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# ANTISEPTICS

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BY

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BY

ANNIE M. HEWER

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DIPLOMÉE OF THE OBSTETRICAL SOCIETY OF LONDON




LONDON

CROSBY LOCKWOOD AND SON

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# INTRODUCTION.

THIS little book is offered to nurses and senior probationers in the belief that the subject treated of is one which is regarded by them with a very deep interest. Many books have been written on the treatment of wounds by antiseptics, but from a nurse's point of view they are all too lengthy and too full of technical terms to be generally read.

The treatment of wounds by the strict Listerian method is anything but an unmixed blessing to a nurse new to the system. At her first operation with what apprehension does a probationer behold the steam spray—especially if it happen to be anywhere near her—hissing and puffing away, until its energy is suddenly directed into its rightful channel and a showery cloud descends, enveloping all around in mist!

With what inward groanings does she plunge her chapped hands into the cruel carbolic lotion in order to wring out the sponges, and with what sighs for the good old times does she cut out the mysterious dressings of muslin and mackintosh!

But why all these washings? For what purpose these complicated dressings? Above all, why am I strictly prohibited from ever dressing the case myself? Questions of

this kind are almost sure to arise at one time or another in the mind of every probationer, and verbal explanations, necessarily brief and disconnected, frequently fail to satisfactorily answer them. The writer would therefore seek to present to her readers such explanations on the subject popularly known as "antiseptics" as were helpful to herself in her own early days of perplexity, in the hope that they may assist other inquirers in their difficulties. It is also hoped that this little book may serve as a sort of framework, having mastered which, a nurse will be enabled to read, both with profit and enjoyment, some of the more elaborate works on this subject which have been written by scientific and medical men. How thankful many a busy surgeon or house-surgeon would be to leave the dressing of some simple aseptic case to a nurse, if only he could be quite sure that no breakdown in the dressings would occur! If the case were not being treated with strict antiseptic precautions, no doubt would cross his mind as to the nurse's competency, but as it is he dare not trust her. Now such a state of things ought not to exist. Then why does it? The writer believes that it is because so little of the *theory* underlying the aseptic and antiseptic treatment of wounds is understood by the nurse. This theoretical knowledge being wanting, the intelligent interest of the nurse is not secured, and sooner or later failure will certainly ensue in practice, and as of course no surgeon is willing to run the risk of this, the whole thing is taken out of her hands.

But surely it is not too much to expect that the rationale of antiseptic surgery is within the capacity of any senior probationer or nurse, if only she get the chance of thoroughly mastering it!

It is not, of course, supposed that the nurse whose sole aim is to get through her training with as little trouble as possible will take any interest in the efforts put forth in these few pages, but the writer feels sure that there are not a few nurses who are willing to do anything and learn everything that will in any way promote the desire of their hearts to be a "good nurse;" and in order to be a good surgical nurse, it is nowadays quite essential that she should have not only a superficial acquaintance with the details of the antiseptic treatment of wounds, but also an intelligent and accurate knowledge of the principles that underlie that treatment.

# ANTISEPTICS.

## CHAPTER I.

### *FUNDAMENTAL PRINCIPLES OF SEPSIS AND ASEPSIS.*

Sepsis—Asepsis—Antiseptic—Fermentation—Putrefaction—Listerism—Rest—Unrest—The Ideal Wound—The Evils of Sepsis—Infective Disease—Cleanliness—Cause of Putrefaction—Micro-organisms.

THE Greek word from which we derive the terms *septic*, *aseptic*, and *antiseptic*, is "septikos," meaning anything that causes sepsis, *i.e.* putrefaction or fermentation. The prefix "a" means *without*, and "anti" *against;* so that *septic* means anything in a state of sepsis; *aseptic* anything without sepsis; and *antiseptic* anything directed against sepsis.

**Fermentation** is the name given to the change, or set of changes which some substances undergo, when, under certain conditions, they are brought into contact with a peculiar class of bodies called ferments, *e.g.* starch, in the presence of the saliva ferment, becomes changed into sugar; or again, sugar, on being brought into contact with yeast ferment, becomes changed into alcohol.

**Putrefaction** is the name given to fermentation when it is accompanied by an offensive odour, *e.g.* the changes which urine undergoes on being kept for some time exposed to the air.

