

THE PRINCIPLES
OF
ANTISEPTIC METHODS

APPLIED TO
OBSTETRIC PRACTICE.

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PREFACE

I have ventured, with the author's consent, to translate and present to the profession of America, Dr. Bar's work on "Les Méthodes Antiseptiques en Obstétrique."

While Dr. Bar is an enthusiastic advocate of the employment of antiseptics in this new field of usefulness, his teachings are conservative, and precise indications alone guide him in the practice of the method. That he has a right to his enthusiasm, I believe will be apparent to any one who will read the gratifying results he has collected of the value of antiseptic midwifery.

The rigid application of antiseptic principles to obstetric practice meets with greatest favor among the practitioners of Germany and France. The various antiseptic procedures adopted by some of the principal institutions of Europe are described in this work, and it is with the hope that some benefit may follow the dissemination of these views that I place the book within the reach of all in this country.

HENRY D. FRY.

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THE ANTISEPTIC METHOD

IN

OBSTETRIC PRACTICE.

CHAPTER I.

RELATION OF THE GERM THEORY TO THE PUERPERIUM.

THE GENESIS OF DISEASE—THE APPLICATION OF THE GERM THEORY TO THE PATHOLOGY OF PUERPERAL AFFECTIONS—BRIEF REVIEW OF THE GERM THEORY—FERMENTATION—PUTREFACTION—INFECTIOUS DISEASES CAUSED BY GERMS—ANALOGY BETWEEN FERMENTATIONS AND INFECTIOUS DISEASES—THE CHANNELS BY WHICH GERMS ARE INTRODUCED INTO THE SYSTEM—CONDITIONS WHICH FAVOR OR RESIST THEIR MULTIPLICATION—THE TRAUMATIC INJURIES OF CHILDBIRTH—INFECTION OF THE WOUNDED—PURULENT INFECTION—PUTRID INFECTION—THE PYOGENIC MICROCOCCUS—THE SEPTIC VIBRIO—MIXED INFECTION—OBJECTIONS TO THE GERM THEORY—PUERPERAL INFECTION.

SINCE the investigations of Pasteur upon fermentation, and more particularly upon putrefaction,¹ the physicians of the past generation have been occupied in studying the conditions that favor the development of organisms in living matter, and in clearly defining the disorders which result from their presence and multiplication. Remembering that researches conducted in the laboratory ought to serve the physician merely as a means of advancing the healing art, they have sought for methods to protect patients from the action of these germs, the great power of which their experimental studies have taught them to fully appreciate. Thus originated the antiseptic methods.

Carried away by enthusiasm, and in opposition to the scientific logic of M. Pasteur, certain physicians have wished to apply to the genesis of all diseases these doctrines, which have thrown such a bright light upon the pathogenesis of septicæmia, to mention alone that affection which particularly interests us at present. In opposition to the ancient doctrine: "Disease is in us, it proceeds from us, it is

¹ Pasteur. "Examen du rôle attribué aux matières animales après la mort." *Acad. des sciences*, 23 juin, 1863.

created by us," they offer a theory which appears to them positive: "Disease comes from without, it is always of parasitic origin."

Let us question whether, in times past, we have not ourselves been guilty of supporting the origin of some system which, like that of Broussais, for instance, has marked an era of arrest and retrogression in the march of science. We cannot study here, as we would wish, this question of general pathology. But, limiting ourselves to the consideration of those grave accidents, which, following in the wake of childbirth, have been described under the name of puerperal fever, we can to-day assert that the strict application of the doctrine of germs to the study of the pathology of these accidents constitutes a real progress.

We have for proof the experimental researches upon which this theory rests, and, above all, the remarkable results obtained by the application of the antiseptic method.

Before taking up the study of this therapeutic method in its application to obstetrics, we believe it is well to review, in a few pages, the germ theory, and to show that, although there may exist some obscure points in matters of detail, the principle itself of this theory is unassailable.

It is a biological law, well established at the present time, that air, earth and water are peopled with organized microscopical beings, of a nature imperfectly determined, but which are generally conceded to be vegetable matters (microbes, bacteria, etc.). They live and multiply at the expense of organized matter, which they cause to undergo incessant transformations.

These transformations constitute fermentation. Such is, at least, the only explanation that can at present accord with facts; for the theories of Stahl and of Willis present nothing more than historic interest, and cannot stand before the celebrated experiment of M. Pasteur.¹ This author has shown that it is sufficient to add a small quantity of yeast to a saccharated solution, in order to witness the production of fermentation. In this case, the ferment, instead of being destroyed, is developed to such a degree that its weight at the end of the experiment is twenty or thirty times greater than at the beginning. It is living matter.

Fermentations are numerous, but the intimate mechanism of the phenomenon is always identical. We find in each case a specific ferment, butyric, lactic, etc., the development and life of which are indispensable for the production of fermentation.

Each of these fermentations has a special name; as, alcoholic, butyric, lactic, etc. It bears the name of putrefaction when these

¹ Pasteur. *Ann. de chim. et de phys.*, 3^e série, t. LVIII.

transformations are accompanied by the production of fetid gases and by all those external phenomena which characterize the usual mode of destruction of dead organic substances exposed to contact of air.

In appropriate conditions of temperature and humidity all nitrogenized organic substance deprived of life and exposed to air putrefies. But putrefaction is only fermentation; for, in order that it be produced, it is not sufficient to expose dead nitrogenized matter to the contact of air; it must be submitted also to the action of special ferments coming from without, ferments of which we will have later to determine the nature and mode of action, but the reality of which is undeniable. This is a fact absolutely demonstrated. Investigations and discussions have completely overthrown the old theory of catalysis (Berzelius,¹ Mitscherlich, Liebig), and that of spontaneous generation (Frémy, Pouchet,² Joly, etc.)—theories which have been abandoned in favor of the general doctrine of fermentations by microscopic vegetable germs of the atmosphere (Pasteur, Tyndall,³ Joubert, Van Tieghem, Chamberland, Miquel,⁴ etc.).

We do not think that any one can now uphold the old belief, even though he be a supporter of Needham,⁵ and an advocate of the *vegetative force* destructible by heat—a position the English author was compelled to assume in order to oppose the experiments of Spallanzani, and to maintain the reality of spontaneous generation. The demonstration of Pasteur was conclusive, and such men as Cl. Bernard⁶ and Flourens, whose independence certainly will not be doubted, accept it as true and incontestible.

Flourens, indeed, has written:—

“So long as my opinion was not formed, I had nothing to say.

“To-day it is formed, and I state it.

“The experiments of M. Pasteur are decisive.

“What is necessary to obtain animalcules (if spontaneous generation is real)? Air and putrescent liquids? But, M. Pasteur mixed air and putrescent liquids, and he obtained nothing.

“There is no spontaneous generation. Whoever doubts that still, does not understand the question.”⁷

Let us record this point without entering into a lengthy discussion at present.

¹ Berzelius. “Action de contact et force catalytique.” *Ann. de chim. et de phys.*, 1836.

² Pouchet. “Hétérogénie ou génération spontanée.” Paris, 1859.

³ Tyndall. “Les microbes.” Paris, 1882.

⁴ Miquel. “Les organismes vivants de l’atmosphère.” *Thèse de Paris*, 1883.

⁵ Needham. Londres, 1745.

⁶ Cl. Bernard. *Comptes rendus, Ac. sciences*, t. LV, p. 977.

⁷ Flourens. *Comptes rendus, Ac. sciences*, t. LVII, p. 845.

It is, on the other hand, a law of general pathology, which is becoming more and more established, and the proof of which is clear in certain cases, that infectious diseases owe their origin to germs living in the surrounding medium.

The proof is well established for those diseases which arise and are reproduced by means of direct inoculation: charbon, chicken cholera, glanders, etc.

The analogy, we might even say identity, which exists between the fermentations we have just studied and the infectious diseases that are inoculable is evident.

But here the ferments act upon a living body, and the manifestations which they occasion constitute the disease. The reality of these ferments is unquestionable, for we can collect, isolate and cultivate them indefinitely, and, when possessed in their pure state, inoculate animals with them; we then witness, reproduced in these last, disorders identically similar to those which were observed in the animal from which the first germs were procured.

Is this reasoning applicable to the diseases considered contagious, but which have not yet been reproduced by inoculation? This is possible, even probable, no one having demonstrated the existence of any contagion other than vegetable organisms, germs or bacteria. We can then, with some reserve, formulate this second proposition:—

It follows from facts well known at present, that if dead matter surely submits to the action of ferments, living animal and vegetable matter can also be affected by these agents. Their penetration into the organism, their action upon the tissues and organs, is followed by disease, and finally, in some cases, by death.

Our intention being to limit ourselves to simple facts, and more particularly to those that have been demonstrated, we will rest content with generalities in reference to pathology, for the purpose of giving more time to the careful study of questions more directly connected with our subject.

Now, what are the channels of introduction that man offers to the morbid agents? The skin and the respiratory and digestive passages are the principal ones. In health, these surfaces are protected against the penetration of germs; altered in the integrity of their lining membrane, they offer an easy access to them.

Consequently:—

Any solution of continuity, any wound (and by wound we mean all varieties, from the denudation of tissue, only apparent by microscopic view, to the worst forms of traumatism) in contact with the morbid ferments, makes a way for their entrance into the economy.

Even without apparent lesion, it may be only the defect of resist-

ance, of solidity, the want of tone, so to speak, of the elements which go to make up the lining membranes, are conditions sufficient for the production of an inoculation, which, although slow and insensible, is none the less real.

Other circumstances play an important rôle in favoring or preventing the multiplication of germs; the chemical state of the tissues and fluids, blood and lymph, the degree of vitality of the organism, which resists and overcomes the enemy, or which is conquered without offering an effective resistance—all these are conditions which should enter *a priori* into consideration when it is a question of any infectious disease whatever.

Concerning the virulence of the germ, its nature, attenuation, form, age, degree of development, we cannot say so much. These are subjects yet to be studied; but it is not in any way repugnant to the mind to consider them from this moment as so many factors of real value.

From all that has been said it results that, in order for a ferment to act upon a living organism, it is necessary—

- (A) That it can penetrate into that organism.
- (B) That it finds there a suitable soil for development.
- (C) That this ferment presents properties such that its development modifies the normal conditions of the life of the being into whose organism it has gained access.

Let us apply, one after another, the preceding facts to the study of the infectious accidents which may arise in recently delivered women.

The puerperal woman suffers from traumatic injuries. We have to look at her in this light and bring to bear on the subject what knowledge we possess concerning the infection of the wounded.

Now, the injuries of childbirth are varied. On one hand, we find wounds of the vulva, vagina and uterine mucosa—*wounds superficial and exposed*. On the other hand, we have lacerations, contusions, partial ruptures of tissues from stretching, and deep contusions of the ligaments, parietes, septa, peritoneum, etc., produced during labor, which are *so many closed wounds, so many interstitial wounds*, but, nevertheless, actual wounds.

If the first are dangerous chiefly because of their exposure to the contact and penetration of germs, the second, as we will demonstrate later, are none the less so; for they constitute a *locus minoris resistentiæ* fully prepared to suffer the effects of infection coming from within. Pathological lesions connected with puerperal infection can recognize a double origin; in other words, metritis, peritonitis and phlegmon can proceed from *direct* inoculation at the surface of the genital passages, or, again, but more rarely, can follow certain deep accumula-

tions of pus—an internal poisoning. (Experiments of Chauveau upon animals submitted to the *bistournage*;¹ theory of Verneuil concerning interstitial auto-infection;² experiments of Bouchard³ upon traumatic injuries in septicæmia.)

Moreover, the lying-in woman is in no wise less liable to contract all diseases of an infectious or miasmatic nature. The various modifications that her organism has undergone during pregnancy seem to play the part of predisposing causes, by making a soil singularly favorable for the development of infectious germs.

If, now, we consider how the puerperal woman is surrounded by nosocomial influences, we can recognize that everything seems singularly disposed to multiply the chances of infection during the puerperium.

Let us study now the infectious phenomena which may arise in those who have received injuries; let us see what part germs play in their pathogenesis. It will be easy for us afterwards to understand the nature of accidents which, occurring in lying-in women, have been described under the name of puerperal fever.

INFECTIOUS ACCIDENTS OF WOUNDS. PURULENT INFECTION— PUTRID INFECTION—SEPTICÆMIA.

These three terms represent the old clinical idea. They are still true if we accept only what is exact in modern researches.

Nevertheless, the tendency at present is to blend more and more these three conditions under the single name of septicæmia.

According to the Germans, all general infection, having for its origin a germ capable of producing either putrefaction, decomposition of organic matters, or any affection whatever accompanied by *purulence* or *putridity*, merits the name of septic. Thus, fevers characterized by eruptions that show a tendency to suppurate, pyrexia in which intestinal putridity is a prominent feature, the transient forms of infection contracted in surroundings where materials of animal decomposition abound, and many other morbid infectious types badly classed in nosology—all these represent so many varieties of septicæmia.

Such reasoning, instead of simplifying the subject, only tends to create unjustifiable confusion, since we cannot ignore the discoveries of certain experimenters, who, like Davaine, Pasteur and Koch, have demonstrated the existence of germs solely and truly septic in the old acceptation of the word; germs whose rôle in putrefaction has

[¹ Castration from atrophy of the testicles produced by reversing these organs in the scrotal tissues, and by twisting them several times around the spermatic cord.—F.]

² *Gaz. hebdomadaire*, 1883.

³ *Cours de la Faculté*, 1881.

been clearly determined, and the effects of which are identical when they act upon living bodies, provided they meet with conditions favorable for development. Thus, then, if we admit the possibility of the existence of numerous agents of septicæmia, and if, in the customary medical language, the word septic takes a very wide significance, there would no longer be any occasion for us to recognize that there exists a veritable *septicæmia*, clearly defined, and which, in a surgical as well as obstetrical point of view, is of primordial importance.

We will see later that the demand for such distinction is so great that experimenters who have believed it their duty to deny the action of septic germs, have been forced to admit the existence of a special poison capable alone of producing the symptoms observed and described under the name of septic in the strict sense of the word.

We will not go back to the original researches that supported the nature of infectious accidents of wounds. It is sufficient to state that until the experiments of Sédillot¹ (1849), we knew nothing important about this subject. To start from this epoch, purulent infection of one part, and septicæmia or putrid infection of another, were accepted as being distinct affections, both clinically and anatomically. One can, in a few words, define what was understood by these expressions: septicæmia, purulent infection.

The penetration of pus into the organism being accompanied by the formation of metastatic abscesses constitutes pyæmia or purulent infection; poisoning without suppuration constitutes septicæmia. No serious objection was raised, experimentally, to contend that the poison started from the wound. The majority did not doubt that the poison came from without, and in the discussion which took place at the Academy, in 1869, Chauffard was the only one who believed in spontaneity.

Meanwhile, the researches of Sédillot had won the attention of all the foreign savants, and Virchow completed them in Germany by substituting for the idea of simple absorption the doctrine of capillary embolism.

As to the nature of the morbid agent, it remained unknown and unsuspected. Consequently there arose varieties of interpretations which still divide surgeons. Some are partisans of the unity of infection (Verneuil); others, the greater number, believe in duality (Guérin, Gosselin). Pyæmia arises directly and solely from suppuration, whilst septicæmia comes from putrefaction.

We see, then, experience demonstrates the virulence of fluids from

¹ Sédillot. "De l'infection purulente ou pyohémie." Paris, 1849.

any infected wound, and chemistry seeks to discover the nature of this poison. (Bergman,¹ Panum,² Zuelzer.³)

Not until 1872 did we commence to accuse the microbes discovered by microscopic analysis in blood and pus. The experiments of Chauveau⁴ clearly demonstrated the first principle. This is, that liquids filtered with necessary care no longer contained any infecting agent, whilst the solid matters that remain upon the filter preserved all their virulence. From this simple but irrefutable experiment naturally proceeded all the doctrine of germs, the agents of infection; for the solid matters retained by the filter alone remained for investigation, and it was an easy matter to show their organic nature, *living and capable of reproduction*. These preliminary labors were the work of Davaine,⁵ Coze and Feltz,⁶ Koch, Toussaint, Béhier and Liouville,⁷ Chauveau,⁸ Vulpian,⁹ etc.

From these researches sprang a certain number of very important data. We learned to appreciate the steps that gave additional virulence to the microbes; we recognized the progressive form of septicæmia in the rabbit (Davaine, Koch), and we could prove that the microbe strengthened itself and increased twofold in virulence in proportion as it passed from one animal to another of the same species. One one-hundredth of a drop obtained from the twenty-fifth culture, *in vitro*, is sufficient to kill the subject of experiment. *This is an important point which will furnish us valuable knowledge when we come to consider the dangers of overcrowding.*

Since July, 1878, Pasteur and his pupils commenced a series of investigations which were published in different learned societies, and which are to-day so well known that we can from this time forth formulate the fundamental principles which resulted from these labors.

In every case, when, following an injury or wound, we observe any of those accidents known under the name of septicæmia, putrid infection, or purulent infection, there has always been the introduction of a poison coming from without. This poison is composed of germs, bacteria. In order that infection may take place, it is necessary not only that these germs be deposited upon the wound, but also that the

¹ Bergman. "On the question of putrid infection." *Deutsch. Zeitsch. f. Chir.*, t. I.

² Panum. *Schmidl's Jahrbücher*, 1859.

³ Zuelzer. "On putrid poisoning." *Berl. Klin. Woch.*, 1874.

⁴ Chauveau. *Revue scientifique*, 1872.

⁵ Davaine. "Discussion sur l'infection purulente." *Acad. méd.*, 1872-73.

⁶ Feltz. "Sur la septicémie expérimentale." *Comptes rendus*, 1874.

⁷ Béhier et Liouville. "Expériences sur la septicémie." *Gaz. méd.*, 1873.

⁸ Chauveau. "Phénomènes de mortification sur l'animal vivant." *Comptes rendus*, 1873.

⁹ Vulpian. "Sur la septicémie." *Gaz. méd.*, 1873.

organism affected offer to them a favorable soil for their development. These points being admitted, and we will show that they should be when we come to study the value of the objections made against the theory, we can study more closely the pathology of the different forms of infections that are described.

Pyæmia.—In his researches, which have been conducted specially with reference to the penetration of pus with the production of metastatic abscesses, Pasteur has isolated an organism or special micrococcus which he has denominated *pyogenic*. It is at the same time *aërobic* and *anaërobic*, and is found in common water.

Its form, when in the period of full vitality, is that of little rods, very short, turning and twisting upon themselves, of a gelatinous appearance and flexible—characters easily recognized in spite of the small length of the organism. Later, all movement ceases; the microbe becomes constricted and forms the double microbe or diplococcus.

Cultivated chemically in contact with air, it absorbs oxygen and gives off carbonic acid. Cultivated in vacuum, or in a medium saturated with carbonic acid, it develops and gives off carbonic acid and hydrogen.

Physiologically, *it makes pus* locally, at the site of the wound, and at the expense of the albuminoid matters of the tissues, and it gives rise also to the production of pus at a distance, by the formation of metastatic abscesses. The metastasis occurs whenever the purulent centres are sufficient to insure penetration into the channels of absorption. One can then imagine that a vast abscess or an extensive suppurating surface, with defective drainage of the pus, energetically favor this transportation of the microbe to a distance. We can foresee, on the other hand, that the first metastatic abscess may become the point of departure of a still more general infection (Davaine). This explains to us likewise how certain internal suppurations of the viscera are very liable to produce pyæmia.

The inoculation of this microbe, after its vitality has been completely destroyed by boiling, does not produce any result except a local abscess—one incapable of determining general infection. In this abscess we find, again, the dead pyæmic organisms, and it is impossible to recultivate them. They have caused the formation of the abscess by acting as foreign substances.

It is then the pyogenic vibrio which generates pus, and we can conceive of the possibility of a generalized purulence by the single fact of the absorption of the pyogenic vibrio.

This point being established, what do we understand by septicæmia?

Septicæmia.—When a dead body undergoes putrefaction, the changes which mark this step do not begin in the parts of the corpse exposed to the air; but, on the contrary, in the deeper portion in direct relation with the intestinal canal.

The organisms which are the cause of the putrefaction are numerous, but among them there is one which is developed only when sheltered from air; its action is very powerful, and, when inoculated after culture in an animal, produces rapid septic poisoning. *This is the septic microbe*, of which M. Pasteur has given us a description.

Its form is that of threads or sticks of variable length and thickness, movable and susceptible of acquiring great development when inoculated in certain animals. In the blood of the guinea pig, taken after death, it assumes the appearance of a moving thread, animated by undulating or spiral motions, which appear amidst the globules like a snake moving through grass or the twisting motion of the earthworm. The length may be sufficient to occupy the whole extent of the microscopical field.

Chemically, it does not develop at all in contact with air or in the midst of oxygen. It is anaërobic. In certain conditions, however, as when the tissues invaded have been deprived of the oxygen they contained, either by a former generation of germs or by any other cause, as a local extravasation of blood, for example, the surviving septic organisms succeed in finding a suitable habitat; they multiply and are able slowly to penetrate the deeper structures. The blood contains them only after death or at the moment of the death agony. One easily understands this, since then the increasing difficulty of hæmatisis has deprived the globules and serum of the oxygen that they contained. If the blood is normal, the vibrio is resolved into germ corpuscles. Inoculated as such in a new soil, without oxygen, it is capable of multiplying and giving rise to septicæmia. It flourishes only under these conditions; that is, in closed cavities, the peritoneum, the pericardium, and in muscles and connective tissue, likewise in the channels of the lymphatic system.

This doctrine of the anaërobic function of Pasteur's septic microbe is demonstrated experimentally in the most simple and conclusive manner. Pasteur expresses the opinion that its development is favored in the midst of decomposing matters by the action of the common vibrios of putrefaction, which, for the most part aërobic, destroy the oxygen and prepare a way for the multiplication of the anaërobic septic vibrio. This would finally be destroyed in its turn by an ultimate phenomenon of oxydation. Inoculated in a living animal, if it lives and develops, the phenomena produced are similar to those witnessed when it is conveyed to dead organized matter. It is evident, then, that

Pasteur could write that septicæmia, *that is to say, the disease due to the development of the septic microbe*, was only putrefaction taking place in the living (Leplat and Jaillard).¹

But can the pyogenic vibrio and the septic bacteria suffice to explain the production of all the accidents observed among those wounded? Are there only a pyæmia and a septicæmia, and can we at most admit the coincidence of the pyogenic and septic microbes in the same individual—admit a form of mixed infection, purulent septicæmia? “Whereas the generating microbe of pus forms, when it is alone, a thick pus, white, scarcely tinged yellow or blue, not at all putrid, diffused, or surrounded by what has been called a pyogenic membrane, not offering usually any danger, especially if localized in the cellular tissue—prepared, in short, if one can thus express it, for prompt absorption; the least abscess, on the contrary, that contains this microbe, when it is associated with the septic vibrio, takes on a pale appearance, gangrenous, putrid, greenish, and infiltrated in the softened flesh. In this case, the generating microbe of pus, carried, so to say, by the septic vibrio, accompanies this last throughout the body; the muscles are full of the two organisms, and are acutely inflamed, filled with serum, and show everywhere pus globules.”²

Pasteur has isolated two varieties less well defined, and the effects of which are comparable to those we have just considered. Nevertheless, he has never given a detailed description of them. This would lead us to suppose that these are not the only species capable of producing septicæmia. This thought is expressed by others; we said in the beginning, that other experimenters, Koch, Coze, and Feltz and Davaine, had produced artificially *gangrenous*, pyæmic, septic, septicoid, and erysipelatous affections, by employing in the experiments putrefied liquids and animal matters.

Besides the septic microbe, or rather the organisms, the septic properties of which have been determined, and which we include under the name of septic microbes, a putrid liquid can contain a large number of others, the action of which is less easy to demonstrate. Ehremberg has described six different varieties. It is even possible that there exists more of them.

Nothing is known of the nature and functions of these organisms. It is better to acknowledge frankly our ignorance. But it is nevertheless possible for us to point out in what direction experimenters are pushing their researches at present.

When one has seen microbes for the first time, and has been able to fully describe their action in human pathology, there is a certain ten-

¹ Leplat et Jaillard. *Acad. méd.*, 1878.

² Pasteur.

dency to multiply the divisions, and to think that the microbes of different forms are distinct from each other.

At present we know that the same microbe living and developing in different media presents itself in variable forms in harmony with its age and virulence.

There is reason, then, to ask if there is not a possible relation between septic vibrios, properly speaking, and these badly characterized microbes of which we speak. Is it not possible to suppose that under certain circumstances they are susceptible of being transformed from one into the other—that, septic in the dead body, after a series of successive generations, they may be restored to the atmosphere in the state of common microbes, and without action, but susceptible, under certain conditions of environment, of recovering all their latent action?

If we wish to consider only real facts the result of conclusive experiments, we can state, as follows, those we have obtained:—

- (A) *Infectious symptoms observed after injuries are due to germs.*
- (B) The infection of the wounded is manifested in various clinical forms which have led authors to describe it under different names: *septicæmia, putrid infection, purulent infection.*
- (C) Is this division established, both anatomically and clinically, if we consider only the pathogenesis?

Here we know but one thing: it is that the germs recovered in cases of infection of the wounded, capable of producing infection, present themselves in varied forms, and seem endowed with different vital properties.

Two forms have been isolated and described; *one produces pus, the other septicæmia.* But can one conceive of purulence without the pyogenic vibrio, of septicæmia without the septic vibrio; or, in other words is purulence a phenomenon always identical *per se*; is septicæmia a distinct affection?

We can only reason hypothetically on these points. *But we know sufficient to justify the application of the antiseptic method, if we have the right to consider as indisputable, that without germs brought from without, there cannot be any infection, purulent, putrid or septic.*

Likewise, is it our duty to show that the objections raised against this doctrine cannot weaken it. These can be classed under three heads:—

- (A) Microbes come from the diseased organism, and not from the exterior; they are formed by certain modifications of the tissues. In a word, they arise by organization, growing from the elementary granulation which enters into the composition of every organized cell.

This is the theory sustained by Béchamp. It is fully explained in

the work just published by this author.¹ The microzyma is, in the living body, the germ of all microbiotic metamorphosis; it changes into bacteria, vibrio, etc., and is the product of this vice of evolution generated by disease, which itself arises spontaneously in and by the organism.

This theory is only a modification of that supported formerly by Chauffard, and of which it plainly bears the imprint. "It is he (the wounded person) who makes the pus, and when the excessive pyogenic activity of the sufferer is deviated from its normal evolution, it happens that the healthy part of the organism is dragged into this whirlwind and succumbs. Just as at a given moment the cancerous become all cancer, so can the pyogenic wounded person become all pus. Pyæmia is established."²

The conclusions of Béchamp have been combated a hundred times. A hundred times well established facts have shown where was the error, the vice of interpretation. But what say we of a theory which admits, *a priori*, that the non-fecundated ovule contains in itself the micro-organisms of all forms of known schizomycetes? The bacteria, vibrio, bacillus, and filamentous microbes are no longer vegetable products; they are the result of transformation of the animal cell.

Let us hasten to make this statement, that A HEALTHY ORGANISM, OR A PART OF A HEALTHY ORGANISM, HAS NEVER PRODUCED A MICROBE.

Urine, blood, flesh, protected from germs, do not undergo any alteration, never contain living beings susceptible of reproduction in appropriate media.

This theory of the microzyma we personally consider false, and base our opinion upon the innumerable debates which have always overthrown it in all its forms. It has yet to furnish an opposing argument based upon the least fact obtained by experimentation. The conclusion of Flourens, which we have already quoted, is perfectly applicable to it.

(B) The microbes have no action whatever; they are an epiphenomenon of disease. Everything is in the quality of the soil which receives them; in the state of health or of disease. When healthy, the organism resists them. When diseased, it is invaded by the microbes which are everywhere—in the air, water, food, the digestive and respiratory passages; but their presence is an effect, not a cause.

"Too much fear exists of the vibrio, of the germ of the vibrio, particularly of that which is connected with true septic symptoms in the economy. Instead of being occupied in pursuing the vibrio, therapeutics should endeavor first to restore the organism and each of its

¹ Béchamp. "Des microzymas." Paris, 1883. ² Chauffard. *Acad. de méd.*, 1869.

parts into good conditions of vitality and resistance. It is, however, the traumatism, the wound, the lesion, in short, that must be treated before all else, because it is in the diseased organ that are prepared, at least in great part, the septic products whose action becomes so often fatal." (Colin.)

This reasoning is only speculative. Without doubt, to find an organism in the blood of an individual suffering from pyæmia does not signify much. But to take a drop of this blood, introduce it in an inert liquid—of broth, for instance—previously rendered sterile and free of any living germ, thanks to a method that has stood the most severe criticism; to take, again, one-twentieth of a drop of this first liquid, in which we will have recognized clearly the multiplication of the organism contained in the blood, sow it in a new culture vessel; repeat this ten, twenty times, if you will, having the liberty to vary occasionally the sterilized liquid which is used as a nutritive medium for the organism, and to find in the twentieth vessel a liquid as virulent and as active as was the first drop of blood, and to reproduce pyæmia by inoculation of a few drops in an animal—does this not demonstrate something more than a simple hypothesis?

Certainly we do not deny that conditions of vitality and of resistance of the organism are not of more consequence. The varying intensity of action of the same germ inoculated in different animals leads us to think so. Recent labors on infectious traumatism and methods of attenuation prove it; but what is that without the germ? You say that the microbe is generated, or that its appearance is the result of infection. Surely you do not prove it.

We claim that the microbe produces the infection, or finds elements suitable for its development; that it is indeed the germ which acts, and nothing else. We prove it, and recall to you this eloquent comparison made by Pasteur: "By twelve cultures, each of ten cubic centimetres only, the original drop is diluted as much as if it had been in a liquid volume equal to the size of the earth."

He states, moreover, when speaking of anthrax, "Culture of the germ of this affection repeated one hundred times would purify it to such a point that it is impossible to suppose it had preserved ever so little of the drop of blood which had served as a point of departure for the cultures. . . . If one imagines the drop of seed for each culture is diluted in one hundred times its volume, which is infinitely below the truth, the original drop of blood is found at the end, diluted in a number of drops represented by the figure 100, raised to the hundredth power; that is to say, by the unit followed by two hundred zeros."

It is not possible to admit that the drop of the hundredth culture

contains still a trace of the presumed virulent and soluble agent that is supposed to exist in the original drop of blood.

(C) Microbes do not act directly upon the tissues or blood ; they act only by intermediary soluble septic products, which they manufacture at the expense of these same tissues.

A special objection is made here to the action of putrefaction. It rests upon the experiments made by Panum.¹ That author, experimenting with liquids obtained by maceration and putrefaction of shreds of flesh, observed that the filtered liquid, submitted to prolonged boiling or to the action of absolute alcohol, was toxic ; consequently, it was impossible to attribute the effect to living organisms, but rather to the presence of a poison soluble in water, a poison isolated by Zuelzer,² and which, introduced into the economy, gave rise to an intoxication identical, clinically and in its mechanism, to poisoning by the alkaloids.

These experiments have received fresh support by the discoveries of Selmi³ and of Gauthier,⁴ of the ptomaines.

Decomposition of organic matters produces, then, toxic substances, without and before the presence of septic vibrios, as well as after the destruction of these same organisms.

It is beyond dispute that in putrefaction there are produced alkaloids, sepsine, etc., by a process analogous to that which brings about the production of acetic acid in alcoholic fermentation, but its importance is extremely feeble ; and, on the other hand, since the recent labors of Bergmann⁵ and of Panum, sepsine, like all ptomaines, can be produced only by the fact of the life of microbes. Perhaps, even, it may be necessary to search in the variety of these microbes for the cause of the varieties observed in these alkaloids.

We do not enter here into a discussion to know whether true septi-cæmia is the result of the action of these poisons, and whether it is necessary to reserve the name of purulent infection for the pathological phenomena produced by the microbes. We keep in mind only this fact : if the chemical researches are true, *one cannot admit the existence of septic poison without the intervention of microbes*, and the doctrine remains unassailed.

In short, it may be said, for the purpose of completing this subject of the infection of wounds, that, according to the opinion of the best

¹ Panum. *Arch. f. path. anat. und phys.*, t. I, p. 348.

² Zuelzer. *Berl. Klin. Woch.*, 1874.

³ Selmi. *Virchow's Archiv.*, t. LXXIX, p. 563.

⁴ Gauthier. *Ac. méd.*, 1882-1883.

⁵ Bergmann. *Allgemeine Chirurgie von Hueter*, p. 543.

authorities, the Pasteurian theory is true in itself, and that the general conclusions resulting from experimentation remain unshaken.

Microbes are the necessary agents of pyæmia and of septicæmia, and in their absence neither of these diseases has ever been produced artificially. As to mixed forms (septico-pyæmia), and to the varieties less clearly defined, as to settling the question whether there is only one microbe of pus, whether the septic microbe can at the same time produce septicæmia and pyæmia, or whether two organisms are necessary, whether one is an attenuated form of the other, and whether putrefaction can generate germs of variable virulence, the future apparently reserves for us definite knowledge, and it would be premature to attempt to decide the dispute. Now, let us apply these ideas to the study of infection of puerperal cases, and verify, if possible, the more or less concurrence of clinical and experimental results.

Puerperal Infection.—Convinced that the genital passages were the only door of entrance of the septic poison, experimenters directed their attention from the first to the study of the altered lochia, hoping thus to be able to determine the cause of the infection of lying-in women.

As far back as 1857, M. Tarnier had demonstrated the contagious character of puerperal fever by inoculating animals with pus obtained from a woman who had died of septicæmia. But his experiment remained almost isolated until the discovery of germs recalled attention to this subject and gave the opportunity for more precise investigation. In 1870, Mayrhofer¹ demonstrated the existence of microorganisms in the putrid discharges of child-bed women; in 1872, Recklinghausen² and Waldeyer³ recognized them in the internal fluids of women who had died during lying-in; d'Espine⁴ and Quinquaud⁵ inoculated animals with the fetid lochia of sick women, and set up in them septic poisoning; Orth,⁶ in 1873, recognized in the pus of women who had died of peritonitis, a micrococcus, which he considered specific of puerperal infection. By experiments he proved the virulence of fluids collected soon after death.

Let us add the researches of Klebs,⁷ Tiegel,⁸ Hiller,⁹ Heiberg,¹⁰

¹ Mayrhofer. Quoted by Winckel.

² Recklinghausen. Quoted by Winckel. *Thérapeutique des suites de couches*, 1873.

³ Waldeyer. Id.

⁴ D'Espine. *Th.*, Paris, 1872.

⁵ Quinquaud. *Th.*, Paris, 1872.

⁶ Orth. *Arch. f. path. anat.*, 1873.

⁷ Klebs. *Arch. f. exp. path.*, t. I, p. 35; t. III, p. 319; t. IV, p. 241.

⁸ Tiegel. *Correspond. Bl. f. Schw. Aerzte*, 1871.

⁹ Hiller. *Arch. f. Klin. Chirurgie*, t. XVII.

¹⁰ Heiberg. *Virch. Arch.*, t. CVI. *Berliner Klin. Woch.*, 1877.

Hausmann,¹ Spillmann,² Kherer,³ Rokitanski,⁴ Hugh Miller, etc.,⁵ and we will have the list of discoveries made up to 1878.

It is possible to recapitulate them briefly.

The lochia of women affected with fever and ordinary symptoms of septic-pyæmic infection of different forms contain living organisms. Fluids collected at autopsy reveal the invasion of the deeper parts of the body by micro-organisms. Their form is that of micrococcus or of cylindrical bacteria. The experimental injection of liquids and lochia frequently reproduces the infection.

We can give precisely the state of science at this period by saying that the presence of micro-organisms in fetid lochia does not prove much, since already a certain number of authors have remarked—a fact which has been verified a great many times—that even when the women were in good health, and the lochia fetid or not, they may contain vibrios. This, however, is a common phenomenon, since M. Gosselin has shown that, in spite of the wadding dressing, one can demonstrate the presence of proto-organisms upon wounds without there resulting the least danger to the patients.

The simple experiment that appears conclusive is that which consists in inoculating animals with these lochia charged with vibrios, and to witness infectious symptoms set up. But we inoculate thus all the elements contained in this liquid without being able to state, with any precision, the influence produced by any one of them.

In 1879 and in 1880, Pasteur⁶ verified, by close investigation, these researches, until then scarcely outlined. He isolated the *corpus delicti*.

In putrid lochia, he established the presence of organisms, micrococci, vibrios and bacteria conveyed by air, in contact with the genital wounds.

In the blood of patients he discovered, in a certain number of cases, a *microbe en chapelet*. In pus obtained from the peritoneal cavity of patients who had succumbed to puerperal infection, in the lymphatics and in the veins, he recognized his *microbe en chapelet*, sometimes alone, sometimes associated with bacteria or the pyæmic microbe. These researches made with fluids collected at autopsy, though less conclusive than the study of the micrococcus contained in blood during life, are none the less very interesting. However, the culture test permits us to isolate the chaplets of the blood in a pure state.

Although the chain-like organism discovered by Pasteur in blood

¹ Hausmann. *Centralblatt*, 1874.

² Spillmann. *Soc. méd. de Nancy*, 1874.

³ Kherer. Giessen, 1876.

⁴ Rokitanski. *Stricker's Jahrbüchern*, 1874.

⁵ Hugh Miller. *Edin. Med. Journ.*, 1878.

⁶ Pasteur. *Bulletin Ac. méd.*, 1879.

and pus, that to which he was inclined to grant the principal rôle, is met with often—very often, indeed—it is not the only one. Moreover, clinical facts would not agree with those of experimentation if it were otherwise.

Such was the state of the question when appeared, in 1880, the inaugural thesis of our excellent friend, Dr. Doléris, who, after having contributed to the work of M. Pasteur, caused great advance to be made by his original researches.

As was expected, the author was convinced, by multiplying researches upon numerous and different types of infection, that the microbes capable of penetrating into the genital passages of lying-in women are variable in form, quantity and quality. Like Pasteur, he isolated the chain-like organism found in the blood and lymphatics. He isolated, likewise, the pyogenic micrococcus, and, in one case, he recognized, one hour after death, a form of septic bacillus in the blood of a patient who succumbed to a rapid infection.

Attempting to group the varieties of microbes according to their external appearance, and referring them to the better defined clinical types, suppurative form (lymphangitis), pyæmic form (phlebitis), and rapid septic form, he has made three species: 1st, the pointed micrococcus (diplococcus, monococcus, groups and little chains); 2d, the microbe in long chaplets of beads (that of Pasteur); 3d, the septic bacillus in threads and small rods. To the first species he attributes slow pyæmia; to the second, rapid suppurative inflammation of the serous membranes; to the third, septicæmia without suppuration or with very little pus, but always with steady progress and fatal termination.

In this essay, Doléris has selected for his division the truly typical clinical forms, those which portray distinct varieties; but they are mixed, and, besides, complications appear when the different organisms are associated. Moreover, in clinical histories, when the forms become mixed and blended, it is not absolutely known what rôle is taken by each variety of microbe in the genesis of the infection.

With Klebs and Koch,¹ however, he establishes a well-marked difference between the infection of bacillary origin and that which is due to the micrococcus and the forms of organisms derived from it.

Experimentation with animals has often, but not constantly, given positive results. Hiller has frequently obtained negative results, but he is the only one, and it is necessary in such a case to consider the facilities possessed by the experimenters. Orth, Waldeyer, d'Espine, Quinquaud, Pasteur, Koch, Klebs, Doléris, etc., have more often suc-

¹ Koch. Leipzig, 1878. "Recherches sur l'étiologie des mal. infect. traumatiques."

ceeded in producing infection, with the exact reproduction of its lesions and symptoms. One should not ask more than to be sustained by facts positively established.

We recognize here, however, all the problems we pointed out when we studied the rôle of germs in the infection of the wounded.

The question of differences of form of the organisms is not yet decided, and less still that of their influence upon the genesis of septicæmias. Is it possible to establish the action according to the form? Does the form depend solely upon the nature itself of the microbe or of the medium in which it is cultivated? Is suppuration only a weakened form of septicæmia, and does pyæmia represent to us only the realization of penetration with prolonged sojourn of the microbe in the blood? Doléris, as well as his predecessors, has not been able to solve these questions. According to Samuel,¹ the blood retains the infectious agents but a short time; the intestine, the glands, and especially the kidney, are their channels for passing out of the system. This is, moreover, an idea in accord with what occurs clinically. Each rigor appears to correspond to a fresh immigration of microbes. It explains, also, why micro-organisms are not always found in the drop of blood obtained by a simple puncture of the skin. On the other hand, the researches of Bouchard,² those more recent of Capitan,³ as well as the earlier ones of Klebs, do not allow of any doubt that microbes are eliminated by the kidney. The blood can be decidedly affected, pyæmia established, only on condition that there exists a focus of supply from whence microbes continually immigrate into the circulation. In these conditions a careful and repeated examination of the blood always permits affirmative results.

But let us put aside all these litigated questions and accept as demonstrated only the propositions which rest upon experiments uncontradicted and indisputable.

After labor, the uterus may contain dead tissues (placental débris), fluids loaded with organic matters, and blood clots.

These substances are liable to putrefy.

But putrefaction cannot take place (in the scientific sense alone of this word as we can accept it at the present day) without the action of microbes coming from the surrounding medium.

These microbes are very different in form and quality.

Some are inoffensive, others excessively virulent. When putrefaction is thus established, the lochia assume a decidedly fetid character, and exhale the fetid odor of animal matters, which, in free air,

¹ Samuel. *Archiv f. Exp. Path.*, t. 1, p. 343.

² Bouchard. *Revue de méd.*, 1881.

³ Capitan. *Th. Thèse, Paris*, 1883.

undergo this special fermentation that has received the name of putrefaction.

The lochia, in such a case, are not only fetid, but also contain microbes, just as a liquid which has been used to wash a piece of putrefying muscle would contain them.

Among the micro-organisms contained thus in the lochia there are those which, cultivated and isolated, can be inoculated, and are then capable of reproducing infectious symptoms in reactive animals.

Here is one point established. In this case, the offensiveness of the lochia is the first sign to attract our attention. The virulent micro-organisms in contact with the uterine wound are able to penetrate into the organism and produce multiple symptoms (general phenomena, metastatic abscesses, etc.).

But in order that all this chain of symptoms may be produced, it is necessary, let us repeat, that the dead tissues contained within the uterus be submitted first of all to the action of microbes that come from the exterior.

This single conclusion is sufficient.

Let us say, finally, that, in a certain number of cases, puerperal infection approaches still more the infection of the wounded, for it seems that the microbes coming from the exterior have a direct action upon the wound. In these cases, offensiveness of the lochia is wanting; the general symptoms are the first signs of infection.

Do not let us prolong this discussion. Setting aside all questions of doctrine and the delicacies of experimentation, not questioning whether there is or is not a puerperal microbe (Chauveau, *Lyon Médical*, 1883), we can say: *Multiple or single in its essence, although of a variable morphology, the microbe is necessary for infection to become established in the lying-in woman.*

There is a close analogy, if not identity, between the infection of the injuries of the wounded and the infection of the wounds of child-bed women—between *surgical septicæmia* and *obstetrical septicæmia*. Upon this knowledge, we will establish the rational definition of contagion, of epidemicity, and of overcrowding. It will furnish us the fundamental facts of obstetrical antiseptics, properly speaking.

