enquiry to animals whose existence entails much demand upon the nervous system; as the life of a racehorse undoubtedly does. The results of my enquiries were strictly negative; at least as regards these Hampshire training stables. But there is much analogy betwixt the existence of racehorses and human beings. Especially young racehorses, run as they now are so largely at two and three years old. It seemed quite possible, that this early training and nervous tension might affect the young horse; just as life in a large town affects human infants in the way of failure of the digestive organs. But so far there is no evidence of any such cause and effect; and this I am inclined to attribute to the fact of young racehorses being reared in the country, in the healthiest localities that can be secured for the purpose.

When we consider the life of children of the present day in large towns, we become painfully aware of the truth underlying the old adage:—"You cannot both eat your cake and have your cake." The town-child is provided with innumerable and many very elaborate complex toys in its nursery. It is constantly carried to sights which will please it, and, in doing so, excite it. Its little life is a round of gaiety, so far as its indulgent parents can manage it. It is taken to the circus, to the pantomime; it has its children's parties, and balls; it is educated to mimic the life of pleasure, Heaven save the mark! of its seniors. Everything to "force" its brain is aggregated. And a forced product it is, in its precocity! But precocity, the late Prof. Laycock held to be an undesirable matter, as incompatible with a full and complete development in the adult; and those who have paid attention to the matter agree with him. The little infant of the Lemuridae, a lowly form of monkey, will follow its mother the day it is born; but it is only a Lemur when its full potentiality is realized.

The little Baboon baby rolls on its back, and gazes at its extremities in perplexity and wonder for about a month before it commences its peregrinations; but it develops

into an anthropoid ape ultimately, capable of much that is impossible to the Lemur. The human baby passes through a longer and more protracted period of helplessness, but it possesses the potentialities of a man in it; and may develop into an engineer who can span a river, throw an iron girdle over an estuary; or an astronomer who can weigh the stars in his balance, and calculate the perturbations of the planets, or the erratic path of a comet.

Early development is not to be desired, and the forced products of town life can no more last well, than does the racehorse raced long before his period of growth is completed. The promising two-year old, and the quick-witted town-child, neither possess much prospect for their later years. The comparatively dull, stupid, heavy country child has a far brighter future before it. It is keeping its cake, not eating it. It is building up a stalwart frame; its brain is comparatively inert "lying fallow;" its energies are not expended in a round of variety and excitement; it is slowly developing its utmost potentialities, not being exhausted prematurely. This is an aspect of the subject which cannot be overlooked in any scheme for the improvement of future generations. Lugol found struma grow up in town-bred children; and what is struma but an impaired protoplasmic digestion, a tissue deterioration? Such children if born of country people and reared in the country would have been free from any such tissue-degeneration.

This subject is one which has long engaged my attention, and in November, 1877, I delivered a lecture before "The London School-Mistresses' Association" upon "The Relations of Growth to Education," which was subsequently republished by them as a pamphlet. More recently the matter has been fully considered in a pamphlet "The Physiologist in the Household, Part I., Adolescence" (published by Balliere, Tindall & Cox, 1880); which I venture to believe is worth perusal by those specially interested in this subject. Oliver Wendell Holmes in his quaint pithy way alludes to this subject in his "Autocrat at the Breakfast Table." He writes—"Men often remind one of pears in their way of coming to maturity. Some are ripe at twenty, like human jargonelles, and must be made the most of, for their day is soon over. Some come into their perfect condition late, like the autumn kinds, and these last better than the summer fruit; and some like the winter helis, have been hard and uninviting until all the rest have had their season, get their glow and perfume long after the frost and snow have done their worst with the orchards. Beware of rash criticisms; the rough and stringent fruit you condemn may be an autumn or a winter pear; and that you picked up beneath the same bough in August, may have been only its worm-eaten windfalls. Milton was a Saint-Germain with a graft of the roseate Early-Catherine. Rich, juicy, lively, fragrant, russet-skinned old Chaucer, was an Easter-Beurré; the buds of a new summer were swelling when he ripened."

This is rather wandering from the exact subject matter,—pursuing a side-issue in legal phraseology, but it bears on what is being discussed here, viz., the development of a healthy physique, endowing its possessor with greater potentialities in the future. The child reared in the country has a brisker appetite and a better digestion than the town-child. If his growth is slower, he ultimately attains a larger stature. Quetelet "Sur l'Homme" proved this about the physical stature; it is equally true about the mental and intellectual stature. How far imperfect digestion and assimilation is the cause of the arrested development, either wholly or in part, may scarcely be apportioned; but it is a factor, beyond question. Girls develop more rapidly than boys; but their ultimate development is less than that of boys. This side issue is intimately linked with the exact matter under discussion, viz., the rearing of town bred-and-born children in the country.