**Antiseptic Surgery** is the name given to the various methods of wound treatment which tend to prevent or retard sepsis.

**Aseptic Surgery** is the name given to a system—first introduced by Sir Joseph Lister—whereby *all* causes of sepsis are excluded from wounds. This system is often known as the Listerian method of wound treatment, or shortly as Listerism.

Although these two terms—antiseptic and aseptic—are often loosely used as if interchangeable, there is a real difference between them which should be always borne in mind. This will be explained further on. The question now naturally arises, Why should we desire to keep wounds in an aseptic condition? In other words, What is the harm of allowing putrefaction to occur in wounds? There is one fundamental principle which underlies the treatment of all wounds, and that principle may be summed up in the one word—REST. Putrefaction violates this great principle. Mr. Watson Cheyne in his book on antiseptics, says: "The causes of UNREST in a wound are:—

**1. Mechanical.**—(*a*) Movements of the parts.

(*b*) The presence of foreign bodies.

(*c*) Tension in the wound.

**2. Chemical.**—(*d*) A substance added to he wound from without.

(*e*) A chemical substance formed in the wound itself, *e.g.* the products of putrefaction and suppuration."

The Ideal Wound is a subcutaneous one kept at perfect rest, and it is found that an aseptic wound behaves practically in just the same way as a subcutaneous one. Of the

causes of unrest the chemical ones are by far the most important, the mechanical ones being by simple precautions easily avoided. Now with regard to the two classes of chemical causes of unrest, it will be seen that the one comes from without the wound, whilst the other comes from within, *i.e.* it is formed in the wound itself. In the first case the irritant does not increase in quantity, and the original quantity being exhausted the irritation ceases. If pure nitric or carbolic acid be applied to a wound inflammation will be set up, but as the acid cannot increase in quantity in the wound, its action soon stops, and with it the irritation and unrest which have been set up by it. In the second case the irritant does increase in quantity in the wound; this any nurse may see for herself in any wound in which putrefactive suppuration is going on.

To interfere with the *causes of unrest* is the great object of antiseptic surgery.

Experience has shown that if sepsis occur in wounds evil must ensue. These evils we will consider under three heads.

1. Sepsis is deleterious to the healing of a wound, *i.e.* septic wounds take longer to heal than aseptic ones. Compare two cases of compound fracture of the leg, the one wound being septic and the other aseptic, and other things being equal, see how much longer the one patient will take to get well than the other. Observe, too, the difference in the appearance between a septic and an aseptic wound, the one having a halo of inflammation all round it, discharging pus, and being tender to the touch; whilst the other has no inflammation round it, discharges a clear serum, and is not tender to the touch.

2. Sepsis in some cases acts not only locally but consti-

tutionally, giving rise to such serious symptoms that the patient's life is endangered and often lost. Look, for instance, at the serious after effects of opening a psoas abscess without efficient antiseptic precautions; a continual discharge and formation of pus is set up, accompanied by hectic fever, loss of appetite and emaciation, frequently leading to disease of internal organs, and after months of suffering the patient dies exhausted; indeed, so usual is a fatal termination that Sir James Paget, referring to such cases, says, "I cannot remember ever having seen a patient recover after the opening of a psoas abscess by free incision;" while I suppose that there is now hardly any nurse of much experience who cannot look back upon at least one case of psoas abscess treated by free incision performed aseptically which recovered perfectly.

The freedom from surgical fever, with its consequent constitutional disturbances, is very remarkable in all aseptic cases. After a severe operation the temperature will often not rise above 99°, the patient will have very little or no pain, and the appetite be quite unaffected from the first.

3. Sepsis predisposes a patient to become the victim of other diseases, especially if at the same time his surroundings are characterised by bad ventilation, overcrowding, and want of cleanliness. The diseases referred to are pyæmia, hospital gangrene, and erysipelas. The aseptic treatment seems to be a perfect guarantee against any of these diseases ever attacking a wound.

In some Continental hospitals, even quite recently, infective disease had spread to such an extent that hospital gangrene, pyæmia, or erysipelas attacked about 70 per cent. of all wounds whether inflicted by the surgeon or not. This state

of things was entirely altered on the introduction of aseptic surgery, and although the hygienic surroundings remained unchanged, infective disease at once vanished. Again, Sir Joseph Lister's own wards in Glasgow, which were some of the most unhealthy in the kingdom, were suddenly converted into "models of healthiness" by the application of his own principles.