At the beginning of this chapter, we recognized that puerperal women were exposed to exterior contagium by other channels than the wound; that the lungs, the intestine, and even the skin may be the doors of entrance of morbid principles. These are hypotheses which concern for the most part diseases of a miasmatic nature, and fevers called, more or less correctly, septic fevers; but the general opinion being greatly disposed to support the parasitic theory, we do not wish to oppose an idea strongly in harmony in other respects with

observation and reasoning. We certainly do not doubt in the least the intestinal origin of septicæmias, and we firmly believe that the *nosocomial* influence may be a more frequent cause of infection than is generally thought. We are inclined to admit this explanation without absolute proof, for it has been impossible until now to follow, step by step, in the cases of which we are speaking, the penetration and march of the poison in the organism.

A discussion of this question is still inadmissible, and it is not a part of our plan to enter into the details of it. Upon ground so little known we risk being misled.

But by accepting as true this *internal infection*, we can better understand the nature and pathogenesis of certain septicæmias which appear in recently-delivered women, in spite of strict local antiseptics. What mean the changes which occur under such circumstances on the surface of the wound? What mean the modifications of the lochia? The question is still *sub judice*. But it is evident that putrefaction accompanied by offensiveness at the site of the uterine wound is by no means necessary in this case in order to understand the lesions that may be produced. Indeed, peritonitis, metritis, lymphangitis, phlebitis, pleurisy, or arthritic inflammations can appear, as they do, in general infectious diseases, scarlatina, typhoid fever, septic pneumonia, etc. We understand why the genito-pelvic regions are the first involved, inasmuch as they offer less resistance, and the recent injuries inflicted subject them one after another to the action of the internal poison. This medical doctrine, sustained by the opinions of a great number of surgeons and experimenters (Verneuil, Billroth, Chauveau, Bouchard, etc.), will furnish us material for a second variety of antiseptics, the aim of which will be no longer *the wound*, but the *respiratory and digestive passages—air and ingesta*.

It is clear, we admit only the existence of hetero-infection, we do not accept auto-infection in any case; for one cannot consider as such the internal infection that we have just described.

In this latter, the cause of the accidents ought to be sought for from without, in the ingesta, and perhaps in the air.

Thanks to the Pasteurian theory, we are able to comprehend in a clear and precise manner what is meant by puerperal infection. We no longer have need to appeal to the doctrine of puerperal fever, and all the discussions that have taken place on this subject possess now only a historical interest before the facts that we have just reported, and which allow us to state precisely the mode of propagation of infectious accidents. Puerperal infection is contagious, and the contagium is an element possessing definite form and body, having as vehicles, it may be, various solid bodies, which may be brought in

contact with the wounds of the puerperal woman ; it may be, perhaps, air and food.

We will show later how the researches of Davaine permit us at the present day to state clearly what it is necessary to understand by epidemic, and that we no longer have occasion to search for the cause of it, with Stohl and the epidemiologists of the eighteenth century, in the variable conditions of temperature, humidity, or of atmospheric pressure. They permit us also to explain in a scientific manner the fatal effects of overcrowding.

CHAPTER II.

THE ANTISEPTIC METHOD AND AGENTS.

WHAT IS MEANT BY THE ANTISEPTIC METHOD—ANTISEPTIC AGENTS AND THEIR MODE OF ACTION—RELATIVE STRENGTH OF DIFFERENT ANTISEPTICS—OXYGENATED WATER—BICHLORIDE OF MERCURY—NITRATE OF SILVER—IODINE—IODOFORM—CHLORINE—CHLORAL—CARBOLIC ACID—SALICYLIC ACID—MENTHOL—THYMIC ACID—BORACIC ACID—ALCOHOL—PERMANGANATE OF POTASSIUM—BENZOIC ACID—OIL OF TURPENTINE—WINTER-GREEN—CAMPHOR—EUCALYPTUS—NEW ANTISEPTIC AGENTS.

IF the details given in the preceding pages have, as we hope, demonstrated to the reader the importance of the rôle played by germs in the genesis of puerperal septicæmia, it will be easy to understand what is meant by the word antiseptis. The therapeutic system which causes the destruction of germs, which prevents their growth, and their introduction within the organism of patients, and which interferes with their development, constitutes the antiseptic method.

One admits readily that this is an extremely complex problem. We repeat what we have said : the woman who has just given birth to an infant is one who is wounded, and the wound is of a peculiar nature ; not only does she present a uterine wound, and wounds, more or less extensive, of the genital passages ; not only is this wound produced as the sequel of a more or less grave traumatism—the labor ; but we ought not to forget that the woman, at the end of her pregnancy, is found in conditions absolutely peculiar to that state.

The modifications produced in the composition of the blood, in the capacity of the circulatory apparatus, and in the functional affections of all the organs, allow, up to a certain point, the comparison of a woman who is just confined with those wounded, of whom M. Verneuil so often speaks, and who, presenting some special complications, as diabetes, albuminuria, etc., seem to be soil prepared for the development of complications of wounds.

Too much effort cannot be made to place puerperal cases in *perfectly* aseptic surroundings. It is necessary to see that their general condition is made as good as possible ; it is necessary, as far as it lies in one's power, to diminish the extent of traumatism connected with the parturient act ; and it is necessary, above all, to prevent the transport of contagious principles to the vulnerable parts of woman's organism, the wounds, etc. We must, if this object has not been attained, kill the germs which have gained access to the surface of the wound, and, if the circulatory apparatus has been invaded, we must

destroy the morbid principles which have penetrated therein. At present we do not possess any means which enable us to obtain this latter result with any certainty. We believe, nevertheless, it is our duty to point out this indication, which certainly will be fulfilled some day.

We should study first the procedures which have improved the sanitary conditions of maternities to such an extent that the mortality in these institutions at the present day is not any greater among the unfortunates who seek refuge here than among those who are delivered at their own homes.

After having studied carefully the rules of nosocomial hygiene, the importance of which it is impossible to fail to recognize, we will show that the efforts are fruitless if the physician is not convinced of the contagiousness of the puerperal infection, and if, by all his actions, he does not give his attention especially to preventing contagion. He must bear in mind that in every operation, in every manipulation, the hand and instruments introduced within the genital passages can be the carriers of septic germs.

If, in spite of all the precautions taken, germs have been deposited upon the uterine wound, it will become necessary to destroy them and to prevent their development. We will show the means for doing so.

All these procedures necessitate a study so much the more complicated, because they include among themselves a thousand little means, the enumeration merely of which would appear absurd if they did not all lead to a reduction of child-bed mortality, and if the results obtained with the antiseptic method did not prove their importance.

Let us repeat: the obstetrician, in order that he may apply thoroughly the antiseptic method, ought to be convinced of the truth of the facts we have enunciated; he ought to be convinced that all cases of infection that he observes are due, careful though he may have been, to some fault committed; generally, indeed, he discovers that he has neglected to practise some little procedure, trifling in appearance, but the application of which would have sufficed to protect the patient.

In order to struggle with greater energy against puerperal infection, recourse is had to the use of agents that practice has demonstrated to be capable of arresting putrefaction, and that experience has shown to have a real action upon the life of microbes. These agents are antiseptics.

Thus, then, any substance which is capable of sterilizing a medium, of antagonizing the life of organized ferments, which is capable of preventing putrefaction, or is sufficiently powerful to suspend it, being able to prevent the development of germs and to diminish their vio-

lence, is an antiseptic. But antiseptics have very different modes of action.

Some fix the germs and prevent them from increasing; others, much more powerful, act upon the germ itself by destroying it.

Attempts have been made to determine the degree of power possessed by each antiseptic, and, for that purpose, the result of experience is considered, and calculations have been made to ascertain the minimum quantity necessary to cause destruction of the germs in a liquid. But these researches are much more complicated than they appear at first sight. Such a solution, and such a quantity capable of sterilizing a given medium for a certain vibrio, will not be sufficient for another medium, and especially for a different vibrio. The real value and power of each antiseptic cannot be recognized then until a series of experiments will have been made upon each known microbe.

Furthermore, the problem is singularly complicated by this fact: small as a microbe is when created, it does not reach in the beginning its state of perfect development. Like all living matter, it undergoes a certain number of transformations; we may call them generations; and, at each moment of its life, its functions—that is to say, its degree of activity and virulence—vary. Now, the older the microbe, the more virulent it is, and the more necessary to combat it with an energetic agent. An antiseptic solution sufficient at one time can become insufficient later.

The same microbe appears, moreover, to offer a different resistance to the action of antiseptics according to the media in which it is developed. This is clearly demonstrated by the experiments of Nicolai Jalan de la Croix.¹

Take microbes that we cultivate in an infusion of tobacco: a certain quantity of carbolic acid will be necessary to kill them; transfer these microbes to another medium (broth), such as Pasteur's culture fluid, and they continue to be cultivated. In this new medium a much smaller quantity of antiseptic will be necessary in order to prevent their development. Changing the medium of the microbe has sufficed, in a word, to diminish their resistance.

Finally, bacteria and vibrio, before presenting themselves as such, exist first in the form of germ corpuscles. It must not be forgotten that germs offer a resistance truly incredible to the action of antiseptics, whilst bacteria and vibrio are more easily attacked.

These are so many peculiarities which greatly add to the complications of the problem. So long as the natural history of all the

¹ Nicolai Jalan de la Croix. "Das Verhalten der Bakterien des Fleischwassers gegen einige Antiseptica." *Arch. für Experim. Path.*, 20 jan., 1881.

microbes be not known, it will be utterly impossible to determine with precision the value of any antiseptic.

We think, nevertheless, that we should give here a sketch of the work which has been accomplished on this subject; but before taking up the study, let us see what agents can be utilized as antiseptics. The following list will give an idea of their number:—

SIMPLE BODIES.

Oxygen.	Iodine.
Oxygenated water.	Sulphur.
Chlorine.	Mercury.
(Hypochlorite of lime and soda.)	Charcoal.
Bromine.	

MINERAL ACIDS AND SALTS.

Acid, nitric and hypoazotic.	Sulphate of iron.
arsenious.	of copper.
chromic.	of zinc.
boracic.	Sulphite of sodium.
sulphurous.	of calcium.
Arsenite of sodium.	Nitrate of silver.
Bichloride of mercury.	of lead.
Perchloride of iron.	Bichromate of potassium.
Chloride of zinc.	Chlorate of potassium.
of manganese.	Permanganate of potassium.
of gold.	Alumen.
of platinum.	Borate of sodium.
of sodium.	Hyposulphite of sodium.
of lime.	Sulphate of ammonium.
	Iodide of potassium.

ORGANIC COMPOUNDS.

Acid, hydrocyanic.	Acid, thymic.
Alcohol.	tannic, gallic, and pyrogallic.
Glycerine.	Camphor.
Chloroform.	Eucalyptol.
Iodoform.	Menthol. Anisol.
Chloral.	Oil of turpentine (terebinthinates).
Acid, carbolic (tar and oil of tar).	Naphtol. Naphtaline.
picric.	Resorcins.
cinnamic } tolu and benzoin.	Quinine.
benzoic }	Sulphuret of carbon.
salicylic (salicylates).	Ether.
creylic (creasote).	

The attempt has been made to classify antiseptics according to their mode of action, as, for example, to divide them into coagulating and oxydizing agents, etc.

It is not possible to call in question these peculiar qualities. It is

more than likely that oxygenated water has an antiseptic action only on account of its richness in oxygen ; it prevents the development of anaërobic microbes, and we have seen that the septic vibrio is of this class.

Alcohol acts only as a coagulating agent. According to Maurice Perrin, this antiseptic impregnates the tissues and prevents the septic vibrios from penetrating them. With this agent the microbe is not destroyed, but the wound is modified in such manner that it offers an insurmountable barrier to the inferior organisms. This coagulating action upon albuminous products is proven by the grayish aspect of the wound, the tardiness of granulation, etc.

Carbolic acid, which acts directly upon the inferior organisms, has been combined with alcohol, so that it is possible, by the mixture of the two, to obtain a very powerful antiseptic product. On the other hand, Neudörfer considers that carbolic acid acts chiefly by coagulating and giving greater fixity to the albuminates of the tissues.

These questions are not yet settled ; they will be only when we shall be more enlightened concerning the physiology of each microbe. Without occupying our time with these considerations, which, as yet, are only theories, we can, nevertheless, tabulate the power credited to the antiseptics by merely employing experimental facts as a basis.

Certainly, we have no wish, in a premature classification, to consider the results that we are about to describe as being applicable to all cases. But they appear to be at least precious landmarks which may be of great assistance as a guide to the practitioner.

Miquel ¹ has recently made a series of experiments to determine the strength of each antiseptic, and he has attempted to make a classification based upon their degree of activity. In order to prevent putrefaction of a litre of beef broth, he adds thereto a certain quantity of some antiseptic agent ; more when its action is feeble, less when the antiseptic is powerful, and on this principle he has constructed the following table :—

Degrees of asepsis.	Quantities necessary to be efficacious.	
	Gr.	Gr.
1st. Eminently	0.01	to 0.10
2d. Very strongly	0.10	to 1.00
3d. Strongly	1.00	to 5.00
4th. Moderately	5.00	to 20.00
5th. Feebly	20.00	to 100.00
6th. Very feebly	100.00	to 300.00

In other words, a substance will be eminently antiseptic, if it be sufficient to add only 0 gr. .01 to 0 gr. .10 to a litre (from $\frac{1}{6}$ of a grain to 2 grains to a quart) of broth to prevent its putrefaction, etc.

¹ Miquel. "The living organisms of the atmosphere." *Thèse de Paris, 1883.*

Here is the complete classification adopted by this author and based upon his experiments:—

1st. <i>Substances eminently antiseptic.</i>		4th. <i>Substances moderately antiseptic.</i>	
	Gr. Grains.		Gr. Grains.
Oxygenated water	0.05 ($\frac{5}{8}$)	Bromhydrate of quinine	5.50 83 $\frac{1}{3}$
Bichloride of mercury	0.07 ($1\frac{1}{6}$)	Acid arsenious	6.00 90
Nitrate of silver	0.08 ($1\frac{1}{3}$)	Sulphate of strychnia	7.00 105
		Acid boracic	7.50 113 $\frac{1}{3}$
2d. <i>Substances very strongly antiseptic.</i>		Arsenite of sodium	9.00 135
Iodine	0.25 ($4\frac{1}{6}$)	Hydrate of chloral	9.30 140
Chloride of gold	0.25 ($4\frac{1}{6}$)	Salicylate of sodium	10.00 150
Bichloride of platinum	0.30 (5)	Sulph. of protoxide of iron	11.00 165
Acid hydrocyanic	0.40 ($6\frac{2}{3}$)	Caustic soda	18.00 270
Bromine	0.60 (10)		
Sulphate of copper	0.90 (15)	5th. <i>Substances feebly antiseptic.</i>	
3d. <i>Substances strongly antiseptic.</i>		Protochlor. of manganese	25.00 375
Cyanide of potassium	1.20 (18 $\frac{1}{3}$)	Chloride of calcium	40.00 600
Bichromate of potassium	1.20 (18 $\frac{1}{3}$)	Borate of sodium	70.00 1050
Ammoniac gas	1.40 (21 $\frac{2}{3}$)	Muriate of morphia	75.00 1125
Chloride of aluminium	1.40 (21 $\frac{2}{3}$)	Chloride of strontium	85.00 1275
Chloroform	1.50 (23 $\frac{1}{3}$)	Chloride of lithium	90.00 1350
Chloride of zinc	1.90 (30)	Chloride of barium	95.00 1425
Acid thymic	2.00 (30)	Alcohol	95.00 1425
Chloride of lead	2.00 (30)	6th. <i>Substances very feebly antiseptic.</i>	
Nitrate of cobalt	2.10 (31 $\frac{2}{3}$)	Chloride of ammonium	115.00 1725
Sulphate of nickel	2.50 (38 $\frac{1}{3}$)	Arsenate of potassium	125.00 1875
Nitrate of uranium	2.80 (43 $\frac{1}{3}$)	Iodide of potassium	150.00 2250
Acid carbolic	3.20 (48 $\frac{1}{3}$)	Sea salt	165.00 2475
Permanganate of potassium	3.50 (53 $\frac{1}{3}$)	Glycerine	225.00 3375
Nitrate of lead	3.60 (55)	Sulphate of ammoniac	250.00 3750
Alumen	4.50 (68 $\frac{1}{3}$)	Hypophosphite of sodium	275.00 4125
Tannin	4.80 (73 $\frac{1}{3}$)		

Researches similar to these have been undertaken already in Germany by Nicolai Jalan de la Croix.¹ Among other questions studied by this author, the great number of which shows how complicated is the subject, we direct attention especially to those researches which have established the quantity by weight of the antiseptic, capable of preventing the development of bacteria which are conveyed directly to broth by adding a few drops of infected broth:—

Corrosive sublimate	1 : 25250	Acid sulphuric	1 : 5734
Chlorine	1 : 20208	Bromine	1 : 6308
Chloride of lime (936 p. to 1000)	1 : 11135	Iodine metallic	1 : 5020
Sulphurous acid	1 : 6448	Acetate of alumina	1 : 4268

¹ Dr. Nicolai Jalan de la Croix. "Das Verhalten der Bakterien des Fleischwassers gegen einige Antiseptica." (*Archiv für experimentelle Pathologie*, 20 janvier, 1881, t. XIII, p. 175 à 225.)

Essence of mustard	I : 3353	Hypermanganate of potassium	I : 1001
Acid benzoic	I : 2867	Acid carbohc.	I : 669
Borosalicilate of sodium	I : 2860	Chloroform.	I : 90
Acid picric	I : 2005	Borate of sodium	I : 62
Thymol	I : 1340	Alcohol	I : 21
Acid salicylic.	I : 1003	Eucalyptol	I : 14

The limitations stated in the beginning foresee that we do not wish to make this study of the antiseptic method in obstetrics depend exclusively upon these conclusions; we ought, nevertheless, to give close attention to the examination we are about to make of each separate antiseptic.¹

In the following paragraphs we treat only of agents which can be

¹ We mention here only the two works which appear to us to be most important, but we should state that for some time these researches had been undertaken, and had given certain results. Pringle had, in 1750, determined the antiseptic value of a certain number of agents (Pringle, "Septic and antiseptic substances," 1750). We will find in M. Vallin's work ("Treatise on Disinfectants and Disinfection," Paris, 1883) a good account of all the recent works on this subject. We should particularly consult the experiments of Smith, ("Disinfectants and Disinfectors," Edinburgh, 1869), who has devoted special study to the action of disinfectant vapors upon putrefaction; and the works of Petit ("Note on Antifermentable Substances." *Compte rendu de l'Académie des sciences*, 14 octobre, 1872, et *Journal de physique et de chimie*, juin, 1874). With the work of O'Neal ("The Relative Power of some Reputed Antiseptic Agents," *Army Medical Report for 1871*, London, 1872, p. 202), we see appear for the first time a study of the influence of antiseptics upon the production and evolution of microbes.

Let us add, finally, the researches of MM. Gosselin and Bergeron directed particularly to the action of alcohol, camphorated eau-de-vie, and carbohc acid ("Study of the effects and mode of action of substances employed in antiseptic dressings." *Comptes rendus de l'Académie des sciences*, 29 novembre, 1879).

Leonid Bucholtz. "Antiseptica und Bakterien; Untersuchungen über das Influenz der Temperatur auf Bakterien." "Vegetation" (*Archiv für experimentelle Pathologie*, 1875, t. iv, p. 181 et p. 159-168); "Über das Verhalten von Bakterien zu einigen Antiseptica;" *Inaugural Dissertation*, Dorpat, 1879.

Th. Haberkorn. "Das Verhalten von Harn." "Bakterein gegen einige Antiseptica." Dorpat, 1879.

Tyndall. "Further researches on the department and vital resistance of putrefactive and infective germs, from a physical point of view." (*Philosophical Transactions of the Royal Society*, vol. 167, p. 149 to 206).

Renault, d'Alfort. Article, "Disinfection" in the New Dictionary of Medicine and Veterinary Surgery.

And finally—

William Harding Crowther. "Some experiments on the relative value of Antiseptics." (*The Medical Times and Gazette*, 1879, p. 261.)

Chieron. "New criterion to determine with scientific accuracy the relative value of different antiseptics." *Bolletino della Scienza medica di Bologna*, 4^e série, t. v, 1880.

employed practically in therapeutics, and especially of those which have been experimentally used in obstetrics.

Oxygenated Water.—Oxygenated water is not employed in obstetrics. It is, however, if we accept the conclusions of Miquel, the most powerful of known antiseptics. Before this, Angus Smith had insisted upon the future which was reserved for the employment of oxygenated water (1869).

Since then, the experiments of Régnard¹ have again called attention to the subject. At the suggestion of M. Paul Bert, M. Péan² employed neutral oxygenated water, deprived of sulphuric acid, and containing 2 parts of oxygen to 1 of water. He used it in douches and in dressings. He also made atomizations with this liquid. Increasing the strength of the oxygenated water to the proportion of 6 to 1, he obtained excellent results.

Oxygenated water acts by setting free the oxygen it contains. Also, when injected under the skin of an animal it rapidly produces death, in consequence of the disengagement of gas. (Experiments of Guttman.) The instability of oxygenated water, and its high price, are the principal causes which limit its employment.

Bichloride of Mercury, or corrosive sublimate, is, according to Miquel, one of the three substances eminently antiseptic. It stands next to oxygenated water. Also, it is found first on the list made by Nicolaï de Jalan, who had not experimented with the former of these agents.

The antiseptic power of corrosive sublimate is, at the present day, contested by no one, only, perhaps, Bergmann,³ of Vürzbourg, who places bichloride of mercury after carbolic acid, and claims that in a solution of this substance micrococci can develop much more readily than in a carbolized solution.

Whilst assistant to M. Tarnier, we had occasion to examine a number of liquids made antiseptic by the addition of various substances, and into which M. Tarnier had placed fragments of placenta. They were then exposed to the free air for a certain number of days. Only the solutions of bichloride of mercury, 1 to 1000, and of boracic acid, 40 to 1000, contained no trace whatever of any germ. However, M.

¹ Bert and Régnard. "Influence of oxygenated water upon fermentation." *Gaz. méd. de Paris*, 1880, p. 359, and *Acad. des sciences*, 22 mai, 1882.

² Bert et Péan. *Académie des sciences*, 3 juillet, 1882. See, too, Sonnerat, *Journal pharm. et chimie*, juin, 1883.

³ Bergmann. *Union Médicale*, 19 sept., 1882.

Tarnier has reported these facts in the discussion which followed the communication of M. Spiegelberg¹ at the London Congress.

The employment of corrosive sublimate presents a series of advantages and disadvantages. The advantages are as follows: The great antiseptic power of the agent, the low price of the solutions employed, the complete absence of odor, and the easy preparation of the solutions. The disadvantages are: Its action upon the skin, which becomes hard and slightly tanned. Let us hasten to add, however, that the irritant action of bichloride of mercury is much less marked than that of carbolic acid, and also that one rarely observes with this agent the erythematous rash which quickly follows repeated action of carbolyzed solutions upon the skin. The true disadvantage is, without doubt, its toxic power.

The more timid physicians do not fear to have recourse to bichloride of mercury as a disinfectant agent. They even employ it quite readily when they are called upon to treat open wounds, of small extent, and exposed to the air. But they hesitate to employ it to treat a wound as large, as deep, and as irregular as that of the uterine wound. They dread, by practising uterine or vaginal injections with bichloride, the production of symptoms of poisoning in their patients.

Practice alone can reply to these objections, and confirm or deny whether these complaints are founded. For two years, at the Paris Maternity, they have freely employed solutions of corrosive sublimate, 1 to 1000 (van Swieten's solution) or 1 to 2000, either to practise vulvar washings, or to make intra-uterine and vaginal injections. Never, numerous as have been the injections, has the least symptom of poisoning been observed. The bichloride has, likewise, under the same circumstances, given excellent results in the hands of M. Budin. And yet, in the quantities we have just directed, the bichloride has a most powerful and well-defined antiseptic action. We remember to have seen at the Maternity a woman who, after the application of forceps practised in the city, had suffered a complete laceration of the perineum and of the recto-vaginal septum. In consequence of the severe contusion of the tissues, patches of gangrene had appeared upon different parts of the vaginal mucous membrane. This patient was in a very critical state, on account both of her local and general condition, when we commenced the antiseptic treatment. During several days we employed vaginal injections, frequently repeated, with a solution of corrosive sublimate 1 to 1000; we soon witnessed the wound take on a healthy appearance, the general condition improve, and without being able to observe the least symptom of mercurial poisoning.

¹ *Transactions of the International Medical Congress*, t. IV, p. 390. London, 1882.

We know of a young puerperal woman now under treatment, to whose house we went, immediately after labor, to perform perineorrhaphy. In the beginning, we made for four days a number of vaginal and vulvar douches with carbolized water; carbolized wadding and gauze were applied to the vulva. After the fourth day, it produced such a violent erythema upon the surface of the external genital organs that, by our advice, the attending physician abandoned carbolic acid in favor of corrosive sublimate. The inflammatory symptoms abated rapidly, and no unfavorable appearance was presented in the process of cicatrization.

Let us remark that if, after labor, the antiseptic method is rigidly applied and bichloride of mercury employed, the lochial discharge is less free than customary, the blood has generally a bright red color, purulent lochia are seldom evident and may be wanting entirely.¹

[The experience of the past few years has demonstrated that the employment of bichloride of mercury as an antiseptic agent in obstetric practice is by no means devoid of risk. Cases of poisoning, some of which resulted fatally, have been reported by different observers.

The toxic symptoms developed were: general depression, hyperesthesia of the skin, slow pulse and sub-normal temperature, and profuse diarrhoea with fetid, and sometimes bloody stools, restlessness, coma, and death. Feverishness, nausea, vomiting, epigastric pain, colic, and suppression of urine have also been observed.

Post-mortem examination has uniformly revealed extensive lesions of the intestinal mucosa, extending from the rectum to the ileum. That portion covering the rectal region is most severely implicated, and the intensity of the pathological changes gradually lessens as the ileum is approached. The mucous membrane is swollen, ulcerated, and, in places, gangrenous. Chemical analysis has demonstrated the presence of mercury in the tissues.

Marked changes have also been found to exist in the kidneys.

As pointed out by Hofmeier and by Auvard, the pre-existence of nephritic complication greatly increases the danger of using corrosive sublimate as an antiseptic.

Dr. N. Charles ("Prophylaxis of Puerperal Fever," Paris, G. Carré, 112 Boulevard St. Germain, p. 22, 1885) directs attention to the importance of watching the gums of the patient when making use of this agent. "Among the symptoms of poisoning we must not forget the *blackish urine* of carbolic acid and the *gingivitis* of mercury. When using the latter regularly, we must examine the gums daily; when they

¹ We will find later a full description of the procedures practised at the Paris Maternity. See also on this subject, Olivier, *Annales de gynécologie*, 1882.

become red and swelled, we should substitute carbolic acid for the bichloride. Do not wait for fetid breath, salivation, tenderness of the teeth, and the ulceration of the mucous membrane which are not slow to appear. When the mercury is discontinued, these symptoms disappear quickly by aid of chlorate of potassium, but they are sufficiently disagreeable to be avoided."—F.]

Nitrate of Silver, which is constantly employed in gynæcological practice, is scarcely ever made use of as an antiseptic in obstetrics. It can, however, render service in the treatment of vulvar vegetations and of vegetating mucous patches. In such cases, much benefit will be derived from washes with a solution of nitrate of silver, 1 to 300. In this manner, the nitrate of silver acts more as an antiseptic than a caustic. Finally, in cases of purulent ophthalmia of new-born infants, the obstetrician will find in solutions of nitrate of silver, 1 to 200 or 1 to 100, a powerful agent, which will not only act as a modifier of the conjunctivitis, but also as a coagulating antiseptic.

Iodine.—Davaine¹ regards iodine as the most powerful of antiseptics. According to the researches of Miquel, it is one of the most important. Boinet, in 1840, had demonstrated the good results that may follow the local application of iodine, and Velpeau gave it an important place in the dressing of wounds.

This formula, given by Réveil, may be employed :—

Water	1000 gr.
Tincture of iodine	5 gr.

This author² has reported cases of retention of the placenta, in which injections made with this solution sufficed to destroy at once the infectious odor that had previously existed.

In more recent times, iodine has not been employed in obstetrics, at least to our knowledge; we stand in need of information relative to its exact value in therapeutics, and to determine whether vaginal or uterine injections practised with iodized solutions do not expose women to all the dangers of iodism. We do not insist, then, upon the use of this substance.

Two bodies are derived from iodine endowed with very unequal antiseptic properties. One, the *iodide of potassium*, is very feeble, and is not employed in obstetrics; the other, IODOFORM, has been for some time in great favor. We should give it special mention.

¹ Davaine. "Recherches relatives à l'action des substances antiseptiques sur le virus de la septicémie." *Gaz. méd.*, 1874, p. 44. Note lue à la Société de biologie, 10 janvier, 1874.

² Réveil. *Arch. de méd.*, 1863.

Iodoform.—Its employment in labor has been particularly extolled by Mann,¹ who applied it in the form of powder to the wounds produced during parturition at the vulvar orifice or in the vagina. It is a good practice to precede the application with douches of two per cent. carbolyzed solutions. In twenty-four cases where this treatment was carried out, he did not observe the least disagreeable symptom that could be attributed to the antiseptic power of iodoform. He has especially obtained good results in cases where wounds were accompanied by œdema of the labiæ majoræ, these symptoms rapidly disappearing.²

Iodoform has likewise been employed for the object of disinfecting the uterus. It was thus that Rehfeldt,³ in a case of putrid endometritis, not being able to employ permanent irrigations of the uterus, carried 5 gr. (seventy-five grains) of iodoform into the uterine cavity, after having carefully administered a two per cent. carbolyzed injection. The lochia resumed their normal character; the pulse and temperature fell; recovery followed.

It is very difficult to come to a definite conclusion regarding the value of iodoform in obstetrics. We know only that, in a general manner, it acts very slowly.⁴ It cannot serve for the disinfection of the hands, sponges, or instruments. It appears, above all, to be indicated in wounds of the vulva or vaginal wall, wounds having a bad appearance, *but not of sufficient extent to make it necessary to employ considerable quantities of iodoform.* It is particularly serviceable in the treatment of small fissures; iodoform in these cases, by stimulating the vitality of the tissues, will hasten reparation.

As an antiseptic, iodoform is used in the form of powder, applied directly to the wound or well dusted over a thin layer of wadding. Iodoform is very readily incorporated with vaseline. One can thus use it in a very convenient form.

Iodoformed gauze is prepared⁵ after the following method: 60 gr. (℥ xv) of colophony are dissolved in 1200 gr. (about 2½ pints) of alcohol, at 95° (C.); add 50 gr. (℥ iss) of glycerine; soak in this solution about 6 metres (yards) of gauze. Remove, and, when only half dried, powder it with the iodoform.

¹ Mann. "Iodoform im Wochenbett." *Cent. f. Gyn.*, 1882, p. 101.

² Consult Schucking. "Über Iodoform nachbehandlung und permanente Irrigation." *Cent. f. Gyn.*, 1882, p. 193.

— König. "Das Iodoform als antiseptisches Verbandmittel." *Central. für Chirurgie*, 1881, no 48.

³ Rehfeldt. "Zur Desinfektion des puerperalen Uterus mittels Iodoform." *Berliner Klin. Wochens.*, 1882, no 9.

⁴ Mikulicz. "Zur Iodoformbehandlung." *Centralblatt für Chirurgie*, 1882, no 1.

⁵ Woelfler. *Centralblatt für Chirurgie*, 1881, no 48.

Iodoform offers some disadvantages. It is very expensive ; it has a very disagreeable odor ; but this latter objection can be overcome by adding some Tonka bean to it. Camphor added to iodoformed vaseline renders it inodorous ; chloral hydrate, essence of rose, and essence of peppermint act in the same way. All these objections are of little importance compared with the danger that may arise from the employment of this antiseptic. Kocher¹ does not report less than twenty-four cases of poisoning by iodoform. Bronstein,² out of sixty cases treated with this agent, has observed intoxication five times.

We will not describe here the symptoms that follow poisoning. They have been specially studied by Falkson,³ and diuretics, as digitalis, which are the antidotes to employ, have not always been sufficient to avert a fatal termination. These accidents, which have been observed in the hands of the most prudent,⁴ should make us distrust the enthusiasm that surgeons in Germany show for iodoform. We think the employment of this antiseptic, the value of which we do not, like Bayer,⁵ doubt, will hardly become popular in French obstetrical practice outside of the cases described.

[Pencils of iodoform are inserted into the uterus in the treatment of puerperal infection. It serves to keep up an antiseptic influence within the cavity, and, in consequence, the repetition of intra-uterine injections is less frequently called for.

The following is a popular formula for making these pencils :—

R.	Iodoformi	20.00	(3 v)
	P. G. acaciæ		
	Glycerinæ		
	Amyli puræ aa	2.00	(3 ss).
	Ft. in bacilli No. iij.		

As we will see later (page 129), iodoform is extensively employed in the clinic of Liege, in the form of pencils introduced into the uterine cavity.—F.]

¹ Kocher. *Centralblatt für Chirurgie*, n^o 14, 1882.
 — Schede. "Iodoform Vergiftung." *Centr. für Chir.*, 1882, n^o 3.
 — Hoffmann. *Centr. für Chir.*, n^o 7.
 — Kussner. *Deutsch. med. Wochenschrift*, 1882, n^o 17.
 — Zeller. "Versuche über die Resorption des Iodoforms." *Centr. für Gyn.*, 1882, p. 391.
² J. Bronstein. "Ein Fall von Harnverhaltung unter Einfluss von Iodoform." *Saint Pétersburger med. Wochenschrift*, 1882.
³ Falkson. "Gefahren, Vorzüge und Schattenseiten der Iodoformwundbehandlung." *V. Langenbeck's Archiv*, Bd. xxviii, 46 Hft. 1.
⁴ Moseitig Moorhofs. "Iodoform Verband." *Klinische Vorträge*, n^o 211.
⁵ Bayer. *Cent. f. Gyn.*, 1882, p. 153.

Chlorine is a powerful antiseptic, and for a long time it was almost the only one employed. Chlorinated water (ad saturandum) has been long in use as a disinfectant for the hands, instruments, etc. Practically, this antiseptic has been abandoned because of its instability, its fetid odor, and frequently of its difficult employment. But there exists a certain number of derivatives of chlorine, possessing real antiseptic properties, which we ought at least to mention.

Chloride of Sodium.—Salt water has decided antiseptic properties, although very feeble. It has not, so far as we know, been experimented with in obstetrics.

Chloride of Lime.—Chloride of lime is a microbicide of great power. The dispensatory gives under the name of liquid chloride of lime a solution having the following formula :—

Chloride of lime (dried)	45 gr.	($\bar{3}$ iij)
Water	4500 gr.	(Oix)

This antiseptic, which is inexpensive, is often used at the present day for washing the rooms of patients and for the disinfection of the furniture, etc. It presents, moreover, a certain obstetrical interest, for it was this agent that Semmelweiss employed when, convinced of the contagiousness of puerperal fever, he attempted to combat the propagation of the disease. One will find all the details of his practice not only in his treatise, but also in the series of pamphlets that he published to defend his views.¹

Chloride of Zinc.—Chloride of zinc is at the present time very much employed by surgeons. It is particularly valuable to the obstetrician in cases where he desires to actively purify wounds that are irregular and of bad appearance, situated at the vulvar orifice.

By using the following solution :—

Chloride of zinc	8 gr.	($\bar{3}$ ij)
Water	100 gr.	($\bar{3}$ iij)

one produces a true cauterization which destroys all proto-organisms, and which modifies the tissues in a very decided manner. We can employ much weaker solutions. One per cent. solutions are often sufficient.²

¹ Semmelweiss. "Offener Brief an sämmtliche Professoren der Geburtshülfe." Pest, 1862.

² Kocher. "Die antiseptische Wundbehandlung mit schwachen Chlorzinklösungen," in der *Berliner Klinik, Sammlung klin. Vorträge*, nos 203, 204.

Hypochlorite of Sodium, or Labarraques' solution, is, we know, an antiseptic of frequent use in the treatment of gangrenous wounds. We have no personal experience with its employment in obstetrics, except in the treatment of wounds of the vulva and vagina.

Chloral.—The researches of Beaumetz have demonstrated the value of chloral hydrate as an antiseptic. In the proportion of 1 %, solutions of chloral are very active. Except M. Hervieux, no one has published a sufficient amount of experience upon the use of injections of chloral hydrate for us to be enabled to judge of their value. Nevertheless, we should not neglect to have recourse to this substance for the want of other antiseptics.¹

Carbolic Acid.—Owing to the influence of Lister, carbolic acid is one of the most frequently employed of antiseptics; perhaps, even yet, it is more commonly used by obstetricians than any other. It would be interesting to show the intimate relations that exist, chemically, between carbolic acid and other substances not less active, as salicylic acid, thymic acid, and picric acid, for example.

The day will come when we will know in a precise manner the relation that exists between different antiseptics; there is no doubt but that a more thorough study of the chemical composition of these different substances would throw a bright light upon their mode of action and their degree of activity. We cannot mention here all the names of those who prefer carbolic acid as their antiseptic. Nearly all the obstetricians would be included in the list. Let us be content to refer to the names of Bischoff,² Fritsch,³ Winckel,⁴ Lucas-Championnière,⁵ etc., etc.

Carbolic acid can be employed locally or internally; we only mention the latter mode, which has not, so far as we know, been experimentally employed in obstetric practice in an earnest manner.

Carbolic acid can be used in various forms:—

- 1st. In aqueous solution, the strength of which varies from one-half of one per cent. up to five per cent.
- 2d. In the form of carbolized oil.

¹ Dujardin-Beaumetz et Hirne. "The antiputrid and antifermentable properties of solutions of chloral hydrate and their therapeutical application." *Bulletin de la Société méd. des hôpitaux*, 11 avril, 1873, p. 134.

² Bischoff. "Zur Prophylaxis des Puerperal fiebers." *Corresp. Bl. für Schweiz Aertze*, 1875.

³ Fritsch. "Puerperal fever and its treatment." *Sammlung Klinische Vorträge*, 1878, no 107.

⁴ Winckel. "Die Pathologie und Therapie des Wochenbettes." Berlin, 1878, 3^e édition.

⁵ Lucas-Championnière. "Antiseptic Surgery." Paris, 1880.

In the latter case, authors agree in saying that the solution of carbolic acid in oil is made very easily, and that the oil thus carbolized is much less irritating than carbolized vaseline of equal strength. When one proposes to make a dressing to the vulva, the carbolized solution in which we soak the pieces of dressing ought not to be too strong; the majority of obstetricians regard solutions of three per cent. as being the strongest to which it is proper to have recourse; solutions of four and five per cent. will be reserved for cases in which it is proposed to practise absolute disinfection of the suspected surface, disinfection of the hands, instruments, and various articles of furniture. Solutions of carbolic acid are frequently used to practise vaginal or intra-uterine injections. In such cases we will be able, perhaps, to employ for a first injection a solution of from one to five per cent. It is preferable to employ only weak solutions, but very copious ones. We thus avoid meeting with certain symptoms of which we will speak presently. This antiseptic is utilized for the manufacture of different kinds of dressing, gauze, lint, cotton, etc.¹

¹ Older solutions of carbolic acid are preferable to those freshly prepared, as there is less risk of their containing small crystals of undissolved acid, which have a decidedly caustic action.

Carbolic acid being slightly soluble in water (1 to 20), it is well to add some alcohol to facilitate the solution.

The following are some of the formulæ employed:—

Carbolic acid	50 gr.	($\frac{3}{4}$ iss)
Alcohol	50 gr.	($\frac{3}{4}$ iss)
Water	1000 gr.	(Oij)

This is too strong a solution to employ when we wish to soak pieces of dressing which are to remain for any length of time upon the vulva.

Solutions of one or two per cent. are usually sufficient.

In practice the obstetrician can have always at hand a strong alcoholic solution.

As, for example:—

Carbolic acid	10 gr.	($\frac{3}{4}$ iiss)
Alcohol	50 gr.	($\frac{3}{4}$ iss)

which permits him to prepare instantly a quantity of carbolized water sufficient for his wants during attendance on labor cases.

M. Lucas-Championnière prefers glycerine to alcohol, and gives the following formula:—

Carbolic acid (crystallized)		
Glycerine āā	25 or 50 gr.	($\frac{3}{4}$ vj to $\frac{3}{4}$ iss)
Water	1000 gr.	(Oij)

Carbolized oil is particularly employed in obstetrics to lubricate the fingers and instruments before being introduced into the genital passages. For some time, at the

Carbolic acid, according to the table of Miquel, is far from being one of the most powerful antiseptics that we have at our disposal. But it is easily handled, dissolves readily, and these are perhaps some of the reasons of its popularity. Carbolic acid, however, is not without possessing a decided action upon the organism of patients who are subjected to a local carbolized treatment. This is proved by the rapid falls of temperature that we witness follow intra-uterine injections—falls of temperature which certainly do not occur merely from destruction of microbes, living, multiplying and developing upon the surface of the uterine wall. It is necessary to take into consideration the absorption which occurs at the wound. Where absorption of carbolic acid takes place, unusual caution ought to be observed, for only too often are more or less grave symptoms of poisoning recognized in patients, due to carbolic acid and described under the name of carbolism.

It is certain that carbolic acid, when absorbed, provokes a certain

Paris Maternity, the custom prevailed of greasing the vulva with carbolized oil at the moment of the expulsion of the infant.

Carbolized oil and glycerine vary from one to ten per cent. in strength.

Carbolized gauze is made as follows:—

Six yards of gauze are soaked in

Carbolized acid (crystallized)	1 part by weight.
Resin (common)	5 “ “ “
Paraffine	7 “ “ “

This dressing must be kept under an impermeable covering, otherwise the carbolic acid will evaporate and it will lose all antiseptic power.

When, as for example, after perineorrhaphy, carbolized gauze is applied upon the vulva, Lister's plan of dressing must be followed as near as possible. In some obstetrical operations, as in Cæsarean section, the obstetrician will perhaps have occasion to make use of catgut.

These are threads made of catgut, but submitted to a rigid disinfection. For this purpose they are soaked five or six months in the following solution:—

Carbolic acid	20 gr.	(℥v)
Water	2 gr.	(℥ss)
Olive oil	100 gr.	(℥ij)

It is especially important to have the catgut of the best quality.

We will speak elsewhere of the value of this material. Many surgeons prefer silk thread, which is made antiseptic by dipping it in melted wax, to which carbolized acid is added in the following proportion:—

Wax	16 gr.	(℥iv)
Carbolic acid	2 gr.	(℥ss)

This precaution is valueless unless done immediately before using the thread, as the waxed silk will soon lose the carbolic acid by evaporation.

number of general phenomena, at present well known, especially since the attempts that have been made in recent times to introduce carbolic acid into the treatment of typhoid fever, etc. Among the first, Hoppe Seyler¹ made a series of experiments for the purpose of recording accurately the phenomena observed. He discovered that carbolic acid acted upon the nervous centres in the same manner as alcohol, chloroform, etc.