Of course the objection will be raised, that it is impossible to send the children away. Well! The Anglo-Indian has to do it. And there is no evidence that Anglo-Indians are wanting in family affection, only they have learned to subordinate their own feelings to their children's welfare. And the town-resident at home, not in Great Britain alone, but wherever the Anglo-Saxon has raised his tent-pole over the face of the earth, must learn to do likewise. The ghost of the Red Indian flitting around the old burying-places, and dreaming of the old wigwam standing where a huge town now exists, has the sinister consolation of thinking that the white man cannot live on the land he has usurped—without special precautions. The red-man's grave is covered with the white man's buildings, solid, massive, immense; but his first-born die in them. Colonel Pyncheon erected "The House of the Seven Gables," where Matthew Maule had built his rude hut, "shaggy with thatch;" but a Nemesis hung around the land snatched from the murdered man. "God!" said the poor man, on his way to the scaffold, innocent of the crime of witchcraft for which he was condemned to die,—"God will give him blood to drink."

So may the ghost of the red-man of the present possessor of his land, too. The Anglo-Saxon has exterminated the Red Indian, "Thou shalt want ere I want" has been his creed. The waning Indian had to vacate his possessions for the Vengees, that they might increase and multiply on the face of the earth. And now what is the result? The Anglo-Saxon is a dying race, perishing beside the tomb of the red-man whom he slew. It is "Naboth's vineyard," in the nineteenth century!

What if this grim and terrible fact be an undoubted fact; and it seems that the threatened extinction of the old population, so immediate for Massachusetts, is being inaugurated in Ohio. The nutrition of the American-born woman is often unequal to feeding a second organism; or if that second organism has successfully struggled into an independent existence, it is unequal to its main-

tenance for long. The spectre of the exterminated Red man sees death reaping a rich harvest among the babes and sucklings of his enemy; there are other graves being dug alongside those of his ancestors'. The angel of death is smiting the usurper in turn. If this be so, the American has the sorry consolation of knowing that in his old home, in the cradle of his race, the same phenomenon is to be observed; only not yet to so distinct and terrible an extent. The Anglo-Saxon exterminated the native British; there was no compromise; the conquered Briton did not become "a hewer of wood and a drawer of water"—the serf of his victorious assailant; he perished, died out absolutely. The Anglo-Saxon settled down on the vacated lands and increased and multiplied. For generations this process went on, successful and unchecked. Dirt, filth, the disregard of all hygienic laws, the neglect of the sanitary arrangements of old Roman civilization; the crowding, the narrow tenements; indeed, the necessity for regarding a town as a fortress in the interminable wars of the dark ages, and erecting the houses accordingly, brought plagues in their wake, often exterminating the inhabitants, and causing the markets to be held in the open country at some distance. Now the scene is changed, but not the venue. Where the wattle huts of the ancient Briton once stood, amidst sacred groves devoted to Druidical rites, now we see the many-storied mill, the long chimney belching forth smoke, the endless rows of cottages inhabited by the toilers who work in the mill. The angel of death is busy still. With the practical turn of his race the town-inhabitant protects himself and his young, so far as lies in his power; brings his water from long distances, constructs elaborate sewerage arrangements, thus copying the wisdom of the old heathen at last; further, he has appointed medical officers of health and analysts, still more to guard him and his. He has learned that poison germs may lurk in his water, and still more in his milk supply; since Dr. M. W. Taylor, of Penrith, first pointed out the danger hidden in the milk-can (1858); and repeated outbreaks of scarlatina, following the milk supply, have driven the lesson home. He has provided so far as in his power lies, against these fluid-borne diseases; and the tale of the dead so slain is but as a unit against myriads. For one victim to zymotic disease, a holocaust perish from failure in their digestive processes. For one infant lying in its last sleep from specific germ carried pyrexia, a thousand wasted marasmatic atoms are to be found in their graves from improper food and an imperfect digestion.

