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**THE RÔLE OF LACTIC ACID IN GASTRIC
DIGESTION.¹**

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LACTIC acid is present in the stomach under normal conditions from thirty to forty minutes after a test-meal composed of a roll and water or of chopped lean beef, dry bread, and water. At the expiration of that time lactic acid should entirely disappear from the stomach-contents and free hydrochloric acid alone should prevail. During the first thirty or forty minutes after meals the digestion of starches and albuminoids progresses quite rapidly, as may be proved by finding the middle-products and end-products of gastric digestion present, so that the presence of free lactic acid does not prohibit digestion.

As soon as food enters the healthy stomach the secretion of hydrochloric acid is excited and it increases in amount until the production of lactic acid is checked. The exact origin of lactic acid in the healthy stomach is still a matter of debate. It may arise wholly from fermentation, or from the combination of some food-product with a secretion

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from the gastric glandules, or from the gastric mucosa as a distinct secretion, although electric stimulation of the gastric glandules excites the secretion of hydrochloric acid and not of lactic acid. I think it arises largely from fermentation of the food, as its amount is usually proportionate to the amount of starchy, saccharine, and milk foods taken.

I have, however, many times found lactic acid present in the stomach-contents two, three, or more hours after the ingestion of lean meat alone, in some cases the patient having been on a meat-diet for several days; under such circumstances I have followed the usual custom of calling it sarcolactic acid.

If after a test-meal consisting of albuminoids and starches, lactic acid is found in the stomach-contents at the expiration of one hour or longer, it may be called abnormal. I have found during the past few years that lactic acid very frequently exists in large quantities in the stomach during the late hours of digestion, and that it is persistently present in some cases, without regard to the character of the food or to the period of digestion. Indeed, I have cases on record in which lactic acid was present in excess during the whole period of gastric digestion, and as many of these cases had diminished peristalsis, their stomachs were free from lactic acid only a few hours during the twenty-four.

When hydrochloric acid exists in the stomach in proportions over from 0.2 to 0.4 of 1 per cent., we dignify the defect in gastric chemistry by the name hyperchlorhydria, or an excess of hydrochloric acid.

But such a state is not more definite, nor is it more susceptible of detection, study, and treatment, than lactic-acid excess; nor are the etiologic factors more definite in the former than in the latter. I therefore think it reasonable to recognize the condition as an entity, and so consider it.

Lactic acid in abnormal quantity is found in the stomach in many cases having a deficiency of hydrochloric acid. It is difficult to determine in these cases whether the lactic-acid excess is the cause or the consequence of the diminished amount of hydrochloric acid. If, however, upon the withdrawal of all starches and milk-foods from the diet free hydrochloric acid appears in normal amount, it is probable that the excess of lactic acid depends upon improper diet rather than upon primarily diminished secretion of hydrochloric acid. If, on the other hand, free hydrochloric acid does not appear in the gastric contents after stopping starchy and milk foods, it is probable that its secretion is really deficient and therefore lactic-acid fermentation is rendered easy.

A very common cause of lactic-acid excess is found in impaired motility of the stomach, which allows too long retention of its contents, with the over-production of lactic acid by fermentation. With insufficient peristalsis poor absorption often exists, and it is in such conditions that I have frequently been able to demonstrate an excessive total acidity of the gastric contents, owing to the presence of both hydrochloric and lactic acids. Thus in gastrectasia of the Germain-Sée type, the stomach contains not only an excess of hydrochloric

acid, but usually also an excess of lactic acid, and the gastric mucous membrane is incessantly subjected to the action of highly irritating contents. When dilatation is associated with stenosis of the pylorus from a malignant growth, hydrochloric acid is present in small amounts only, or is entirely absent. In some of these cases I have found very large quantities of lactic acid, usually with other organic acids, making a total acidity far in excess, while other cases were characterized by a very small amount of lactic acid and a faint total acidity.

Chronic catarrhal gastritis, resulting from whatever cause or causes, renders lactic-acid excess liable. In cases of atrophy of the gastric glandules and a consequent absence of gastric juice we would expect to find lactic-acid fermentation at its height, but such is not the case. In four cases of this nature that I reported¹ the gastric contents were almost invariably neutral in reaction unless acid foods had been taken. In other cases, as yet unreported, lactic acid was found in moderate amounts, and the total acidity was always subnormal.

Of all the factors entering into the production of lactic-acid excess, none is so potent as improper diet. The ingestion of mixed starchy milk puddings at the end of a hearty meal results in the formation of so much lactic acid that its fermentation is perpetuated throughout the entire period of digestion, to the hindrance of proper change of the albuminoids and starches. The common custom of eating pastries, sweetmeats, ice-cream, cakes,

¹ New York Medical Journal, May 27, 1893.

and cheese after having eaten thick soups, meats, fish with various sauces, entrées made with cream, salads and salad-dressings, is to blame for many digestive disorders.

Drinking milk at meals and between meals, or living on milk alone, not uncommonly lights up the lactic-acid habit in the stomach, and cases of this habit illustrate the baneful effects of persistence in a diet that is not regulated by the condition of the gastric chemistry.

I cannot emphasize sufficiently the importance of lowered general health in the establishment of a gastric state in which the over-production of lactic acid is made easy. When the blood is reduced and the nervous and muscular systems are very much enfeebled, the functions of the stomach are imperfectly performed, because the organ is supplied by impoverished blood, its innervation is disturbed, and its musculature is weak. Therefore under the many indiscretions in diet that are inevitable as the average individual lives and as the average cooking prevails, with all its death-dealing virulence, gastric chemistry is necessarily disturbed.