Sumner Stone² has shown that a large dose of carbolic acid acted by producing convulsive phenomena. The dose being increased, paralytic phenomena developed.

It is certain, too, that carbolic acid acts energetically upon the composition of the blood. Hæmoglobinuria, which often comes on in the first hours that follow intoxication, proves it conclusively.

Whatever explanation may be given by authors, there is no doubt that a certain number of cases of poisoning by carbolic acid have been observed.³ Recovery usually takes place if the use of the carbolic acid is suspended when the urine appears blackish. A number of rapidly fatal symptoms, due to the action of carbolic acid, have been observed in new-born infants.⁴

In short, carbolic acid is not more dangerous than any other active drug; it is sufficient to employ a certain amount of precaution when using it, and to stop it when the urine becomes blackish.

In case the symptoms become alarming, we can follow the method proposed by Sonnenburg,⁵ and give the patient, every two hours, a tablespoonful of a solution of sulphate of soda, 5 gr. to 200 (75 grains to 6 ounces), if for an adult, and 4 gr. to 200 (3j to $\bar{3}$ vj) for an infant. In six cases observed by this author, this method of treatment gave the happiest results.

However, to deal only with facts which interest us more particularly, we can say that we have made some thousands of uterine injections

¹ Hoppe Seyler. "Ueber das Vorkommen von Phenol im thierischen Körper und seine Einwirkung auf Blut und Nerven." *Pflüger's Archiv*, t. v, 1872, p. 470.

² Sumner Stone. "Physiological Action of Carbolic Acid on the Nervous System." *Phil. Med. Times*, Sept. 27, 1879.

³ Ferrand. "Poisoning by Carbolic Acid." *Ann. d'Hygiène*, publ. et de méd. légale, 1876, p. 289 and 498.

— Küster. "Ueber Giftigen Eigenschaften des carbolsaure bei chirurgischer Anwendung." *Berl. Klin. Woch.*, 1878.

⁴ Zitt. "Zur Kasuistik des Carbolsaure Intoxication bei Säuglingen." *Arch. f. Kinder Heilkunde*, t. 1, cahier 12.

— Genser. "Vergiftung durch Carbolsaure nach ausserer Anwendung derselben bei einem 14 Tage alten Kinde." *Arch. f. Kind.*, t. 1.

⁵ Sonnenburg. "Zur Diagnose und Therapie der carbolic Intoxication." In *Deutsche Zeitschr. f. Chirurgie*, 1878.

with carbolized solutions without having witnessed the slightest serious symptom. It is by no means the danger of intoxication, which can always be foreseen, that is the cause of the efforts made by obstetricians to establish the employment of other antiseptics. Concerning its use in obstetrics, the principal disadvantage of carbolic acid arises certainly from the local irritation caused by this agent. In case one employs moderately strong injections, two per cent., or in case the solutions employed are abundant (and this is absolutely necessary when we wish to practise uterine, vaginal, or vulvar douches), a very painful erythema often appears over the surface of the large and small lips, and sometimes even patches of gangrene, which compel the obstetrician to discontinue the use of carbolic acid. Let us add, finally, that this antiseptic possesses a disagreeable odor, and that its action upon the skin is so irritating that midwives experience some pain in their use of it.

The attempt has been made to substitute for carbolic acid some of the salts, as, for example, *carbolate of soda*, but this substance has not presented practically any special advantage. The carbolates are less active than carbolic acid, and they are much more expensive.

Salicylic acid or its derivatives have been extolled by a certain number of obstetricians, by Crede,¹ Matthews Duncan,² Richter,³ etc.

Kolbe⁴ appears to have been the first to demonstrate fully its therapeutic value. The researches of Nicolai Jalan de la Croix⁵ as well as the experiments of Miquel⁶ have clearly set forth the antiseptic power

¹ Crede. "Kurze Mittheilung ueber Anverdung der salicylsäure." *Arch. f. Gyn.*, t. VII, p. 567.

² M. Duncan. London Obstetrical Society. *Lancet*, Feb. 11th, 1882.

³ C. Richter. "Ueber Aussfülung der Gebärmutterhöhle mit Carbolwasser und über Salicyl." Behandlung im Wochenbette Mittheilungen aus der Gebäranstalt der Charité zu Berlin *Zeitschr. f. Geburtsh. und Gynäkologie*, Bd. II, Hft. I.

See also Filatoff. "Ueber Vaginalinjectionen mit Salicylsäure im Puerperium." *Arch. f. Gyn.*, t. IX, p. 467.

— Julius Muller. "The antiseptic properties of salicylic acid compared with those of carbolic acid." *Berlin. Klin. Wochens.* n^o 19, 10 mai, p. 260, 1875.

— Thiersch. "Klinische Ergebnisse der Listerschen Wundbehandlung und über den Ersatz der Carbolsäure durch salicylsäure." *Volkmann's Sammlung, Klinisches Vorträge*, n^{os} 84 et 85.

— Weisz. "Die Anwendung und der therapeutische Werth des Natron salicylicum bei einigen Fieberkrankheiten aus des Klinik des Prof. Bokai." *Orvosi hetilap*, 1880, p. 1.

⁴ Kolbe. "Ueber eine neue Darstellungsmethode und einige bemerkenswerthe Eigenschaften der Salicylsäure." *Journal für prakt. Chemie*, 1874, t. x, p. 89.

⁵ See page 36. ⁶ See page 35.

of salicylic acid, and have shown that it is inferior to that of carbolic acid.

According to the researches of the first of these authors,¹ it appears almost certain that very large quantities of this substance are necessary to destroy the germs of bacteria; as to the bacteria themselves, salicylic acid appears to benumb rather than kill them. This being established, it is proper to ask whether salicylic acid does not make up for the preceding fault by the possession of some properties which render its employment of advantage. Now, it is much less dangerous than carbolic acid, although when absorbed it can give rise to certain symptoms; it offers on the other hand inconveniences which limit its use. The vaporization of salicylic acid is impossible on account of the unpleasant sensations, heat in the throat, etc., that patients experience when compelled to breathe the vapors of this substance. This agent can be employed then only for dressings and douches.

Salicylic acid is but slightly soluble. It is true that it has been proposed to overcome this objection by mixing salicylic acid and borax, which renders it much more soluble. But this mixture of the two is less active than either alone. The *salicylate of soda*, praised by certain authors,¹ although vastly more soluble, is much less active.

To sum up, salicylic acid, while it is an antiseptic that we should keep in mind, does not seem to merit the importance that certain obstetricians have wished to credit to it in the therapeutics of infectious symptoms affecting lying-in women.²

Menthol.—We will only mention this agent which has not been, so far as we know, experimented with in obstetrics. It is a crystallized, alcoholic body, extracted by the cooling of the essential oil of mint, the odor of which it retains. It is slightly soluble in water, but is freely so in alcohol, ether, glycerine and the volatile oils.³

According to the researches of Macdonald,⁴ menthol, and the same

¹ Salicylate of soda is scarcely ever employed in obstetrics, except internally. In some Maternities, at Turin, for example, every puerperal woman takes daily 3 gr. (45 grains) of salicylate of soda. See Bergesio, *L'Observatore Gaz. delle Cliniche*, 1878, n° 8.

² Crede employs salicylic acid in form of solution, the strength of which varies from 1 to 300 to 1 to 900.

Matthews Duncan recommends the use of salicylated cream, 1 part of the acid to 5 of vaseline or glycerine. This would make a good disinfectant for sponges, instruments, etc.

³ Vallin. "Treatise on Disinfectants and Disinfection," p. 179.

⁴ Archibald Macdonald. "On a new antiseptic and anti-neuralgic agent." *Edinburgh Med. Journ.*, Aug., 1880, p. 121; also *Revue de Hayem*, 1881, t. XII, p. 65.

is true of thymol, has an antiseptic power double that of carbolic acid.

Thymic Acid.—To Dr. Paquet is due the honor of the introduction of thymic acid in the treatment of wounds and pulmonary gangrene.

Its employment in obstetrics has been praised highly by Inverardi.¹ Thymic acid possesses the following advantages: it is more active than carbolic acid, and its odor is not disagreeable.

According to Ranke,² thymol is ten times less violent a poison to the organism than carbolic acid. However, the researches of Küstner³ have demonstrated that thymol is not so free from danger as one would think. It is toxic to animals if absorbed in the proportion of 1 décigr. to the kilogr. (gr. iss to Oij). Marchand, of Halle, has discovered a special action of thymol upon the blood corpuscles, which it dissolves.

Thymic acid is claimed to have no irritating action upon the skin. This is, however, a statement that experience has demonstrated to be inaccurate; Fritsch states that it is no less objectionable to midwives than carbolic acid. Fritsch⁴ speaks highly of the employment of thymic acid for making continuous irrigations and intra-uterine douches. He recommends the following formula:—

Thymol	1 gr.	(15 gr.)
Alcohol	10 gr.	(3 iiss)
Glycerine	20 gr.	(3v)
Water	1000 gr.	(Oij)

In this proportion the thymic acid is still active, since 1 gr. (15 grains) of the substance sterilizes 1300 gr. (Oiiiss) of broth.

After a period of infatuation for thymic acid, the Germans now tend to renounce its employment; the principal causes of this sudden change can be sought for in its irritating action and its high price.

Boracic Acid.—Of all the antiseptics that we have studied, boracic acid is, perhaps, the one which, in ordinary practice, ought to be considered as the best. Without any doubt, its antiseptic power is

¹ Inverardi. "L'acido timico nei processi puerperali febbrili." *Annali di ostetricia*, 1882, n° 3-4, p. 195.

² Ranke. "Ueber das Thymol und seine Benutzung bei der antiseptischen Behandlung der Wunden." *Sammlung Klin. Vorträge*, n° 128.

³ B. Küstner. "Ueber die physiologischen und Therapeutischen Wirkungen des Thymols." *Habilitationsschrift*, Halle, 1878.

⁴ Fritsch. *Centralblatt f. Gyn.*, 1878, p. 134.

relatively feeble, especially if we compare it with that of corrosive sublimate, and even with that of carbolic acid. But it offers this great advantage, of not being toxic and of not being irritating. It can, consequently, be employed by midwives without fear of the least symptom of intoxication being produced. Its solubility is very feeble. Its antiseptic power, although not great, is practically sufficient. The following experiment, made at the Tarnier pavilion, proves this:—

During the last six months of 1880, 79 women occupied the ground floor of this pavilion; 76 were confined in the first story. In the 79 women, all the dressings, douches, etc., were practised with carbolized solutions, 1 to 40 or 1 to 80. There occurred: 3 cases of septicæmia; 2 cases of œdema of the vulva with temperature above 39° (C.); 3 cases of the same with temperature below 39° (C.); 1 case of offensiveness of the lochia with temperature below 39°; and 1 case of gangrene of the vulva.

The 76 women who were delivered on the first floor were all dressed with boracic acid. There occurred: 1 case of septicæmia; 3 cases of œdema of the vulva with temperature above 39°; and 3 cases of the same complication with a temperature below 39°.

Thus, the results obtained were pretty much the same, and we can conclude from the preceding facts, that outside of all epidemic influences, when it is a question of simple cases, boracic acid is as good an antiseptic as carbolic acid; it has, besides, these advantages over the latter, of being neither toxic nor irritating.

Boracic acid can be employed with advantage for want of bichloride, to practise intra-uterine or vaginal injections; but it appears particularly useful in cystitis occurring after labor. It has given the best results in the hands of M. Guyon, and we will see, when we come to study the treatment of cystitis, the advantage to be derived from it.

Solutions of boracic acid should be made 1 to 20, 1 to 40, or 1 to 100. The strongest of these solutions does not occasion any inconvenience. The greatest benefit will be derived by using boracic acid to soak the dressings which are applied to the vulva, especially if one uses pledgets of oakum, which have been employed for a long time at the Strasbourg Maternity, and to which M. Weber has recently directed attention. Boracic acid is readily incorporated with vaseline, so one can thus have at his disposal a very antiseptic ointment which, applied to wounds, to fissures of the nipple, and to the umbilical wound of the new-born, will render the greatest service. In order to dress the wound which is left after the umbilical cord comes away from the infant, we may still make use of the boricated ointment of which Lister has given the formula:—

Boric acid (washed)	1 part by weight.
White wax	1 " " "
Paraffine	2 " " "
Oil of almonds	2 " " "

Let us add, finally, that washes with a boricated solution are of the greatest utility in the treatment of purulent ophthalmia of infants.

In connection with this subject, we ought to mention the *borates*, the antiseptic action of which is real, although inferior to that of boric acid. What we said of the action of the salicylates compared to salicylic acid is perfectly applicable here.

Alcohol.—Alcohol is one of the most useful antiseptics. Although experiments have demonstrated that it is not very powerful, it has the immense advantage of permitting the use of a very large quantity without the fear of producing the least injurious action, local or general. The experiments of Gosselin and Bergeron have, however, shown that the antiseptic power of alcohol, although inferior to that of carbolic acid, is none the less decided, since the atomization of alcohol at 86°, prolonged for 15 minutes, retarded even to the ninth day the putrefaction of 20 gr. of blood exposed to the free air. We know, moreover, that dressings with alcohol have still some advocates, even among surgeons who have the utmost confidence in the antiseptic method.¹

The obstetrician can make use of alcohol mixed with water for the object of practising intra-uterine injections. Nevertheless, in cases of fetid lochia, alcoholized water ought scarcely be looked upon except in the light of a make-shift. It will be better to employ one or other of the more powerful antiseptics, such as corrosive sublimate or carbolic acid. Compresses soaked in alcohol are particularly serviceable to the obstetrician in treating cases of erythema or of superficial lymphangitis succeeding chaps of the breast. Alcohol deserves also to attract the attention of the obstetrician, for it is the best of vehicles for antiseptics. The majority of these agents, but slightly soluble in water, are freely so in alcohol. One need not hesitate then to use large quantities of alcohol in the solutions, because it not only insures a more perfect solution, but also exerts a favorable action in itself, thanks to the coagulating properties of the alcohol.

We will only refer to *tannin*, the feeble antiseptic properties of which are little utilized in obstetrics. Let us but mention the names of *alum* and *sulphate of copper*; the antiseptic properties of the latter

¹ Boinet. "Means of preventing purulent infection, or antiseptic dressing of wounds by means of alcohol and alcoholic tinctures." *Gaz. hebdomadaire*, 1879.

agent can be made use of in the treatment of the ophthalmia of the new-born.

Permanganate of Potassium deserves to attract our attention. It is soluble in 15 or 16 parts of water, but it will never be necessary to have recourse to such concentrated solutions. A solution of 5 to 1000 is irritating; it is then too strong.

The employment of solutions 1 to 3000 does not involve the least inconvenience, and in this proportion they are amply sufficient (Davaine) to neutralize the septic virus. Permanganate of potassium is generally employed in the form of solutions of 1 to 1000. Its action is very rapid, but quickly exhausts itself. It has, practically, the great objection of discoloring a brownish-red¹ the linen, skin, and every object with which it comes in contact; this is the principal disadvantage that can be brought against it.

In obstetrics, it has been employed for dressings, but more particularly to practise intra-uterine injections in cases of fetid lochia, with retention of placental or membranous débris. It has become less popular only since the discovery of other antiseptics as powerful and, at the same time, less disagreeable to use. However, permanganate of potassium still has some advocates, among whom we mention Schmid,² who uses it to make intra-uterine injections, and prefers it to other antiseptics because of its complete harmlessness. Calderini uses permanganate of potassium, two and a half per cent. solution, to disinfect the hands. We will see later that this antiseptic is still frequently employed at Prague. In short, permanganate of potassium is a good disinfectant, and can be relied upon in case of need.

Benzoic Acid and its Derivatives.—Benzoic acid, the antiseptic action of which has been fully studied by Bucholtz³ and Salkowsky,⁴ has scarcely been much used by obstetricians. However, Lehnebach⁵ has employed it internally with success; he considers it a spe-

¹ By washing the linen or skin with a one per cent. solution of hydrochloric acid, we can cause the rapid disappearance of this discoloration.

² H. Schmid. "Beitrag zur Puerperalfiebertherapie." *Med. Correspondenzbl. des Württembergischen ärztlichen Vereins*, 1880, n° 33.

³ Bucholtz. "Antiseptica und Bakterien." *Arch. f. experimentelle Pathologie*, 1875, B. IV. "Ueber das Verhalten von Bakterien zu einigen Antiseptica." *Dissertation inaugurale*, Dorpat, 1876.

⁴ Salkowski. "Ueber die antiseptische Wirkung der Salicylsäure und Benzoesäure." *Berliner Klin. Wochenschrift*, 1875, n° 22.

⁵ Lehnebach. "Vier Fälle von puerperalfieber geheilt durch Natron benzoicum." *Allgemeine med. central. Zeitung*, 1879, n° 55.

cific for puerperal fever. In order to derive any benefit from this antiseptic, it is necessary to employ two per cent. solutions. In this strength it is perfectly harmless. Benzoic acid is worthy of trial for intra-uterine injections.

It has been especially recommended by Roth,¹ who, deputized to establish regulations to prevent the propagation of puerperal fever, advised midwives to have always at hand a solution of 12 gr. (ʒ iij) of benzoic acid in 60 gr. (ʒ xv) of alcohol, of which to pour two table-spoonfuls in a litre of water for the disinfection of the hands, instruments, and for injections.

We already know that it is excellent for producing a modification of the urine, and we should always have recourse to it whenever a woman has retention of urine with ammoniacal fermentation.²

The Sulphite of Soda has been esteemed in Italy, notably by Minich.³ This antiseptic, much less powerful than carbolic acid, would scarcely be made use of except in case of a wound of the vulva. We could, in that instance, employ the following formula:—

Sulphite of soda	100 gr.	(ʒ iij)
Glycerine	50 gr.	(ʒ iss)
Water	1000 gr.	(Oij)

Oil of Turpentine.—The oil of turpentine has been for a long time given internally in puerperal fever.⁴ It acts principally as a deodorizer. Solutions of the following proportion can be used in washes:—

Venice turpentine	1
Water	6

We have not sufficient evidence to state the exact value of this agent.

¹ Roth. "Puerperal prophylaxis." *Bayr. arztl. Intelligenzblatt*, 1873, n° 7.

² Benzoic acid is employed to make benzoated gauze. (Bruns, "Einige Vorschläge zum antiseptischen Verband." *Berliner Klin. Wochenschrift*, 1878, n° 29.)

1 kilo of gauze is soaked in a solution of 2500 gr. of

Benzoic acid	50 gr.	(ʒ xij)
Castor oil	20 gr.	(ʒ v)
Spirit of wine	2430 gr.	(Ov)

³ Minich. "Cura Antiseptica delle Ferite, etc." Venice, 1876.

⁴ *Thèse de Paris*, 1830.

— Copeman. "Puerperal affections treated by turpentine." *Med. Times and Gaz.*, October 27th, 1872.

— Tournatoire. "Puerperal fever; its causes, nature and treatment." *Thèse de Montpellier*, 1876.

Essence of Wintergreen.—The antiseptic of which we now speak is still described by some authors under the name of *the essential oil of Gaultheria*, or yet, again, under that of the salicylate of methyl. This essence is very soluble in alcohol, it is insoluble in water, but the alcoholic solution mixes very well with the latter menstruum. In England, it has been experimented with in general surgery, and with very good results; its virtue being due principally to the salicylic acid which it contains. Its agreeable odor has no little to do with the welcome it has received at the hands of our neighbors across the channel. In France, M. Lucas-Championnière, Périer, MM. Gosselin and Bergeron have employed it successfully.

We think it advisable to mention the different formulæ recommended by these authors, so as to assist obstetricians who may be tempted to experiment with the action of this antiseptic. MM. Gosselin and Bergeron¹ have made two solutions, a strong one containing 5 gr. (75 grains) of the oil of gaultheria to 150 gr. (℥ivss) of alcohol at 60°; this is used to wash instruments and the skin. The other is a weak solution, containing 2.50 gr. (37 grains) of the essence to 200 gr. (℥viss) of alcohol at 45°. The latter solution appears to possess an antiseptic power equal to that of a carbolic solution, 1 to 45. It offers, moreover, the advantage of not having any irritating action upon the skin. M. Périer proposes the following formula for use with antiseptic dressings:—

Oil of gaultheria	30 gr.	(℥j)
Tinct. quillaya saponaria	6 gr.	(℥iss)
Water	1 litre	(Oij)

This antiseptic is employed regularly at the obstetrical clinic in Nancy, conducted by Prof. Hergott. In this institution “the pupils permitted to examine the women are required to wash their hands, first with water and soap, using a nail brush, then to soak them in water to which is added the essence of gaultheria. As a lubricant for the fingers, they employ vaseline mixed with some essence of gaultheria.”²

Camphor.—There is no occasion for us to dwell upon the antiseptic properties of camphor. We mention it here, although its employment in obstetrics is scarcely spoken of by the authors. Our friend Fischel³ has made use of it in the form of an emulsion, 1 to 10, in the

¹ Gosselin and Bergeron. “Researches upon the antiseptic value of certain substances, and in particular upon that of the alcoholic solution of gaultheria.” *Arch. gén. de méd.*, janv. 1881, p. 16.

² Communication of Prof. Hergott.

³ Fischel. “Zur Therapie der puerperalen.” *Arch. f. Gyn.*, t. xx.

case of eschars or small suppurating wounds of the vulva or vagina. Small tampons soaked in this emulsion and applied to the diseased parts have seemed to be particularly serviceable in cases of localized gangrene, the result of compression.

Eucalyptus.—Employed in surgery since 1872 by Demarquay, the oil of eucalyptus has been highly praised in recent years by Lister, who has substituted it for carbolic acid, the inconveniences of which it does not possess. The rigid application of the antiseptic method by means of eucalyptus is enforced in the Glasgow Maternity.

Eucalyptol appears to act, like the oil of turpentine, by the property it possesses of setting free oxygen in the presence of water and under the influence of light, and of transforming water into oxygenated water.

Such are the most useful antiseptic agents. We have not spoken of infusions of walnut leaves, which the older obstetricians employed for injection, and which, if we accept recent views on the subject,¹ possess undoubted antiseptic properties. But their true value is but little known.

[NEW ANTISEPTIC AGENTS.—The antiseptic properties of certain agents have recently been brought to the notice of the profession, and a few of them deserve, at least, a brief consideration.

Biniodide of Mercury.—This salt possesses powerful germicidal properties, and is employed by some obstetricians as a substitute for the mercuric chloride. The biniodide is said to be less irritating, but this statement is questionable. When swallowed in over-doses it acts as a powerful local irritant, producing symptoms that resemble very closely those following over-doses of bichloride of mercury. It remains to be seen whether there is less danger of the development of toxic symptoms in using this preparation of mercury for vaginal and intra-uterine injections.

The strength of solutions of biniodide of mercury should be about half of those of the bichloride when employed under similar conditions.

The addition of an equal quantity of iodide of potassium forms a perfect solution (potassio-mercuric iodide), which Dr. R. J. Levis states is effective in the proportion of one to twelve thousand.

¹ Sloan. *Lancet*, Sept. 2d, 1882, also note on p. 83.

— Nelaton. *Acad. méd.*, 19 sept, 1887.

— Davaine. "Recherches sur le traitement des maladies charbonneuses chez l'homme." *Bulletin de l'Acad. de méd.*, 27 juillet, 1880, p. 757.

— Talamon et Dérignac. "Deux cas de charbon chez l'homme, étudiées suivant la méthode de Pasteur." *Revue de méd.*, 1881, p. 408.

² *Phila. Med. Times*, vol. XVI, 1885, p. 126.

Hydronaphthol.—Hydronaphthol was introduced to surgical practice by Dr. George R. Fowler,¹ who published, in 1885, an excellent account of this agent and its uses. If it possesses the merits claimed for it, of being non-irritant, non-poisonous and non-corrosive, it is an *ideal* antiseptic for obstetrical use, and bids fair to supersede others in certain conditions. Being non-poisonous and non-irritating, it is preferable to either corrosive sublimate or carbolic acid for vaginal and intra-uterine douches, provided, of course, the results obtained with it will equal those agents. Being non-corrosive, it is an excellent substitute for carbolic acid for the purpose of disinfecting metallic instruments.

The following account is extracted from Dr. Fowler's article:—

Hydronaphthol belongs to the phenol series, and is ten or fifteen times more efficient than carbolic acid. It has a slight aromatic taste and odor, and crystallizes in scale-like laminæ of a silvery white or grayish hue.

The crystals dissolve readily in alcohol, ether, chloroform, glycerine, benzol and fixed oils.

It is soluble in water in the proportion of 1 part in 1000. This sparing solubility in water is rather an advantage, as it is a protection against errors in making solutions stronger than necessary.

Hydronaphthol is not volatile at ordinary temperature, but begins to sublime at about 90° (C.). Its vapor when volatilized for fumigating purposes has no obnoxious effects on the respiratory organs. In substance or solution it does not injure colors or textile fabrics.

The aqueous solution 1 to 1000 is sufficient to preserve indefinitely animal tissues and fluids, and yet upon living tissues it produces no perceptible effect except the formation of a slight albuminate film.

Dr. Fowler gives the results of experiments made by himself alone, and of others in conjunction with Dr. Abbott, of the Johns Hopkins University, to test the antiseptic power of hydronaphthol. He states that it is active in arresting the development of bacteria, in the proportion of 1 to 6000. Failure resulted only when the 1 to 8000 solution was reached.

It possesses, however, feeble germicidal properties, and failed to disinfect decomposed beef-tea containing pathogenic organisms and spores when employed in the proportion of 1 to 200.

Washing out the bladder once a day with a saturated solution of this agent has given excellent results in purulent cystitis.

¹ G. R. Fowler, M.D. "Hydronaphthol—A New Antiseptic." *New York Med. Journ.*, 1885, XLII, pp. 374, 401, 457, 630.

For use in the spray, a one per cent. alcoholic solution may be employed.

The softness of the crystals and the facility with which they adhere to the meshes of gauze make it particularly good to incorporate with such material. Absorbent cotton, gauze, jute, etc., may be made antiseptic by being immersed in an alcoholic solution and dried.

The crystals are easily reduced to powder, and in this state, when triturated with carbonate of magnesia, silicates, as fullers' earth, etc., in the proportion of 2 parts hydronaphthol to 100, it makes a good substitute for iodoform. Dr. Levis¹ employs it mixed with oxide of zinc.

Preparation of Catgut.—The catgut is wound upon a spool made of hard rubber, glass or porcelain. It is then immersed for twelve hours in a one per cent. solution of corrosive sublimate, in order to sterilize it. For permanent preservation, it is afterward transferred to an alcoholic solution of hydronaphthol, 1 to 1000. This hardens the gut as well as preserves it against changes.

Naphthaline has recently been employed as an antiseptic for dressing surgical injuries. It occurs in brilliant white, friable crystals of a peculiar, disagreeable odor. Insoluble in water, it dissolves readily in hot alcohol, ether, and in fatty and essential oils. Naphthaline is non-poisonous, and is used only in powder. It has done good service in surgical practice, but does not appear to have been employed by obstetricians.

Iodol is recommended as a substitute for iodoform. It contains nearly ninety per cent. of iodine, and does not possess the disagreeable odor of iodoform. Another advantage claimed is, that symptoms of intoxication do not follow its use.

Iodol is prepared by precipitating pyrrhol from the ethereal animal oil by means of iodide of potassium. It occurs in the form of a brownish powder, which does not undergo decomposition when heated at a temperature of 100° C. At a higher degree of temperature the iodine is liberated in the form of vapor.

Acetate of Aluminium.—This salt is non-poisonous, and is an efficient germicide. According to the classification of Nicolai Jalan de la Croix (see page 36), it is efficient in the proportion of 1 to 4268. Dr. Rose² states that it is more effective and less irritating than carbolic acid for injections during the puerperal period.

¹ *Phila. Med. Times*, vol. XVI, 1885.

² A. Rose, M.D. *Therap. Gaz., Detroit*, 1875, 3, 5, 1, 724.

He gives this formula for preparing it:—

R. Alum	72 parts.
Plumbi acetat.	115 “
Water	1000 “
M. et filtra.	

This makes a three per cent. solution, which, for irrigation, should be diluted with from three to six times its volume of water.

Aseptol¹ belongs to the phenol class. Chemically, it resembles salicylic acid very closely.

Aseptol	$C_6H_4, OH(1), SO_2OH(2)$
Salicylic acid	$C_6H_4, OH(1), COOH(2)$

It is a syrupy, amber-colored liquid, with a somewhat characteristic odor, but not disagreeable like that of carbolic acid. It is freely soluble in water, non-irritating and non-poisonous. As aseptol has the same characteristics and similar chemical properties as salicylic acid, it has likewise the same antiseptic virtues, which are greatly intensified on account of its perfect solubility. It unites energetically with the ammoniacal bases which result from putrefactive changes. Aseptol, added to river water, in the proportion of 1 to 500, prevented decomposition when exposed to air at a temperature of 20° (C.) for fifteen days. Compared with carbolic acid it is very slightly caustic. There is no irritation following its use, even when prolonged contact occurs with the skin, or when employed upon sensitive organs, as the eyes, the bladder or nasal cavities. Freedom from poisonous qualities permits its internal use in large doses as well as concentrated solutions for local application. An amount of aseptol three times greater than a fatal dose of carbolic acid was administered to a dog without any perceptible effect. Finally, it may be said, the excellent results that have followed its use under all circumstances during the past year have caused it to supersede carbolic acid.

Boroglyceride.—The chemical composition of boroglyceride is $C_3H_5BO_3$. It forms a hydrate when diluted with a large quantity of water. Preparations of this agent must be carefully made in order to be reliable. Greater demand would undoubtedly secure this end as well as reduce the cost of manufacture.

It has a salty taste, is inodorous, unirritating and non-poisonous.

Dr. W. T. Parker,² who has at different times called attention to

¹ E. Transer. “Un Nouvel Antiseptique l’Aseptol.” *Union Méd.*, Paris, 1884, 3, 5, xxxviii, pp. 549 and 558.

² W. T. Parker, M.D. *Phila. Med. Times*, 1883-4, xiv, 926.

this article, says it is excellent for use by injection during the puerperal state.—F.]

These agents are numerous ; many among the number deserve a place in common practice. There is no doubt but that a day will come when experience will guide us to select this or that antiseptic to combat such and such a fermentation.

At present it would be difficult to make a definite choice. However, this is of little importance.

It is not the employment of a certain antiseptic agent which brings success ; it is the care taken to prevent failure by the physician who is convinced of the dangers his patients may run from the slightest of his oversights.

CHAPTER III.

INFLUENCE OF ANTISEPTICS ON PUERPERAL EPIDEMICS.

HISTORY OF EPIDEMICS OF PUERPERAL FEVER—THE LABORS OF SEMMELWEISS—THE ORIGIN OF THE PARIS MATERNITY—THE FRIGHTFUL MORTALITY IN MATERNITY HOSPITALS—POPULAR PREJUDICE AGAINST THESE INSTITUTIONS THREATENS THEIR EXISTENCE—TARNIER'S VIEW OF THE CONTAGIOUS NATURE OF THE DISEASE—THE CONCLUSIONS OF LEFORT—THE DEVELOPMENT OF ANTISEPTIC PRINCIPLES—CESSATION OF EPIDEMICS OF PUERPERAL FEVER—REDUCTION OF CHILD-BED MORTALITY IN PUBLIC INSTITUTIONS AND PRIVATE PRACTICE.

IN Chapter I we demonstrated that puerperal infection is of a contagious nature; we have also shown of what the contagion consists, and that it always comes from without. In conformity with this view, which we have endeavored to render as clear as possible, was evolved the necessity of guarding patients from the action of the poison. Whence arose a therapeutic system which, composed of various procedures, constitutes the antiseptic method.

In the preceding chapter we have seen how many different substances can be employed for this purpose. It now remains for us to make use of the materials we have collected: placing the physician before a woman, pregnant, in labor or delivered, to show him what he should do to meet the indications resulting from the knowledge we now possess of the nature of puerperal infection.

Meanwhile, although the scientific details into which we have entered appear to us sufficiently conclusive to gain the confidence of the reader, we believe it our duty to furnish, in addition, a different class of proofs derived from the results obtained with the antiseptic method. We will compare the mortality of child-bearing before the adoption of this method of treatment with what it now is. This will be, we hope, an incontestable argument. We also think the reader will understand better why we attach so great importance to those thousand little procedures which may appear ridiculous, but the scrupulous application of which is the true cause of the success now obtained.

We will investigate particularly the mortality of women delivered in maternity hospitals.

Far from us, however, the thought to accept as true these words which physicians practising in the country love so well to repeat: "What use have we for your antiseptic methods? We do not meet with puerperal fever; our patients always recover."

Such language is dangerous. We could mention numerous cases of puerperal infection having been developed in the country, and in the production of which the physicians, most likely, were chiefly instrumental.¹ Women delivered in maternities are surrounded by special conditions; the cases observed are studied more carefully and appear more convincing. In reality the antiseptic method has been applied in maternities regularly and on a large scale only during the past eight or ten years. Nevertheless, some of the measures now considered as constituting a part of the antiseptic method were made use of in former times. These, however, did not constitute a true antiseptic method, properly speaking, because obstetricians did not possess then correct information of the nature of puerperal infection. When, for instance, Harvey² practised intra-uterine injections in cases of retention of the placenta; when Recolin³ proposed intra-uterine injections of warm water; when, under the same circumstances, Levret⁴ wrote: "if there be any putrefaction I obtain its discharge, and that of the foreign substance (placental fragments), by means of aqueous injections made into the cavity proper of the womb; and I find it very useful," these writers acted wisely; they carried out antiseptic views, but without suspecting the extent of their intervention. Besides, we know very little concerning epidemics of puerperal fever in ancient times, and, if we accept the opinion of Litzmann,⁵ this affection would be classed a modern disease.

The cases cited by Hippocrates, or rather by his disciples, and which are attributed to puerperal infection, were nothing else than epidemics of bilious fever, affecting puerperal women as well as females not being in the puerperal state. One of the most ancient epidemics of which we have any history—the most ancient of all, perhaps—is that which, in 1664, attacked the women who sought refuge at the Hôtel-Dieu, in Paris. We possess few records regarding the origin of these epidemics. We know, however, that since 1664 the increased mortality among the lying-in women at the Hôtel-Dieu was attributed to the proximity of surgical cases.

It is doubtful what steps were taken to combat the epidemics that desolated the Dublin Maternity in 1672 (epidemics of which Thomas Bartholin has left us the history), or those which, according to Dela-

¹ Discussion of the Academy of Medicine, 1858.

² Harvey. Quoted by Matthew Duncan. "Antisepsis during delivery." *Brit. Med. Journ.*, February 15 and 22, 1879.

³ Recolin. "Mémoires de l'Académie royale de chirurgie," t. III, p. 202. 1757.

⁴ Levret. Edition 1786, 460.

⁵ Litzmann. "Das Kindbettfieber in nosologischer, geschichtlicher und therapeutischer Beziehung." Halle, 1844.

motte, occurred in Normandy in the beginning of the eighteenth century.

Not until the year 1773, when Young described an epidemic which occurred at the Edinburgh Maternity, had any attempt been made to investigate carefully into the causes of the symptoms witnessed, or to endeavor to contend against them. This author gives the following account: "The epidemic commenced toward the end of February, and the disease attacked nearly all the women after the first day of the lying-in. No matter what treatment was employed, all the women succumbed. Meanwhile the sanitary state of the city was good. The puerperal patients recovered more slowly, but there was scarcely a case of death there. On this account I thought that we ought to attribute this difference to a local infection, and I believed it was proper to close the hospital for a long time, and to proceed to a complete disinfection of the wards and beds, since I had lost six patients." We could follow from year to year the progress and extension of puerperal fever, and see how no country offered protection against its murderous epidemics. From 1774 to 1786 it raged continuously at the Hôtel-Dieu, in Paris. In 1774 it appeared in Dublin; in 1775, in Derbyshire. Stoll investigated it, in 1777, in Vienna. In 1778 and 1780, Selle observed it in Berlin. In 1781 Osiander gave an account of the epidemic that attacked puerperal women at the Maternity of Cassel. In 1782 puerperal infection decimated the women delivered at Vaugirard. In 1783 and 1784 it appeared at Giessen; in 1786 it raged in Copenhagen, and Bang gave an excellent account of this epidemic, together with a very accurate description of the lesions observed. In 1786 and 1787 Cerri observed it in Lombardy, and not a patient survived the disease. We can mention only the epidemics witnessed in Dublin, from 1787 to 1789, by Clarke; in Aberdeen, from 1789 to 1792, by Gordon; in Copenhagen, in 1792, by Rink; in Rouen, in 1793, by Leroy, etc.; also those which broke out in St. Petersburg, about 1825, and which were accompanied by the frightful mortality of 1 death out of every 11 confinements. Puerperal infection was met with everywhere. Imbued with the ideas of Stoll, and of the epidemiologists of the eighteenth century, obstetricians sought, in the climatic, thermometric or barometric conditions, the origin of these murderous epidemics; for the most part, acknowledging their ignorance, they were not slow to accept these epidemics as one of the sad necessities which it is impossible to escape.

At the beginning of the present century epidemics became more violent and more numerous, particularly in Paris. Under the influence of Bichat and his pupils, a new field was opened for the study of pathological anatomy. Obstetricians performed autopsies with more

care, hoping to discover in this way the characteristic lesion of puerperal fever. The most illustrious of our pathologists, Cruveilhier, was appointed physician to the Maternity. He multiplied his anatomical researches, and at the same time the mortality in this institution increased. To sum up, in 1850 we knew nothing definitely of the origin of puerperal epidemics. We recognized the influence of overcrowding; we adopted measures to disinfect the rooms of patients; and even, in cases of fetid lochia, some obstetricians employed intra-uterine injections; but in carrying out all these measures we did not act in accord with any special theory; the antiseptic method, properly speaking, did not exist.

It was about this period that, almost simultaneously, in Germany, England and France, there appeared works that now represent the foundation of all the progress that has been realized since. In Germany we will mention in the first rank the name of Semmelweiss. According to this obstetrician the infectious symptoms met with in puerperal women are nothing else than manifestations of a fever resulting from the absorption of putrescent animal substances which had become deposited upon the wounds of the genital tract of the woman. Investigating the different epidemics which had succeeded each other from 1664 to 1847, he showed that it was possible to have avoided them if they had prevented putrescent substances from coming in contact with the wounds of the genital organs. According to his view, the number of cases of puerperal infection should be limited to those arising from auto-infection, and he wrote: "Puerperal fever has existed for 200 years; it is time that it should disappear."

Imbued with this idea, that the physician is often instrumental in the propagation of puerperal fever, he adopted a series of prophylactic measures, which we will briefly mention, as well as point out the results he has obtained thereby. (Let us add that this author's researches date from the year 1848, when he was attached to the Vienna Obstetrical Clinic.)

The results that had been obtained in this Maternity when Semmelweiss made his first investigations are shown by the following figures:—

From August, 1784, to December, 1822, the physicians connected with the Vienna Clinic had not performed any autopsies.

During this period, 71,395 women were confined in this hospital; there were 897 deaths, or a mortality of 1.25 per cent.

From the first of January, 1823, to the first of January, 1833, post-mortems were made, and the mortality increased considerably: out of 28,429 deliveries, 1509 deaths occurred, a mortality of 5.30 per cent. If, now, we investigate the rate of mortality for the six years immediately preceding the advent of Semmelweiss, we will see that the

proportion is increased to 9.92 per cent. And in the meanwhile some prophylactic precautions had been taken. Every woman in whom unfavorable symptoms developed was immediately transferred from the service. During his attendance at the Maternity, Semmelweiss never performed any operation or made an examination without first disinfecting the hands with chloride of lime. He proceeded with the greatest care possible; he required all the pupils in his service to exercise the same precautions, and the mortality suddenly dropped to 1.27 per cent. This result, he said, would have been better could he have obtained always a perfect disinfection of the students and midwives who frequented his service. The success of this obstetrician induced a certain number of physicians to practise his method. Michaelis and Lange, the first in Kiel, the second in Heidelberg, made no obstetrical intervention without previously having washed the hands with a solution of chloride of lime. The result was excellent. Lange¹ explained his method in the following language:—

“At the time of my entrance into the Heidelberg Maternity, I observed a great number of cases of puerperal infection. Convinced of the truth of Semmelweiss’ theory, I directed that cadavers should be immediately conveyed from the Maternity, and that after-births should be removed at once; I likewise directed washes of chloride of lime. Since my arrival in Heidelberg, no epidemic of puerperal fever has been observed; complications have become rare, and the mortality has dropped to such a point that out of 300 deliveries I have had only one death.” In spite of the opposition that the views of Semmelweiss encountered, gradually the custom developed to treat the wounds of the genital apparatus by disinfectant measures, and we see, in 1862, Hugenberger,² and in 1863, Grünwald,³ give uterine douches with a solution of chloride of lime; in 1866, Winckel⁴ made intra-uterine injections with permanganate of potassium, sulphate of copper and sulphate of zinc. Finally, in 1870, Radecki⁵ showed the importance that should be attached to local treatment.

In England most physicians believed in the contagiousness of puerperal fever. The cases reported by Reedal, Sleight, Hardey, Stors, and Churchill had carried conviction. Already the custom prevailed

¹ Lange. *Monatsschrift für Geburtskunde*. Band 18, Heft 5.

² Hugenberger. “Das Puerperalfieber,” etc. St. Petersburg, H. Schmitzdorf, p. 60.

³ Grünwald. “Ueber puerper. Septichämie,” etc. *Petersburg med. Zeitschrift*, 1869, t. xv, H. 3, p. 152.

⁴ Winckel. *Die Path. et Ther. d. Wochenb.* Berl., Hirschwald.

⁵ Radecki. “Ueber intract. Inj. in Puerp.” *Petersburg med. Zeitschrift*, 1874, Heft 5.

in English maternities to isolate the sick, and the attendance at private houses was so well organized that it was exceptional for a puerperal patient to be conveyed to the Maternity for treatment. Consequently we should not be surprised to see the success obtained at the Dublin Maternity.

In 1850, out of 1980 confinements	15	deaths, or	0.75	per cent.
“ 1851 “ 2069 “	14	“	0.67	“
“ 1852 “ 1913 “	11	“	0.56	“
“ 1853 “ 1906 “	17	“	0.89	“
“ 1854 “ 1943 “	36	“	0.85	“

Meanwhile, in France the results were much worse, and the women who came to be confined at the Maternity in Paris fell victims to puerperal fever. We understand the origin of this institution.

After the report of Tenon,¹ the National Convention, on July 13th, 1795, decreed that the old Abbey of Port Royal should be converted into a hospital for lying-in women; the object was to protect those unfortunates who were not able to be confined at their homes from the frightful mortality (1 out of 12) that occurred among them when they sought assistance at the Hôtel-Dieu.

Was this object gained? We can decide upon reading the memoirs of Tarnier,² Lefort,³ and the more recent one by Pinard.⁴

All efforts to combat the disease were useless; the mortality among lying-in patients continued very high, and M. Pinard⁵ was correct when he wrote: “In what way did the result differ between those women who were delivered at the Hôtel-Dieu and those who entered the Maternity? This only: in the latter they were attended more skillfully, but the death-rate was none the less.”