It is time then that some general united effort be made to arrest this slaughter of the innocents; compared to which Herod's massacre was as nothing. It may be costly; it may entail many sacrifices; the parent may have to consent to separation from the child; children may have to grow up no longer under the parent's eye, except at intermittent periods; but under the skilled supervision of guardians bound to

them by no tie of blood. All this may be very repulsive; but unfortunately it is unavoidable! Some such practice, which will enable children to be reared in the country, must be adopted before long. Food of the most digestible character may be supplemented by artificial digestive agents; but this is only palliative as regards the individual,—it is not curative as regards the race!

The town-population in Great Britain now constitutes the majority of the people. The issue is a sharp one: and must ere long occupy the attention of our legislators. But it is to be feared that any such action must be preceded by much outside discussion of the question. How, and by what precise measures the evil has to be met, and, if possible, vanquished, it is not for me to say here. First the evil must be fully appraised before adequate measures for dealing with it can be formulated. My duty extends to pointing out the actual facts, and indicating the direction the proposed measures must take; to go further would savor of impertinence, and over-weening vanity. The actual solution of the problem will engage many minds, and exercise many intellects, before "Eureka" can be shouted.

In order, however, to grapple with the difficulty in a practical form, and to do what can be done, until such arrangements can actually be made for the rearing of town-children in the country, I give some valuable remarks by Prof. L. Duncan Bulkley, M. D., of New York, the wearer of an honored name. Dr. Bulkley and myself discussed most earnestly the question of the coming race—if there is to be one at all—on the banks of the Cam, at the Annual Meeting of the British Medical Association, 1880; and now, by his courtesy, I am enabled to lay before the reader what he has found desirable in the interests of the children in the U. S. A.; whose necessities are indeed greater than ours.

"ON THE FAILURE OF NUTRITION IN CHILDREN, WITH ITS TREATMENT, BY DR. BULKLEY.

THE nutrition of the body is dependent on very many different factors, all of which must be perfect to constitute perfect health. Nutrition in children has to do with two quite different elements; first the growth of the body, and second the repair of waste. Failure in nutrition to a greater or less extent must involve defect in one, or both of these respects; when the growth of the body is interfered with, the actions of life are deranged. Failure in nutrition in children has two great causes, which are hereditary or acquired. Far too much stress has ordinarily been placed upon the former, which, of course, is irremediable; whereas the latter, upon which in reality the greatest measure of the difficulty rests, is quite amenable to careful and judicious treatment. We will first, therefore, briefly dismiss the former, or hereditary causes of failure of nutrition, in

order to devote more thought to the second or acquired causes, upon whose proper recognition and understanding must rest much of success in medical practice.

In regard to hereditary causes of imperfect nutrition in children, all cases may be divided into three great subdivisions; first, those exhibiting the influence of the strumous habit; second, those showing the gouty; and third, those characterized by the nervous temperament, or habit. There can be no doubt that as children manifest to a greater or less extent certain physical peculiarities of form and feature, and also certain mental idiosyncrasies; and as certain diseases, as syphilis, can undoubtedly be transmitted to offspring; and certain conditions of system, or tendencies thereto, such as phthisis, gout, rheumatism, and cancer, can likewise be transmitted; that the less pronounced states of physical constitution can in like manner be handed down, so that the individual with the strumous, gouty, or nervous habit, or condition, transmits the same even to the child at its youngest period of life. Thus we may have developed and exhibited in the infant these stages to a greater or less degree, and they may act as sufficient causes in modifying its nutrition.

We therefore see a certain number of infants, or very small children, exhibiting signs of imperfect nutrition, which are intimately dependent upon the state or habit of body which they have acquired with birth. The strumous child speaks plainly by its light delicate hair, its pasty-white complexion, and its enlarged lymphatic glands and flabby muscles; either with very light or very dark eyes, long eye-lashes, large nose, thick upper lip; and if skin lesions form they will be characterized by the development of pus and a tendency to the formation of thick scabs, or crusts, not accounted for by the intensity of the inflammation. Its failure of nutrition will be exhibited rather by the great appetite, decayed teeth, swollen abdomen, often filled with wind; tendency to constipation and intestinal worms. The gouty child will show a tendency to an acid stomach, as an infant will often vomit milk, will have occasional attacks of constipation, alternating with diarrhoea. Will very frequently be restless at night as a result of its indigestion; and if skin lesions manifest themselves they will be characterized rather by a redness of surface, great itching, tendency to watery exudation, drying into thinner scales or crusts, with much less tendency to pus formation. The child with the nervous habit or temperament will show its failure of nutrition by an irregular and fitful appetite, and easily deranged digestion, especially interfered with by nerve causes, as over-excitement, &c. It will be wakeful rather than restless at night, and irritable during the day.