On the first of April, 1856, there broke out at the Paris Maternity an epidemic of puerperal fever which lasted until the first of May. This epidemic—the sad history of which was described by M. Tarnier, then interne at the institution—was most fatal, since out of 347 labors that took place during that time, 64 women died, or 1 death to less than every 6 labors. (Tarnier, th. Paris, 1857.)

Whilst women died at the Maternity, those delivered in the city suffered in nowise from the epidemic. Although the mortality for the year 1856 was about 1 out of 19 at the Maternity and in hospitals, it was only 1 to 382 in the 12th district. In other words, the mor-

¹ Tenon. “Mémoire sur les Hôp. de Paris,” 1788.

² Tarnier. “De la fièvre puerpérale,” 1858, *et thèse de Paris*, 1857.

³ Lefort. “Des Maternités.” V. Masson, 1866.

⁴ Pinard. “Les nouvelles Maternités et le Pavillon Tarnier.” *Ann. gyn.*, 1880.

⁵ Pinard. *Ann. gyn.*, 1880, t. XIII, p. 432.

tality was, at this time, seventeen times greater at the Maternity than in the city. This frightful conclusion was partly the cause of the celebrated discussion which took place, in 1858, in the Academy of Medicine. The discussion can scarcely be called a brilliant one. The most diverse opinions were held by men of equal authority, but no clear and practical view was elicited which suggested a reformation. Following this discussion, M. Tarnier published a new memoir upon puerperal fever, one that caused great advance to be made on this subject, and in which he developed and confirmed his conclusions upon the contagious nature of puerperal fever. Meanwhile, the general opinion in France appeared settled on one point: it seemed evident that puerperal fever was developed only in maternity hospitals.

The suppression of establishments intended for lying-in women became the *delenda Carthago* of all who had any thought on the subject.

It was in vain that Danyau pointed out their value for purposes of instruction; such considerations could not prevail against the conclusive arguments set forth in the work of Tarnier. It was in vain, also, that certain authors, and at their head was Tarnier, proposed to fight the disease "by isolating, as far as possible, the recently delivered, and by separating them from each other." It would seem that the time had come to give up half-measures. Radical means were indicated, such that would bring relief to this unfortunate class by an entire change of organization.

The book of M. Lefort¹ upon the subject of maternities is but an expression of the opinion that gained ground from day to day.

Statistics, which are numerous in this excellent book, develop these conclusions:—

1st. That the mortality, in all countries, was always higher in maternities than in private practice. Even in cities where the maternities were conducted with the greatest care, the mortality was still from five to ten times greater in these institutions than it was among those women who were attended at their homes. This rule has no exception.

2d. Struck by the sad results obtained in maternity hospitals, obstetricians have put in practice every resource that hospital hygiene offers. The mortality has diminished in consequence, but it always remained much higher than in their private practice.

By consulting Plate I, we will see that scarcely any favorable result was obtained at the Paris Maternity, and in 1866 M. Lefort could write without injustice:—

¹ Lefort. "Des Maternités." Paris, 1866, pp. 93, 94.

“Statistics alone, with the irresistible eloquence possessed by figures when they relate to elements so exactly comparable as labor, whilst showing the sad state of affairs that existed in our Paris maternities during the latter years particularly, demonstrate not only their unhealthfulness, but bear witness at the same time that they have not participated in the great advances made during the last ten years in foreign maternities.”¹ And the author was able, with good reason, to arrive at this conclusion, which can be considered a formal condemnation of maternities.

“The great difference that exists between the mortality among women delivered at their homes and in maternities should cause to spring up the desire for the complete suppression of these establishments. Unfortunately, this cannot be accomplished, and no matter how perfect may be the organization of attendance at homes, it will be always indispensable to maintain charitable institutions for the admission of women in labor.”²

In a word, the institution of maternities was considered by Professor Lefort, in 1866, as being a sad necessity, of which it was proper to make as little use as possible.

The solution of the problem was no nearer at hand, and it is necessary to come to the first labors of Pasteur, and to the researches of Guérin upon the padded dressing, to see obstetricians derive from the doctrine of germs the principles of the antiseptic method—principles which had commenced already to give Lister his first results. It was toward 1872 that we commenced to apply the antiseptic method in maternities in a rigid manner. Obstetricians now hold but one opinion, and if we wish to follow up the history of the antiseptic method during the last ten years, it would become necessary to call over the names of all obstetricians. Let us mention, however, those who have exercised the greatest influence in this direction, and refer to the names of Bischoff, Fritsch, Schroeder and Breisky, in Germany; to Tarnier, Pinard and Lucas-Championnière, in France. The results obtained have surpassed all expectation, and the desire, then Platonic, that Semmelweiss formulated, in 1847, is realized; for we can say to-day that epidemics of puerperal fever no longer exist.

We will prove this by pointing out the results that have been obtained in maternities; we will see that each improvement diminished the number of deaths, and we hope the study of the plates here added will gain the opinion of those who still express doubt of the value of antiseptic methods applied to obstetrics.

Examine, for instance, Plate No. I, which represents the mortality

¹ Lefort. “Des Maternités.” Paris, 1866. Introduction, p. vii. ² *Ibid.*, p. 309.

curve at the Paris Maternity from 1859 to 1883, inclusive. You will observe that from 1859 the general curve of mortality at this institution gradually declined.¹ In 1867, the mortality was quite considerable, being no less than 4.9 per 100.

¹ It is well to give here some account of the different antiseptic procedures practised at the Maternity. *During labor*, the women are placed in a common room and are delivered upon a bed, the linen of which is changed whenever it becomes soiled. This room is washed daily with a five per cent. solution of carbolic acid, and the same antiseptic solution is kept constantly boiling in a number of vessels.

The uncomplicated labors are put in the hands of the midwives, those requiring artificial delivery being in charge of the midwife-in-chief or her aids, or of the interne or surgeon-in-chief. When pupils come into this apartment, they are compelled to wash the hands, using a nail-brush, with a solution of corrosive sublimate 1 to 1000. They are not allowed to examine different women without repeating the disinfection of the hands with van Swieten's solution. The pupils have never experienced the least inconvenience from this practice. Carbolized vaseline (1 to 40) is used as a lubricant for the fingers. All the women, during their labor, take vaginal injections, and when the duration of labor is prolonged, the injections are repeated every two or three hours, using always for this purpose a solution of corrosive sublimate 1 to 2000. Catheters are dipped into the same solution, 1 to 1000, before being used. Formerly, when the head appeared at the vulva, they lubricated the fourchette with carbolized oil, but this proceeding has been abandoned since the employment of vaginal injections during labor. If an operation becomes necessary, they redouble the care with which the antiseptic method is applied. Immediately before operating, the vulva is washed carefully with a solution of corrosive sublimate, 1 to 1000. This is immediately followed by a vaginal injection. It is useless to say that the operator and his assistants have previously disinfected their hands and forearms with the same solution. The forceps, or whatever instruments may be employed, are soaked in a 1 to 40 solution of carbolic acid. When the vaginal tampon is applied, as, for example, in placenta prævia, the pledgets of lint are always prepared beforehand and soaked in van Swieten's solution.

The Puerperium.—When labor is terminated, they do not give any vaginal injections unless the confinement has been tedious, unless the woman is delivered of a macerated infant, or else it has been necessary to perform some operation. The vulvar dressing is renewed every one or two hours. Intra-uterine injections are used only in cases of fetid lochia with fever.

When labor has been perfectly natural and the lying-in is normal, the vulvar dressings are made after this fashion:—

The external genital organs are washed with a sublimate solution, 1 to 2000, and a small tampon soaked in the same solution is applied to the vulva; this is kept in position by a compress dipped in the same antiseptic fluid. Special precautions are taken when the labor has been tedious, or the bag of waters prematurely ruptured.

The rooms in which the patients lie are quite large. Each bed is placed in a kind of stall, separated from the adjoining stalls by an incomplete partition, which leaves in the middle of the room a central space or lobby. In each of the lying-in rooms is a number of vessels continuously giving off the vapor of carbolized water. When a patient becomes ill, the walls of her compartment are washed with carbolized water 1 to 20, and a solution of the same is sprinkled upon the bedding, covers, etc. If

But at that time the Maternity was far from being organized as now. One can realize this fact by reading the discourse that M. Tarnier delivered at the Maternity in June, 1882. "In 1867, when I was appointed surgeon-in-chief, the interne still went, as he had in the past, from the infirmary to the obstetric service; the student midwives took turns in nursing in the infirmaries, and they who had charge of dressing wounds went repeatedly from one service to the other. The assistant midwives were called to the infirmary when patients died, and returned afterwards to the obstetrical wards; the interne even made autopsies upon women who had died of puerperal fever, and the student midwives assisted at these examinations. In short, they passed, without sufficient precautions, from the infirmaries, and even from the dead house, into the wards containing healthy women."

We see, by our plate, that in 1870, the mortality decreased in a very decided manner, and reached a lower figure than any year since 1858. Beginning from this period, the mortality among women in childbirth follows a line that perceptibly decreases, with the exception of some trifling rises in 1872, 1876 and 1880. But in 1870 an important measure was adopted at the Maternity.

In consequence of the protestation made by M. Tarnier, the director of the public assistance decided that hereafter there should be two services at the Maternity: one for the pregnant and lying-in women in good health; the other, the infirmary, for those suffering from some disease. To each service was attached a special *personnel* entirely distinct from that of the other. The sudden and continued improvement in the mortality of the Maternity, starting from this time, is undoubtedly due to the complete isolation thus practised.

We will notice that in 1881 the mortality fell again, and that in 1882 and 1883 it reached figures that it had been impossible to obtain before. Since 1878 M. Tarnier has attempted to introduce the antiseptic method at the Maternity, but his excellent recommendations

her condition becomes more grave, and if infection is suspected to exist, the patient is transferred to the infirmary. The puerperal patients are taken care of by the student midwives, who afterwards remain at least forty-eight hours in quarantine before taking up their service in the delivery room.

Pregnant Women.—At the Paris Maternity, pregnant women are likewise subjected to the application of antiseptic precautions. Vessels, similar to those we have described, are kept for the constant evaporation of antiseptic fluid. Besides, all pregnant women take a bath when entering the Maternity, which they repeat every eight days. They are also required to bathe the vulva morning and evening with a carbolyzed solution, 1 to 80.

(We are indebted to Madame Henry, midwife-in-chief of the Maternity, for the above information, and we wish to express our sincere thanks for the kindness with which she has placed at our disposal the numerous documents in her possession.)

could not overcome the opposition in favor of old customs. The antiseptic method could be enforced strictly only from 1882.

It seems strange that the antiseptic method has been adopted at the Maternity only during the last few years. It must not be inferred therefrom that, in this institution, they remained passive in the struggle against the propagation of puerperal septicæmia. Since 1876 a special pavilion has existed at the Maternity, constructed under the direction of M. Tarnier, and designated usually by the name of Tarnier pavilion,¹ and "in which every woman who comes to be confined occupies a room completely isolated during the whole period of her lying-in and until she is entirely recovered." We do not intend to describe here the pavilion of which we are speaking. A good description of it will be found in the memoir of M. Pinard, to which we have already referred ("Les nouvelles Maternités et de pavilion Tarnier." *Annales de gynécologie*, 1880). Let us add only that the antiseptic method has not ceased to be rigidly enforced there. Also, the mortality has been very slight. In fact, the statistics of this pavilion gives the following figures:—

¹The following brief account gives the antiseptic precautions employed at the Tarnier pavilion:—

Each woman occupies a room completely separated from others.

When a woman in labor is admitted to the Pavilion she takes a general bath, if her labor is not advanced too far; if expulsive pains exist, they are content to wash the vulva with a carbolized solution, 1 to 80. Before making an examination, the midwife and interne carefully wash their hands in a solution of corrosive sublimate, 1 to 1000. From 1878 to 1882 they employed for this purpose carbolized water, 1 to 40. Since the beginning of 1883 they give, during labor, vaginal injections with a solution of bichloride, 1 to 2000. During the period of expulsion, when the head appears at the vulva, carbolized oil, 1 to 10, is applied over the fourchette.

Atomization is not employed, but throughout the labor carbolized vapor is produced by boiling an aqueous solution, 1 to 20.

Each patient remains in the room she occupied during her confinement.

Three times a day, when the lying-in is normal, the vulva is washed with carbolized water, 1 to 80. Intra-uterine injections are reserved for cases in which fetid lochia are accompanied by fever. For bathing the parts, they make use of ordinary wadding cut into pieces sufficiently large, so that when squeezed they are about the size of a common sponge. Each piece is burned as soon as it has served its purpose.

A compress soaked in carbolized water, 1 to 40, is afterwards applied to the vulva.

These dressings are repeated every three hours, day and night, when the puerperal patient is not doing well.

We will not mention the measures adopted to disinfect the rooms, furniture, etc., of the Tarnier pavilion.

We owe the above information to the kindness of Mlle Hanicot, midwife of the pavilion, to whom we take this occasion to express our thanks.

	Deliveries.	Deaths.		Deliveries.	Deaths.
1876	88	1	1880	155	0
1877	204	2	1881	235	0
1878	234	2	1882	185	0
1879	182	1	1883	117 ¹	0 ²

Finally, since June, 1880, there has not been a single death in the Tarnier pavilion, although the number of deliveries amounts to 785.

We see that the results obtained in this little Maternity are such that it is impossible to hope for better, no matter what may be the conditions surrounding women confined at their own homes.

The mortality is still considerable in the Maternity proper, where, indeed, it is greater than in some of the foreign maternities, especially those existing in the small cities. The cause of this difference lies in some condition relating to its organization. Above all, we must take into consideration the large number of confinements that occur there daily.

The Maternity is, moreover, a hospital for instruction. The number of midwives there is very large, and it is not always possible to exercise a very strict supervision over them. Although the best portion of the buildings has been given up to the lying-in cases, the conditions for ventilation, etc., which we will show to be of the greatest

¹ This includes all the labors that occurred at the Tarnier pavilion from the 1st of January to the 4th of June, 1883.

² Let us compare with these figures those of morbidity in this same pavilion.

In 1876, six women were sick: two with typhoid fever, two with pelvic peritonitis, one with metritis, and one with mammary lymphangitis.

In twenty of the women the temperature was elevated to 39° or 40°, in nine to 39° and in eleven to 40°; but in these cases there did not exist any puerperal complications, properly speaking.

The case of death mentioned for 1876 was caused by mania complicated with peritonitis.

In 1877, three cases were seriously complicated: one septicæmia, one peritonitis, and one pleurisy of the right side. Of the two deaths, one was from acute septicæmia and the other from peritonitis.

In 1878, there were two deaths: one from uterine lymphangitis, the second from purulent infection. Three cases were seriously complicated: one with a scarlatiniform eruption, one morbilious, and one arthritis of the knee.

In 1879, there was one death which was due to purulent infection. There occurred besides two cases of uterine lymphangitis, one case of acute articular rheumatism. In three cases there was gangrene of the vulva, with a temperature above 39°.

In 1880, there occurred one case of mild septicæmia. Cured.

In 1881, one case of quotidian intermittent fever, two of septicæmia, one of perimetritis, one of abscess of the left ischio-rectal cavity. All these cases were cured.

In 1882 and 1883, one case of pelvic-peritonitis occurred in each year, and both recovered.

importance, are not good ; in this respect the rooms in the Maternity are greatly inferior to those of certain maternities of which we will speak later. One other fact contributes to impair the statistics. Every day a large number of women present themselves at the Maternity who are on the point of being delivered. The midwife-in-chief seldom receives cases unless some abnormal condition is met with (unfavorable presentation, twin pregnancy, albuminuria, etc.). As far as possible, they transfer to the midwives attached to the Maternity all the women who give promise of a normal labor. The proportion of difficult labors, those requiring interference, is consequently much greater at the Maternity than in a hospital that receives indiscriminately all pregnant woman. Also, it must not be forgotten that many women are brought to the Maternity after having submitted to repeated operations performed by unskillful hands in the city. Such patients often die at the moment of their entrance into the Maternity, sometimes only a few hours after having been delivered. These are, then, a series of causes that explain why the mortality is still so high at the Maternity. We believe it is well to give a different example of the value of antiseptic treatment, one in which the causes of error are reduced to their minimum.

The best example we can select appears to be that offered by the Maternity of Prague. Plate No. II represents the mortality curve in this Maternity from 1865 to 1882. We will observe that this table is divided into two parts by a checkered column, corresponding to the year 1875. The black columns represent the mortality. We will notice at first glance that a marked difference exists between the height of the columns placed to the left and those to the right of that representing the year 1875. But the curve extending from 1865 to 1875 represents the mortality in the *old Maternity*. At this time the imperfect arrangement of the rooms and the absence of all antiseptic method, made the Maternity of Prague one of the most deadly of hospitals. In 1875 they gave up this Maternity, and established a new institution, much better regulated. The antiseptic method was taken up. Suddenly, the mortality decreased to a point that had never been reached before. The improvement continued until 1877.

After the slight increase produced in 1877, they redoubled the precautions. The antiseptic method, better understood, was applied with the greatest care by M. Weber and by Prof. Breisky.¹ We witness, in consequence, the mortality drop to an extremely low point.

¹ See Fischel. "Zur Therapie der puerperalen Sepsis (nach der Erfahrungen der zweiten geburtshülflichen Klinik des Herrn Hofrath, Pr. Breisky in Prag während der letzten drei Jahre 1^{er} juin, 1879-1^{er} juillet, 1882)." *Arch. f. Gyn.*, t. xx.

The mortality for the year 1881 is not given, but we are aware that the good results obtained the preceding year were kept up.¹

We see by the details given in the foot-note how carefully antiseptic is carried out in Prague. It is certainly to these numerous precautions that Profs. Weber and Breisky owe their success. The result that we have given appears the more demonstrative since the mortality before and after the introduction of the antiseptic method is compared under the same conditions; that is, in the same city, in the same hospital, and in the same school.² Let us add, that at Prague, the surveil-

See Breisky. "Ueber die intrauterine local Behandlung des Puerperalfiebers." Prague, 1880.

— Weber von Ebenhof. "Das antiseptische Verfahren in der Geburtshülfe." Prague, 1880.

— Dvorak. "Eine Skizze interessanter Beobachtungen auf der geburtshülftlichen Klinik für Hebammen des Pr. Weber Ritter von Ebenhof du 1^{er} mai, 1878-80 avril, 1879." *Casopis českých lékařů*, 1879.

¹ The column corresponding to the year 1882 gives only the results in the service of Prof. Breisky. My excellent friend, Dr. Fischel, to whom I am indebted for the above information, has stated briefly the cause of the 5 deaths that occurred during this year. 1 case was the result of rupture of the uterus followed by peritonitis; drainage had been employed. In May, 1882, 1 case died from uterine rupture, the fatal result following secondary hemorrhage, which occurred suddenly after an attack of coughing; there was no peritonitis. In July, 1 death from eclampsia; the end came twenty-four hours after labor. The fourth death was in December. Violent hemorrhage resulted from placenta prævia; death took place two hours after delivery was effected. The fifth case occurred in a woman who had been brought to the general hospital, and who died three months after her labor with endocarditis of the right ventricle; she had, at the same time, two pulmonary abscesses. Although the genital organs were healthy, it is quite certain that infection existed.

² The organization of the Prague Maternity is as follows:—

The institution serves for the instruction of both midwives and physicians. It comprises three services; two of them, which are for physicians, are conducted, one by Prof. Breisky, the other by M. Sträng. The service for the midwives is in charge of Dr. Weber, who is likewise director of the Maternity. In the services of M. Weber and of M. Breisky, the only two we have visited, the antiseptic method is carried out with great care. Each pregnant woman takes a general bath (tepid) once a week. Only in exceptional cases do the women take vaginal injections during their pregnancy. This was done only three times in 1882 in the service of Prof. Breisky. Here, each woman entering the *salle d'accouchement* bathes with soap and water before any examination is made. If she is suffering already with expulsive pains, they are content to wash the external genital organs with carbolized water and soap. My friend, Fischel, to whom I owe all this information, insists especially upon this point in the letter which he wrote to me on this subject. "Never forget the soap; we consider it more important than carbolic acid." Before making a digital examination, the fingers are carefully washed with soap and carbolized water, using a brush, and the nails, always cut very short, are scrupulously cleaned. In this connection, let us add that the disinfection of the personnel is carried to the highest degree in

lance of the midwives is so strict, that it is rare to meet with those cases, so common in Paris, of women who are brought to the hospital in a dying condition. Perhaps we can terminate our study at this point.

But can it not be said: "Without doubt, by the antiseptic method, you have obtained the very best results in maternities. But with your best efforts, you can never make, either in these establishments or in the midwives' houses, the mortality equal to or less than that obtained in private practice."

At first sight this objection appears to be true; but, without wishing to give a positive opinion on the subject, the question of the reorganization of maternities is worthy of further consideration, when, perhaps, this conclusion will be arrived at: that, far from abolishing the

Prague. We do not remember having seen in this Maternity a single midwife whose hands were in the slightest way soiled. Carbolized vaseline, 5 per cent., is used for lubricating the fingers. Vaginal injections are not employed during labor. In the service of M. Breisky they have had recourse to this procedure only about ten times during the year, and when the vaginal secretion is very profuse and presents a decidedly purulent character. In case of leucorrhœa there is no danger to fear, and the vaginal douche is superfluous. "Everything that is superfluous should be avoided, because we cannot be certain it is not dangerous." In 1881, atomization during labor was still practised in the service of Dr. Weber. Since that time, I believe M. Weber has ceased to employ it. Each woman is examined only by five or six students, and the intervals between these examinations are sufficiently long to prevent the woman from experiencing any fatigue. If a larger number of students examine the patient, vaginal injections are made during the labor. When labor has been normal, the surface of the vulva is irrigated with a carbolized solution of 2 per cent. strength, or with chlorinated water, 1 to 10. Small fissures and contused wounds of the vulva are dusted with powdered iodoform. If lacerations exist which require the employment of sutures, they operate at once. After every operation, a vaginal injection is given with carbolized water, 5 per cent., or with chlorinated water. If the necessity should arise to introduce the hand or instruments into the uterine cavity, it is followed by an intra uterine injection; syringes are never employed, carbolized water, 5 per cent., is used always with an irrigator. Two to six litres (3 to 10 qts.) are passed in this way into the uterine cavity.

These irrigations are likewise employed after the birth of a macerated foetus, or when feverish symptoms have come on during labor. In Breisky's service the spray is not used. It is not necessary to say that before the performance of any operation, forceps, version, etc., a vaginal douche is always given.

Thanks to these precautions, the puerperium is always excellent, and the morbidity in Breisky's service is almost *nil*. Thus, in 1881, only 12 cases, and in 1882 10 cases of puerperal infection occurred that caused any anxiety. In this service, vaginal injections are used only in one-third of the cases, and only when precise indications exist; excessive lochial flow, putrid lochia with or without fever, purulent vaginitis, etc.

In exceptional cases, they have introduced pencils of iodoform into the vagina. All these dressings are made by the attendants, the physicians themselves avoid con-

maternities, it would be better, in all probability, to construct them. We cannot enter into the details of this subject, but, if we judge of it by the results obtained at Copenhagen, we will see that it is not impossible, owing to the antiseptic method, to obtain as good results in hospital service as in city practice.

Plate III represents the mortality curve at the Maternity in Copenhagen and in its auxiliary houses.¹

The Maternity is composed of forty-four special rooms, a description of which will be found in a memoir of Prof. Stadfeldt.²

Under the name of *succursales*, or auxiliary houses, is embraced the confinements conducted at the midwives' houses and in certain families approved of by the Administration.³ The latter scarcely ever receive any but uncomplicated cases. This system, while possessing great advantages, also offers some disadvantages: it has seemed that the mortality among infants was much greater in these houses than in the Maternity proper.

Professor Stadfeldt described, in 1868, at the Brussels Congress, the various measures he practised to secure disinfection.⁴ We will

tact with all septic or suspicious matters: the best disinfection consists in not being infected. Seldom do they have recourse to intra-uterine injections; these are always made by the physicians.

In cases of puerperal infection, they content themselves generally with using vaginal injections: ulcerations of the vagina, of the vulva and of the uterine neck are treated with a saturated solution of permanganate of potassium, or with a very strong tincture of iodine:—

Iodine	1 part.
Alcohol	8 parts.

Let us add, that in all cases where they have recourse to vaginal injections, glass canulæ are used.

In M. Weber's service, the methods employed are practically the same, only they use tampons of chlorinated wadding applied directly to the vulva, believing that they avoid by these means the irritation caused by the applications of carbolic acid to the surface of the external genital organs.

I cannot enter here into a full description of all those details which make the Prague Maternity one of the best conducted in Europe.

¹ A. Fløystrup. "Die prophylaktische und kurative antiseptik während Geburt und Wochenbett." Copenhagen, 1880.

— E. Ingerslew. "Sur la mortalité en Danemark par suite de la fièvre puerpérale." Copenhagen, 1880.

— E. Ingerslew. "Sur la mortalité par suite de la fièvre puerpérale à Copenhague et dans les villes des provinces danoises pendant les cinq années, 1877-1881." Copenhague, 1883.

² Stadfeldt. "Les maternités, leur organisation et administration." Copenhagen, 1874.

³ *Archives de Tocologie*, juillet, 1874.

⁴ See *Proceedings of the Congress*, 1876.

have occasion many times to refer to them. Let us add that the antiseptic method has been employed in Copenhagen since 1870.¹

This explains, no doubt, the low mortality that existed at the time in this Maternity (compare Plate III with Plates I and II).

Since 1876 the mortality has not reached one per cent., and it fell, in 1880, to 0.26 per cent. If now we compare Plates III and IV we can reach the following conclusion: so long as the antiseptic method is not employed in the maternity, the mortality is from five to seven times greater in this institution than in the city. But in proportion as the proficiency of the antiseptic method is enforced the range becomes less and less considerable, and we see that in 1880, and even in 1881, the figures are nearly equal. The comparison of these two lines appears conclusive.

The antiseptic method should not be applied only in maternities. It ought to be carried out likewise with the greatest care in the establishments of the midwives and in private practice. We do not possess any statistics sufficiently extensive to allow us to reach definite conclusions from the results that have been obtained in this line. We will

¹ The following is an account of the measures adopted at the Copenhagen Maternity:—

Every woman entering the Maternity is received in a special room, where she undergoes an examination by the midwife-in-chief, one of the physicians, and by one or two student midwives. At the end of the examination a carbolyzed two per cent. vaginal injection is given. This is the strength of the solution most frequently employed in this institution. The greatest care is taken in the disinfection of the medical personnel. Before each examination the hands are scrupulously washed and scrubbed with soap, and subsequently disinfected with carbolic acid solution, 2.5 per cent. The fingers are lubricated with ten per cent. carbolyzed oil or with salicylated ointment of same strength. When this examination is finished the patient is transferred to the obstetrical service, of which the medical and auxiliary *personnel*, etc., are entirely distinct from that of the lying-in service. A vaginal injection is given every two hours during the labor. When the head presents at the vulva a carbolyzed spray is projected against the genital organs. After the placenta is extracted another vaginal injection is administered; sometimes one is given after the birth of the infant and before the end of the third stage. Intra-uterine injections of carbolyzed water, of three, four, or five per cent., are reserved for cases in which an operation has been demanded, or when membranous débris has been retained. For ruptured perineum they operate at once, and dress the surface with wadding soaked in ten per cent. carbolyzed oil. Sponges are never employed in the Maternity. About one hour after delivery the woman is transferred to the lying-in ward. If all is normal, the external genital organs are bathed two or three times a day with carbolyzed water. Vaginal injections are reserved for cases with foetid lochia or some analogous symptom. They employ intra-uterine injections only when placental débris retained within the uterine cavity become putrescent. When a patient manifests any sign of puerperal infection, she is immediately transferred to the hospital, and the attending midwife is carefully disinfected.

content ourselves on this point by making an appeal to the conscience of all obstetricians. But, since the memoirs of M. Lefort upon maternities, the service of the midwives has become greatly extended in Paris. We have some data which permit us to show that here also the application of the antiseptic method in Paris has yielded the happiest results.

We were led to believe, for a long time, that the organization of the service for accouchement at the homes of midwives had given wonderful results. We believed that in this service the mortality was *nil*, or nearly so. M. Siredey¹ has rendered a good service by showing how the statistics published by the Administration were incorrect. The midwives, guarding their reputation, took care, when a woman fell dangerously sick, to send her immediately to a hospital. That certainly would have been a worthy act had they intended only to send away sick women who were capable of becoming a source of infection.

But the object sought was very different; they wished only, by acting thus, to be able at the end of each year to furnish to the Administration a report in which there was not figured a single death. For a long time this error was unrecognized, or, at least, the importance of it was not suspected. M. Siredey then consulted with the director of the Lariboisière hospital, and every time that a woman suffering with puerperal symptoms was brought to the hospital they took care to trace up the history of the case. The result is that:—

In 1879, 73 women were sent by midwives to the Lariboisière hospital. There were 14 deaths: 12 from septicæmia, 1 from hemorrhage, and 1 from phthisis.

In 1880, 41 were transferred and 10 died: 9 from septicæmia, and 1 from pneumonia.

In 1881, 27 were transferred, and 6 died: 3 from septicæmia, and 3 from typhoid fever.

Thus, in three years, at the *Lariboisière hospital alone*, 143 women were received from the houses of the midwives, suffering with serious puerperal symptoms, and 30 of the number died. This corrupts both the hospital statistics and the statistics of the mortality among the women confined at the establishments of the midwives. Examining the preceding figures, we see that the number of transfers diminished during the years 1880 and 1881. It must not be inferred that the sanitary state was proportionally improved during those years. We recognize simply that the midwives, feeling themselves closely watched whenever they sent their sick women to the Lariboisière hospital, had adopted the expedient of transferring them to other hospitals.

¹ *Union Médicale*, août, 1882.

These facts¹ fully demonstrated that a radical reform was demanded. It could not be carried out, however, until the administration of Public Assistance decided to appoint obstetric physicians to the hospitals. About 6000 women are delivered each year at the houses of the midwives. The four obstetricians connected with the hospitals are required to see that all the hygienic measures prescribed by the Administration are faithfully carried out.

To do this, the physicians exercise a continued surveillance over the midwives approved by the Administration, and pay at least two visits to each puerperal woman. They compel a strict antiseptic to be conducted continually at these establishments. It must be said that the Administration has sustained them energetically in the struggle they have undertaken against ignorance and the bad will and inactivity of a certain number of midwives.

Thanks to their perseverance, they have had the satisfaction to see the sanitary condition become gradually improved. We can now appreciate the results they have obtained—results which are greatly due to the energy with which they have required the application of antiseptic methods.²

M. Pinard has had charge of this service since the 1st of November, 1882. He gives the following statistics: "Out of 555 labors conducted at the houses of midwives connected with the Lariboisière hospital, there has been one death (from peritonitis). We should mention, also, one other patient who was transferred to the hospital with bronchitis, but who recovered."

The comparison of these two results appears very convincing. In both cases, the same rule governed the admission of patients. The

¹ M. de Beurman, *thèse Paris*, 1878, et Budin, *Progrès Méd.*, 9 septembre, 1882.

² The following are the principal prophylactic measures practised by the midwives:—

The patients sent by the hospitals to the midwives' houses are placed in separate and well-aired chambers. The apartments, etc., are kept always clean, and a midwife is never allowed to use them, or to place any women in them except those sent from the hospitals. Each midwife receives, whenever a patient is sent to her, one litre (2 pints) of the following antiseptic liquid:—

Carbolic acid	250 gr.	(Oss)
Alcohol	750 gr.	(Oiss)
Thymol	20 gr.	(ʒv)

Four tablespoonfuls of this liquid poured into a litre of water make a good antiseptic solution. Carbolized water prepared after this fashion is used to wash the hands, for dressings, etc. They require the dressings of each puerperal woman to be changed at least three times a day. The use of sponges is prohibited; compresses are employed and thrown away when used.

midwives now, as formerly, receive only simple cases (out of the 555 labors the forceps was applied twice, and there were two artificial deliveries). The cause of the difference between these results is entirely the active supervision of M. Pinard, a supervision which has permitted the introduction of the antiseptic method into the midwives' houses.

M. Ribemont, out of 860 deliveries, furnishes 3 deaths, of which 1 was from pneumonia.

M. Budin, on his part, has obtained results no less satisfactory, as is shown by the following table, which is a summary of his statistics:—

	Deliveries.	Morbidity.	Cases transferred to Hospital.	Mortality.	Mortality of Infants.	Ophthalmias.	
November, 1882.	126	5	1		6	3	Forceps once.
December, 1882.	135	14	4	2	5	8	
January, 1883.	152	5	1		10	1	Forceps once.
February, 1883.	167	4	3		9	6	{ Forceps once. One artificial delivery.
March, 1883.	194	4	2	1	9	6	Forceps once.
April, 1883.	120	3	1		5	1	
May, 1883.	127	5	1		4	2	Forceps three times.
Total,	1021	40	13	3	48	27	

This table appears to us very conclusive. It demonstrates, in fact, that the sanitary condition is improved in proportion as the antiseptic method is applied with greater care.

Finally, M. Pinard, out of 1001 labors conducted at the homes of midwives, gives 3 deaths.

M. Budin has had the same number of deaths out of 1021 labors.

These results are, we think, the best reply that can be made to those who have considered inopportune the reforms which were made by the Administration of Public Assistance.

Can we assert that this system of attendance at the establishments

of the midwives, as at present organized, is perfect? No, and obstetricians know this better than any one else. They can show, indeed, that at these houses many infants die who might have been saved had they been born in maternities. This fact has been observed likewise by Stadfeldt, in Copenhagen. (See page 78.)

In giving an abstract of the writings which have been kindly communicated to us by M. Budin, we have ascertained that, out of the 48 deaths of new-born infants, 9 only were unavoidable.

Obstetricians have given this question their serious attention, and have sought for the proper means to remedy this excessive mortality among infants.

In conclusion, the antiseptic method has yielded the most brilliant results wherever it has been applied. We consider it useless to insist upon this point, the preceding statistics reply to all objections.

NOTE.—[It is impossible to give a description of all the Maternities of Europe; consequently, those only have been selected which seemed most appropriate and convincing.]

THE MATERNITY OF GLASGOW.

	Labors.	Deaths.	Operations
1875-76	293	5	8
1876-77	254	5	9
1877-78	193	6	9
1878-79	170	5	13
1879-80	223	3	12
1880-81	219	10	36
1881-82	256	5	14
From the 15th Novem- ber, 1882, to the 3d May, 1883	127	1	11

Without entering into any full description of the Glasgow Maternity, we will state that the rooms, which contain a number of beds each, are sufficiently spacious to allow every patient 1500 cubic feet of air. The antiseptic method is adopted in this institution.

The pregnant women are well fed, they are kept clean, and live as much as possible in the open air.

Every woman in labor, entering the Maternity, takes a bath before being admitted into the obstetric room. During labor, the women are not submitted to any special antiseptic rule, but they are examined as seldom as possible. Before each examination, the physicians wash their hands and nails with carbolized water and soap. Carbolized vaseline is employed, and special precautions taken when instruments are used.

When the labor is completed, each patient is given an intra-uterine injection of a warm carbolized solution, 1 to 80, during which the uterus is compressed in order to facilitate the expulsion of any clots that may be contained within its cavity.

Some hours after delivery, the patient is carried upon a litter to the room which she is to occupy during her lying-in. The nurse having charge of the case attends, at the same time, other cases.

Morning and evening, during her stay in the hospital, each puerperal woman takes a carbolized vaginal injection, 1 to 80. On the sixth day after labor, they place a suppository of eucalyptus in the uterine canal. The linen is disinfected by the vapor of sulphur. The rooms are occupied alternately and disinfected with sulphur.

The new hospital was opened in 1881. The antiseptic method has been employed for some time, but only in cases of fetid lochia. Antisepsis has been strictly carried out only during the last ten years. This Maternity is used for instruction and receives 120 students.

This information is kindly furnished by Dr. Sloan.

MATERNITY OF VIENNA.

STATISTICS FROM 1865 TO 1881.

	Clinic of Carl Braun.	Spaeth.	Spaeth and Braun.
1865	1.6	—	0.9
1866	1.6	—	1.1
1867	1.1	—	1.1
1868	1.2	—	1.4
1869	1.2	—	1.8
1870	1.8	—	2.8
1871	1.3	—	3.0
1872	2.5	—	2.7
1873	2.4	3.9	2.1
1874	2.5	5.5	4.2
1875	2.5	3.9	3.9
1876	1.3	1.3	0.2
1877	0.9	0.8	1.0
1878	1.2	0.9	1.3
1879	—	1.1	—
1880	—	1.13	1.3

CHAPTER IV.

DISINFECTION AS AN ANTISEPTIC MEASURE.

THE DANGERS OF OVERCROWDING—CONTAGION—VALUE OF ISOLATION—DISINFECTION OF APARTMENTS—VENTILATION—WASHING—FUMIGATIONS—DISINFECTION OF FURNITURE; OF MEDICAL ATTENDANTS AND ASSISTANTS—DUTIES OF AN OBSTETRICIAN WHEN ATTENDING CASES OF INFECTION—SHOULD AN OBSTETRICIAN MAKE POST-MORTEM EXAMINATIONS?—SHOULD HE ATTEND PATIENTS SUFFERING WITH CONTAGIOUS DISEASES?—ATTENTION TO CLOTHING—DISINFECTION OF THE HANDS AND INSTRUMENTS.

THE first duty of the obstetrician is to place women in a perfectly aseptic medium. This condition can be obtained in maternities, but only by one means. It is necessary to take measures to prevent the birth of germs, and to destroy them as soon as produced.

Our ideas of the mechanism of putrefaction, and the knowledge we possess of the genesis of puerperal infection, clearly indicate that, in order to prevent the appearance of these germs, the action of which we dread both in the hospital and sick room, it is necessary:—

- 1st. Never allow to remain there animal matters capable of undergoing putrefaction.
- 2d. Disinfect carefully all articles that may be brought in contact with the sick.

1st. Never allow animal matters capable of becoming putrefied to remain in the rooms.

Every lying-in woman may become a source of danger. We cannot fail to recognize this if we remember that blood and lochial fluids are particularly liable to putrefy under the influence of air. Consequently we should see to it that the placenta, and that linen cloths soaked in blood, lochia or urine, are never allowed to remain in the room with recently delivered women. These apartments should be large and well aired.

Above all, we will avoid placing too many patients in the same room. It is well, at any cost, to shun the dangers of overcrowding.

All obstetricians, since they have known the fear of puerperal fever, have called attention to the evils which result from the congregation of numerous patients within contracted quarters.

It was to obviate in part the objection of overcrowding that Tenon proposed the establishment of special hospitals destined for lying-in women. It is sufficient to read the discussion which took place in 1858, at the Academy of Medicine, to be convinced that the opinion

on this point was unanimous. At the time Tarnier made his inaugural thesis (1857), when he wrote his memoir on puerperal fever (1858), and when Semmelweiss undertook his first researches, overcrowding appeared to be the principal cause of epidemics of puerperal fever. We cannot fail to compare the sad statistics of the mortality in maternities at that time with those deadly epidemics which affected our wounded during the Crimean war, and to which attention was directed.

But overcrowding is not the only cause of the production of epidemics of puerperal fever. Semmelweiss did not recognize that there existed another element, the action of which was predominant; he denied the contagiousness of puerperal infection. It was reserved for M. Tarnier to demonstrate its reality. Semmelweiss wished to avoid overcrowding because he would thereby promote the cleanliness of the rooms of the sick. He was correct. M. Tarnier, in proposing to isolate sick women, had a more precise conception of the nature of puerperal fever. Without doubt, to crowd a great number of patients into the same room is to place them in the most unfavorable condition, and is especially apt to increase the chances of contagion.

M. Tarnier did not know, and could not recognize, the contagious principle itself, but we cannot ignore the service he rendered by clearly stating the terms of the problem.

When M. Lefort published his work on maternities, Pasteur had not undertaken his researches on septicæmia, nor had Lister then obtained the marvelous results which have since attracted attention to the antiseptic method in surgery. M. Lefort was able only to repeat and confirm the conclusions given by Tarnier, which also sustained Lorain, in his inaugural thesis: "If we wish to avoid epidemics of puerperal fever, we must separate the healthy from the sick."

Thanks to these works, completed now by laboratory researches, which, under Pasteur's influence, have been made during the last ten years, it is possible for us to understand fully what brings and develops an epidemic, and to determine the exact value that isolation can be called upon to render.

Here, for instance, is a room in which are crowded, side by side, sick women and well; the air is confined, the linen and bedding are never disinfected, and are the receptacle of a great number of septic germs; the physicians, etc., go from one patient to another, examining them, here practising the touch and there giving a vaginal injection. What happens then? The morbid germs are conveyed from a sick woman to one in health, and she in turn is affected. This being repeated a certain number of times in the same room, and the epidemic is started.

We know enough of the importance of putrefaction, and its rôle in the pathogenesis of septicæmia, to recognize that morbid germs can be conveyed into the room of lying-in women by the physician who, a little time before, may have performed an autopsy, may have attended a patient suffering with erysipelas, or dressed the wound of one having purulent or septic infection.

We know also that the poison can be developed in the room itself, where, from the fact of overcrowding, organic matters are exposed to the air, become putrescent, and are filled with septic germs.

Finally, if we study an epidemic of puerperal fever, we will find always a single cause, contagion; overcrowding will act as a supplemental cause favoring contagion. And, indeed, we all know examples of epidemics of puerperal infection having broken out in the clientele of one physician, and yet in such cases all the women are separated from each other.

Can it be argued from this that isolation is useless? Far be it from us to think so. But it is well to fully comprehend what is meant by this word: to isolate the lying-in patients.

It does not suffice to construct maternities in which we will arrange numerous lying-in rooms and rooms for isolation. In order that a woman may be isolated, it is necessary that the medical or auxiliary *personnel* from whom she will receive attention, that all the instruments which may be needed, etc., must be absolutely special to her case.

It is impossible to take such precautions, in the strict sense of the word, in a maternity where so many women are delivered. But it is possible to obtain satisfactory results by making use of a certain number of indirect means which constitute, perhaps, the most important part of the antiseptic method.

We have said that the cause of epidemics is contagion, that is to say, the transport of the contagium from one woman to another. We know, on the other hand, that this contagium is constituted of germs. Now, if we can destroy these germs during their conveyance from a sick woman to one who is healthy, we will be able to avoid contagion, and the women will be, so to say, isolated.

To attain this we must—

First. Disinfect the air, which may be one means of the propagation of the germs.

Second. Disinfect all the movable articles, etc., contained in the rooms of the patients, and which too often are the vehicle of the germs.

Third. Disinfect the medical *personnel*.

If we had at our disposal some way of acting which permitted us to obtain these results to a certainty, it would be useless to place sick

women in separate apartments, and to cause special attendants to nurse them.

Disinfection such as we have mentioned would allow us to isolate women while keeping them together. Unfortunately, and the details into which we will enter later will prove it, such is not the case. The procedures that we will indicate, while having a real value, do not offer the physician absolute security.

The best disinfection consists in not being infected. Also is it of the greatest importance to isolate women when they become sick, and when we suspect the possibility of infection, to do so by taking all the precautions we have just pointed out.

We see what rôle contagion plays in the genesis of puerperal epidemics. But an epidemic is not always started by a large number of puerperal women becoming attacked simultaneously with infectious symptoms. When an epidemic breaks out, we witness the symptoms gradually assume a more and more serious character. In the greatest epidemics there happens a time when not only all patients die, but they perish, so to say, as if struck by lightning.

This gradation of the gravity, that epidemiologists know so well, is one of the most important characteristics of every epidemic; it remained inexplicable until the experiments of Davaine (reported in our first chapter, p. 16), were made, and which seem to throw the brightest light on this point.

Indeed, if the septic microbe, cultivated in the rabbit, ends by acquiring a virulence greater and greater in proportion as it passes from one animal to another, is it not possible to admit that the same phenomenon happens in epidemics of puerperal infection?

In the beginning, we found that the septic microbe when inoculated has given rise to infection.

The consequent phenomena may be grave, and death result; but, more frequently, the fatal end occurs unexpectedly after a certain length of time, during which the physician had not lost all hope.

But the germs affecting this woman may become transferred to other puerperal cases, and the symptoms observed in this second series of patients may be more severe.

In passing from one woman to another, septic germs acquire their virulence; this will continue to increase indefinitely in proportion as the contagion is transported from case to case. In a word, by producing the progressive form of septicæmia in the rabbit, Davaine and Koch have produced experimentally one of the characteristics of epidemics, which, more than any other, perhaps, appeared inexplicable to the older writers, and forced them, by acknowledging their ignorance, to attribute epidemics to a divine will.

In this chapter we intend to study more particularly those measures by which we obtain :—

- 1st. The disinfection of the apartments in which lying-in women are placed.
- 2d. The disinfection of various movable articles contained therein.
- 3d. The disinfection of the medical and auxiliary *personnel*.

A.

DISINFECTION OF THE APARTMENTS.

For a long time we have recognized the importance of taking proper measures to disinfect the rooms of patients. The older obstetricians advised that the rooms which had contained puerperal fever patients should be disinfected by burning sulphur, by washing the walls with solutions of chloride of lime, etc. We have mentioned already the doctrine of Semmelweiss; we have shown that, according to his view, puerperal infection was always caused by the introduction of putrid matters into the system of patients. We readily understand all the importance that this obstetrician attached to the disinfection of rooms that had contained puerperal patients.¹ (Ventilation and washings with chloride of lime, etc.)

Since the doctrine of germs has been formulated, the disinfection of the rooms of puerperal patients is conducted by precise rules in accordance with the theoretical idea governing obstetricians.

In order to study systematically the methods which secure disinfection of the lying-in rooms, we believe two classes should be recognized :—

- 1st. Disinfection of rooms which do not contain puerperal patients.
- 2d. Disinfection of rooms when occupied by such cases.

CLASS I. One of the oldest methods which has been highly thought of, is what has been called the *alternation of rooms*. One ward contains, for example, ten beds. When these ten beds have been occupied by women for a certain length of time, no more patients are placed there; to use a common expression, they allow the room to rest. During this period, a series of disinfectant measures are employed, such as ventilation, washing, changing of bedding, etc.

From 1858, M. Tarnier insisted upon the importance of this step : “The rooms should be occupied alternately. The apartment in which a recently delivered woman has passed her puerperium ought to remain vacant fifteen days to facilitate washing, ventilation and change of bedding.”²

¹ See Semmelweiss. “Zwei offene Briefe an Siebold und an Scanzoni.” Pesth, 1861.

² Tarnier. “De la fièvre puerpérale,” 1858, p. 151.

In 1866, M. Lefort again urged this point: "The Maternity ought to contain two sets of beds regularly in use, so that each room, after having been occupied sufficiently long to permit the recovery of the patients who were treated there, can be ventilated and remain unoccupied for an equal length of time."¹

This principle of alternation of rooms is recognized by all obstetricians as being of the greatest importance, and is applied in a large number of maternities.

Among the institutions that strictly carry out this method, we can mention the Maternity of the Cochin hospital² and the Brussels Maternity, under the management of M. Hyernaux.³

This principle being admitted, what must be done while the room is unoccupied. It is evident that it does not suffice to let the rooms rest, but it is necessary also, during this respite, to have recourse to certain special measures of disinfection, measures that it is always prudent to take, even when the rooms have not been occupied by infected patients.

Ventilation of the Rooms.—We should never be satisfied simply to shut up the rooms, for, in such cases, no matter how long the rooms may remain unused, they are not safe. We have cited cases where a rest from four to six months has not been sufficient to guard patients from infection, who were afterwards placed in the rooms. But during these four or six months the windows had been rigidly kept closed.

The windows must be left widely open to wind and sun. This is what is done at Brussels, where they do not practise any special mode of disinfection. In this Maternity, the walls being whitened with lime, it is next to impossible to make any practical application of the measures of disinfection of which we have spoken. We may be led to believe that this whitening of the rooms is one of the best methods to kill the germs which become deposited upon the walls; but it is not so.

The walls present in such cases a wrinkled surface, and the milk of lime covering them is nothing but a porous bed, which retains in the interstices of the wall and upon itself the germs it is incapable of killing. M. Vallin has shown that it is time to abandon this coating, which is not in the least caustic.⁴

From this point of view, the stuccoed and varnished walls, such as

¹ Lefort. "Des Maternités," 1866, p. 318.

² Lefort. *Ibid.*

³ At Brussels, when a patient is discharged, the room is opened for ventilation. It is in this way dried and aired for five weeks.

⁴ Vallin. "Traité de la désinfection et des désinfectants," 1883, p. 388. See, also, on this point: "Deger. Bau der Krankenhäuser," p. 102.

we meet with in certain hospitals, in the Lariboisière, the pavilion Tarnier, and the Obstetrical Clinic, for example, offer real advantages.

To secure perfect disinfection of the premises, we can employ washings with or without antiseptic liquids, and fumigations.

Washing the Rooms.—In the Tarnier pavilion, when a room is vacated, a large quantity of water is thrown against the walls and ceiling, which are stuccoed or varnished, and upon the floor, which is of bitumen or mortar. In this way is carried off all the dust which had accumulated upon the walls of the chamber during the stay of the patient. The water employed for such purpose is immediately removed from the room.

These washings, made only with pure water, constitute one of the most powerful means of disinfection, and it is with good reason that M. Tarnier attaches great importance to them.¹

We think that in ordinary cases they answer the purpose, but it is well known that this method is applicable only when the walls of the chamber are perfectly impermeable. It is necessary, however, that the liquid should penetrate into all the crevices of the walls, windows, etc. It is for this reason that, in the Tarnier pavilion, where the different walls of each chamber come together, they are rounded and perfectly smooth instead of being angular. It is, consequently, impossible for dust to accumulate there and escape being washed away by the liquids.

If the object should be to disinfect a room which had been occupied by an infected patient, it would be prudent, after having washed with pure water, to throw against the walls a considerable quantity of water impregnated with antiseptic substances.

We can use in this way a solution of chloride of zinc, of chloride of lime, of carbolic acid, or of potash.²

Solutions of corrosive sublimate, the antiseptic value of which is extremely powerful, can be employed with great advantage. There would be no reason to fear that patients, who will be placed in the rooms thus disinfected, can be injured in any way, for, on one hand, the tension of sublimate vapor being extremely feeble, this antiseptic

¹ See Vallin. "Traité des désinfectants et la désinfection." Paris, 1883, p. 390.

² The following solutions are employed:—

Chloride of zinc	5 or 10 to the 1000.
Chloride of lime	5 to the 100.
Carbolic acid	2 to the 100.

Washes with potash were very serviceable in an epidemic which occurred at the Maternity connected with the hospital Tenon. They were used by direction of MM. Hallopeau and Stakler. (*Union Médicale*, 7 oct., 1880.)

does not act at a distance ; and, on the other, the quantity of corrosive sublimate remaining attached to the wall is infinitesimal.¹

These considerations refer to the disinfection of a room, the floor of which presents a smooth surface, mortar, bitumen, etc. But in the majority of hospitals we find wood flooring, the numerous and deep cracks of which seem to be nests prepared to collect and preserve the dust of the atmosphere. Without doubt, the best method would be to abolish wood flooring, but this *desideratum* is scarcely to be obtained.

It is urgently demanded, even when the patients who had been treated in such rooms did not present any symptom of fever or infection, to wash, brush, and sponge with the greatest care these floors by making use of a solution of potash or of bichloride of mercury. In all cases the floors of the rooms should be coated with wax.

Fumigations.—Certain authors, M. Vallin among others, consider washes only half measures, and that fumigations are much better calculated to disinfect in a thorough manner the rooms of sick persons. To speak truly, the most certain means of destroying all germs existing in a confined space, would be to raise the temperature of the atmosphere to 150° (C.); but this method is by no means practicable for the rooms of invalids. If we wish to act effectively with fumigations, we must have recourse to the employment of vapors capable of destroying organic matters.

The researches of Miquel² have demonstrated that antiseptics which act energetically in a liquid state, possess only a trifling influence in a gaseous form. This is true, for example, with the vapors of—

Chloroform,	Sulphuret of carbon,
Carbolic acid (cryst.),	Hydrocyanic acid,
Chloride of lime,	Sulphurous acid gas,
Camphor,	Ammoniac gas.
Ether,	

These were shown to be incapable of killing bacteria which were submitted to their action, although the contact lasted from fifteen to twenty days.

These are the conclusions to which this author has arrived :³—

“Vapors of iodine, bromine, chlorine, hydrochloric acid and subnitrous acid, justly praised by MM. Ch. Girard and Pabst, have completely destroyed all germs at the end of a space of time varying from a few hours to ten days.

¹ In the Tarnier pavilion, whenever a room is vacated by a woman who has had fever, the floor is given a second washing with a 5 per cent. carbolized solution.

² Miquel. “Des organismes vivants de l’atmosphère.” *Th. de Paris, 1883*, p. 298.

³ *Ibid.*, p. 299.

“Chlorine, when properly dry, acts with the greatest difficulty, and I have found germs still alive in dust which had been submitted to its corrosive action for eight days. Bromine, hydrochloric acid and nitrous gas are more violently destructive of germs. According to my experiments, an atmosphere charged by the cubic metre with 5 grams of one of these bodies has the power to remove all fecundity from the seed of *schizomycetes*, when exposed for two days to its action. Vapors of iodine act more slowly; their microbicidal action is complete only at the end of eight or ten days.”

We see how limited is the number of bodies to which we can have recourse. We will find in the work of M. Vallin a very complete description of the different operative procedures which ought to be employed. We cannot pursue this subject further; let us say, however, that fumigations are so injurious to the furniture, etc., contained in the rooms, that they are disagreeable to use.

CONCLUSIONS.

In general practice, the washings will prove more useful made with pure water or with the addition of antiseptic liquids. It is desirable that the rooms of all maternities be constructed in such manner that frequent and complete washings can be readily applied.

Disinfection of Rooms which contain Patients.—It does not suffice to destroy germs in the absence of patients; it is necessary, also, and this is an absolute rule, to contend against them in rooms occupied by lying-in women. It is very evident that a certain number of the preceding measures are not appropriate in such cases, at least in a practical manner. We could not, for example, propose fumigations with nitrous vapors, etc. The most common practice, as well as most simple, is ventilation, which should be as complete as possible.

The patients must occupy spacious rooms, elevated, receiving the air by large windows, and be exposed freely to sunlight. If many patients are in the same room, ventilators must be introduced which will be capable of renewing the air rapidly. In the Maternity of Bonn these conditions appear to have been accomplished successfully. They have spacious chambers with large bay windows; the ventilating arrangements are well conceived, and, at the same time, the heating apparatus permits a uniform temperature to be obtained in spite of the rapid renewal of air. The ventilation of rooms is secured more certainly by the use of chimneys. The rooms are heated in this manner at the Tarnier pavilion.

In certain hospitals in London open fires are kept burning during the whole year, but this is a costly method for securing ventilation. M. Vallin gives the following advice, which appears to us very prac-

tical and suitable for the rooms of invalids: "In seasons when it is unpleasant to light a fire, we have often obtained a good effect by an extremely simple, and yet efficacious, means. Instead of placing the night lamp upon a piece of furniture, we put it in the chimney place, where it gives sufficient light; at the same time, being continuous, it causes an active ventilation, especially when the opening of the chimney place is large. We have many times assured ourselves that by this means the odor of confined air in the rooms of patients was much less marked the next morning."

In this connection, we ought to mention *atomization*, which, for some time, enjoyed a certain degree of popularity.

Until about the middle of the year 1881, we produced the atomization of carbolized water in the rooms of the Maternity. We used, for this purpose, the same apparatus employed when one performs operations after Lister's method. These atomizations were made intermittently. In some maternities—at Copenhagen, for example, where they are still used—a heavy mist can be seen in the rooms.

These atomizations are useful and act in two ways. First, the molecules of water, being projected in the form of an extremely fine spray, readily fix the dust and germs floating in the atmosphere of the room, and become incorporated with them when deposited upon the walls and floor. Owing to the existence of the slight humidity then produced, the dust is fixed upon the floor or against the walls of the room, and, for a certain length of time, the air of the chamber where the sick woman is confined is freed of the dusts which infect her.

In a word, we produce artificially a phenomenon exactly similar to that which we witness in the free atmosphere after a rain.¹

Atomizations act not only by washing away and fixing germs, but also they destroy them. Indeed, when water is thrown into the air in a state of minute subdivision, each of the little drops combines with oxygen. Certain authors have thought that, in this way, germs washed away by the aqueous mist will be destroyed more readily, and that the destructive power of the vapor of water will be increased if we would use an antiseptic solution of carbolized water, 1 to 30 or 1 to 20, for example.

Perhaps this second mode of action is a little too hypothetical; but it is none the less true that, thanks to their first mode of action, atomizations are capable of rendering good service. Even when making use of carbolized solutions, patients do not experience the

¹ See Pierre Miquel. "Etudes sur les bactéries de l'atmosphère." *Annuaire de Montsouris*, 1881.

— "Les organismes vivants de l'atmosphère." *Th. de Paris*, 1883.

least inconvenience, provided the substances employed are chemically pure. We could employ with advantage those antiseptics having an agreeable odor, such as the essence of wintergreen.

Nevertheless, a considerable number of obstetricians have abandoned their use.

At present, in the Maternity and in the Charity Hospital, they have recourse to the *vaporization* of carbolized water. M. Tarnier, after his visit to England, adopted the practice of Dr. Fancourt Barnes, and instead of using atomization, he has had placed in the rooms at the Maternity a series of pots, which are kept filled with carbolized water and continually boiling. Although these vapors have quite a disagreeable odor, the patients do not make any complaint. However, if we will revert to the experiments we have quoted, from which it is shown that vapors of carbolic acid have no microbicidal action, we will conclude it is more rational, at least in the present state of science, to prefer atomization, and to place only a feeble confidence in carbolized vaporizations.

To sum up in a few words the details into which we have entered, we would say that, in simple cases, when there was no infection, thorough airing and ventilation will be sufficient generally for those isolated in a maternity and for patients cared for in a city; but if the condition has reference to patients crowded in the same room, or to patients isolated, but suffering from fever, it will be necessary to make the disinfection more perfect by the atomization of water, to which we will add, in case of need, some carbolic acid. If the construction of the rooms permit it, we will find it to our advantage to wash the walls with an antiseptic liquid, as is done at the Maternity.¹

B.

DISINFECTION OF THE FURNITURE.

It does not suffice to disinfect the rooms; we must give attention also to their contents. We can wash the rooms while the beds, bedding and different articles of furniture remain in place; but, however little we make use of disinfectant fumigations, we must remove the bedding and most of the furniture to prevent serious injury being done to them by the substances employed.

¹ In this connection, we should at least mention the method proposed by Rabot, of Versailles (*Méthode d'assainissement des hôpitaux par l'oxygène, Gaz. hebdomadaire, 1871*). This author has obtained excellent results by forcing large quantities of oxygen into the rooms occupied by the wounded. This method of purification appears to exert a favorable influence upon the healing of injuries.

Whatever method we adopt, it is necessary, under all circumstances, to give special attention to the disinfection of the furniture contained in the lying-in room. We will say nothing about curtains, because now they are abolished from the beds of invalids. It would be wise, also, to remove curtains from the windows, being content to substitute for the ordinary panes some of rough glass.¹

We believe it our duty to call attention particularly to the disinfection of the night tables and bedding. We know that too often, in our Parisian hospitals, the night tables are used by the patients to hold their eatables, clothes, etc. But, whilst admitting that this custom has never been sanctioned, we know that it is very difficult to obtain a perfect disinfection of these articles of furniture. Without doubt, the best method would be to abolish them, as is done in a large number of foreign maternities. Meanwhile, if we retain them, it is scarcely possible to secure complete disinfection unless we employ night tables like those used at the Tarnier pavilion.² With these, a simple washing with pure water is sufficient; but, if it is desired to obtain absolute disinfection, an antiseptic solution can be used.

BED, BEDDING.—All obstetricians have felt the want of a bed that can be disinfected in a simple manner. In certain maternities, at Bonn, for example, the beds are constructed of a simple iron framework, upon which is placed a straw mattress. In other maternities, as at Vienna, a light mattress, which is changed with each patient, is placed upon a bed having a lattice work of iron-wire. At the Obstetrical Clinic in Paris the bed is very similar to that used in the majority of our hospitals. The most ingenious arrangement, and one which, while giving patients a comfortable bed, allows easy and rapid disinfection, is that which is adopted at the Tarnier pavilion.³

Whatever kind it may be, it is always necessary, before a patient is placed in the bed, to have it disinfected by washings with pure water or with an antiseptic solution.

But we should especially look after the complete disinfection of the bedding.

¹ This method is employed at the Charity Hospital, in M. Budin's service.

² These night tables are constructed of iron, and can be taken to pieces rapidly and be perfectly disinfected.

³ At the Tarnier pavilion, oat-chaff is used to fill the mattresses; at Dresden, ordinary straw; in some maternities, wheat straw. The oat-chaff appears preferable. The contents of these mattresses ought to be burnt in every case if the patient has suffered from puerperal infection. The ticking should be carefully washed before being dried. At the Brussels Maternity the ticking is washed with carbolized water.

All these details will appear, perhaps, superfluous,¹ but we are firmly convinced that the brilliant result obtained at the Tarnier pavilion (not a single death having occurred since June, 1880) is, in great part, due to the employment of all these little measures.

In some maternities, at the Tarnier pavilion, at the Strasbourg Maternity in charge of M. Freund, in some of the rooms of the Brussels Maternity, at the Maternity of Rouen, and at that of Dresden, the patients lie upon a simple straw mattress, which is changed after the departure of each woman.

Ordinary mattresses should be entirely prohibited. If they are used, we must never rest satisfied to simply card them after the departure of each patient, as was done recently at the Paris Maternity, and as is done still at the Prague Maternity.

Whilst an interne at the Maternity, we collected one day the dust which arose from the wool beaten by the carders. After having cultivated the germs collected in this way, we inoculated a rabbit, and it succumbed rapidly to septicæmia. This occurred, it is true, from a mattress which, for more than twenty years, had never been submitted to any other means of disinfection than beating, and which had been used indifferently for well and sick women. Any mattress that has been used by a puerperal woman ought to be carried to the drying room, and there submitted to a temperature which would destroy all germs that may be contained within its interior. It is necessary to take the same precautions with the coverlets and with the sheets; in fact, all the linen used in maternities should be washed separately and passed to the drying room.²

¹ The following instance is communicated by M. Budin, and it proves that we can never take too much precaution:—

“At the time that I came on service, a midwife had just lost a woman in her clientèle. No cases were sent from the hospital to this midwife’s care for fifteen days; all the linen was washed, the mattress was carded, and the apartment was left open night and day.

“She then received three women. The one placed in the room in which the patient had died, had fever, but recovered; the other two women passed a normal lying-in. Three more women were received by this midwife. The one placed in the room in question had fever; the others did well. In attempting to find a cause for these accidents, I learned that every night the midwife’s servant made her bed and slept in this room. She would remove her bed the next morning. I directed: 1st, that the servant should not sleep in this apartment any more; and 2d, that the floor be washed with a carbolized solution.

“Since that time there has not been any other case of sickness in this house, and the midwife washes her floors, and is convinced of the utility of antiseptic measures.”

² We should bear in mind those experiments by which Tyndall demonstrated that *germ corpuscles* easily resist a temperature of 100° (C.). In order to destroy them, it

C.

ANTISEPTIC PRECAUTIONS WHICH SHOULD BE TAKEN BY MEDICAL ATTENDANTS AND ASSISTANTS.

We have shown, at the commencement of our work, that contagion was often recognized as the cause of septicæmic accidents affecting puerperal women. We believe we have given sufficient proof of this fact.

It is sufficient to recall the facts which were reported during the discussion that took place in 1858 at the Academy of Medicine, upon the origin and nature of puerperal fever. Those facts, and numerous others which have been reported since, have demonstrated irrefutably that only too often does it become necessary to accuse the physician of being the medium of conveying the contagion.

Already has Danyau pointed out all the precautions that an obstetrician should take when, in his clientèle, he is called upon to treat women suffering from puerperal septicæmia. "I think it is his absolute duty, whenever a case of puerperal fever occurs in his practice, to be doubly careful of his person, to change his garments often, to have them aired, or, following the method of Bush, to submit those recently removed, if necessary, to the action of a high temperature. He should employ disinfectants freely, especially in cases where his fingers have been in contact with the morbid secretions; he should not multiply his visits to the case unnecessarily, but, in order that his patient may not be neglected, a well-informed pupil must be kept near, who will supply his place in all the duties that can be intrusted to him. The obstetrician should avoid going from her house directly to the houses of other puerperal patients who are doing well, particularly to those who are passing the first days of their puerperium; finally, he should relinquish his obstetric practice for a time, if, in spite of all these precautions, the disease continues to spread among his patients."¹

The advice of Danyau, which, in 1858, appeared greatly exaggerated, at present would be considered not sufficiently prudent.

Now, an obstetrician, when compelled to give his attention to an infected case, should act more radically and cease entirely to attend women in labor; in a word, to imitate the conduct

is better not to use a very high temperature at first. Acting intermittingly and with a lower temperature, we encourage the transformation of the germ corpuscles, which can be more readily killed after they have reached a more advanced stage of development.

¹ Danyau. *Bulletin de l'Académie de médecine*, 1858, p. 562.

of Prof. Hergott, who, during a recent epidemic that raged at the Maternity of Nancy, refrained from attending any case of labor in his private practice, notwithstanding all the antiseptic precautions he employed.

AUTOPSIES.—Ought the obstetrician to make post-mortem examinations? Ought he to visit the dissecting rooms? We have previously shown (pp. 70 and 71) the great danger to which the physician exposed puerperal women when he attended confinement cases after coming from the dissecting room and dead house.

The conditions are particularly hazardous when he has performed autopsies upon women who died of puerperal fever. We know how persistingly the odor clings to the hands when we make an autopsy upon a body that has died of typhoid fever, for example, and we have good reason to ask if it is not better for an obstetrician to give up entirely all such anatomical work, and also whether the advice lauded by Volkmann¹ and by M. Lucas-Championnière is very prudent. The first of these writers says that he has not the slightest fear in making autopsical examinations, or in performing, during six months of the year, all the operations of a course of operative surgery, and to execute afterwards, in his service, the most complicated operations. He is content to practise rigid disinfection. The second author is no less positive in his statements: "We take a thousand useless precautions and neglect one. If an interne knows how to purify himself properly, he can attend to all his duties; perform autopsies as he should do; dissect, and examine patients without danger. If he is careless about antiseptic precautions, it will be useless to condemn himself to quarantine: a time will always come when he will infect his puerperal patients. People who never make post-mortem examinations often kill many more victims than anatomists who are careful in the use of antiseptics," Thanks to antiseptics, these surgeons can prevent grave accidents; but we think, nevertheless, that the better antiseptic method is for the physician not to touch bodies loaded with septic matters, and it is wiser for the obstetrician to give up entirely the performance of autopsical examinations.

We think, moreover, that the obstetrician ought to refuse to attend women suffering from erysipelas, the relations of which with puerperal

¹ R. Volkmann. "Darf ein Chirurg oder Geburtshelfer Leichenöffnungen vornehmen?" *Cent. für Chir.*, 1880, n° 26.

² Lucas-Championnière. "Chirurgie antiseptique." Paris, 1880, p. 219.

fever are now so evident.¹ He will avoid opening abscesses² and attending women affected with scarlet fever, etc.³ We have no fear in expressing this opinion, although there are still many obscure points concerning the relations which exist between certain eruptive fevers and puerperal septicæmia.⁴ There are certain authors, we must admit, who consider all these precautions unnecessary, and who think that, by applying the antiseptic method rigorously, it is possible for an obstetrician to attend cases of septicæmia and other contagious affections.⁵

It seems impossible to apply these rules strictly in maternities, which are visited by a large number of students, or to force them upon the midwives.

In certain maternities the students are obligated not to attend any medical or surgical service while they take the obstetric clinic. In some cities they are excluded from the maternities if found guilty of having infringed this rule. At the Vienna Maternity, which is visited by a very large number of students and young doctors, as, for instance, in the service of Carl Braun, where the greatest freedom is given to physicians, an extremely simple and practical method allows them to trace, step by step, the cases of contagion which may develop. Every student who makes a vaginal examination is required to write his name upon a card placed at the head of the bed. This often enables them to recognize the origin of cases of infection. The students who appear culpable are excluded from the service for a certain time.

As to the midwives, they have distributed among them pamphlets which, in a simple form, teach them the dangers to which they expose women when they visit normal puerperal cases at the same time that

¹ Atthill. *Med. Press and Circ.*, April 25th, 1877.

— Wadsack (de Bensheim). "Epidémie de fièvre puerpérale causée par une sage-femme atteinte d'érysipèle." Stuttgart, 1878.

— J. Crocker. "Erysipelas and Puerperal Fever." *Boston Med. and Surg. Journal*, August 2d, 1877.

Voyez l'article "Erysipèle" du dictionnaire de Jaccoud.

² F. P. Tuckey. *Med. Press*, October 2d, 1878.

³ G. Griffith. *Med. Press*, January, 1879,

— The unity of the poison in scarlet fever, puerperal fever, typhoid fever, diphtheria and erysipelas. *Obstet. Jour. of Great Britain and Ireland*, No. 65, 1879, p. 424.

⁴ Walker. *Brit. Med. Jour.*, January 10th, 1880.

⁵ Th. Dolan. *Obstet. Journ. of Great Britain and Ireland*, No. 68, 1878, November, p. 465.

they attend those who are ill. In a certain number of cities, in Dresden, etc., they have made special regulations on this subject.¹

In other cities the midwives are compelled to relinquish their duties entirely whenever one of their puerperal cases is attacked with septicæmia.² In England they go still further, and have prosecuted a midwife who communicated puerperal fever to a number of her patients. She continued to practise, although warned by a surgeon not to take care of any women for two or three months. Other women succumbed. In spite of the advice of another surgeon, she persisted in practising obstetrics. Another death occurring, she was accused of homicide from imprudence and condemned to six months' imprisonment by the Salford court.³ Without wishing to be too severe upon the midwives, and causing them to suffer penalties for this new crime, which we might call "homicide by infection," it would seem wise to follow the example set by Germany and repeat unceasingly to the midwives the importance of the measures required of them.⁴

¹ Roth. "Sur la prophylaxie de la fièvre puerpérale." *Bair. ärztl. Intelligenzbl.*, 1877, n° 7.

— Weisl. "Die antiseptische Behandlung während des Wochenbettes, etc., besprochen für Hebammen." Prag. Grégr. et Daftel, 1878.

— Weber-Ebenhof. "Das antiseptische Verfahren in der Geburtshülfe. Ein Leitfaden für Geburtshelferinnen und Belehrung für Frauen." Prag. Fr. A. Urbanek, 1880.

— Böhr. "Untersuchungen über die Häufigkeit des Todes im Wochenbette in Preussen. Ihre Ursachen und ihre Consequenzen für die Sanitätspolizei. Bericht, erstattet im Auftrag der Puerperalfieber Commission der Gesellschaft für Geburtsh. und Gynäkologie in Berlin." Stuttgart. F. Enke, 1878.

— Winckel (Dresden). "Die Thätigkeit der Geburtshelfer und Hebammen des Königreichs Sachsen im Jahre, 1878. Das Vorkommen des Puerperalfiebers in den Medicinalbezirken Sachsens, nebst Vorschlägen zur Verhütung und gegen Verbreitung des Kindbettfiebers in Privatwohnungen (mit 9 Tafeln und 1 Karte Sachsens). Berichte und Studien aus dem K. sächs." *Entbindungs und Gynäk. Institut*, Bd. III.

— Prof. Splöndlin. *Correspond. Bl. für schweiz.* Aerste, 15 octobre, n° 20, p. 588, 1875.

— H. Fehling. "Über den praktischen Werth und Modus des Desinfektions-Verfahrens in der geburtshilflichen Praxis, speciell der Hebammen. Jahresbericht der Stuttgarter Entbindungsanstalt." *Würtemb. med. Correspondenzblatt*, 1880.

² Ahlfeld (Leipzig). "Was hat die Zeitweise suspension der Hebammen als Prophylaktikum der Puerperalerkrankungen für eine Bedeutung?" *Cent. für Gyn.*, 1880, p. 374.

— Winckel. "Instruction für die Hebammen zur Verhütung des Kindbettfiebers," 1^{er} avril, 1880, paragr. 10.

³ *Obstetrical Journal*, May, 1875, p. 93.

⁴ ["The police authorities in Berlin have published an order requiring physicians to give written notice to the sanitary board within twenty-four hours after the diag-

The clothing, and above all those of cloth, are particularly liable to retain any germs with which they may come in contact. An excellent plan, adopted by some foreign maternities and by that of Paris, requires all persons whose duty it is to take care of the sick to be clothed in linen blouses—garments which show the least stain upon them, and which are easily and rapidly disinfected. In some cases suspected persons are compelled to enter into a sort of disinfecting chamber before going into the rooms occupied by the patients. This practice is followed at the Copenhagen Maternity with great care.¹

We ought to insist particularly upon the importance of disinfecting the hands. Although there is no reason to show that this is the chief point of the antiseptic method, what we have said upon the causes and mode of propagation of puerperal septicæmia clearly points out its importance. Before every examination the obstetrician or midwife should carefully wash their hands with soap and bathe them a second time in some antiseptic liquid, whether they have or have not examined previously a woman suffering with puerperal fever. All obstetricians agree in the wisdom of directing pupils and midwives to clean the finger nails with the greatest care, using for the purpose special brushes. This advice is based upon good ground, because matters capable of retaining germs readily accumulate around and under the nails. Basins of cold and of warm water should be kept in every obstetric service, and the pupils ought never to fear that excess of cleanliness which alone prevents the transmission of contagious matter.²

We have said that the obstetrician ought to employ an antiseptic liquid. We cannot describe here all the antiseptic substances which answer the purpose, inasmuch as we have discussed already the value of the different antiseptics. Usually we have had recourse to carbolized solutions, the strength of which varies from two and three to five per cent. We have pointed out all the objections resulting from the use of carbolic acid, and will not repeat them.

Solutions of boracic acid, the essence of gaultheria, and above all the solution of bichloride of mercury, 1 to 1000, can be substituted for it with advantage.

nosis of the disease, in every case of puerperal fever, whether followed by death or not. The name of the midwife in attendance is also to be given." *Med. and Surg. Reporter*. Phila. Vol. LV, No. 17, p. 544.—F.]

¹ Stadfeldt, M. D. "Les maternités, leur organisation et administration." Copenhagen, 1876.

—O. Marchionneschi. *Lochiazione, Annali di Ostetricia*, Vol. III, p. 685 et Vol. IV, p. 18.

² The organization of the Prague Maternity is perfect in this respect.

These precautions should be taken likewise in the private practice of every physician. In order to remove from midwives all excuse for not employing the antiseptic method, there are some German cities where they are wholly unselfish of the amounts expended to procure the necessary antiseptics.¹

Rigid antiseptic measures must be adopted to disinfect whatever instruments we may have occasion to use in the performance of obstetric operations. They will be mentioned later.

¹ Dr. Reinstaedler. "Vorschläge zur Einführung der obligatorischen Antisepsis für die Hebammen." (Vierteljahresbericht für gerichtliche Medicin und öffentliche Sanitätswesen, von H. Eulenberg, octobre, 1882, t. XXXV, p. 323.)

CHAPTER V.

HYGIENE OF THE PUERPERIUM.

CARE OF THE PREGNANT WOMAN—CLEANLINESS AND ATTENTIONS TO THE TOILET—SHOULD SHE EMPLOY VAGINAL INJECTIONS?—ATTENTIONS TO GENERAL HEALTH—IMPORTANCE OF TREATING AFFECTIONS THAT ARE APPARENTLY TRIFLING.

In the majority of maternities, even in those of recent construction, and in which the antiseptic method is carried out rigorously, pregnant women are placed in rooms too small for the number of patients they should contain. This is very wrong. During their pregnancy, women in maternities should be the object of as much care as the puerperal cases. They ought to be completely isolated from the latter. We have been astonished to see, as in the Maternity of Bonn, for instance, pregnant women utilized as nurses in the rooms of women recently confined.

Pregnant women should not neglect to secure cleanliness of their person by bathing, and the ordinary attentions of the toilet must not be overlooked.

Ought they to take antiseptic vaginal injections? This method of treatment, praised by some authors,¹ has given rise to accidents. It is preferable to reserve them for those cases in which the patients suffer from vaginitis. Here the local treatment acts less in the interest of the mother than in that of the child, who is exposed to the danger of purulent ophthalmia. We will refer to this subject later.

We will say nothing of the appearance of the rooms, or of the *personnel* attached to the pregnant cases. This point has been insisted upon sufficiently, and it is useless to revert to it.

The indications mentioned are most simple; but, by the side of them, there are other attentions which, although they act only indirectly, ought never to be neglected.

It is necessary that every pregnant woman should be in the best general state possible. During pregnancy, we ought not to treat with neglect any of those indispositions which are often indicative of local affections as yet latent, but which are capable of creating, after labor, complications of great gravity.

An example will better explain our meaning: Take a woman in good

¹ Stadfeldt. "Über prophylaktische Uterusausspülung mit Karbolwasser post-partum." *Cent. für Gyn.*, 1880, p. 145.

health; she is confined; she is attacked with symptoms of septicæmia of slight gravity. Thanks to the treatment employed, she recovers. Let us imagine, now, that she is not in such good condition; is predisposed to some intermittent affection, to diabetes, or to a local trouble, an old but latent hepatitis, for example. We will witness her recovery from the septicæmia, but after some days grave symptoms will develop near organs which were previously diseased and which offer less resistance. Often such women, after having recovered from the septicæmia, will succumb to these later complications.

CHAPTER VI.

ANTISEPSIS DURING LABOR.

ANTISEPSIS DURING NATURAL LABOR—USE OF CARBOLIZED OIL AND VASELINE—ANTISEPTIC VULVAR AND VAGINAL DOUCHES—ANTISEPTIC SPRAY—PRECAUTIONS WHEN FETUS IS DEAD—ANTISEPSIS DURING ARTIFICIAL LABOR—THE TAMPON—VERSION—FORCEPS—EMBRYOTOMY—ARTIFICIAL PREMATURE LABOR.

This subject is of special importance when it refers to women who are confined in maternity hospitals. Obstetricians have questioned the advisability of maintaining special rooms for the delivery of women who, as soon as their labor is completed, will be removed to other beds, which they will occupy during their lying-in. At the Tarnier pavilion, the patients occupy the same room and remain upon the bed they used in their confinement. At Brussels, the women remain in the room in which they are delivered, but lie upon a special bed, which is carried from room to room. At Strasbourg, the labor is conducted in an *accouchement* room, and when completed the patients are placed upon a sofa until the bedding and linen are changed. At the Paris Maternity, at the Obstetrical Clinic, and at the Vienna Maternity, the number of deliveries occurring daily is so great that complete isolation during labor would necessitate a large number of attendants and assistants, and also would impair the advantages for instruction.

Accouchement rooms can be maintained, provided the attention for securing disinfection of which we have spoken is given as rigidly here as in the lying-in rooms.

In the majority of maternities, the women are required to take a bath and to change their clothing when they enter the *accouchement* room; this is a good practice. Throughout the labor, the physician should pay strict attention to antiseptic precautions, the good or bad progress of the puerperium depends upon it.

In this chapter we propose to study successively :—

- A. Antiseptis during natural labor.
- B. Antiseptis during artificial labor.

A.

ANTISEPSIS DURING NATURAL LABOR.

Never, and this is a rule without any exception, will we introduce the finger or hand into the genital passage, without previously having washed them in an antiseptic solution: carbolic acid, corrosive sublimate, etc.

We have stated that the finger of the obstetrician was often the vehicle of the contagious principles. The best antiseptic precaution will consist then in practising the vaginal touch as little as possible; we will do so only when it becomes necessary to establish a correct diagnosis, or to follow the progress of labor during the expulsive stage. The finger should always be covered with a fatty substance, with which we will incorporate some antiseptic. Carbolized oil, in the strength of 10 or 15 per cent., and carbolized vaseline, are generally employed. Vaseline is very convenient, and can be kept almost indefinitely. But is carbolized oil an antiseptic? Koch has shown by a series of experiments that the spores and bacteria of charbon were not influenced or altered in any manner after having remained in carbolized oil for more than three months. A different result was obtained if they were immersed in carbolized water.¹

We have seen how variable was the power of antiseptic agents, according to the nature of the ferment upon which they acted. Consequently, we may not consider the experiments of Koch as being conclusive with reference to the ferments of the septicæmia of lying-in women.

Carbolized oil must not be considered as the only antiseptic agent to which the obstetrician should have recourse. Vaginal injections with a solution of carbolic acid or corrosive sublimate are much more powerful and certain means; but, until new researches have definitely fixed this point of practice, we think that the addition of a certain amount of carbolic acid to the fatty substance employed is desirable. Fehling, indeed, has noticed that, since he has had recourse exclusively to the use of carbolized oil, he no longer observes any whitelows, which formerly were so frequent among the *personnel* of the Maternity, especially when they examined women suffering from vaginitis, metritis, and cancer of the neck with profuse secretion.²

¹ Koch. "Mittheilungen des kaiserlichen Gesundheitsamts," 1881, et *Berliner Klin. Wochenschrift*, 1881, n° 5.

H. Fehling. "Soll Karbolöl (Vaseline) in der geburtshilflichen Praxis beibehalten werden?" *Cent. für Gyn.*, 1883, p. 153.

Volkman. *Deutsche Zeitschrift für prakt. Medicin*, 1877.

Zweifel. "Du catgut comme agent d'infection." *Cent. für Gyn.*, 1879, p. 295.

Hausmann. "Ueber die Anwendung des Karbolöls in der Geburtshilfe." *Cent. für Gyn.*, 1883, p. 217.

Hausmann. *Berliner Klin. Wochenschrift*, 1878, n° 44.

Bernhardi. *Berliner Klin. Wochenschrift*, 1878, n° 26.

² It is well to remember that carbolic acid does not mix as well with solid fatty substances, vaseline, for instance, as with oil. Carbolized vaseline of 4 per cent. strength often occasions a painful sensation of heat when applied to the vulva. This

Is it necessary to give vaginal injections during labor? Authors differ in opinion upon this point. Some, as Spiegelberg,¹ think that infection always comes from without, and as the infectious germs are deposited upon the external genital organs, it is necessary, before any examination, to wash the external genital organs and adjacent parts with carbolized water. When we wish to make an examination, we should, before and after doing so, give a two per cent. carbolized injection into the vagina.

For fear the labor may be of long duration, and even when no operation is indicated, Fehling² recommends the use, every one or two hours, of a vaginal injection of carbolized water from one to three per cent. strength. This plan, highly spoken of by Fritsch,³ Bischoff,⁴ and others, is employed regularly in some maternities, as in that of Copenhagen.⁵

When describing the antiseptic procedures employed at the Paris Maternity, we mentioned that, in M. Tarnier's service, vaginal injections were practised on a large scale in every labor, even when all seemed to be progressing normally.

It is a trifling operation which should be made always in maternities, and especially in those where, for purposes of instruction, each woman is compelled to be examined by several persons. It is indispensable when any complication renders operative interference necessary.

We will consider later the question as to whether vaginal injections should be practised during the normal puerperal state, and when there does not exist any wound of the mucous membrane of the vagina or vulva. We cannot make any serious objections to their

unpleasant sensation is much less marked when we employ carbolized oil of 5 and even 10 per cent. strength. This objection ceases with the use of boracic and benzoic acids. The proportion of boracic acid can be double that of carbolic acid without causing the least inconvenience.

¹ Spiegelberg. "Die Entwicklung der puerperalen Infektion." *Berliner Klin. Wochenschrift*, 1880, n° 22.

² H. Fehling. "Ueber den praktischen Werth und Modus des Desinfektionsverfahrens in der geburtshilflichen Praxis, speciell der Hebammen. jahresbericht der Stuttgarter Entbindungsanstalt." *Wurtemb. med Korrespondenzblatt*, 1880.

See, also, by same author. "Ueber den Werth eines antiseptischen Verfahrens in der geburtshilflichen Praxis Versammlung des Arztlichen Bezirksvereins zu Ludwigsburg." *Med. Corr. Bl. des Wurtemb. Arztl. Ver.*, 18 Nov. 1877.

³ H. Fritsch. "Sur la fièvre puerpérale et son traitement local." *Samml. Klin. Vorträge*, 1878, n° 107.

⁴ Bischoff. *Corresp. Bl. f. Schweizer Aerzte*, 1875.

⁵ See page 78.

use during labor. Vaginal injections employed at such times have never given rise to the slightest accident, and women do not complain of them.

We should add, however, that this harmlessness ought not to exempt the physician from taking a certain number of precautions that are too often forgotten, and to which we cannot refer too frequently. We should never employ those instruments so commonly used in France and known by the name of clyster-pumps. This apparatus gets out of order easily, and is always dirty. It also has the objection of projecting the liquid with too much force and often in an irregular manner, besides allowing the entrance of air.

It is preferable to use Hégar's funnel, or a vessel of any description, for a reservoir, which should have an opening at the lower part for the attachment of a soft rubber tube. When the reservoir is elevated above the woman's pelvis the fluid flows in a regular stream and without the admixture of air. A stop-cock placed at the middle of the tube or near the nozzle permits an easy control of the injection. We cannot insist too strongly that, in order to be useful and not injurious, the injection ought to be made under a very feeble pressure. Our object is only to wash out the vagina. We ought never to place the reservoir higher than 20 or 25 centimètres (8 or 10 inches) above the patient's pelvis. Under such conditions we can employ very copious injections. We obtain better results by passing great quantities of water under feeble pressure than by projecting a small quantity of liquid with force. In each injection, practised according to the preceding rules, from 1 to 2 litres (2 to 3½ pts.) of the antiseptic liquid can be employed.