These states, or conditions which belong more or less markedly to infantile cases, are important to recognize. And there is undoubtedly no little truth in the old idea, in regard to the family physician understanding

the constitution of the patient; and this is especially true with regard to children. But if a reasonable amount of care and judicious thought be given to the cases, these features may be understood and developed by one who has but recently met the person affected. And success in practice depends to a very large measure upon the grasp which the physician takes upon the idea as to the constitution, or state of the child he is to treat.

But if the knowledge and appreciation of these feature are valuable in the treatment of disease, or the restoration to health of those suffering from imperfect nutrition; a perfect comprehension of the elements next to be considered is, if possible, yet more important. For the features which have been dwelt upon belong so completely to the constitution or state of the individual, that frequently they cannot be altered to any very great extent by the physician; whereas the elements relating to the daily life of the patient, next to be treated of, are such as the physician can affect; and upon his proper management of them, will rest, to a large degree, the success.

We come therefore to the second, or most important element, or factor of failure of nutrition in children, namely, the acquired causes of its beginning and continuance.

There is no one who has even the slightest knowledge of botany but recognizes that the plant-life is different, not only in various sections of the earth, but in different portions of the same tract of territory, according to the relations existing. Not only is there the vast difference between the products of the earth, of temperate and tropical climates; but in the temperate zone we find the greatest varieties in nature, according to the soil, situation, moisture, and sunlight, etc. We would never expect to find the lily of the valley, or wood violet on top of a mountain, nor the mountain shrub pine in the depths of the valley. Certain plants absolutely require a certain soil; if they are placed in any other, they wither and die. One will require a great amount of moisture; others but little, or none. The same is true of the animal creation; one animal thrives upon food on which another would perish. Therefore, upon the proper selection and administration of food, or the proper regulation of the hygiene and surroundings of the patient, depends the measure of health which it is to enjoy. The cause of failure of nutrition in children, in by far the larger proportion of instances, has to do with external factors rather than with hereditary states. The diet and hygiene of the child require to be regulated with the utmost nicety, if we would secure perfect nutrition. Even as a hot-house in which delicate plants are being reared, requires careful skill and thought; ignorance in one will be followed by evil results, quite as surely as ignorance in the management of the other.

Instinct is undoubtedly given to living beings for the purpose of the preservation of the species: and when allowed to operate undisturbed may be very largely and safely re-

lied upon. In the lower animals instinct undoubtedly is all sufficient for the maintenance of perfect nutrition in the young as well as in the adult; provided that other causes do not operate in too great a degree. But animals and birds can readily be made sick by temptations offered them in the way of food; also by deprivation of air, light, etc. The natural instinct of the young infant is for milk; and upon proper milk it thrives. Older children are quite satisfied with very simple food, provided they are not attracted by other things. It must be remembered, however, that instinct cannot be trusted to entirely in children because of the many perturbations to which life is subject, and of the many temptations which appear on all sides to transgress the rules of health. The child is then dependent upon the intelligence and knowledge of those older than itself; and it certainly does not answer to allow the tastes of the infant, or child, to be the guide in the matter of diet and hygiene. On unsuitable food, given in an improper manner, perfect nutrition certainly will not be maintained; and for the perfect development of the child care and thought should be exercised by its guardians.

As failure in nutrition may be due to improper food, so it may also be due to imperfectly prepared food. Coming now to the actual facts, the food which the infant feeds upon, the mother's milk, may often be greatly impaired in its quality; and where there is failure of nutrition in the infant child at the breast this should always be looked to. In nursing infants with eczema it will constantly be found that the health of the mother is not perfect, and a careful investigation will always find elements to be corrected in it. It is very common to find that the mother is in the habit of consuming large quantities of tea, or perhaps beer, or ale, or takes wine pretty freely; or perhaps she is taking strong chocolate, or milk, in order to promote lactation, and these disagree with her, causing dyspepsia. Or she is constipated, or in her urine she has disorders indicative of derangement of digestion and assimilation. Now, if these elements exist, if the mother's secretions, as from the bowels, kidneys, skin, liver, etc., are not healthy, certainly the secretion of milk is not healthy—and thus it cannot afford the proper nutriment for the child. In the case of nursing infants, therefore, exhibiting the signs of failure of nutrition the attention should always be turned first towards the mother; and in a very large percentage of cases, errors of assimilation and integration will be found in the mother, which must be corrected before we can hope for or expect great and permanent benefit to the child. It must never be forgotten that the mother may have extensive oxaluria as almost the sole indication of mal-assimilation, or she may have simply a coated tongue, acid taste in the mouth, or other signs, or she may have a general tired feeling, especially in the morning after sleep. The nursing mother should not be allowed, as a rule, to take fermented liquors; and generally the quantity

drank should be diminished, especially if it is used in excess. Milk answers best in the large proportion of instances for the mother, and if it is not well borne at first the habit of taking it can be acquired. Very frequently it is necessary to add a little alkali, and the liquor potassæ, 10 or 15 m., may be added to each tumbler-full of milk.