Let us say, once for all, that it is always imprudent to use the same gum nozzle for different patients. Glass canulæ are preferable; they are easily cleaned, and can be destroyed when they have been used to wash out an infected case.

The antiseptic substance selected varies with the fancy of the physician. For our part, we give preference to a solution of bichloride of mercury, 1 to 2000, which is more active than a carbolized solution of 2 per cent. strength. It is not at all irritating, does not produce any symptoms, and gives greater security. If we should select any other antiseptic, it would be necessary, of course, to proportion the quantity according to the power of the agent we employ.¹

In some maternities, atomizations with a carbolized solution are used during the expulsive stage. The women are delivered under the

¹ G. Johnson. "The dangers of vaginal injections." *Md. Med. Journ.*, Dec. 1877.

spray. Fritsch¹ advises this plan in maternities where puerperal fever rages. This is likewise the opinion of Winckel.²

The authors who have adopted this procedure, and notably Stadfeldt,³ speak of it with the greatest praise, and attribute to it in great part the good results they have obtained. Fehling has thought that atomization would seem to favor consecutive hemorrhage; besides, it is painful for women to be exposed in this way for so long a time. The use of the spray is also very disagreeable for the operator, and necessitates the employment of an apparatus that can scarcely be made use of except in the best conducted maternities.

Finally, the use of the spray is perhaps in itself irrational.

Hégar, indeed, has shown that atomizations intended to wash away the dust contained in the air, throw a column of vapor upon a region which is to be the seat of an operation, and thus direct toward this region all the germs that are brought under the influence of the spray. We will defeat, in this way, the object we seek.

At the Paris Maternity women are not delivered under the spray, but, to protect the external genital organs from germs, M. Tarnier formerly recommended to lubricate the posterior commissure of the vulva with carbolized oil when the head commenced to distend the perineum.

This method was afterwards adopted by Prof. Weber at Prague. At present, in M. Tarnier's service, they are content to give vaginal injections according to the rules we have pointed out, and the results obtained are excellent.

WHEN THE FÆTUS IS DEAD.—We have studied antiseptic in natural labor when the infant is living. If the product of conception is dead, there are certain precautions it is prudent to take, because there is always the fear that putrefaction may exist. Statistics show the importance, in such instances, of doing all that is possible to lessen the dangers of infection.

In order that a dead foetus contained within the uterus can putrefy, it is absolutely necessary for air to penetrate to the ovum.

Whenever, during labor, we shall have recognized that the foetus be dead, we will do all in our power to avoid premature rupture of the bag of waters. We will rupture it only when certain of our ability to terminate labor rapidly.

If the membranes be already broken, we will proceed to end the

¹ H. Fritsch. *Samml. Klin. Vorträge*, 1878, n° 107.

² Winckel. "Die Pathologie und Therapie des Wochenbettes." Berlin. A. Hirschwald, 1878, 3 aufl.

³ Stadfeldt. "Des Maternités."

labor as soon as possible. If the state of the neck of the uterus will not permit it, it will be necessary to have recourse to antiseptic vaginal injections. We will take care to repeat these often and to make them copious.¹

B.

ANTISEPSIS IN ARTIFICIAL LABOR.

When, during labor, some complication arises requiring operative interference, the obstetrician should apply the antiseptic method in the most rigid manner.

We will not repeat the many different procedures at his command, as the details into which we have already entered would seem sufficient.

We will be content to limit ourselves to a brief description of special rules to be observed in some of the obstetrical operations.

1st. THE TAMPON.—The most frequent indication for tamponing the vagina is in case of hemorrhage from vicious insertion of the placenta. This was done formerly by using lint obtained from pieces of old and worn-out linen, and, without being submitted to any disinfection whatever, they were made into a series of small tampons, each having a thread attached.

In order to tampon the vagina, as large a number as possible of these pledgets was introduced into the canal in such way as to render the escape of blood impossible. Once applied, the tampon was left without disturbance for five or six hours. When removed, an odor, often nauseous, escaped. The patients complained of a painful sensation of heat at the genitalia, and examination with the finger was often very painful. After labor was completed, the puerperal state was usually complicated by grave symptoms, and the death rate from puerperal fever was much greater in these cases. If we consult the statistics given by Muller,² we will see that out of 921 cases of placenta prævia, nearly all of which were treated with vaginal tampon, there were 50 cases of death by puerperal infection.

It is true, we cannot attribute the fatal issue in all these cases to the use of the tampon; the operations rendered necessary to terminate labor come in for a large share of the evil.

¹ See Bamberg. "Tympanites uteri." *Thèse*, Halle, 1877.

— Berger. "Infektion durch abgestorbenen Zwilling." *Hygiea*, 1881.

— Stande. "Ueber den Eintritt von Luft in die Gebärmutter in Verlauf zögernder Geburten und intrauterine Frucht fäulniss." *Zeitsch. für Geb.*, t. III.

² Ludwig Muller. Stuttgart, 1877.

We will see later, the means that the antiseptic method offers us to render less fatal the operations we may be compelled to perform.

At present, let us be content to assert that the tampon, as here practised, cannot but be injurious. We will understand this readily, if we refer to what has been said about the disinfection of linen in maternities, and if we stop to consider that the lint used in these cases came from worn-out linen that was not disinfected. These pledgets were filled with microbes. To avoid this danger, it has been proposed to tampon the vagina by means of rubber balloons, which can be disinfected easily.

Gabriel's balloons and Braun's colpeurynters have been employed. Unfortunately, even if these means better fulfilled the demands of the antiseptic method, we must recognize that they often adapt themselves badly to the parts, and the immediate object sought, the arrest of hemorrhage, is not attained. Necessity compels us to return to the tampon, such as was used before, but modified in a manner to render it possible to guard patients from septicæmia. With this object in view, it has been proposed to place the vaginal tampon in the interior of a sheath composed of gold-beater's skin or of India rubber. This method has not been adopted.

The following is a very simple procedure which seems to answer every indication. First, we give a vaginal injection with carbolized water, or a solution of bichloride of mercury, 1 to 1000, in order to wash away from the vagina any blood-clots that may have been retained. At the Maternity, the pledgets of carbolized lint are kept in a tightly-closed bottle.

We will always have a tendency to distrust lint. At present, we use *hydrophile* wadding, which it is easy to render antiseptic either with carbolic acid, boracic acid, or a solution of corrosive sublimate, 1 to 1000. Tampons made with this substance are well applied; the blood, penetrating it, coagulates, and we can thus guard women from septicæmia, whilst acting in an energetic manner against the hemorrhage.

No matter how carefully the tampon has been applied, it should not remain too long; twelve hours at the most.

Finally, when the tampon is removed, it is necessary, before doing anything else, to give a large vaginal injection with a solution of bichloride of mercury, 1 to 1000.

2d. VERSION.—In version by internal manipulation, we introduce the entire hand and sometimes a part of the forearm into the cavity of the ovum. Consequently, we should be doubly careful in the disinfection of the hands. Before commencing the operation, we should irrigate the vagina with an antiseptic solution. Ought we to give an

intra-uterine injection after the operation is completed? We do not think so, at least in cases where the operation has been performed easily and without the occurrence of any accident. In fact, the hand is introduced, in these cases, not into the uterine cavity, but into that of the ovum, the walls of which (amnion, chorion) are intact except at one point, and constitute a kind of division wall. Also, when the infant has been extracted, it is better to wait, and not give an injection into the interior of the ovum, for that would effect nothing. When the placenta, membranes, etc., are removed, we can content ourselves by giving a vaginal injection with an antiseptic solution of carbolic acid, boracic acid, or bichloride of mercury.

3d. FORCEPS.—We will refer but briefly to the application of the antiseptic method to the forceps operation. We believe that all the details into which we have entered up to the present, are sufficient to teach the operator the importance of having carefully washed his hands and brushed his nails with an antiseptic liquid.

The instrument will have been washed and brushed with a strong antiseptic liquid. An objection to these solutions is that they act energetically upon steel, and remove its polished surface, but this can be overcome by using nickel-plated instruments. But what we cannot insist upon too strongly is, that in every application (which must be preceded and followed by an antiseptic vaginal injection) the best antiseptics consists in operating well, in interfering only when the uterine neck is dilated or dilatable, in placing the instrument in such manner that the extremity of the blades cannot tear the soft parts, and in exercising traction so slowly that the perineum cannot be ruptured.

It does not suffice to direct all our efforts to avoid the transport of injurious germs to the walls of the genital canal, we must strive likewise not to open the door to these germs which, in spite of all our precautions, will be deposited there.

4th. EMBRYOTOMY.—In this operation, the antiseptic method ought to be applied with the greatest care. Here, we operate generally upon a woman weakened by a long labor, in whom febrile phenomena are observed already, and who, too often, has been submitted to repeated and useless operations. Embryotomy is always an operation that is delicate and of long duration; it has for its object the expulsion of foetal substances which are sometimes putrefied, and can become, in themselves, a source of infection to the mother. Under these conditions, it is useless to repeat that the operator should avoid with care the production of lacerations of the vaginal wall or cervix

uteri. An antiseptic vaginal injection will precede and follow the operation, it will be copious and will bathe the uterine neck. All the necessary instruments will have been submitted to a most thorough disinfection.

The operation of craniotomy, by itself, is so simple, that we will say only a few words about it. It is often only a preliminary operation. In this case, before applying the forceps or cephalotribe, we should give a vaginal injection, which washes away the cerebral matter and blood from the vagina and prevents their being conveyed into the uterus.

During cephalotripsy, we should watch carefully that no osseous fragment projects and wounds the vaginal mucous membrane. It is wise to repeat the vaginal injections often, especially if the operation can be completed only after repeated attempts.

In *embryotomy proper*, we will increase our antiseptic precautions, particularly if the fœtus has been dead for some time, and premature rupture of the bag of waters has permitted foetal putrefaction to become developed. In this case, it is necessary to wash out the vagina often, and to act after the manner of a surgeon who, in a bloody operation, continually bathes the surface of the wound. We have given, in a few words, the principal rules which should be observed by the obstetrician in these operations. In order to demonstrate their importance, it would be interesting to show, by aid of statistics, what was the mortality before the introduction of antiseptics in maternities, and what it is in recent years. Unfortunately, we have not at our disposal any documents which permit us to do so in a sufficiently complete manner. We will be content to refer the reader to the general statistics already given.

5th. ARTIFICIAL PREMATURE LABOR.—There are few operations for the performance of which so many different methods have been proposed as for this one, which has for its object the production of labor. Sufficient attention has not been given as yet to the antiseptic precautions demanded in such cases.

The use of the vaginal tampon, originally advised by Schæller in 1842, has been proposed by some.

We have pointed out how much care must be exercised in order that the application of a tampon may be deprived of its dangers. Let us add that, even if we can set aside these objections, the tampon is too uncertain an agent to make use of when we wish to treat heroically such hemorrhages as are capable of rapidly ending the days of the mother.

We should give our attention particularly to the more common

methods, which consist in producing labor by dilating the cervical canal. In a strictly antiseptic point of view, the plan of Busch is bad, for the dilator expands the neck by tearing it, and the wounds thus produced become so many doors for the entrance of septic germs. If it does not cause any laceration, the dilatation is either *nil* or insufficient.

One of the most common procedures, and, we admit, one of the most certain, consists in introducing a sponge tent into the cervical canal. Since the writings of Bruninghausen (1820), this method has been widely used. Kluge has had recourse to it almost exclusively at the Charity Hospital in Berlin. It is still often used at the Obstetric Clinic by Prof. Depaul. We understand how it is employed; a sponge tent is introduced into the cervical canal, and at the end of a variable time, from six to twenty-four hours, the compressed sponge is swelled under the influence of moisture, and distends the walls of the neck. This method nearly always succeeds. But for some time, we have noticed that women in whom it had been employed were attacked often with puerperal infection. We had reasons for attributing it to the employment of this method, because all obstetricians had been struck with the fetid odor diffused by the sponge tent when it was extracted from the neck. Haussmann, who has studied this subject with much care, has ascertained that the surface of the sponge being in close apposition to the walls of the cervix, adhered to them so intimately that two hours after its introduction it was completely covered with epithelium. Even at the end of one hour and a half, a liquid flowed away that was filled with vibrios and presented all the characteristics of a septic fluid. It is true, we have sought to obviate this objection, which is all the greater the longer the sponge is allowed to remain. For this purpose, we have proposed to employ sponge tents that were previously carbolized and disinfected; but have only slight confidence in this method, which appears to give false security. It has been proposed to enclose the sponge tent in a rubber covering, but by this measure we prevent the swelling of the tent. In short, the sponge tent ought to be abandoned. Moreover, we possess now measures fully as active, which offer, in addition, the advantage of allowing the antiseptic method to be applied with full force.

We will not ignore the fact that, since the work of Van Leynseele and of Grand, a certain number of writers, while renouncing the use of prepared sponge, have recourse to sticks of laminaria. These are just as bad. According to the investigations of Kohn, the liquid in which the laminaria sticks are macerated presents a corrosive action at the end of a few hours, and is filled with germs. We have often witnessed infectious phenomena follow the application of laminaria tents,

and besides, they have the disadvantage over sponge tents of acting less rapidly. The preceding remarks are applicable likewise to the gentian root and to the tupelo.¹

The separation of the membranes with an elastic sound, after the method of Lehman or that of Krause, is compatible with absolute antiseptis, provided we employ only instruments that have been thoroughly disinfected, as with an antiseptic solution of corrosive sublimate.

In connection with this method, we ought to mention the bags of Tarnier and of Barnes, which, while possessing a certain degree of efficacy, do not expose the women to any danger of infection. This is manipulated in the following manner: several hours before the application of Tarnier's bag, it is dilated gradually by injecting slowly into its cavity from 100 to 150 gr. of carbolized water. The syringe used should be perfectly air-tight. A thread is tied around the tube attached to the bag, and the latter, thus dilated, is soaked in strongly carbolized glycerine. The instrument is not withdrawn until we are ready to apply it, when, being emptied, it is fixed upon the conductor and carried up beyond the internal os. Then we inject into its cavity an antiseptic solution of bichloride of mercury or of carbolic acid.

The same precautions should be taken when Barnes' bags are employed.

To repeat, the antiseptic method allows only two kinds of instruments to be employed—the bags and the sounds. These methods are also among the most active, and, thanks to their use, we can consider artificial premature labor as an operation not exposing women to any danger.

¹ Consult Hegar and Kaltenbach. "Die operative Gynäkologie." Stuttgart, 1880.

CHAPTER VII.

ANTISEPSIS DURING THE THIRD STAGE OF LABOR.

IMPORTANCE OF THOROUGHLY EMPTYING THE UTERUS—THE DELIVERY OF THE PLACENTA—EXPRESSION—TRACTION UPON THE CORD—EXPECTANCY—ARTIFICIAL TERMINATION OF THIRD STAGE—DANGERS OF INTRODUCING THE HAND INTO THE UTERUS—TREATMENT OF POST-PARTUM HEMORRHAGE—DELIVERY OF PLACENTA AND MEMBRANES IN ABORTION—DELAY OR IMMEDIATE REMOVAL?—VAGINAL AND INTRA-UTERINE INJECTIONS.

We will divide the study of this subject into two parts: the first relating to a consideration of antiseptic during the third stage of labor at term, and the second will take up the special rules to be observed in cases of abortion.

A.

THE THIRD STAGE OF LABOR AT TERM.

Let us study first the delivery of the placenta and membranes without artificial aid.

It is superfluous to insist upon the necessity of having recourse to the antiseptic method. At the surface of the vulva, upon the vaginal wall, and at the uterine neck, there are found usually fissures, and lacerations which serve often as a door for the entrance of germs. Now, more than ever, the obstetrician ought to take every antiseptic precaution. We have mentioned these so many times (washing the hands, etc.) that the importance of the subject is well demonstrated.

During the third stage, the foetal membranes and the greater part of the serotina vera ought to be expelled. When this stage is terminated the uterus should contain nothing but some clots of blood, which will be rejected rapidly by the first uterine contraction. It is necessary, at any price, to avoid the retention in the uterine cavity of shreds of membrane or of placental débris, because they act as so many foreign bodies ready to undergo putrefaction, and their presence constitutes a perpetual danger for the women.

The conduct of the obstetrician can be summed up as follows:—

Avoid any manipulation that will facilitate the introduction of germs into the genital passages, or that will increase the danger of tearing the foetal appendages, and thus aiding their retention. But how can we obtain this double result? Authors differ in opinion on this point. Some, with Credé, Barnes and others, consider uterine expression as

the best method that can be adopted. Others, again, think that tractions, exercised judiciously upon the cord, are preferable and better avoid the tearing and, consequently, the retention of the membranes. Others still (Kabierske, Freund), believe that all interference during a normal third stage is useless, if not dangerous. The best antiseptic method consists in waiting.

Uterine expression appears to be the method to which we should give preference; in fact, according to the just remark of Abegg,¹ the best antiseptic measure is that which avoids the introduction of the hand into the uterine cavity.

If it were demonstrated that uterine expression secures the complete expulsion of placenta and membranes better than any other procedure, we would claim that Barnes and Credé had rendered a great service by having brought this mode of treatment to the notice of the profession.

Credé believes that uterine expression, performed according to the rules that he has set down,² does not facilitate rupture of the membranes, and he quotes, in support of his opinion, the following statistics: Out of 2000 cases in which his method had been employed, it failed only 96 times to secure complete evacuation of the uterus (the entire chorion remained 18 times and pieces of membrane 78 times).

However, the majority of obstetricians who have practised uterine expression, Runge and Weis,³ among others, have observed that the retention of the membranes was not so exceptional as Credé thought.

It would seem, according to the researches of Dohrn,⁴ that failure is not attributable to the method itself, but to the manner of its application. It appears, indeed, that the later we interfere, the less frequent do the membranes tear; such, at least, is the conclusion to be derived from the statistics given by the writer. If we interfere during the first five minutes, the membranes tear in 8 cases out of 100. Fetid lochia occurs in 18 per cent. of these cases, and fever in 12 per cent.; while, on the other hand, if we wait from fifteen to thirty minutes before employing expression, we observe retention of the

¹ Abegg. "De la délivrance d'après la méthode de Credé." *Arch. f. Gyn.*, t. XVII.

² Credé. *Monatschrift für Geburtskunde*, 1861, p. 274.

— "Sur la délivrance." *Arch. für Gynæk.*, t. XVII, p. 260.

See, also, Germann. *Monatschrift für Geburtskunde*, 1860, t. XVI, p. 345.

³ Weis. "Sur la conduite à tenir pendant la délivrance." *Centralb. f. Gyn.*, 1881.

⁴ Dohrn. "Zur Behandlung der Nachgeburtzeit." *Deutsch. medic. Woch.*, p. 153, 1881.

membranes only once out of 100 cases, and fever with fetid lochia, 3 times in the same number of observations.

This teaches that uterine expression ought not to be employed too hastily, by recognizing which fact can we alone satisfy the double demand already mentioned. What advantage is gained by making tractions upon the cord? All authors agree that tractions ought to be made only when the placenta and membranes are completely separated; they should be employed only for the purpose of facilitating the passage of the placenta through the cervical canal, or to withdraw it from the vagina. We can make these tractions without introducing the finger or hand into the vagina. We have stated that tractions should not be exercised until we are positive that the placenta and membranes are completely separated, but usually we are not able to ascertain this point except by practising the vaginal touch. In this respect, delivery by traction is inferior to delivery by expression.

But ought we to allow the fear of intervention to keep us passive in all cases, and even go so far as to say that the physician should restrain himself from interfering, in order that natural delivery may be normal and spontaneous?

Kabierske¹ professes such an opinion, and asserts that if we have introduced neither finger nor hand into the genital passages, in other words, if we have not conveyed any germ into the uterine cavity, the retention of the placenta or membranes cannot produce any accident. He cites, to this effect, cases observed by Crantz, Plenck and Æpli, cases in which they witnessed the retention of the membranes for four or five days without the slightest symptom resulting.

Such management is imperfect, for we can never have the assurance that antiseptics has been carried out with sufficient care during the labor.

In short, it seems that we will better carry out the indications of the antiseptic method by not interfering too soon. Employed in this way, Credé's method will render the greatest assistance, and it is, perhaps, the one that gives the greatest security. If we should prefer to make tractions, the greatest care must be taken to employ the measures of disinfection that we have pointed out.

When the third stage is terminated, we should endeavor to avoid the retention of clots within the uterine cavity. Ergot is indicated to prevent atony of the uterus.

Artificial Termination of the Third Stage.—When an accident, such as hemorrhage, compels us to interfere for the purpose of completing

¹ Kabierske. *Centralb. für Gynæk.*, 1881, p. 145.

the third stage of labor, we ought not to forget that the introduction of the hand into the uterus to separate the placenta and extract it, constitutes one of the most dangerous obstetrical operations. After this operation we will always give an intra-uterine injection with an antiseptic solution. This will wash away the blood collected within the uterus, and will provoke contraction, often insufficient, of the walls of that organ.

In other cases, the placenta and membranes are expelled or extracted, but we are led to interfere actively on account of hemorrhage from uterine inertia which ergot has not had power to arrest. In these cases, we direct our treatment to the uterus by introducing the hand within that organ or by making an injection into its cavity.

By turns, they have proposed to inject vinegar and water, iced water, hot water, etc. Barnes has recommended the use of intra-uterine injections of perchloride of iron.¹

We do not deny the energy with which this agent acts, but we recognize in it a very dangerous method of treatment. The injection of perchloride of iron, given with all the precautions indicated by Barnes, does not guard against accidents, rare, it is true, and which have been observed after injection with other liquids (sudden death, etc.).² But this mode of treatment is especially dangerous, because the clots formed by the action of perchloride of iron generally remain in the uterine cavity and putrefy with the greatest readiness. Such is the cause of the large mortality observed after the use of injections of perchloride of iron. Torrey,³ who has studied this subject extensively, reports that Ringland has seen one case out of four die after injections of perchloride.

Fritsch goes even further and affirms that recovery is an exception, and adds: "It would be irrational to prevent death by hemorrhage, if treatment prolonged life only for several days." This author had

¹ Barnes. "Obstetrical operations."

— "Injections of perchloride of iron in post-partum hemorrhage." *Obstet. Journal*, 1874.

² Heywood Smith. "Treatment of hemorrhage after labor by injection into the uterus of perchloride of iron." *Lancet*, March 1st, vol. 1, p. 305.

— Cory. "Death from intra-uterine injection of perchloride of iron." *Med. Times and Gaz.*, 1879, vol. 1, p. 383.

— Hermann. "Sudden death during an injection of perchloride of iron into the uterus." *The Obstet. Journ.*, Jan., 1880.

— Snow Beck. "Death from injection of perchloride of iron into the uterus." *Brit. Med. Journ.*, 1874.

³ Torrey. "Intra-uterine injections in Post-partum Hemorrhages." *Boston Med. and Surg. Journ.*, July 26th, 1877.

recourse to the antiseptic method for combating the infectious symptoms which seemed to be the consequence of this mode of treatment. He has obtained good results by the use of repeated uterine douches. We will refer later to this point, and will demonstrate the advantages to be gained by this practice.

Nevertheless, in spite of these improvements, the injection of perchloride of iron into the uterus is none the less a measure always accompanied by great danger. Obstetricians have sought to discover some method which, while not lacking in energy, will, at the same time, better answer the requirements of the antiseptic system.

Encouraged by the brilliant success that Bretonneau and Trousseau, and, later, Simms and Emmet, have obtained by using injections of very hot water to arrest uterine hemorrhage (other than that connected with the puerperal state), some authors have applied this method to the treatment of hemorrhages occurring at childbirth. M. Tarnier had already demonstrated that a hot bath could arrest hemorrhage; and the investigations of Richter¹ and Hartstein² had shown that intra-uterine injections of water at 40° (C.) had a very hæmostatic action. The addition of an antiseptic agent to the liquid employed will suffice to combat, at the same time, the hemorrhage and the septicæmia. This method recommends itself to our serious consideration, and is the one to which we should give preference.

B.

DELIVERY OF THE PLACENTA AND MEMBRANES IN ABORTION.

In abortion, the expulsion of the secundines constitutes the most important part. During the first two months of pregnancy interference is rarely called for. Antiseptic vaginal injections usually suffice to counteract the phenomena of infection; if they prove insufficient, we should direct treatment to the uterus itself, and, in such cases, intra-uterine injections employed with prudence will triumph over all the symptoms.

Abortion at the third or fourth month is much more troublesome because of the frequent retention of membranes. What is proper to be done?

Experience teaches that generally, after a variable time, the membranes are expelled spontaneously.

¹ Richter. "Ueber Ausspüllungen des Gebärmutterhohle mit 40° R. Warmen Wasser bei Blutungen im Wochenbett." *Zeitsch. für geb. und Gyn.*, t. II.

² Hartstein. "Ueber die hæmostatische Wirkung der Irrigation von Warmen Wasser bei Verletzung von Blutgefässen." Bonn, 1878.

But this retention of the membranes is liable to be followed by the appearance of grave symptoms, the most important among them being hemorrhage and septicæmia.

Ought the physician to wait and decide to interfere only when symptoms of puerperal infection shall have appeared? Is it not better to prevent them, if it be possible?

According to the principles of the antiseptic method, we recognize that the wisest course consists in handling the uterus as little as possible.

Granted that the expulsion of the placenta or membranes is usually effected spontaneously, the physician will act wisely by having recourse to vaginal injections and by giving careful attention to vulvar dressings.

Ought he to interfere more actively and give intra-uterine injections? An absolute reply is not possible. If the first stage is completed spontaneously, and without the least interference, perhaps it would be better to content one's self with making vaginal injections, but if repeated examinations have been made, if the fœtus is putrefied, or the liquids that flow out have a fetid odor, we should not hesitate to employ intra-uterine injections.

Some authors have thought it necessary to interfere still more energetically; that the best prophylaxis against infectious symptoms consists in immediate removal of the still adherent membranes. For this purpose, they dilate the cervix if necessary, and if the finger does not suffice to remove the membranes, the internal surface of the uterus is scraped with a curette. When the operation is completed, they give an intra-uterine injection of a strong carbolized solution.

The principle of this hasty interference, sustained by Fehling, Spondly and Guéniot, has hardly been adopted among us.

Vaginal injections and, in case of need, intra-uterine injections made with antiseptic solutions, appear to us, in short, to constitute the procedure which answers best the demands of the antiseptic method.

But if the infectious symptoms have developed, if the preceding management does not appear sufficiently energetic, it is necessary to make every effort to extract the retained secundines. If the cervix is not sufficiently dilated to admit the passage of the finger or of instruments, we can utilize the bags of Tarnier, of Barnes, or of Chassagny, to increase the size of the opening; using chloroform, if necessary, to do so. All these manœuvres, which will always be made with prudence and gentleness, should be preceded and followed by strong antiseptic injections.

[The proper management of abortion complicated by retention of

the secundines is one of the unsettled questions which has recently given rise to no little discussion. Expectancy and active interference have each its enthusiastic supporters who warmly advocate the one or other method of treatment to the exclusion of the other. A careful consideration of the opinions expressed will determine the fact that the best authorities, and the most progressive members of the profession in this country, favor the latter method. Forcible, whether manual or instrumental, removal of the retained portions should be undertaken as soon as possible after the escape of the fœtus, and before the cervix has contracted. Fetid discharge, hemorrhage, or the appearance of any symptom indicative of septic infection, demand instant removal of the offending substance.

Instrumental or digital dilatation of the cervical canal may be required as a preliminary step.—F.]

CHAPTER VIII.

ANTISEPSIS DURING THE PUERPERIUM.

ABSENCE OF FEBRILE REACTION—MILK FEVER OR SEPTICÆMIA—ANTISEPTIC PRÉCAUTIONS NECESSARY DURING THE NORMAL LYING-IN—CLEANSING AND DRESSING THE GENITALIA—CONSIDERATION OF THE ADVISABILITY OF EMPLOYING VAGINAL AND INTRA-UTERINE INJECTIONS—PRECAUTIONS DEMANDED WHEN THE SECOND OR THIRD STAGE OF LABOR HAD OFFERED SOME SPECIAL COMPLI-CATION—RUPTURE OF THE PERINEUM—IMMEDIATE OPERATION—WHEN, AND WHEN NOT, DEMANDED—WOUNDS OF THE VAGINA—CANCER OF THE NECK OR OF THE VAGINA—LACERATION OF THE CERVIX—RETENTION OF MEMBRANOUS SHREDS AND PLACENTAL DÉBRIS—ANTISEPSIS WHEN PUERPERAL INFECTION ALREADY EX-ISTS—VAGINAL INJECTIONS—UTERINE IRRIGATION: INTERMITTENT AND CONTINUOUS—METHOD OF ADMINISTERING INTRA-UTERINE INJECTIONS—THE DANGERS OF THIS MODE OF TREATMENT—PAS-SAGE OF FLUIDS INTO THE PERITONEAL CAVITY—PENETRATION OF THE FLUID INTO THE VESSELS—SHOCK AND SYNCOPE—EMBOLI—ENTRANCE OF AIR INTO THE VEINS—HEMORRHAGE—CONTINU-OUS IRRIGATION OF THE UTERUS—DRAINAGE OF THE UTERUS.

DURING her lying-in, the puerperal woman ought not to have fever.

However, as we said in the beginning of our work, she is one wounded ; she has suffered a traumatic injury—child-bearing. She has a wound, the uterine wound, and generally a certain number of other wounds much smaller, but the existence of which, nevertheless, is of great im-portance. These are the lacerations and stretching of the tissues of the uterine neck, and of those of the vaginal wall and vulva.

We should not fail to recognize, also, the multiple contusions, the bruising and tractions, to which the pelvic cellular tissue has been subjected. When, however, everything has been normal, and when the most rigorous antiseptis has been practised, the repair of all these lesions is made without the slightest feverish reaction of the general condition of the woman. But do we go so far as to say that every puerperal woman who will have fever must be considered as suffering from infection in a more or less intense degree? We do not believe so.

Indeed, in many cases where labor has been retarded, and the pains very active, we witness during the first and second days a certain febrile state, which disappears rapidly without leaving the slightest trace. Fatigue and soreness sufficiently explain these cases of elevated tempera-ture, without attributing them in any way to the influence of infection.

Milk fever is still described in many works on obstetrics. At present, we believe that in normal cases, we do not meet with febrile attacks meriting the name. On the second or third day we often see, it is

true, a slight elevation of temperature, but it is not sufficiently well marked to be called fever. As a rule, we should look upon the febrile attacks of which we speak as being indicative of septicæmia. We must act accordingly.

Genzmer and R. Volkmann¹ have thought they could distinguish febrile attacks occurring after traumatism, and which feign the symptoms of septicæmia, and from which they ought to be carefully differentiated.

In such cases the quantity of chlorides in the urine would not be modified, and the injured would not experience any *malaise*. We do not know whether the distinction given by these authors is correct, and whether it is fully applicable to the lying-in period. This is a field for further investigation. But, as a rule, when on the second, third or fifth day after labor a patient is taken with chill, followed by rapid elevation of temperature, we must think at once of puerperal infection. The application of the antiseptic method proves, usually, that this diagnosis is correct.²

We have seen what precautions should be taken during labor to avoid infection; the same attentions ought to be kept up during the lying-in. But, let us understand, the management of the case will vary according to whether the lying-in is normal or whether an elevation of temperature indicates that some complication has arisen.

We will divide the study of this subject into three classes:—

- 1st. Cases in which labor is completed naturally, and the placenta has come away spontaneously.
- 2d. Cases in which some complication is presented either in the second or third stages of labor; or, when some lesion has resulted, which causes the physician to give a guarded prognosis.
- 3d. Cases already attacked with puerperal infection.

1st. *Antisepsis during the normal lying-in, when the woman is confined naturally, and the expulsion of the placenta is spontaneous.*—We will not repeat all the general precautions that should be taken: disinfection of the *personnel* of the physician and his assistants, disinfec-

¹ Genzmer et Volkmann. "Ueber septische und aseptische Wundfieber Sammlung." *Klin. Vortr.*, n^o 121.

² We must never neglect to examine the breasts, especially when the mother nurses her infant. We often see upon the skin of the areola small streaks of lymphangitis, which are the cause of all the febrile symptoms. Fissures of the nipple require attention. Washing the nipple frequently will do much to prevent this lymphangitis, which only too often leads to abscess of the breast.

tion of the rooms, beds, etc., etc. We have sufficiently gone over these points, so will limit ourselves to the study of such attentions as refer directly to the care of the puerperal woman.

There is one rule from which we should never recognize any departure: Avoid doing too much; all that is useless, is dangerous.

Thus, for example, we will restrain from making any vaginal examination of a puerperal woman.

[The importance of this warning is well illustrated by a case quoted from Charpentier by Prof. Parvin (*Journ. Amer. Med. Ass'n*, Vol. iii, No. 16, p. 421). It seems that a French physician, immediately after having visited a case of phlegmonous inflammation of the thigh, unwisely made a digital examination for the purpose of ascertaining the progress of involution in a puerperal woman who had successfully passed to the seventeenth day after her confinement. The unfortunate victim of his curiosity was his own wife, who contracted puerperal septicæmia and died.—F.]

It often happens that, even after normal labor, retention of urine occurs, and the obstetrician is compelled to resort to catheterization. The precaution that should be exercised in performing this little operation will be indicated in a special chapter.

At present we will study only the attentions that should be given to the genital organs.

Immediately after the termination of labor and the expulsion of the placenta, we will take the precaution to wash carefully the external genital organs with an antiseptic solution. No clots should be allowed to remain adherent in the hairs covering the external surface of the labia majora.

We ought then to apply a dressing upon the vulva, which must be made with the greatest care and according to the principles of the antiseptic method.

We will place upon the vulva a wide strip of gauze, carbolized, salicylated or benzoated, folded several thicknesses, which will be covered over with a strip of mackintosh. Carbolized gauze is very irritating, and, at the end of a few hours, we observe an eruption, often very painful, upon the skin of the neighboring parts. In such cases we will employ compresses or gauze soaked in a solution of bichloride of mercury, 1 to 2000.

The *hydrophile* wadding, salicylated or carbolized, is very valuable, and can be substituted with advantage for the gauze. Oakum is very much used for this purpose in the service of M. Freund.

Whatever antiseptic dressing may be selected, it must always be renewed three or four times a day, oftener still when the lochial flow is very abundant.

[Dr. Henry J. Garrigues read before the Medical Society of the County of New York, December 31st, 1883, a paper entitled the "Prevention of Puerperal Infection," in which he described the antiseptic precautions which he had adopted at the Maternity Hospital in New York. The antiseptic pad introduced by him, and which has since been so successfully employed by others, is thus described: "After the expulsion of the secundines the patient is washed with the solution (bichloride of mercury 1 to 2000) and the vulva covered with a *dressing* consisting (1) of a piece of lint, six by eight inches, folded lengthwise, so as to be three inches wide; (2) outside of that a piece of oiled muslin, nine by four inches; (3) outside of that a large pad of oakum or cotton; and (4) the whole is fastened with four pins to the binder in front and behind by means of a piece of muslin eighteen inches square, and folded diagonally so as to form a kind of boat, five inches in width, for the reception of the other pieces of the dressing.

"*This dressing is put on with the same care as we dress a wound after a capital operation, and renewed four times in the twenty-four hours, twice by the day nurses, and twice by the night nurses. At the same time the parts nearest the genitals are washed with the solution. Before each washing the nurses disinfect their hands, as before labor. Any substance, such as cotton, lint, etc., brought in contact with the genitals, is beforehand thoroughly soaked in the solution. No vaginal injections are given, except in rare cases in which the lochia become offensive. By the effective antiseptic treatment at the entrance, preventive injections become superfluous, and thus one great source of infection is avoided.*"—*Amer. Journ. of Obstet.*, Vol. xvii, 1884, pp. 415-416.—F.]

When changing the pieces of dressing, we will never neglect to wash thoroughly the external genital organs.

There is a number of little details that will bear mentioning. If we select a carbolized solution, we should always use it as weak as 1 to 100; this is strong enough. The solution of bichloride of mercury will be 1 to 2000. Boricated solutions can be employed from two to three per cent. without the slightest inconvenience.

In order to make the washings we will proceed in the following manner: Having poured into any kind of receptacle at least one litre of the solution intended to be used, we will soak in this liquid a tampon of *hydrophile* wadding nearly as large as the fist. When the wadding is saturated, it is carried above the genital organs and squeezed in such manner that the liquid it contains is expressed and irrigates the labia majora, washing therefrom all débris of blood clots, etc., that may have been attached. This manœuvre will be repeated a number of times, taking care to draw apart the labiæ majoræ, in

order that no part of the vulva may escape the action of the wash. We will afterward sponge with care the external genital organs, using always the tampon of wadding, which will be thrown away or burned after use. In no case should we employ sponges. New dressing is applied when the bathing is completed.

During the lying-in the lochia are more or less abundant and often flow intermittingly. This is because the lochial fluids have been retained for some time in the uterine cavity or vaginal canal, and, in consequence of uterine contraction or some muscular effort, they are expelled. These liquids, contained in this manner in the vaginal canal, are liable to undergo putrefaction and become a cause of infection.

Fritsch has particularly called attention to this point, and has shown that the posterior commissure of the vulva is more elevated when the woman is lying down than the top of the vagina. If we take into consideration the relaxed state in which the vaginal wall is found we will acknowledge that everything seems to favor the constant retention of a certain quantity of lochia within this canal. To do away with this objection, he recognizes but one mode of treatment, viz.: vaginal injections. They offer the twofold advantage of washing away the clots, etc., that are retained in the vagina; at the same time they substitute for them a certain amount of antiseptic liquid which is capable of opposing putrefactive changes in the lochia. He directs, consequently, in all puerperal cases, two vaginal injections a day, and he concludes in the following words:—

“No one contests the utility of washings during the lying-in. Vaginal injections are not more difficult.”¹

This mode of treatment has enjoyed some popularity. Bischoff,² Runge³ and Hartmann,⁴ have had recourse to it, and they speak of having obtained good results.

Vaginal injections, in the cases under consideration, have been experimentally employed at the Maternity; at present they are no longer used; they fatigue the women. We should have recourse to them only when there is actual retention of lochia in the vagina and when it is fetid. But, to desire to adopt them in all cases, without distinction, is, perhaps, to exceed the object, and even to be injurious;

¹ Fritsch. “Puerperal fever and its local treatment.” *Samml. Klin. Vorträge*, n° 107.

² Bischoff. “Zur Prophylaxis des puerperal fiebers.” Bale, 1875.

³ Runge. *Gynæcological Society of Strasbourg*, 1876.

⁴ Hartmann. “Jahresbericht über die Entbindungsanstalt der Charite zur Berlin.” *Charite Annalen*, 1880, p. 661.

for, as Brennecke¹ remarks, we risk provoking accidents by the introduction of a dirty instrument into the vagina.

We can now foresee what advice will be given concerning the employment of intra-uterine injections in all puerperal cases, including even those in which the second and third stages have been normal.

Schultze² declares that "it is not necessary to wait for the appearance of symptoms before interfering; we must adopt some aggressive form of treatment and treat each puerperal woman as if she already had puerperal fever." The employment of intra-uterine injections will be considered later, and we will show that they must be looked upon as one of the most serious means we possess for combating puerperal infection.

What are the indications for their indiscriminate use in all cases? A certain number of authors, and we mention in the first rank Schülein,³ has advised this treatment. At the beginning of his investigations he was satisfied to employ vaginal injections; but he soon saw fit to modify his plan, and he practised intra-uterine injections in all puerperal patients, even when but a few examinations had been made during their labor. This practice appeared to him to possess decided advantages. Uterine contractions became more frequent and stronger and secondary hemorrhage more rare. He has never observed any evil results. Grünewaldt, of St. Petersburg,⁴ and Haussmann follow a similar practice.

However, this method of treatment is not universal. Hofmeier, fortunately, has formulated all the objections to be made against it, and he clearly proves by statistics that the use of uterine douches in all cases does not constitute so good a method of treatment as the authors mentioned thought. In fact he administered uterine douches in 260 cases, although labor had been normal; 42 of these presented more or less serious symptoms. The morbidity here was raised to 16 $\frac{1}{2}$ per cent.

In another series of 240 cases, who were likewise delivered without

¹ Brennecke. "Ein Beitrag zur Prophylaxis des Puerperalfiebers." *Berliner Klin. Woch.*, 1881, n° 3.

² Schultze. *Allg. Med. Centralzeitung*, 1877, n° 20, quoted by Labesque. *Thèse de Paris*, 1881.

³ Schülein. "Zeitschrift für Geb.", t. II, p. 97.

⁴ Grünewaldt. "Ueber puerperal Septicämie." *Petersburg Med. Zeitschrift*, 1869, p. 132.

This author gives intra-uterine injections with a solution of chloride of lime, one spoonful to 500 gr. of water. He says he has seen the mortality fall from 6 per cent. to 0.75 per cent. in consequence of the universal employment of this mode of treatment.

any interference, he did not give uterine douches; only 19 of these women presented any unusual symptoms. The morbidity fell to 8 per cent.¹

This result is more demonstrative, and has greater value than that mentioned by Grünewaldt. It is irrational to give intra-uterine injections in all cases. Indeed, no matter what precautions are taken, we can never feel certain that we do not introduce into the uterus some of the fluids retained in the vagina.

This is, then, a method to which we should not have recourse in simple cases. Bergesio² advises to place in the vagina a tampon of carbolized wadding, which should be changed every six hours. The vagina should be washed out carefully with carbolized water at each renewal of the dressing. This procedure does not offer any advantage.

Marchionneschi³ has praised the use of carbolized spray thrown into the vagina by the aid of the speculum. Such practice necessitates a complicated armamentarium, and favors the introduction of air into the genital passages, and, consequently, uterine infection.

In short, we should be content, in simple cases, to employ dressings to the vulva. They will suffice to give protection against any accident.⁴

¹ Hofmeier. "Ueber den Werth desinificirender Uterusausspülungen post partum." *Centralbl. für Gynæk.*, 1880, n° 5, p. 97.

² Bergesio. *L'Osservatore Gaz. delle clinique*, 1878, n° 8.

³ Marchionneschi. "Lochia zone." *Annali di ostetricia*, V. III, p. 685, et V. IV, p. 18.

⁴ Certain authors, Wasseige among them, have recommended the use of iodoform. We give the practice followed at the clinic of Liege, conducted by that professor:—

"The treatment of the lying-in has been always an antiseptic treatment, but it has been altered for some time at the suggestion of M. le Dr. Van den Bosch, assistant of the clinic. We no longer employ two per cent. carbolized injections, once or several times a day, followed by the application to the vulva of a compress soaked in a two per cent. carbolized solution. Our plan is, as soon as the third stage is completed to give a two per cent. carbolized intra-uterine injection. Immediately after this we carry some iodoform into the neck of the uterus, and throughout the remainder of the lying-in we do absolutely nothing. In the beginning we applied from 8 to 10 grammes of iodoform to the uterus, and 4 grammes to the upper part of the vagina by means of a speculum. The iodoform is placed in the neck of the uterus by an instrument constructed under the direction of M. le Dr. Van den Bosch. Later, we discontinued the practice of placing the iodoform in the vagina, and have gradually diminished the quantity inserted into the uterus until, at present, we do not employ more than 6 grammes of the medicament. The lochia of our patients are never fetid; they always retain the odor of iodoform up to the seventh day. We have never had any symptoms of intoxication, except two or three times a little drowsiness, which disappeared after one or two days. The elimination of iodine is rapid, for on an average of twelve hours after labor we have always discovered it in the urine."—*Wasseige. Written communication.*

2d. *Antisepsis during the lying-in, when the second or third stage of labor had presented some special complication.*—We have given all the different procedures required by the antiseptic method when, during the second or third stage of labor, we have been compelled to interfere. If, after the operation is completed, there does not exist any lesion of the vagina or uterus, we ought to manage the puerperium as we would if labor had been normal. Extra care will be given to the application of dressings to the vulva, and we will watch attentively the pulse and temperature of the patients and the character of the lochial discharges. At the slightest suspicion of infection coming on, we will prepare for energetic action.

We do not forget that such conduct is at variance with that held in high esteem by a number of other writers. Many obstetricians who admit that we should abstain from giving vaginal and intra-uterine injections when labor has been normal, think, on the other hand, that we should not hesitate to employ these procedures when we have been compelled to use operative interference. This opinion is held by Bischoff, Fritsch, Schülein, and Richter.

If, however, we have carefully practised antisepsis during the labor, if no complication arose during the operation, and no lesion resulted, we prefer to wait; usually all ends favorably. We will be in readiness, perhaps, to interfere more actively when a woman is delivered of a dead and putrefied infant.

But if, after delivery is completed, there exists any complication (rupture of the perineum, lacerations of the vaginal mucous membrane, gangrenous wounds, laceration of the cervix, or retention of fragments of placental tissue or shreds of membrane), we think such inactivity would be prejudicial to the woman's welfare, and we must recognize the necessity for active interference.

Rupture of the Perineum.—The conduct of the obstetrician will vary not only according to the extent of the tear, but also according to the cause that has produced it. Generally the fourchette alone is lacerated, and we have a forced stretching of tissue rather than a true rupture of the perineum. In this case the vulvar dressings, employed as we have indicated, suffice generally to obtain rapid cicatrization.

There is, however, one little point in detail that we wish to mention. It happens often, when we use carbolyzed dressings and washes, that during the first few days cicatrization proceeds satisfactorily; then, toward the eighth or ninth day, it is arrested; the wound is fair, but it remains stationary, and often becomes excessively painful. In these cases it will be sufficient to substitute boracic acid for carbolic acid,

and cicatrization will terminate rapidly. If this disappoints us we can use iodoform with benefit.

What is to be done when the rupture of the perineum is more marked? When we have reason to think that a single *serre-fine* will be sufficient to reunite completely the edges of the tear we will adopt this expedient, being careful, however, to see that the wound has been washed thoroughly with an antiseptic liquid before closing it.

But suppose the laceration is sufficiently extensive to demand perineorrhaphy, what is to be done? Shall we, as the majority of French surgeons propose, wait and interfere only after the complete recovery of the woman, limiting our treatment of the wound to the use of antiseptic washes and dressings? Or, is it better to follow the example of the English surgeons, and operate at once? We cannot enter into a discussion of this subject. But it is impossible for us to refrain from stating that the introduction of the antiseptic method has singularly modified the terms of the problem; the result of the operation was often a disappointment formerly, now it unites readily. Statistics which have been published before the application of the antiseptic method ought not to be taken into consideration. To-day, the majority of obstetricians declare themselves in favor of immediate interference. However, it is well to refrain from too great enthusiasm. To wish to interfere immediately in all cases, is to throw discredit upon a method excellent in itself and which renders important service when judiciously applied.

We should recognize two classes:—

- a.* The rupture is produced suddenly, the edges of the wound are regular and are not contused. The immediate operation is demanded.
- b.* The lips of the wound are contused, irregular and present points that appear liable to become gangrenous. The immediate operation is not demanded.

a. We operate at once. First, the vagina is thoroughly washed out and, if the rupture extends to the rectal mucous membrane, we should give a large injection into the rectum. After this we can readily see the extent of the lesion; the lips of the wound will be brought together, and we will carefully wash away all adherent clots of blood.

Having taken these steps, we will introduce the sutures. We cannot give all the details of the operation; we will mention only that catgut ligatures are hardly ever employed.¹ Silver wire is generally

¹ Zweifel. "Catgut as an agent of infection." *Centralb. f. Gyn.*, 1879.

selected, different sizes being used, the fine for the superficial and the coarse for deeper sutures. The secret of the success obtained by certain surgeons must be sought for in the care with which they apply the stitches, in the advantage they derive from deep sutures, and in the precaution they take to wash the wound continually, so that no particle of foreign matter (clots, blood) is interposed between the lips of the wound.

When the operation is terminated, the vaginal injection must be repeated. These injections should be given two or three times a day, and in using them the rules we have given must be observed. When the sutures are removed, it sometimes happens that there remains a wound—the result of incomplete union. Iodoform powder is valuable for producing rapid cicatrization.

b. We do not operate at once. In these cases the wounds are always contused, etc.

We must repeat the vaginal injections frequently and give special importance to the application of vulvar dressings. Certain writers have proposed to practise continuous irrigation in such cases; we will examine later into this method of treatment and see to what extent we can employ it with advantage.

Generally, vaginal douches, repeated often, give good results; the wounds become clean, they assume a healthy appearance, and gangrenous parts become detached. In spite of the multiplicity of the lesions, the puerperium progresses satisfactorily. We remember to have seen, on the outskirts of Paris, a young and healthy woman who, after a difficult labor that required the application of the forceps, presented multiple tears of the perineum. When we saw her, two days after her confinement, she had fever, and a careful examination of the lesions revealed the presence of extensive gangrenous patches seated upon the vaginal wall and surface of the perineum. We advised to be given, six times a day, an irrigation of the vagina and wound with a one per cent. solution of carbolic acid. Three litres (about five pints) of this solution were used at each irrigation. In consequence of this treatment, the temperature fell from the first day, the lying-in passed in a normal manner, and at the end of twenty days the patient, who was a foreigner, was able to return to Vienna. I have learned since that Gustave Braun successfully performed perineorrhaphy in this case.

We have mentioned before an analogous case (p. 39). If, in spite of these douches, fever persisted, if the wounds became covered with a whitish membrane, like that which we observe on the wounds of those suffering with hospital gangrene, much more energetic action would be called for.

The wounds should be painted over with an eight per cent. solution of chloride of zinc (see page 44). Iodoform would be valuable. A concentrated solution of permanganate of potassium would modify beneficially the surface of the wound (see page 77).

Although we had recourse to these means, it would be necessary, nevertheless, to continue the use of vaginal injections.

Wounds of the Vagina.—The rules given will apply to the treatment of lacerations of the vaginal wall. In these cases, certain obstetricians, Bischoff and Bergesio, among others, have proposed to introduce into the canal of the vagina a tampon soaked in carbolized oil (10 per cent.), which would be changed at each dressing, that is to say, three or four times a day. We would avoid in this way the injurious action of the lochial fluids upon the wound. Usually, vulvar dressings and vaginal irrigations are sufficient; these lacerations heal readily. We could, however, employ the method of Bischoff in case of hypersecretion or offensiveness of the lochia.

Cancer of the Neck or of the Vagina.—In case of cancer of the vagina, we should take extra precautions. The lochia are usually very fetid. The chief indication in treatment is the use of vaginal injections.

Lacerations of the Cervix.—We know how frequent are lacerations of the cervix in labor. Generally, cicatrization occurs spontaneously. When the lips of the wound remain apart, we often witness symptoms so serious that a special operation is demanded, Emmet's operation. One is called upon to treat this complication only after complete recovery of the woman from her lying-in. Lacerations of the cervix demand a more strict application of the antiseptic method. They do not necessitate the use of any special procedures.

Uterine Rupture.—(See special chapter.)

Retention of Shreds of Membrane and of Placental Cotyledons.—This question demands rigid investigation.

In order to determine positively the best course to pursue here, it is well to report carefully all the different cases that one is able to meet with. Take, for instance, a woman who has had a normal labor. To facilitate the expulsion of the placenta, we have had recourse to Credé's method. The membranes are torn, and, by examining the after-birth, we ascertain positively that some membranous shreds have remained adherent *in utero*. What is the proper course to follow?

Must we administer intra-uterine injections from the beginning of the lying-in, when there does not exist any indication pointing to the outbreak of infectious symptoms? Such is not our opinion. Experience teaches, indeed, that if antiseptics has been carefully carried out during the labor, the membranes detach themselves and are eliminated without giving rise to any symptom.

If, however, the lochia become fetid, it is well to act more energetically. Some think that intra-uterine injections are indicated (Fritsch, Bischoff, Winckel, etc.). Others consider that vaginal injections are sufficient.

*It is very difficult to arrive at a definite conclusion. If the offensiveness of the lochia is accompanied by fever, intra-uterine injections appear to us to be indicated.

But when the offensive odor is slightly marked, when there is no fever, when only some fragments of membrane remain adherent, vaginal injections often suffice. Such is the practice adopted at the Maternity. There exists always a series of circumstances which causes the physician to lean toward this or that mode of action. A correct appreciation of clinical facts alone permits us to throw aside all doubt.

But take a case in which the placenta has been delivered artificially. We recognize by examination of the after-birth that one or several cotyledons remain adherent to the uterine wall; we have judged proper not to introduce the hand into the uterus a second time in order to remove them; we have given an intra-uterine injection to wash out the cavity of that organ. But what must be done during the lying-in?

Ought we to be content to wash the vulva?

Will we give only vaginal injections? Or would it be better to have recourse to intra-uterine injections before the appearance of any unfavorable symptoms?

Here, again, opinions differ widely. The following is what we consider the wisest course: So long as any bad symptom shall not have appeared, we will be content to employ vulvar washes; if the lochia be fetid, we will have recourse to vaginal injections. From the first symptom of infection, chill or fever, we will practise intra-uterine injections.

From our point of view, the antiseptic method does not consist in wishing to interfere in every case. In obstetrics, as in surgery, we ought never to obey any but precise indications. But when, during the lying-in, everything is satisfactory, the indication is to abstain from making repeated vaginal injections, and particularly from those intra-uterine injections that certain writers consider prophylactic, but which,

made indiscriminately, directly oppose the object we seek to attain. Frankenhäuser,¹ Massari,² Breisky³, and among us M. Tarnier, have always insisted upon the danger of this teaching. To be sure, these advocates of prophylactic intra-uterine injections can cite to us the statistics published by Schülein and by Grünewaldt; they tell us that the intra-uterine injection is absolutely harmless, and mention, in support of their opinion, the researches of Richter. We can say in reply, that it is always dangerous to introduce into the uterine cavity a catheter that has traversed the canal of the vagina, and which, in spite of all precaution, can wipe from its walls any germs or suspicious fluids. We will refer, finally, to the statistics published by Hofmeier,⁴ which are very valuable.

Antisepsis during the lying-in when there exist certain indications of puerperal infection.—In the preceding pages we have discussed the value or expediency of this and that procedure, at the same time that we recognized the necessity of applying the antiseptic method to all cases, no matter how simple they appeared.

But when infectious symptoms develop, all discussion is idle, and that method which we hesitated before to employ, on account of the inherent dangers of its application, becomes now an heroic measure to which all physicians are eager to have recourse.

When a woman is attacked with puerperal infection, the first duty of the obstetrician is to carefully establish his diagnosis. Not only should he diagnosticate puerperal infection, and recognize the clinical form that the disease assumes (lymphangitis or phlebitis, etc.), but, with a view to the proper treatment of the case, he should seek for and discover the cause of these symptoms.

In the immense majority of cases he will find it in some lesion of the genital passages (wounds of the vagina or vulva, or retention of placental débris, etc.).

Natural sequence :—

Local Treatment is Indispensable.—When there is reason to accuse the wounds of the vulva or of the vaginal mucous membrane as being the doors for the entrance of the poison into the system, and when there exists nothing abnormal about the uterus, we must proceed to disinfect the vagina and modify the wounds. Here vaginal injections will be

¹ Frankenhäuser. *Corresp. Bl. für Schweiz. Aerzte*, 1877, p. 320.

² Massari. "Beiträge zur Pathologie und Therapie des Wochenbett." *Weiner med. Presse*, 1880.

³ Breisky. *Loc. cit.*

⁴ Hofmeier. *Cent. f. Gyn.*, 1880.

of the greatest assistance. It is to these cases that the remark of Fritsch is applicable: "The treatment of puerperal affection without irrigation of the vagina is irrational; it is absurd."

We will not repeat all the procedures that we have mentioned.

But very often it is necessary to seek in the uterus itself for the cause of the symptoms. We must then act directly upon that organ.

This is done in two ways:—

(A.) *Uterine irrigation.*

(B.) *Drainage.*

These must be studied in detail.

A.

UTERINE IRRIGATION.

Irrigation of the uterus has for its object to rid the cavity of all putrefied matters contained therein, to facilitate their expulsion, and, at the same time, to modify favorably the uterine wound. For this purpose an antiseptic substance is added to the liquid employed.

Theoretically, irrigation of the uterus is perfectly rational; "for it is necessary simply to consider the uterine cavity as the cavity of an abscess that suppurates, and to treat it as the surgeon treats deep abscesses." (Fritsch, *loc. cit.*) We will see later that experience has demonstrated that this mode of treatment is one of the best to which we can have recourse. Here, also, theory and practice are found to agree:—

(a) We can irrigate the uterus in an *intermittent manner*. We say, in that case, that we employ *intra-uterine injections*.

(b) When we irrigate the uterus in a *continuous manner*, we practise then *permanent irrigation of the uterus*.

We will consider these two methods separately.

(a) *Intra-uterine Injections*.—We do not propose to give a complete history of this mode of treatment.

We have said already that, up to the middle of the present century, intra-uterine injections had been employed only in an exceptional manner. When we mention Recolin, Levret and Baudelocque, we give the names of the principal obstetricians who had made use of them. We have shown the importance of the labors of Semmelweis; among the first, he employed intra-uterine injections of chloride of lime with the object of preventing the putrefaction of clots, of placental débris or of membranes which were retained *in utero*. After him, Grünwaldt, Hugenberger, Radecki, Winckel demonstrated the advantages to be derived from this mode of treatment.

In France the authors showed more reserve. The unfortunate facts cited by Bretonneau made an impression upon their minds, although some voices were raised in behalf of this procedure. Chomel¹ and Jacquemier² had pointed out the possibility of using intra-uterine injections in cases where clots were retained in the uterus; but we should mention particularly Gensoul³ who wrote, in 1849: "I have every reason to believe that injections practised in the uterine cavity at the beginning of puerperal fever, will diminish much the gravity of that disease and can even arrest its progress." Hervez de Chégoin,⁴ in 1858, showed himself a warm advocate of the method. Let us add also the names of Piorry, Guyot,⁵ Fontaine,⁶ Hervieux⁷ and Komorowski.⁸ In spite of all these works, the use of intra-uterine injections was not popularized, and we must pass on until we come to the important memoir of Bischoff⁹ to see the question taken up anew in Germany. Since that time works have multiplied, and we can consider the question seriously and with a thorough knowledge of the advantages to be derived from intra-uterine injections, as well as of the precautions it is prudent to take when we apply this mode of treatment. We derive special information on this subject from the memoirs of Fritsch,¹⁰ Münster,¹¹ Richter, and from the theses of Rendu¹² and Labesque.¹³ We will find in the memoir of Münster, and in the theses of Rendu and Labesque all the biography on this subject.

Method of Operating.—When we wish to give an intra-uterine injection, the woman is placed upon the edge of the bed, the limbs widely separated and the buttocks raised by a hard cushion. A vessel is placed beneath the genital organs to receive the fluid that flows out during the operation.

The instruments employed to practise intra-uterine injections are

¹ Chomel. Dict. de med. en 30 vol., 1846. Art. "Métrite."

² Jacquemier. "Manuel d'Accouchement," t. II.

³ Gensoul. *Union Médicale*, 1849, p. 574.

⁴ Hervez de Chégoin. Discussion Acad. de Méd., 1858.

⁵ Guyot. *Thèse de Paris*, 1868.

⁶ Fontaine. *Thèse de Paris*, 1869.

⁷ Hervieux. "Traité des Maladies puerpérales," 1870.

⁸ Komorowski. *Thèse de Paris*, 1876.

⁹ Bischoff. "Zur Prophylaxis des Puerperalfiebers." *Corresp. Blattes für Schweiz. Aerzte*, n° 22 et 23, 1875. See also Breisky. *Loc. cit.*

¹⁰ Fritsch. "Puerperal fever and its local treatment." *Samml. Klin. Vorträge*, 1878, n° 107.

¹¹ Münster. "Die intrauterinen Injectionen im Wochenbett." *Zeitschrift für Geb.*, t. II.

¹² Joanny Rendu. *Thèse de Paris*, 1879.

¹³ Labesque. *Thèse de Paris*, 1881.

varied, and there is hardly an obstetrician, having had much experience with this mode of treatment, who has not invented some special canula. All agree in condemning the use of clyster pumps and such kind of instruments. We must avoid the introduction of air into the uterine cavity. Only one apparatus secures this result: that is a simple syphon, composed of a reservoir holding from three to four litres (five to seven pints) of liquid, and provided with a rubber tubing from one to two metres (yards) long. To the extremity of the latter is attached the canula, which is to be introduced into the uterine cavity. Most writers recommend the use of double canulæ; they seek in this way to secure the easy return of the fluid injected into the uterus. It is rare that the cervix is sufficiently contracted to cause an obstacle to the outflow of the fluid. On the other hand, we often see the efferent canal of the double catheter become obstructed by little clots and débris of membrane, and it is rendered useless.

Fritsch's catheter is, perhaps, the best instrument to use; it is 30 centimètres (12 inches) long, and presents a diameter sufficiently large to permit the escape of one litre of water per minute, under a pressure of 30 centimètres. Schülein¹ used glass tubes constructed after the model suggested by Hildebrandt; these, the orifice of which is not less than one centimetre, have a curve corresponding to that of the pelvis. We have advised the use of elastic catheters, but these instruments are difficult to guide, and we soon ceased using them.

In short, we rather give preference to a glass tube, similar to the one used by Schülein. This instrument is cheap and can be destroyed after use; this is the principal reason we give it the preference over metallic catheters, which are commonly employed.

There is scarcely any antiseptic liquid that has not been employed in intra-uterine injections. Chloride of lime (Grünewaldt, Semmelweiss, Hugenberger), permanganate of potassium (Winckel), chloral (Hervieux), powdered charcoal mixed with water (Eisenmenger), sulphate of copper (Winckel), etc., have each received its share of praise. At the present time, carbolic acid and bichloride of mercury are chiefly employed. Carbolic acid has been particularly recommended by Bischoff, Richter, Stadfeldt,² Egli Sinclair,³ Lucas-Championnière,⁴ and Bouchard.

¹ Schülein. "Intra-uterine injections with carbolized solutions during the lying-in." *Zeitschrift für Gyn.*, Bd. II, Hft. I.

² Stadfeldt. "Ueber prophylaktische Uterus ausspülung mit Karbolwasser post-partum." *Centralbl. für Gynäk.*, 1880, p. 145.

³ Egli Sinclair. "Die antiseptische Behandlung der Puerpera." *Corresp. Bl. für Schweizer Aerzte*, 1877, N° 21.

⁴ Lucas-Championnière. "De la methode antiseptique." Paris, 1880.

Corrosive sublimate has been used in the following manner at the Paris Maternity.¹

If we have recourse to a solution of carbolic acid it will be from one to two per cent. strength. The sublimate solution will be 1 to 2000. The temperature of the fluid injected from 20° to 25° (C.).

Everything being in readiness, we begin by carefully washing the vulva, and then administer a vaginal douche. When this canal is washed free of all the secretions collected there, we introduce the catheter into the uterus carefully and slowly, guiding the instrument with the finger passed into the vagina, and, at the same time, straightening the uterus if anteflexion is sufficiently marked to obstruct the introduction of the canula.

We then allow the liquid to flow; for this purpose the reservoir is raised from 20 to 25 centimètres (8 to 10 inches) above the pelvis of the woman. It is never necessary for the pressure under which the liquid flows to be greater, and we should not forget that all we propose to do is to give an uterine douche.

The first portion of the injected water will be returned mixed with pus, and will wash away shreds of membrane. The injection should be continued until the liquid flows out absolutely clean. Generally, it is necessary, in first injections, to use from two to three litres of fluid; later, one or one and a half litres suffice.

We will withdraw the sound slowly, allowing the liquid to flow, so that it may bathe the vagina again and wash away the pieces of membrane that have collected there during the washing. These intra-uterine injections are repeated twice a day. If given more frequently, they fatigue the women.

¹ J. L. Miller. *Glasgow Med. Journ.*, Aug., 1878, p. 345.

— A. Guichard. "Contribution à l'étude des injections intra-utérines." *Ann. de Gynec.*, janvier, 1878.

— F. Lalesque. "Les lavages utérines dans les infections puerpérales." *France Médicale*, 10 janvier, 1880.

— Walker. "Case of puerperal septicæmia with abnormally high temperature, treated by intra-uterine injections, cure." *American Journ. of Obstet.*, vol. x, p. 405.

— Gsell. "Des injections intra-utérines et de leurs indications dans les suites de part." In 8, p. 38, Paris, 1878.

— Obstetrical and Gynæcological Soc. of Berlin. Discussion, July 10th, 1877. *Berliner Klin. Wochens.* n° 2, p. 25.

— Zweifel. "Die Prophylaxis des Puerperalfiebers." *Berliner Klin. Wochenschrift*, 1878, n° 1.

— Piccini. *Ann. de Gynecol.*, 1879.

— Breisky. "Ueber intrauterine Localbehandlung des Puerperalfiebers." *Zeitschrift f. Heilkunde. Prag.*, T. 1, f. 3, 4, p. 308.

Result :—

Intra-uterine injections practised after this manner have a very rapid action. Sometimes after the first, more often after the second injection, the temperature falls from 1° to 2° (C.).

This is a fact noticed by all authors who have studied this question. The pulse improves and the lochia rapidly lose their offensiveness. This rapid action is due without doubt to the expulsion of all the putrid substances contained in the uterine cavity and to the absorption of a part of the injected liquid. We must certainly accept the truth of this latter explanation, when we witness in two days the temperature fall to normal or below it.

How long ought the intra-uterine injections to be continued? When the temperature has fallen to normal or near that point, and when all the substances contained in the uterus have been expelled, we will cease to have recourse to them. However, we ought not to neglect to keep the patient under close surveillance; we will be prepared to renew this method of treatment if the temperature should rise again.

At the present time, all obstetricians favor the use of intra-uterine injections; all agree in considering them the most powerful means at our disposal to combat puerperal infection. The period of uncertainty seems passed. We believe, however, it is but right to mention briefly the objections that have been raised against it. After the injection is given, we occasionally see some alarming symptoms develop: the woman becomes pale, she faints; soon she complains of severe pain in the hypogastric region; then she experiences the greatest anguish.

These symptoms may be temporary. But sometimes they assume the greatest gravity, and death may supervene immediately or after a few hours. We have made a certain number of hypothetical explanations for the production of these symptoms which, we must say, are rare when intra-uterine injections have been practised with care.

a. At first we thought that these symptoms were due to the *passage of the injected liquid into the peritoneal cavity*. But in the majority of the observations reported in support of this opinion, the authors state that they have found only some pus in the peritoneal cavity. That proves nothing. We have found only a few rare observations in which it was expressly stated that they had discovered the injected liquid in the peritoneum (perchloride of iron).¹

¹ Borg. "Mort subite après l'accouchement." Hygeia, 1877.

— Cory. "Death from intra-uterine injection of perchloride of iron." Obstet. Soc. of London, 1879.

The possibility of liquids injected into the uterus being able to pass to the peritoneum has been a subject of the closest investigation. Experiments made upon the uterus in a state of vacuity have been published. But they possess little value, because the conditions for which we have recourse to intra-uterine injections were not reproduced by the experimenters. Clinical experience teaches us only this much: liquids injected into the uterus after confinement or abortion can pass through the tubes and reach the peritoneum. The fact is incontestable. But experience teaches us likewise that this accident is extremely rare, since out of 3000 intra-uterine injections Richter has not observed it a single time. We think, however, that by carrying out the rules we have given, this accident is not to be feared.

b. Certain authors, Winckel,¹ Fritsch² and Matthews Duncan,³ think it must be attributed to *penetration of the antiseptic liquid into the vessels.*

Fritsch even goes so far as to think we ought to make a distinction between the cases where the liquid penetrates into the venous system and where it is encountered in the lymphatic vessels. It is indisputable that liquids can penetrate into vessels which, like the sinuses, are quite large. But ought one to admit that the quantity of liquid that gains entrance in this way into the vessels is sufficiently large to explain the grave phenomena observed? It is doubtful. Let us add that Matthews Duncan has proposed to prevent this accident by giving the patients injections of ergotine. We would produce thus sufficient contraction of the vessels to prevent the occurrence of this accident.

(c) The *nervous shock*, the syncope, the suffering experienced by the patients; all have been attributed to reflex influence. Sometimes even convulsive phenomena have been observed (Richter). The cases published by Bruntzel⁴ and Frommel⁵ are very interesting, and seem to prove the truth of this interpretation.

(d) In certain cases the nervous phenomena observed were due to a more distinct cause—to *emboli*—which, under the influence of movements necessitated by using the injection, became detached from the uterine veins (Kustner⁶).

¹ Winckel. *Loc. cit.*

² Fritsch. "Ueber das Einfließen von Desinficientien in die uterus venen bei der Irrigation." *Centr. f. Gyn.*, 1878, p. 341.

³ Matthews Duncan. "Antisepsis in labor." *Brit. Med. Journ.*, 1879.

⁴ Bruntzel. *Berl. Klin. Woch.*, 14 fév., 1879.

⁵ Frommel. *Zeitsch. für Geb.*, T. v, p. 224.

⁶ "Ueber Carbolintoxicationen nach Ausspülungen des puerperalen Uterus." *Centr. f. Gyn.*, 1878, p. 313.

(e) Finally, intra-uterine injections must be considered as being particularly liable to render possible *the entrance of air into the uterine veins*, in consequence of which special symptoms arise that are well known to surgeons (entrance of air into the veins of the neck), and which, for the veins located in the uterus, have been especially investigated by Olshausen.¹

We have not found a single well-authenticated case in which death has resulted from this cause, after an injection. It is possible to guard against this accident by using the apparatus for irrigation that we have devised, and by seeing that the patient is always placed upon her back. In that position the intra-abdominal pressure is always greater than the atmospheric pressure.²

(f) *Hemorrhage* is sometimes met with during the administration of intra-uterine injections; the liquid projected with force would detach clots which serve to plug the uterine vessels. Schatz has particularly called attention to this accident, which is never serious. One can, however, avoid it by operating with great gentleness; if, nevertheless, hemorrhage be produced, we can arrest it easily by raising the temperature of the fluid injected.

We have seen that the liquid employed for injection is manifestly absorbed; we can prove this by analyzing the urine, which sometimes becomes cloudy after the first or second injection. We have already spoken of carbolism, its symptoms and treatment. We will refer to the subject again, in order to remind the obstetrician that he should never forget the possibility of intoxication whenever he has occasion to make use of intra-uterine injections, and especially when practised with carbolic acid solutions. When the urine becomes cloudy, he should employ another antiseptic. In short, intra-uterine injections, even when carefully administered, can give rise to a certain number of accidents; and this suffices, we think, to justify the reserve we expressed when speaking of the employment of this treatment during normal lying-in. But these dangers are too slight to give up this mode of treatment when puerperal infection exists.

¹ Olshausen. "Ueber Lufteintritt in Uterus venen." *Monatsch. f. Geburtskunde*, 1864.

² Stande. "Ueber der Eintritt von Luft in die Gebärmütter." *Zeitsch. f. Geburt.*, 1878.

— Kezmarski. "Ueber Lufteintritt in der Blutbahnen durch der Puerperalen uterus." *Arch. f. Gynæk.*, T. XIII.

— Kutsner. "Die permanente Scheiden irrigation; eine methode Streng Antiseptischer Behandlung der Genitar Wunden der Frau." *Centralb. f. Gynæk.*, 1880, p. 369.

Continuous Irrigation of the Uterus.—We should say a few words concerning this method of treatment which will never be seriously considered except in the most desperate cases.

Schucking is, so to say, the promoter of it. He operates in the following manner:—

He introduces a canula to the fundus of the uterus, and gives a slight douche with a five per cent. carbolized solution. For continuous irrigation, he employs a solution of sulphite of sodium, 10 parts; glycerine, 5 parts; and water, 100 parts. This antiseptic is used so as to avoid all danger of intoxication. The tube is withdrawn every twelve hours, and washed in a five per cent. carbolized solution. If the case is serious, the solution of sulphite of sodium is temporarily discontinued at certain intervals, and replaced by a five per cent. carbolized solution. The irrigation is kept up for six or eight days.

The method of operating has been modified by different authors who have had recourse to this procedure.¹

Lowenstein has treated a certain number of cases of very grave infection by means of continuous irrigation. He employed chlorinated water and solutions of salicylate of soda, hypochlorite of potassa and carbolic acid.²

What is the value of this method of treatment? Is it necessary, as Schucking has done, to have recourse to it in cases where labors have been difficult, but where serious infectious phenomena have not yet shown themselves? We think not. All the objections we have made to intra-uterine injections can be applied here with greater force.

We should not forget that continuous irrigation is a method of treatment that requires the possession of special instruments, continuous cares, and which fatigues the patients very much.³

In desperate cases, continuous irrigation will render valuable service. Lowenstein has treated by this method 41 cases affected with the gravest symptoms, and 28 of the number were cured. This is without doubt a very encouraging result. We experience, however, a certain repugnance against keeping up for several days continuous irrigation of the uterus, and we believe that injections repeated often during the day will generally answer all the indications.

¹ Lowenstein. "Permanent irrigation of the uterus in puerperal affections." *Wratsch*, 1880, n^o 25, p. 410.

² *Centralblatt für Gynæk*, 1877.

³ Breisky. *Loc. cit.*

B.

Drainage of the Uterus.—Properly speaking, drainage of the uterus, such as has been employed by Veit,¹ Langenbuch,² Thiede,³ M. Schede⁴ and others, is derived directly from the preceding method. It differs from it, in that the intra-uterine injection is intermittent.

Veit practises the method as follows:—

He uses rubber drainage tubes, proportioning the size to the degree of uterine involution, and having walls sufficiently thick to resist the pressure exercised upon them by the uterine wall. This tube is introduced into the uterine cavity, its upper extremity is closed, and upon its walls (the portion contained within the uterus) are a number of openings. After the tube is placed in position, it is cut off at several centimètres from the vulva. When it is necessary to give a douche, the nozzle of the irrigator is attached to the inferior extremity of the tube. In this way we avoid the introduction of the finger into the vagina.

This tube remains in position for some days, and its presence in the uterine cavity does not cause any inconvenience. According to Langenbuch, a tube can remain nineteen days in the uterus without producing any symptom. Schede, who prefers drainage to irrigations, expresses the same opinion.

Uterine drainage has been employed in too small a number of cases to judge of its value.

Veit does not fear to have recourse to this measure in cases where the uterus is healthy, but where there are grave lesions situated at the vulva. In these cases, he attributes to drainage the property of preventing the progression of germs towards the uterus.

We have said enough about the precautions that should be taken in all such cases to indicate clearly that drainage is a method that directly opposes the object we seek to attain. Indeed, far from preventing the introduction of germs into the uterus, the tube can only act to carry them there, and we accept fully the conclusion of Küstner: "Drainage of the uterus has always reminded me of a parody on the brilliant discovery of Chassaignac."

¹ Veit. "Ueber die Drainage des puerperalen Uterus." *Berliner Klin. Woch.*, 1879.

² Langenbuch. "Drainage of the puerperal uterus." *Zeitsch. für Geburtsh.*, T. 2, p. 83.

³ Thiede. "Ueber lokale Antiphlogose in Wochenbett." *Zeitschrift f. Geb.*, T. v.

⁴ Schede. "Drainage of the uterus in puerperal septicæmia." *Berliner Klin. Woch.*, 1877, nos 23 et 24.

See also Fritsch. *Loc. cit.* Winckel. *Loc. cit.*

In serious cases, when there is retention of the membranes, and when the cause of the symptoms is manifestly situated in the uterus, drainage is not irrational, and it has given good results to Langenbuch, Winckel and Fritsch.

But, even though numerous facts have demonstrated to us the complete harmlessness of the retention of a drainage tube within the uterus, we hesitate to have recourse to it, and express preference for intra-uterine injections.

CHAPTER IX.

ANTISEPSIS IN CATHETERIZATION.

THE ANTISEPTIC METHOD IN CATHETERIZATION OF THE BLADDER—
PUERPERAL CYSTITIS—AMMONIACAL DECOMPOSITION OF URINE—
THE INFLUENCE OF MICROBES—VARIETIES AND DISINFECTION OF
CATHETERS—VESICAL DOUCHES, INTERMITTENT AND CONTINUOUS
—DRAINAGE OF THE BLADDER.

CATHETERIZATION is one of the little operations that the obstetrician is very often called upon to perform.

It was the custom in former times, when, after her labor, a woman suffered from retention of urine, for the physician to give prompt relief by means of a silver catheter, which answered indiscriminately for all his patients, sick or well, and which was not submitted to any special disinfection.

Frequently we witnessed then the supervention of cystitis of greater or lesser severity, but which, in some cases, assumed characters sufficiently grave to awaken our fears as to the termination of the disease. All the symptoms of an acute cystitis developed, and the urine became loaded with pus. Too often the patients died, and post-mortem examination revealed various renal lesions; sometimes there was a simple epithelial nephritis, at others the kidneys presented a peculiar appearance, and from place to place upon their surface were presented purulent spots which extended into the parenchyma of the organ—in a word, suppurative nephritis existed. Death resulted from a series of symptoms resembling puerperal infection, but a particular form of the disease was manifested because the function of these organs was crippled.

Cystitis was quite a frequent complication of the puerperal state. Schwarz,¹ indeed, reported the histories of thirty-two cases of cystitis observed at the clinic in Halle, from 1868 to 1875. During this same period 1100 women were delivered in the clinic. Of the thirty-two cases, in twenty there was a simple cystitis; but in twelve there existed at the same time a catarrhal nephritis. When an interne in the Maternity, we made a certain number of observations, in M. Hervieux's service, on puerperal cystitis complicated with nephritis, which have already been published. Finally, M. Tarnier, in a communication to

¹ Schwarz. "Die Ætiologie der puerperalen Blasen-Katarrhe." *Thèse Halle*, 1879.

the London Congress, has briefly shown¹ the importance that should be attached to this complication.

In order to fully appreciate the value of the antiseptic method in the prophylactic and curative treatment of this accident, it seems necessary to state in a few words the views now held of its pathogeny.

Some authors, following MM. Pasteur, Bouchard, etc., have warmly supported the view that attributes to microbes the principal rôle in the ammoniacal decomposition of urine, and think the phenomena bear the following relation to each other:—

Catheterization favors the transport of germs to the bladder; the urine undergoes fermentation, becomes ammoniacal, and, in consequence, very irritating; inflammation of the bladder, often extending along the ureters, and even to the kidneys; finally, very grave symptoms frequently threaten a fatal termination.

The *organized ferment* (the ammoniacal torula of Pasteur or bacterium of Bouchard) would be then the immediate agent necessary and sufficient for the ammoniacal decomposition and the prime cause of these formidable accidents.

Everything seems favorable, in the woman who is just delivered, for such an accident to develop. When all is normal, the vulvar folds and the meatus are bathed with the lochial flow. But the researches of Hugh Miller, which we have many times verified, demonstrate that even in the normal cases this liquid contains a large quantity of vibrios. Schwarz thinks their introduction into the bladder cannot but be dangerous; but the possibility—we will say almost the necessity—of the introduction of septic germs into the bladder becomes evident when it is a question of sick women presenting fetid lochia, and in whom the large and small lips are covered with grayish-white patches resembling hospital gangrene. It is necessary, in addition, to consider the state of the instrument employed. To employ catheters imperfectly cleansed, and serving for use with well and sick, is to be guilty of conveying puerperal infection to patients who would have, perhaps, escaped it.

Some facts exist, however, which do not accord well with the preceding theory; to such belong the cases of serious cystitis which develop when catheterization had not been practised. These are few in number; for, in the thesis of Schwarz, out of thirty-two cases, two only could be classed in this category. The thesis of Mons² can also be consulted with reference to this point.

Pasteur and his followers suppose that in these cases the retention

¹ Tarnier. *Tr. of the Congress*. London, t. IV.

² Mons. *Th. Paris, 1877*. "Cystitis during Pregnancy and Labor."

of urine by itself is incapable of provoking cystitis, but the germs have reached the meatus urinarius, have penetrated into the urethral canal, and have, by a series of successive multiplications, reached the bladder itself, where they have set up an acute cystitis.

Prof. Guyon¹ denies the action attributed to microbes. Cystitis can be developed without the intervention of ferments.

Again, Dr. Guiard,² one of M. Guyon's pupils, has attempted to reconcile the two preceding opinions. Relying upon experimental and clinical researches, he has reached the following conclusion:—

The introduction of germs into a healthy bladder does not suffice to set up fermentation of urine and cystitis. In order that the germs may have power to act, it seems necessary that some inflammatory action should already exist in the vesical mucous membrane. *Without this pre-existing cystitis, the germs are not injurious*; from whence arises this therapeutical rule: The treatment of cystitis in lying-in women will consist of two parts—1st, *To prevent the development of cystitis*, and, for this purpose, to avoid the retention of urine and to *catheterize the patients*; 2d, *To avoid the introduction of septic germs*, and, consequently, to practise *catheterization only under the strictest antiseptic rules*.

We cannot judge fully, as yet, all the details of M. Guiard's theory; it rests upon the closest experimental study.

Let us say only that the practical conclusion to which this author arrives appears correct, if we can be guided by clinical experience.

*We should not fear, then, to practise catheterization in women suffering from retention of urine. But it is necessary to do so in a proper manner.*³

The catheters employed, if metallic, should be of lead; if they are gum, we will carefully wash them in carbolized water or a solution of bichloride of mercury. An excellent method, carried out at the Maternity, consists in using only catheters made of vulcanized rubber, and to leave them constantly soaking in a bichloride solution. Since this precaution has been taken, cystitis has entirely disappeared from the wards of the Maternity.

It would be advisable to abandon entirely the use of gum sounds,

¹ Guyon. "Clinical lessons on diseases of the urinary passages," 1881, p. 375.

² Guiard. "Clinical and experimental study of the ammoniacal transformation of urine." *Th. Paris, 1883*.

³ We will find very interesting matter on the importance of these accidents in the following memoirs:—

Monod. *Annales de gynécologie, 1880*.

Thompson. "Propagation of cystitis by instruments." *British Med. Journ.*, May 10th, 1879.

the internal surface of which is rough and very difficult to disinfect. Instruments of unbreakable glass or transparent celluloid could be employed with advantage, for the transparency would permit one to judge of the state of cleanliness of the instrument.

Before practising catheterization, one will be careful to wash thoroughly the vulva with an antiseptic solution, and to wipe the meatus urinarius as well as surrounding parts.

If, in spite of all these precautions, cystitis should develop, it would be necessary to act energetically, and, regarding medical treatment only as an accessory, recourse should be had to antiseptic *vesical douches*, which have, in some cases, given results truly marvellous.

One could, following the example of Thornton,¹ use solutions of sulphate of quinine; but vesical douches, with carbolized, boricated or benzoated water, or with a solution of corrosive sublimate, are more generally employed. These washings can be intermittent or continuous. Intermittent douches may be used alone or combined with drainage.

Intermittent Douches.—The excellent results that M. Guyon has obtained by repeated injections of the bladder in the treatment of cystitis in the male are well known. These results are no less happy in the puerperal woman suffering from cystitis. In general, one prefers to have recourse to boricated solutions, boracic acid being, according to the investigations of Pasteur, the antiseptic which best antagonizes fermentation of urine. These douches, to give decided results, ought to be repeated several times during the day.

If this fails, what is to be done? One can employ a method much more energetic, which, without doubt, would give excellent results. We refer to *injections of solutions of nitrate of silver*.

In the beginning, an injection can be given of 150 gr. (fʒv) of a solution of nitrate of silver, 1 to 500. This will be repeated every day or every two days. If the attack is very acute, the strength of the solution will be 1 to 250. The action of nitrate of silver is very rapid. It appears to us to act as an antiseptic rather than a simple modifier of the vesical mucosa, as think the authors who recognize in inflammation the result merely of a simple passage of white corpuscles through the walls of the capillaries (Cohnheim, Hayem, Vulpian).

¹ Knowsley Thornton. "The local employment of a solution of quinine in chronic irritation of the bladder." *Lancet*, 1878. The vesical injections are made with a solution of sulphate of quinine, 1 to 250, with a few drops of sulphuric acid added.

Intermittent Douches, with Drainage.—This method of treatment has been especially recommended by Schmidt¹ and by Fritsch.² A catheter is allowed to remain in the bladder, and one makes from three to six one per cent. carbolized injections each day. The instrument is changed every three days. Thanks to this method, we avoid the stagnation of urine and its fermentation.

Schucking³ has employed this procedure in six cases; he was successful four times. However, according to this author, vesical drainage is not a perfect method of treatment. For there always remain in the bas-fond of the bladder matters loaded with germs; therefore he has great confidence in continuous irrigations.

Continuous Irrigations.—Schucking employs the following solution:—

Sulphite of soda	10 gr.	(ʒ iiss)
Glycerine	5 gr.	(lxxv gr.)
Water	100 gr.	(ʒ iij)

In Schucking's memoir will be found the description of the apparatus he uses, and which is very much like that we have described when speaking of continuous irrigations of the uterus.

Each of these methods is valuable. Perhaps, though, we shall hesitate to employ drainage, as it facilitates the entrance of air into the bladder.

¹ Schmidt. "Ueber die Behandlung schwerer Formen von Blasen Katarrhen durch Drainage des Harnblase." *Th. Halle, 1880.* ² Fritsch. *Loc. cit.*

³ "Treatment of Vesical Catarrh." *Centralblatt f. Gynæk., 1881.*

CHAPTER X.

THE ANTISEPTIC METHOD IN RUPTURE OF THE UTERUS.

DELIVERY BY THE NATURAL PASSAGES—LAPAROTOMY—REMOVAL OF THE UTERUS—PERITONEAL DRAINAGE.

FOR a long time uterine rupture was considered one of those accidents which it is impossible to foresee and which one could not prevent. As all methods of treatment seemed useless, obstetricians considered the accident almost necessarily fatal.

More recently, the investigations, carried on especially in Germany, in regard to the effacement of the neck during labor, have made more clear the pathogenic conditions of uterine rupture, and have established upon a truly scientific basis the preventive treatment of this accident. We will not stop to consider this point, for the solution of which the application of the antiseptic method has not had any influence. This is not true, however, in regard to the curative treatment.