In not a few instances the milk furnished by the mother is absolutely too weak to sustain the child properly, and the mother's health must be improved by such tonics as iron, bark, cod liver oil, etc.

The nursing child with mal-nutrition may also be benefited by the exhibition of certain remedies; although in the main the proper supply of milk, with sun-light and fresh air, and absence of nervous excitement, will generally be all sufficient. Constipation is a far more common state even in infants, than is usually supposed; and many will be found who are dependent for their daily action of the bowels upon enemata, or suppositories of soap, etc. The occasional administration of a proper dose of calomel, will in some cases be of the very greatest service in promoting the nutrition of infants. This of course should not be persisted in to any great extent; but occasionally it may be given with advantage as often as every few days. Pepsin, or lacto-peptine may be used with very great advantage at times in even very small infants exhibiting imperfect nutrition; either a little placed dry on the tongue, or held in suspension in flour-water, or the like, taken at each time of nursing.

In many instances, especially in strumous children, cod-liver oil will be found to be of the greatest service, even in very small infants; although their power of digestion of fats being small, it should be given in very small quantities, and not too often. It may sometimes be used with great advantage in the way of ununction; and linseed oil, or sweet almond oil may be substituted for this purpose.

Again, very many children, especially those of a "gouty stock," will have their nutrition very greatly benefited by the administration of a small quantity of alkali; for this purpose, perhaps, lime water answers very well, having the additional advantage of supplying the elements necessary for the growth of the bones. But sometimes this is distasteful, and sometimes it seems to fail; we may then use the liquor potassæ with advantage. Inquiry should always be made in regard to the urine of these little ones, and if it is found to stain the diaper much, an alkali should be used, with remedies calculated to act upon the kidneys. For this purpose the following prescription will often be found of very great value:

℞ Potassæ Acetatis ℥i.—℥ii.
Spiritus Ether Nitrosi ℥i.—℥ii.
Liquor Ammon. Acetatis ℥ii.

A teaspoonful three or four times daily near the time of nursing.

If there is much restlessness at night, and any tendency to feverishness, a little aconite

may be added to this mixture with great advantage.

Many infants receive, in addition to the parent's milk, or perhaps in place of it, diet which is entirely erroneous. A number of infants suffering from imperfect nutrition are found to be taking large quantities of starchy food, such as corn starch, bran, etc.; and, in many instances, far too much sugar is given with the food. Sometimes, however, there are very great errors committed with regard to the diet of these little ones; and one finds constantly among the poor classes of children of the most tender years, those who are allowed to partake of anything eaten by adults for which they may crave. And it is not at all uncommon to find children, even less than a year old, who are allowed to partake of tea, and coffee perhaps, even more than once a day. And one may often see in the hands of very small children the most indigestible substances, to say nothing of crackers, candy, etc. It would seem almost, at first sight, as though these errors could not prevail among the upper classes; but we have only to remember that the nurses, to whom so much is often committed, all come from the lower ignorant classes; and unless they are watched and directed otherwise, they will tend to practice just what they have been brought up to, and taught at home.

One sees a great many children in whom imperfect nutrition has resulted from the continuance of nursing long after the suitable period has passed, or after the mother has ceased to secrete milk which is properly nutritious. The manner in which little infants so impoverished will pick up when placed upon proper and suitable nutriment, is sometimes amazing. The greatest benefit may be often derived from the addition of the yolk of an egg once or twice daily to the diet of very small children; this may be given either raw or lightly cooked, mingled with the milk, or taken separately.