Suppose that a woman has been in labor for a long time; it may be that she has a vicious presentation (the shoulder, for instance), a pelvic contraction, or some foetal malformation, as hydrocephalus; perhaps, for the purpose of increasing the strength of the uterine contractions, the woman has had given to her some ergot, the labor does not terminate. Suddenly, the woman turns pale, complains of a sharp pain in the abdomen, sometimes hemorrhage occurs, and palpation reveals, in spite of the acute pain experienced by the patient, that a uterine rupture has just occurred, and that the infant partly or wholly has left the uterine cavity and passed into that of the peritoneum. What is to be done? Must delivery be effected by the natural passages? Must laparotomy be resorted to? If the statistics of Trask¹ and of Jolly² are accepted, immediate action is called for; it would be absolutely necessary to perform laparotomy; delivery by the natural passages, followed by expectation alone, would nearly always be fatal. Since the introduction of the antiseptic method, these statistics have lost their value wonderfully.

Without doubt, to limit one's action merely to terminate labor by

¹ Trask. *Am. Journ. Med. Sciences*, 1856.

² Jolly. *Th. Paris*, 1870. According to the statistics of Jolly, the proportion of cures would be 68.4 per cent. when laparotomy was performed, and only 17.5 per cent. when forceps or version was employed.

the natural passages, and to await events without doing anything to combat the development of peritonitis and septicæmia, is to wait for almost certain death. But must laparotomy always be resorted to?

This operation appears to be particularly indicated when the uterine rupture is very extensive, when the fœtus and its appendages have escaped into the peritoneal cavity, and when considerable hemorrhage has taken place into this sac. It then seems necessary to perform laparotomy, which, alone, will permit one to thoroughly wash the serous membrane, and to remove all trace of blood and of matter susceptible of undergoing putrefactive changes. The operation decided upon, ought one, after having extracted the child and having made the toilet of the peritoneum, to suture the uterine wound, or would it be better to perform hysterotomy after the method of Porro? Uterine suture, in these cases, would nearly always result in failure, on account of the irregularity of the wound and of the contused state of the lips. Removal of the body of the uterus by Porro's method is then the proper course. The results obtained appear to have been excellent. Ablation of the uterus would seem then absolutely indispensable for the success of laparotomy in such cases.

But laparotomy is, it is well to remember, a fresh traumatism, which is added to that already resulting from a long and laborious confinement. The attempt has been made to secure an aseptic state of the peritoneum, without imposing additional fatigue upon the patient. Some authors think they have obtained this result by practising *PÉRITONEAL DRAINAGE*.

It is known that drainage, thanks to the genius of Chassaignac, has been for a long time applied to the treatment of deep wounds. With Lister, the employment of drainage tubes has been perfected, and it is to drainage that this author and his pupils attribute the excellent results which they have obtained in the treatment of extensive wounds. Ovariomists have for a long time recommended the use of peritoneal drainage after ovariectomy or the removal of tumors necessitating the opening of the peritoneum. But, according to these authors, drainage of the peritoneum should not alone be employed in cases where peritonitis had developed; one should have recourse to it before the appearance of any symptom; it is well to practise *preventive* drainage of the peritoneum. This method of treatment, which will be found described in all its details in the book that Bardenheuer has devoted to the study of drainage, is popularized in Germany under the influence of the success reported by the Cologne surgeon. The application of drainage to the treatment of uterine rupture has met with

¹ Harris. *Am. Journ. of Obstet.*, October, 1880.

some success at Berlin, in Schröder's Clinic, by Frommel;¹ at Munich, by Hecker;² and at Pesth, by Mann.³ At this moment, however, a reaction has occurred in England against the employment of this procedure in ovariectomy, which, having been received favorably up to the present time, is now the subject of much discussion. The recent work of Spencer Wells⁴ fully considers the subject.

To practise drainage, a tube of variable calibre and length is introduced into the uterine wound, for the purpose of permitting the fluid, which has escaped into the peritoneum, to flow without. Before applying the instrument, the uterine cavity must be thoroughly washed out, and, if necessary, that of the peritoneum. Once in place, the tube should not be disturbed, according to the advice of Frommel, for two days, in order that peritoneal adhesions may form. Some authors, however, have proposed to make, from the beginning, injections through the tube with an antiseptic liquid. The tube is withdrawn every two or three days, and a thorough washing of the uterus and vagina made each time.

It is unquestionable that this method has given good results. Thornton,⁵ Morsbach,⁶ Frommel, Reben,⁷ Voss,⁸ Gräfe,⁹ Hecker¹⁰ and Mann¹¹ have been remarkably successful by this mode of treatment, which seems, indeed, to be perfectly rational.

¹ Frommel. "Zur Therapie der Uterus ruptur." *Centralb. für Gynæk.*, 1880, p. 417.

— "Zur Etiologie und Therapie der Uterus ruptur." *Zeitschrift für Geburtsk.*, T. v, p. 400.

² Hecker. "Ueber einen Fall von spontaner Completer Uterus ruptur mit Ausgang in Genesung durch Drainage." *Centr. für Gynæk.*, T. v, p. 225.

³ Mann. "The Treatment of Uterine rupture by drainage." *Centr. für Gynæk.*, 1881, n° 19.

⁴ Spencer Wells. *Med.-Chir. Trans.*, 1877.

⁵ "The antiseptic method and drainage of the peritoneum in laparotomies." *Lancet*, August 30th and Sept. 20th, 1870.

⁶ E. Morsbach. "Ein Fall von Uterus ruptur, mit Austritt des Kindes in die Bauchhöhle. Drainage und Genesung, aus der Frauenklinik zu Halle a/s." *Cent. für Gyn.*, t. v, p. 400.

⁷ Reben. "Zur Therapie der Uterus ruptur." *Th. de Berlin*, 1879.

⁸ J. Voss. "Ruptura uteri." *Norsk Magazin for Logevidenskab*, 3 R., Bd. III. *Anal. C. f. Gyn.*, 1880, p. 46.

⁹ Gräfe. "Ein weiterer Fall von erfolgreich mit Drainage Behandelte Uterus ruptur." *Cent. f. Gyn.*, 1880, n° 26, p. 614.

¹⁰ C. von Hecker, in München. "Ueber einen Fall von spontaner. Completer Uterus ruptur mit Ausgang in Genesung durch Drainage." *Cent. f. Gyn.*, t. v, p. 225.

¹¹ Mann. "Treatment of uterine rupture by drainage." *Cent. für Gyn.*, 1881, n° 16.

However, the expediency of peritoneal drainage has been sharply opposed by Ott, who has made a series of experiments upon rabbits for the purpose of studying anatomically the results of drainage of the peritoneum in these animals.¹ Having opened the abdomen, he placed a drainage tube in the wound, causing thus a communication to be made between the serous cavity and the exterior; twice daily he made injections of 2 per cent. chlorinated water, at a temperature of 35°.

The following results were obtained:—

From the first day after the operation, the greater part of the drainage tube is found surrounded by exudation; from the third day, the tube is completely isolated from the peritoneal cavity, and the purulent discharge proceeds, not from the peritoneum, where no inflammation exists, but from an abscess which is developed in the new tissue formation surrounding the tube. Injections made through the tube do not prevent the formation of this capsule. After the third day, this capsule prevents the liquid injected from passing into the peritoneal cavity. To these results the author adds the evidence derived from post-mortem examinations in ovariectomy cases where drainage had been employed. He concludes that drainage of the peritoneum is dangerous, on account of the communication made between this serous cavity and the air (Olshausen), and also because the tube acts the part of a foreign body and produces injurious irritation.

From these researches, which deserve repetition, it would seem that drainage, after the third day, is useless, since the tube is completely shut off by the capsule of exudation matter which surrounds it.

Also, a certain number of facts exists which show that simple intra-uterine injections have sufficed, without drainage, to prevent any accident. M. Tarnier has communicated to us two very interesting observations in which drainage was not employed and recovery was rapid. Alberts has reported a similar case.²

To act wisely, one must know how to conduct himself according to the nature of the cases he is called upon to treat. Here is what we believe to be the best treatment to have recourse to in case of uterine rupture. If the case is one of pelvic contraction, or if the conditions under which the rupture is produced are such as to render it very difficult to extract the infant by the natural passages, or that such an

¹ Ott. "Drainage after laparotomy. Experimental study." *Medicinsky West-nick*, 1878, n° 51.

² Alberts. "Uterine rupture cured without drainage." *Berl. Klin. Woch.*, 1880, n° 45.

operation is possible only at the expense of long and dangerous efforts, it would be well to have recourse to laparotomy.

So long as delivery by the natural passages is easy, it should be accomplished. Is it well to employ drainage? Must we imitate the practice followed at the Paris Maternity? We must look to the future for an answer. We acknowledge, however, to having a tendency to limit the indications for drainage to cases in which blood or fluids poured out into the peritoneum strongly indicate the almost certain occurrence of peritonitis.

If antisepsis has been carefully carried out during labor, if there is no peritonitis, intra-uterine injections will usually be sufficient to prevent infectious accidents.

CHAPTER XI.

THE ANTISEPTIC METHOD IN THE CÆSAREAN OPERATION.

TREATMENT OF THE ABDOMINAL WOUND—TREATMENT OF THE UTERINE WOUND—DRAINAGE—CAPILLARY DRAINAGE—LAPARO-ELYTROTOMY—ANTISEPSIS IN PORRO'S MODIFICATION—IN THE PORRO-MÜLLER OPERATION—ANTISEPSIS IN THE TREATMENT OF EXTRA-UTERINE PREGNANCY—INTERNAL ANTISEPSIS—ELIMINATIVE TREATMENT—SUPPORTING TREATMENT.

If one can still dispute the value of antiseptics in obstetrics, the facts we are about to mention in reference to the Cæsarean operation suffice to overthrow the most obstinate convictions.

So long as the antiseptic system was ignored, the Cæsarean operation was of such gravity that it was seldom undertaken; the mother was doomed to almost certain death. One finds in Guéniot's work¹ a series of statistics which leaves no doubt on this point. Paul Dubois performed 17 Cæsarean operations; he had 17 deaths. Out of 4 operations by Depaul, 3 by Danyau and 6 by Kuneke,² as many deaths resulted as operations performed.

It would be interesting to collect a true statement of all the Cæsarean operations performed since the introduction of the antiseptic method; it would be seen that the chances of recovery gradually increased in proportion as this method was applied with greater care. We would thus obtain a curve which would resemble that given by Spencer Wells in the memoir descriptive of his first thousand ovariectomies. By reading the two articles by Knowsley Thornton³ and by Keith,⁴ a correct idea may be formed of the value of the antiseptic method in operations which necessitate opening the abdomen. All the remarks made by these authors can be applied strictly to the Cæsarean operation.

The Cæsarean operation, according to the full acceptance of the term, comprises three procedures:—

The old operation, designated in popular language by the name *Cæsarean operation*, properly speaking;

Laparo-elytrotomy, and

The procedure of Porro, called, also, *Porro's operation*.

¹ Guéniot. "Comparison between cephalotripsy and Cæsarean operation." *Th. de concours*, 1866.

² Kuneke. *Mon. f. Geb.*, 1864.

³ Knowsley Thornton. *British Med. Journ.*, Oct. 19th 1878.

⁴ Keith. "Results of ovariectomy before and after the use of antiseptics." Same journal.

We will only direct attention to laparo-elytrotomy, which is an old procedure, described first by Joerg,¹ that soon fell into oblivion, and from whence it was brought to light by the efforts of Gaillard Thomas, Skene and Garrigues.² This operation, which has not been done to our knowledge with the aid of the antiseptic method,³ has been devised for the purpose of avoiding the opening of the peritoneum. We now know that the opening of this serous cavity does not constitute a condition unfavorable for the patients, and we see at present some surgeons, as Czerny or Billroth, not to mention Bardenheuer, who never hesitate in an operation to open the peritoneum freely whenever it can render the operation a little more easy. What is most important of all is to guard the patients from septic germs. But, in itself, laparo-elytrotomy cannot constitute a method of choice, and we recognize why surgeons are not tempted to employ it more frequently. We will occupy ourselves, then, with the two operative procedures that are more frequently practised—the Cæsarean operation, properly so called, and Porro's operation.

The Antiseptic Method in the Cæsarean Operation.—Before undertaking such an operation, the obstetrician, it is useless to repeat, should take all the antiseptic precautions which are demanded in an operation of so much gravity. The patient will be placed in a perfectly aseptic medium; she will occupy the room alone; she will be attended by a personnel not having any communication with the sick; the bedding shall have been disinfected by heat, etc., etc.

Before the operation, one will have made in this room prolonged atomizations with an antiseptic solution, which will have the effect of washing away all dust suspended in this air which will soon be in contact with the peritoneal membrane. The temperature will be kept elevated and moist at the same time; every instrument that will be employed must be soaked in a strong carbolized solution (5 per cent.); all the hollow instruments, catheters, etc., and all the non-cutting instruments, as hæmostatic forceps, etc., will have been carefully purified by passing through a flame before they are placed in this solution; they will not be removed from it except when needed in the operation. The sponges must positively be new, and shall have been passed through the drying stove and placed in a carbolized solution.

All these precautions are useless if the medical personnel be not submitted to rigid antiseptic measures. The assistants will be required to exercise the same precautions, and the operator himself will undertake

¹ Joerg. "Handbuch,"

² Garrigues. *New York Med. Journ.*, 1878.

³ Säger's hysterotokotomy must not be confounded with this procedure.

the operation only after having carefully disinfected his hands, etc. (See page 97.) As to the patient, she will have taken a bath, if possible, and in every case, before the operation, the abdominal wall will have been carefully washed with soap and water; after this a second bathing with an antiseptic solution. It is absolutely necessary to give the woman a copious antiseptic vaginal injection.

In England the spray is scarcely ever employed in ovariectomy. We have already shown that the atomization of carbolyzed water can be injurious by favoring the transport of germs to the wounds. We will not insist then upon this point.

The abdominal wall being opened, all the attention of the operator should be directed to this object: to avoid any fluid (blood, amniotic fluid) escaping into the peritoneum. To obtain this result, the two assistants, placed on each side of the patient, maintain the two lips of the abdominal wound closely applied against the uterus. Sponges will be furnished as needed. The assistants will watch that the edges of the wound always remain in contact with the uterus after the incision of that organ. They should act just as in a case of ovariectomy.

After the foetus has been extracted, and the secundines delivered, Kehrer¹ gives the advice to carefully wash the internal surface of the uterus with carbolyzed water, and to sponge it out afterwards with carbolyzed sponges.

The obstetrician ought to take the greatest pains with the toilet of the peritoneum, and remove any blood or amniotic fluid that may have escaped into its cavity. For this purpose he will use sponges attached to holders and soaked in a carbolyzed solution. He will give his attention especially to the folds of the peritoneum in the small pelvis, where fluids have a tendency to accumulate.

For these precautions to be of any use, no hemorrhage must be allowed to occur.

After the toilet of the peritoneum is ended, the two edges of the uterine wound are closely approximated.

What is to be done in these cases? Must we proceed at once to suture the abdominal wound? Must we first sew up the uterine wound? or is it better to drain the uterine wound before applying sutures to the abdominal wall?

All these opinions have been sustained, but none are supported by sufficient facts to render it possible to give a decided answer.

Is it Necessary to Suture the Uterine Wound?—Formerly, when the good results obtained by uterine douches in rupture of the womb were

¹ Kehrer. *Arch. f. Gynæk*, T. XIX.

not known, the necessity of the uterine suture was generally admitted, from whence arose the discussions concerning the suture, etc., and the utero-parietal suture. It is of the greatest importance to avoid the escape of lochial fluids into the peritoneum.

It is yet very difficult to arrive at any conclusion, when one sees the advocates of the uterine suture—as Kehrler—recommend to place a drainage tube in the inferior angle of the uterine wound, in order to permit the fluids escaped into the peritoneum to flow through the genital channel.

The question is unsettled; but whatever practice may be adopted, whether we employ the uterine suture (and preference is given to silk or large catgut sutures) or leave the uterine wound untouched, does the antiseptic method demand that we place a drainage tube in the inferior angle of the wound?

When the wound in the abdominal wall is sutured, is it also necessary to employ a drainage tube?

All these methods have been practised.

[One of the most important modifications of the improved Cæsarean section relates to the treatment of the uterine wound. The object is to isolate as completely and as early as possible the uterine cavity from that of the peritoneal. A drainage tube is not employed, as it would directly antagonize what we seek.

During the operation every effort is made to prevent the escape of blood, amniotic fluid, etc., into the peritoneum. The uterus is emptied, and its cavity made aseptic by cleansing with carbolyzed sponges and dusting with powdered iodoform.

The uterine wound is treated by—

- 1st. Turning in the edges of the peritoneum, and
- 2d. Closing the wound with multiple sutures.

The original modification suggested by Säger consisted of cutting out a slip of muscular tissue from each side of the uterine incision, for the purpose of securing a good flap of peritoneal tissue. It has been found unnecessary to resort to this procedure, because the diminution in size of the uterus, after retraction, supplies sufficient redundant peritoneum to turn into the wound before suturing.

The uterine wound is closed with numerous sutures, both superficial and deep. Preference is given to silver wire for the deep sutures, which should extend down to, but not through, the mucous lining of the uterus.

“The value of the multiple system of suturing lies in the fact that the gaping *force* is so divided as to reduce very materially the individual tension upon each stitch, and thus is prevented what had

been so often found on autopsy, a gaping wound, with escaped uterine discharge in the peritoneal cavity.”

This quotation is taken from an article by Dr. R. P. Harris,¹ in which he gives the marvelous success that has been obtained in the first fifty cases of Cæsarean section under the Sanger method.

Of this number, 35 women, or 70 per cent., were saved.

In Germany, 33 operations saved 29 women; nearly 88 per cent. 30 of the children were known to have been saved; 2 had not been heard from, but were probably alive.

In Austria, 5 operations saved 2 women (40 per cent.), and all the children.

In the United States, 5 operations resulted in as many maternal deaths, and but 2 children were saved.

In Italy, 2 women and all the children were saved in 3 operations.

In Russia, France and Switzerland, 4 operations saved 2 women, and 3 children are known to have survived.

More gratifying still is the result of the operations performed in the following Maternities:—

Leipzig . . . operations	7 . . . women saved	7 . . . children saved	7
Dresden . . . “	15 . . . “	14 . . . “	15
Innspruck . . . “	2 . . . “	2 . . . “	2
	24	23	24

In other words, out of 48 lives involved, all were saved but 1.—[F.]

(a) *Is it necessary to employ a drainage tube in the inferior angle of the abdominal wound?*

This question has been little studied in its relation to the Cæsarean operation proper, and to discuss the subject fully, it would be necessary to write the history of drainage in laparotomy. We cannot do this, but ought, nevertheless, to mention briefly the state of the question.

In Germany, during the years 1878 and 1879, drainage of the peritoneum was especially employed by Bardenheuer. In the book which he has devoted to the study of this antiseptic procedure, he professes the following views, which are the basis of his practice:—

Opening the peritoneum is without danger, provided drainage is employed.

Whenever blood has escaped, it is necessary to practise drainage.

By this author’s influence, drainage will be popularized. The

¹ Robert P. Harris, M.D. *Medical News*, Phila., March 26th, 1887, p. 344.

objections to its use soon appear. Spencer Wells had already shown that the method exposed patients to accidents; it allowed air to penetrate to the peritoneum.

Thornton¹ demonstrated that in laparotomies it is useless to employ drainage when the antiseptic method had been rigorously carried out.

To-day, one ought to practise drainage of the abdominal wall only in cases where a large quantity of blood or of amniotic liquid has escaped into the peritoneum; in those cases, also, where one cannot be certain that the antiseptic method has been applied in all its details; and in those where a putrefied fœtus has been extracted from the uterus—in all cases, in a word, where the development of septic peritonitis would appear inevitable.

One or two tubes should be used sufficiently long for their internal extremities to rest on each side in the vesico-uterine folds.

To avoid the penetration of germs through the tube, the external extremity of each tube can be covered with wadding (Fritsch).

Capillary drainage (Hegar, White, Spencer Wells) will be, perhaps, preferable. One can, for instance, place in the angle of the wound a certain number of threads or horse hairs that have been carefully disinfected. The fluids escape into the peritoneum flow well, by capillary attraction, towards the exterior, and by withdrawing each day one or two threads, the gradual closure of the abdominal wound is permitted.

(b) *Is it necessary to drain the uterus?* All that we have said in regard to drainage of the uterus, in case of uterine rupture, is fully applicable here.

(c) *Is it necessary to drain through both the uterus and the abdominal wall?* Frank² advises to place a drainage tube so that one extremity would open without by the abdominal wound and the other end terminate in the vagina. This procedure has scarcely ever been employed, and it is impossible to say what advantage it possesses.

To repeat:—

The utility of drainage *in simple cases* is doubtful.

This procedure will be able to render assistance *in a case where peritonitis seems inevitable.*

If drainage be employed, should we drain the uterine wound or the

¹ Thornton. "The antiseptic method and drainage." *Lancet*, 1879.

² Quoted by Kehrer, *loc. cit.*

abdominal wound, or both? Nothing positive is known on this point.

When the operation is terminated, the sutured abdominal wound will be dressed and treated according to Lister's method.

Vaginal and uterine douches should not be neglected during the lying-in. One will act, in this respect, as though it were a case of uterine rupture.

Antisepsis in Porro's Operation.—All the rules we have just given in the preceding paragraph will be applied here.

We will insist only upon two points which have appeared to us to present a special interest.

We have seen the importance in the Cæsarean operation of preventing blood and amniotic liquid from penetrating into the peritoneal cavity. This is one of the dangers of the Cæsarean operation. It exists likewise in Porro's operation.

Müller,¹ supported by Rein,² has proposed a modification of Porro's operation which avoids this accident. For this purpose, he draws the uterus outside of the abdominal cavity before opening it.

Unfortunately, this procedure is often difficult of execution. To accomplish this, it is sometimes necessary to exert violent traction force to the uterus, ligaments, etc. The procedure of Müller is not very generally employed, and, in a strictly antiseptic point of view, these difficulties of the operation cause the advantages attributed to it by the author to be of secondary consideration.

In Porro's operation, after the uterus is excised, there remains a pedicle. The majority of obstetricians fix it in the inferior angle of the abdominal wound and treat it exactly as ovariologists treat the pedicle after ovariectomy. But, whatever may have been the antiseptic precautions employed, it is thought that the stump always constitutes a door of entrance for the septic germs. It has been proposed not to fix it in the abdominal wound, but to replace it within the abdominal cavity, after having previously applied the ligature to prevent hemorrhage.

We stand in need of more evidence to fix the value of this modification of Porro's operation, a modification to which, henceforth, the objection may be made that patients are not safe from hemorrhages.

For several years Porro's operation has been frequently employed. The mortality is about 50 per cent., and much less than that of the Cæsarean operation.

¹ Müller. *Centr. f. Gynäk.*, 1878.

² Müller. *Arch. Gyn.*, 1879.

This difference is due to two causes, which have been well illustrated by Sanger,¹ Kehrer² and by Cohnstein.³

The Cæsarean operation has not been very often performed since the introduction of the antiseptic method. All of the Porro operations have been practised with the aid of this method. Consequently, the statistics of the two operations are not comparable.

One cannot fail to recognize, on the other hand, that Porro's operation overcomes all the dangers resulting from the passage of lochia into the peritoneum; it substitutes, for the irregular uterine wound of the Cæsarean operation, a regular wound, which can be treated locally by antiseptic procedures (cauterizations, etc.).

From whence the authors we have cited conclude: It is necessary, in modifying the operation, to cause the dangers we have just mentioned to disappear.

They have, in consequence, proposed a series of very ingenious procedures, but these have not received the sanction of practice, and we cannot mention them here.

Antisepsis in the Treatment of Extra-uterine Pregnancy.—We will only say a word upon this subject: Whatever mode of treatment be adopted, the antiseptic method will be applied in all its details. If the cyst be punctured, the instrument employed will have been carefully disinfected, etc. We will not describe the antiseptic precautions that must be employed when one has recourse to laparotomy; to do so, would be to repeat all we have just said in regard to the Cæsarean operation.

When the cyst suppurates and opens, whether externally or in the intestine or genital passages (uterus, vagina), the conduct that the obstetrician should pursue will vary according to the direction taken by the pus and the intensity of the general phenomena (hectic fever, etc.).

Often the contents of the cyst are eliminated gradually and the general phenomena are slight. In these cases one should follow the practice adopted by surgeons when they have to treat a deep abscess which opens externally by a long and tortuous tract (douches, antiseptic dressings).

Drainage will scarcely be of any service except in cases where the

¹ Sanger. "Zur Rehabilitirung des classischen Kaiserschnittes." *Arch. f. Gynæk.*, T. XIX, p. 370.

— "Der Kaiserschnitt bei Uterus fibromen, etc., Kritiken Studien und Vorschläge zur Verbesserung des Kaiserschnittes." Leipzig, 1882. ² Kehrer. *Loc. cit.*

³ Cohnstein. "De l'operation cæsarienne." *Centr. f. Gynæk.*, II juin, 1881, p. 289.

cavity of the cyst is easily accessible, so that frequent douches can be made into the interior.

If recourse to laparotomy is decided upon, the general rules already indicated will be followed. (See Cæsarean and Porro's operations.)

We have now passed in review the various applications of the antiseptic method to obstetric practice; yet we have scarcely studied till now any but local antiseptics. There is another, however, which is no less important; we refer to internal medication, by which it is proposed to act upon the germs, the microbes, when they have penetrated into the organism.

We have seen all the means by which one can combat the introduction of the poison into the economy.

Once it has gained a foothold there, we must fight and destroy it, if such be possible.

We ought to favor its Elimination.—It is with this object in view that certain authors (Hervieux) have proposed purgatives and emetics; but this practice entails such inconveniences (fatigue, general depression, etc.), that at present nearly all obstetricians oppose it.

It is Necessary to Combat the Infectious Agent and to Destroy it, if one can.—Above all else, it is important to sustain the strength of the patient and to increase the resistance against the action of the infectious agent. Alcohol, aconite, sulphate of quinine and the different febrifuge preparations act probably in this manner.

But can one combat the microbe itself? Do we possess antiseptics that can be employed internally, and which are capable of acting effectively upon the microbe? Carbolic acid, salicylic acid, salicylate of soda, benzoic acid and the benzoates and thymol have been successively praised, especially the latter, which, in the hands of Invernardi, has given good results.

Each of these antiseptics, according to the authors who have lauded them, would be the specific of puerperal fever; however, their employment has not met with much favor because, without doubt, of the accidents which have followed their use.

With the exception of sulphate of quinine and alcohol, which act perhaps also as antiseptics, we do not believe any of these medicines can be employed without danger.¹

¹ Sulphate of quinine should be administered in large doses, from 0.80 centigrammes to 2 gr. (gr. xiii to xxx), and even more. The severity of the symptoms will be the guide. (Bouchard, Lucas-Championnière, Breisky, Conrad.)

The association of alcohol and sulphate of quinine has given excellent results to

So long as one does not know exactly the manner in which the microbe lives when it has been introduced within the organism, internal antiseptics cannot yield good results.

The medicines which are really antiseptic, and which we would employ, often exceed the limit desired; we should not, "while wishing to kill the microbe, risk destroying the patient."

Breisky and to Conrad in the treatment of septicæmia unaccompanied by marked lesions of the genital apparatus.

APPENDIX A.

I. ANTISEPSIS TO THE UMBILICUS.

THE APPLICATION OF THE ANTISEPTIC METHOD TO DRESSING THE UMBILICAL WOUND—SEPTIC INFECTION OF THE NEW-BORN—MOIST AND DRY DRESSINGS.

PUERPERAL infection is contagious:—

The new-born infant is in constant contact with its mother; it can then, if it presents an open wound, be infected.

At the present time, infection of the new-born is uncontradicted. No one thinks, as Dugès and Billard, of any longer disputing its reality.

We will not give a historical account of this question; we will not show how the works of Trousseau, of Underwood, of Rilliet and Barthez, of Bouchut, of Schidler and of Hueter made preparation for the conclusion reached by Lorain. In his inaugural thesis this last writer, by a series of statistics, has shown how, in maternities, the mortality of the infants increased proportionally with that of the women. Autopsy demonstrated in the new-born the existence of peritonitis, of multiple phlegmons, of erysipelas and of gangrene of the limbs, etc.

The laws which govern the propagation of puerperal fever from one woman to another are applicable here. The new-born is infected because septic germs have been enabled to penetrate into its organism. For which reason there arises a new application of the antiseptic method. Thanks to it, we can place by the side of the statistics of Lorain some new ones which show that the morbidity of infants decreases in proportion as this method is applied with greater care (see page 81).

The doors for the entrance of the poison are numerous in new-born infants. There is one, the importance of which cannot escape the attention of any one; it is the umbilical wound.

Consequently:—

It is necessary, in dressing this wound, to apply the antiseptic method.

Germs can likewise be deposited upon accidental wounds (wounds

of the head from forceps, bullæ, etc.). Epstein¹ looks upon the buccal mucous membrane as one of the channels by which infection often takes place. During the first days of life, we frequently see, indeed, small erosions appear upon the surface, which readily heal when all is normal, But if infectious germs be deposited upon their surface, they become covered with grayish patches containing numerous "giant-like" microbes capable of becoming the source of infection.

In certain cases, the indications of beginning infection appear around the genital organs (Bergeron).

Finally, Geyl² thinks that the infant can be infected through the lungs.

The infectious accidents met with in the new-born are multiple. Generally, we observe erysipelas of the umbilical region, and peritonitis. The umbilical wound has been, usually, in these cases, the door of entrance for the poison. But by the side of these accidents, the infectious origin of which is fully demonstrated, there are others which are probably of the same nature, but their pathology is still very obscure. Such are the scleroderma of new-born (Hervieux), trismus (Franck, Eisenmann³), icterus, and more particularly that form of the disease called by Winckel, "Cyanosis afebrilis icterica perniciosa cum Hämoglobinuria," and finally that hemorrhagic diathesis described by Klebs and Grandidier.

Isolation is the first precaution to take in order to avoid infection of the new-born.

Also, the different wounds upon the integument, and especially the umbilical wound, should be dressed by the antiseptic method.

We cannot fail to recognize that the umbilical dressing, as practised, does not in any way answer the demands of the antiseptic method.

Max Runge⁴ has made a series of experiments to determine the mode of dressing which gave the best results. From his investigations he concludes that moist dressings, even practised with carbolic acid, are defective, because they retard the decay of the cord and prevent its desiccation. Dry dressings are preferable.

¹ Epstein. "Ueber Septische Erkrankungen der Schleimhäute bei Kindern." *Prager med. Wochenschrift*, 1879, n° 33 and 35.

² Geyl. "Die Ätiologie der sogenannten 'puerperalen Infektion' des Fötus und des Neugeborenenen." *Arch. f. Gyn.*, Bd. xv, Hft. 3.

³ Eisenmann. Quoted by Buermeister, *Th. de Berlin*, 1881.

⁴ Max Runge. "Ueber Nabelerkrankung und Nabelverband." *Zeitschrift für Geb.*, T. vi, p. 64.

Dohrn¹ has proposed a method of dressing which seems to answer fully this double indication: 1st, To permit the contact of air to the umbilical cord and not prevent its desiccation; 2d, To oppose the transport of the germs contained in the air to the cord.

For this purpose, after having thoroughly washed the umbilical region and the adherent portion of the cord with a two and one-half per cent. carbolized solution, he makes a dressing of carbolized wadding. This dressing remains in position for seven days without being changed. By this time the cord will have been detached, or nearly so. In twenty-eight cases, this mode of treatment has given the best results. The cord is dry, there is little or no odor, the secretion is slight and less than with the ordinary dressing, and the infant's skin is not inflamed in the slightest.

At Leipsic,² the umbilical region is dusted with salicylated powder, according to the advice which has been given by Fehling; the whole part is covered with salicylated wadding, maintained in place by a band 0.07 centimetres wide by 0^m80 long. This dressing is renewed every day, after having washed the baby. This antiseptic dressing should be continued until complete cicatrization of the umbilical wound has occurred.

Although these precautions are not sufficient to shelter the new-born infants absolutely from all infection (the umbilical wound not being the only door of entrance for the poison), we think it would be interesting for us to employ the dressings of Dohrn and of Sanger, which appear very natural and capable of rendering service.

II. OPHTHALMIA NEONATORUM.

PROPHYLACTIC TREATMENT—ANTISEPTIC VAGINAL INJECTIONS DURING LABOR—CLEANSING THE EYES OF THE INFANT IMMEDIATELY AFTER BIRTH—CREDÉ'S METHOD.

We think that we should say a few words about the prophylactic measure it is well to adopt against the propagation of ophthalmia neonatorum. It is well known how prevalent this affection is in Maternities where the antiseptic method is not employed. Ophthalmias, in a certain number of cases, are contracted during labor; it results from the action of fluids secreted by the vaginal mucosa (blennorrhagia, etc.); in other cases, the inflammation of the conjunctiva is due to

¹ Dohrn. "Ein neuer Nabelverband." *C. f. Gyn.*, 3 juli, 1880, p. 313.

² Sanger. "Sind aseptische Nabelverbande bei Neugeborenen nothwendig und moglich?" *Centralbl. f. Gyn.*, 1880, p. 444.

— Zur Frage vom "antiseptischen Nabelverband." *Centralbl. fur Gyn.*, T. v, p. 125.

the action of germs conveyed to this surface by the fingers, sponges, etc.¹

The latter mode of propagation of the disease is prevented by carefully applying all the rules of disinfection that we have mentioned (disinfection of the medical personnel and assistants).

It appears more difficult to overcome the action of the vaginal fluids: one can endeavor to do so, however, 1st, by giving antiseptic vaginal douches; 2d, by washing the infant's eyes after its birth.

1st. By giving vaginal douches with antiseptic substances.

In 1835, Wendt² recommended the frequent employment of vaginal injections in women who were suffering with leucorrhœa, given both during pregnancy and labor. Haussmann³ has recently insisted upon the utility of these vaginal injections. But this mode of treatment is often insufficient; therefore it has been thought well to act directly upon the eyes after the birth of the infant. Ætius,⁴ in 1542, employed this method of treatment.

To mention only modern authors, we see Hasse,⁵ in 1829, advise to wash the eyes of all the new-born infants, twice a day, with a solution of chloride of lime. In 1839, Sonnenmayer⁶ spoke highly of bathing the eyes of all syphilitic infants; he employed a solution of corrosive sublimate or one of chloride of lime. More recently, Haussmann⁷ has recommended to wash the eyes of new-born infants with a one per cent. carbolized solution before the eyes are opened. But Crêdè⁸ especially has popularized the employment of this method.

Before the month of October, 1879, he employed vaginal douches with two per cent. carbolized or salicylated solutions in all women suffering from vaginitis who presented themselves at the Leipsic Ma-

¹ See Ritter. "Ophthalmia of the new-born." *Prager med. Woch.*, 1877.

² Wendt. *Die Kinder Krankheiten*, 3 Aufl., Breslau, 1835, § 32, p. 87.

³ Haussmann. "Zur prophylaktischen Behandlung Während der Geburt eintretenden Infektion der Augen des Kindes." *Centralbl. f. Gyn.*, T. v, p. 76.

— "Zur Entstehung und Verhütung der ophthalmia neonatorum." *Centralbl. f. Gyn.*, T. v, p. 204.

⁴ Ætius. "Tetrabiblos." Bale, 1542, pp. 180 and 183.

See Quellmalz. "Panegyris medica de cœcitate infantium flueris albi materni ejusque Viridenti pedissequæ." Leipzig, 1750.

⁵ Hasse. *Gemeinsame Deutsche Zeitschrift für Geburtskunde*, 1829, Bd. v, p. 636.

⁶ Sonnenmayer. "Die Augenkrankheit der Neugeborenen." Gelnhausen, 1839.

⁷ Haussmann. "Ueber die prophylaktische Beseitigung der Während der Geburt sich ereignenden Infektion des Kindes." *Deutsche med. Wochenschrift*, 1879, n^o 35.

⁸ Crêdè. "Treatment of ophthalmia of the new-born." *Arch. für Gyn.*, T. XVII, Heft. 1.

ternity. The cases of ophthalmia neonatorum diminished, but still remained so common that he thought it prudent to treat the eyes directly by making, immediately after birth, an instillation with a solution of borax, 1 to 60. In December, 1879, the result not having come up to his expectations, he abandoned borax and made injections with a solution of nitrate of silver, 1 to 40, the eyes having been carefully washed beforehand with a solution of salicylic acid of two per cent. strength. Since June, 1880, this author operates in the following manner: Immediately after birth, he instils into the eye a single drop of a solution of nitrate of silver, 1 to 50: then, for twenty-four hours, he applies upon the eyelids compresses soaked in a solution of salicylic acid two per cent. He thus avoids the irritation produced by the injections of nitrate of silver, 1 to 40. This mode of treatment was applied to all the infants indiscriminately.

The following results were obtained:—

In 1874, the frequency of ophthalmia was 13.6 per cent. From 1875 to 1880 it varied from 8 to 9 per cent. From June 1st, 1880, to December 8th of the same year, thanks to the use of the preceding prophylactic method, it fell to 0.5 per cent. During these six months there were 200 deliveries.

These remarkable results attracted the attention of all obstetricians. Olshausen¹ also employed prophylactic washes; but, acting upon the advice of Graefe, he had recourse to a solution of carbolized water, 1 per cent., and not to nitrate of silver. The occurrence of the affection fell rapidly from 12.5 per cent. to 6 per cent.

Credé's method has been practised by some of the French obstetricians. At present, it seems evident that in Maternities it will render great service. Such is the case at the Paris Maternity. As soon as the infant is born, they use the nitrate of silver collyrium, 1 to 50; to-day, ophthalmias have almost entirely ceased to exist in that hospital. If, in spite of all these precautions, a purulent ophthalmia is produced, energetic local treatment is demanded. We will find in nitrate of silver, mitigated stick and solutions, also in carbolized or boricated washes, the best agents for treatment.

We must not forget that the pus which flows out is extremely virulent, and when one eye becomes affected, the other should be protected.

¹ Olshausen. "The prophylaxis of the ophthalmia of new-born." *Centralblatt für Gyn.*, 1881, p. 33.

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MAY, 1887.

CATALOGUE

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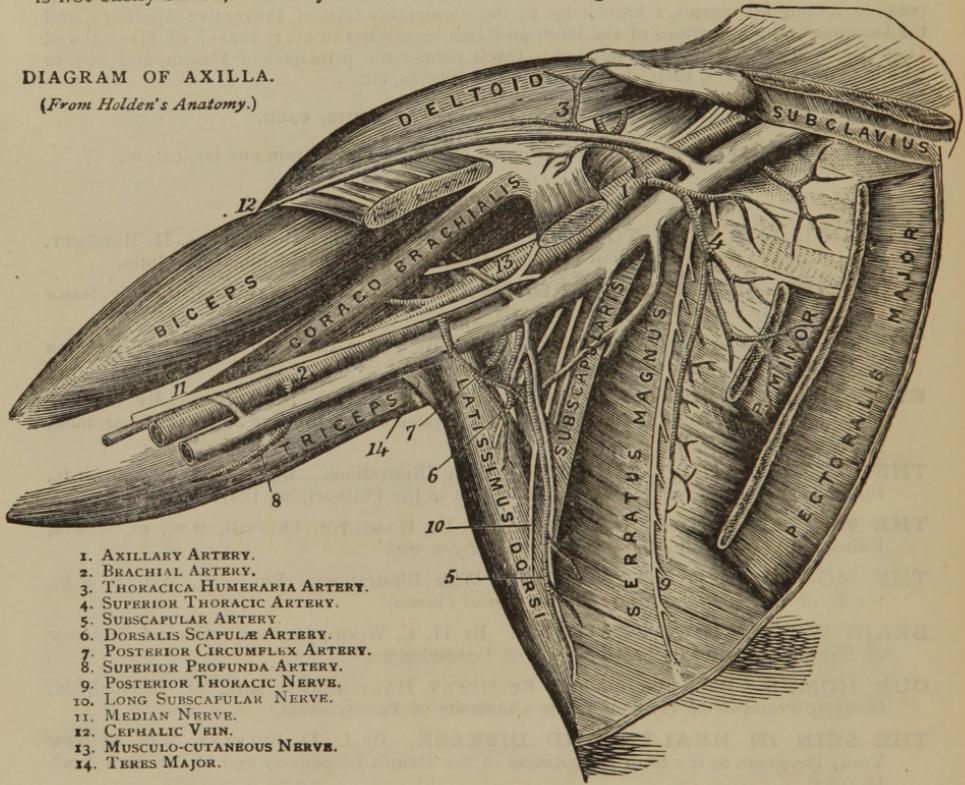
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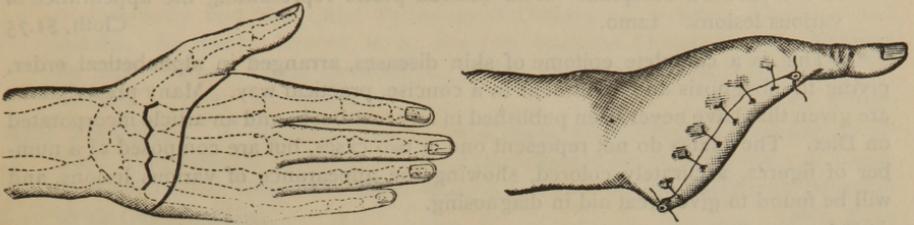
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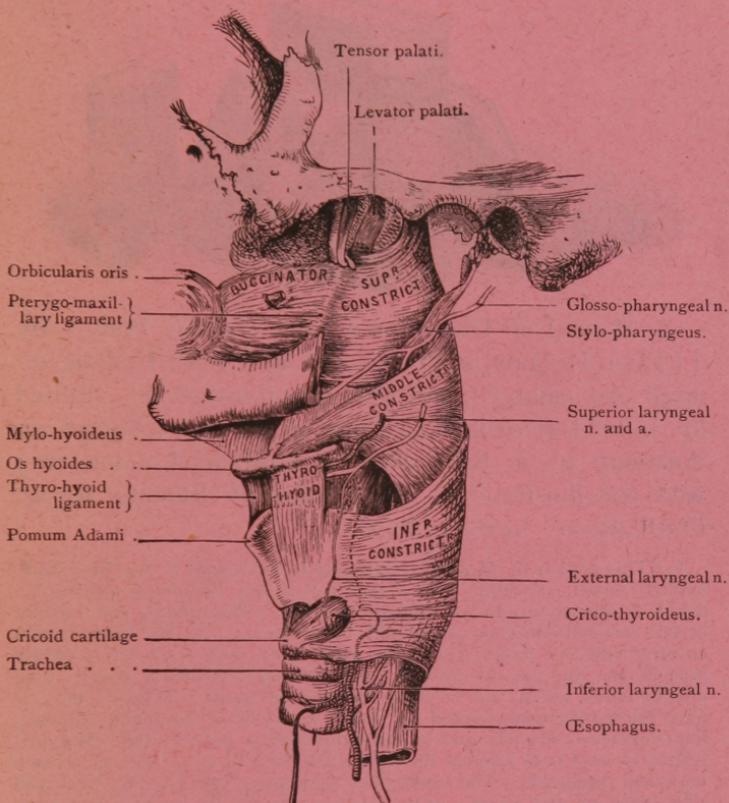


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