After children have passed from the breast, there is danger of very great errors being committed in regard to the nutrition of the child. Far too often it is allowed to select its own food indiscriminately from that used by adults. And even if it does not fail in securing the elements required for the formation of its frame, it will very commonly be found that it has induced an indigestion which may be kept up by the same means; and thus have its nutrition materially impaired. The weak, strumous, irritable child therefore, should have its diet looked to, and directed with even greater care than its lactation. Injurious articles must be absolutely interdicted with a firm hand; and the proper nutriment for the case must be insisted upon at all hazards. Some of the element of "indigestion, biliousness, or gout in its protean aspects" may be very commonly discovered; ultimately to be developed elsewhere. These must be diligently sought for and remedied. It is useless, when called upon to improve the condition of a growing child, simply to give this or that remedy; either one which has been recommended by some one or another,

or one which has been found serviceable in what seems a similar case. These cases cannot be treated upon a written plan. The habit, or constitution of the child must be investigated; its diet and mode of life, powers of sleep and bathing, and also anything which can conduce in any way to its health, must come under the scrutiny of the physician.

When the child arrives at somewhat older years, the elements of schooling, and its intercourse with others, must be taken very carefully into consideration. Every child cannot be submitted to the same routine of life; every child cannot bear the same amount of schooling, or even of home instruction. Nor can every child be allowed the free exercise of its will in regard to its exercise, and many other matters of life; just as all adults, or even animals, cannot be submitted to the same work, confinement, nervous strain, etc., and yet maintain health.

Far too little attention has been paid in past and recent times to the value of milk as a nutrient. This can be advantageously added to the diet of very many individuals—even of adults; and it can even be taken in the intervals between the meals, or made to supplement them. Should it cause any of the elements recognized under the general term of "biliousness," this tendency may be more or less averted by the administration of an alkali at the same time, together with care in the regulation of the bowels, etc., etc.

We have thus seen that failure of nutrition in children in a large number of instances, is not always one and the same, depending upon identical causes; but that there are many elements connected with it, each one of which may be of more, or less importance in individual cases. And as the chain is only strong in the perfect integrity of each and every link, so health is only maintained at a perfect standard by the integrity of action of every organ; and the proper supply of nutriment for the growth and repair of each portion of the body. The hereditary tendency of the child, must be to a greater or less extent recognized in each instance therapeutically and the main general line of treatment must be more or less altered in accord therewith. But by far the largest share of causation of the failure of nutrition, is to be found in the surroundings of every day life; and only by careful study and acquaintance with these, can a case be guided into health.

Internal medication can undoubtedly do a great deal to improve nutrition even in the youngest subjects; but it must be ever remembered that the action of the medicant is, and will be but temporary; while the erroneous diet or mode of life may go on long after the patient has ceased to take medicine. And as treatment cannot restore the patient to more than the condition of perfect health previously enjoyed; so when the diseased state is removed, there will be naturally the tendency to return to it, if the same causes are continually at work, and in operation.

In addition to the cod-liver oil so com-

monly required by strumous children, and the alkalis or service in the gouty state, we find very great improvement in many instances from the use of arsenic. And when combined with iron, it forms one of the most powerful means of restoring nutrition and vitality. The following combination will be found of great service in many instances:

℞ Liquor Potassæ Arsenitis, ʒ ss.— ʒ i.
 Ferri Ammon. Cit., ʒ ss.— ʒ i.
 Potassæ Citrat, ʒ i.— ʒ ii.
 Vini Ferti Dulcis (Malaga), ʒ iii.

Teaspoonful after eating.

The syrup of lacto-phosphate of lime is often very valuable in improving the nutrition of children, as also the syrup of the phosphates of lime, soda, and iron. Care must always be exercised, however, in administering these tonics, that the action of the bowels be as perfect as possible, and that the kidneys do their work. Many cases will be found, where iron, cod-liver oil, and various tonics have been previously employed without effect, in which success was attained rapidly after very moderate attention to the emunctory organs of the body.

The condition of the skin as an organ, should never be forgotten in connection with failure of nutrition in children. It is not very common that they are bathed too little, although this sometimes occurs. Probably they are more often bathed too frequently; and are perhaps too often chilled in the bath or afterwards, and the repulsion of the blood from the surface may result in internal disorders.

Cold hands and feet are a very frequent indication of imperfect nutrition in children. These should be attended to; the children should not be allowed to go to bed with icy feet, which will often be the means of causing wakefulness for some length of time after retiring.

The feet should be warmed either artificially by putting them in hot water, or by warm application to them, and wearing of socks. Or if there is sufficient vigor, a reaction may be obtained by a quick plunge into cold water. The hands and feet are always an evidence of imperfect circulation; and this of itself does most frequently cause an indigestion. When the hands and feet are cold, the bath should be used in moderation.

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