It should be particularly noticed that under this treatment infective disease is not only diminished, it is absolutely abolished.* Some have objected that thorough cleanliness and good hygiene would produce exactly the same results, but this has been proved not to be the case. Cleanliness is most important in its place, and a nurse cannot be too cleanly, but cleanliness alone is not, and cannot be, a guarantee against infective disease. Listerism is, and in every failure it is not the system that is at fault, but the method of its application. With regard to cleanliness, Sir Joseph Lister says, "If we take cleanliness in any other sense than antiseptic cleanliness, my patients have the dirtiest wounds and sores in the world; æsthetically they are dirty though surgically clean." As a proof that aseptic measures render a wound to a great measure independent of hygienic surroundings, one might instance the case of the Bristol General Hospital; here at one time the drainage and ventilation were most defective, drain smells prevalent, and

* A striking example of this is furnished by the following statistics. In the Crimean War 95,615 soldiers died, of which number 85,375 died of infective disease. In the American War 279,000 died, 184,000 from infective disease. In the Franco-German War, of 40,535 deaths 12,253 were due to infective disease. But in the late Egyptian War, where the aseptic treatment was carried out, not one soldier lost his life from infective disease.

more than half of the patients seized with diarrhœa, and yet, in spite of all this, the surgical cases, being protected by strict aseptic measures, could not have done better.

Now arises the question, What is the cause of putrefaction in wounds? This is a question which seems almost from the earliest ages to have troubled the mind of the surgeon, and numerous have been the theories advanced to account for its occurrence, and still more numerous the practices followed to prevent its occurrence. But why should putrefaction occur in anything? 1. Is it the inherent property of some substances to undergo putrefaction? *i.e.* is it spontaneous? 2. Is it due to the admission of air? 3. Is it due to the admission of something contained in the air? Let us consider these three propositions.

On first thought a nurse would probably say, "Yes, it clearly is the inherent property of some substances to putrefy. Look at the rapid putrefactive changes that such substances as meat, milk, beef-tea undergo, if kept for any length of time, especially in hot weather." But on reflection she will remember that milk, meat juice, essence of beef, &c., can, *under certain conditions*, be kept for an indefinite time, no matter how hot the weather may be. Indeed, it has been positively proved that milk, meat juice, blood, urine, or indeed any substance, can be kept perfectly fresh and free from putrefaction indefinitely. Spontaneous putrefaction would involve spontaneous generation of life, which has been proved over and over again to be impossible.

Putrefaction, then, must be caused by something from without.

In the beginning of this century, a German named Schwann discovered that the air was full of little solid par-

ticles, and, curious though it may seem, this discovery may be looked upon as the real starting point of the solution of the difficulty.

Open a tin of Brand's essence of beef, and in a few days putrefaction will set in. Why? Is it due to the admission of air to the beef? or is it due to the admission of those solid particles which are perpetually floating about in the air? This question is easily answered by opening the tin in air from which these particles have been removed. What will now happen? The beef will now not putrefy at all, and will keep sweet for any length of time; admit the particles and the beef will at once begin to show signs of commencing putrefaction. That these particles are solid, and not gaseous, is seen in the fact that they can be quite easily removed from the air by simple filtration through cotton wool. The cause, then, of putrefaction, is *solid particles;* prevent the entrance of these particles, or render them inert, and putrefaction cannot occur.

What are the characteristics of these solid particles?

1. They are organisms or the spores of organisms.
2. Their vitality is destroyed by heat and various chemical substances, *e.g.* corrosive sublimate, carbolic acid, &c.
3. They are all minute, and their spores still more so.
4. They increase numerically by fission, *i.e.* an organism divides into two or more independent organisms; or, by producing spores which, in due time, develop into mature organisms.
5. There are various kinds of organisms, differing from one another in shape, size, and manner of growth.
6. As far as is known, one variety of micro-organism

never, under any circumstance whatsoever, changes into another variety.

7. These micro-organisms require food in order to grow and multiply, and it is the set of changes brought about by their growth and multiplication that produces fermentation.

Now, when we come to treat of wounds, we find that what holds good of putrefaction in general, holds good also of putrefaction occurring in wounds. If micro-organisms are kept away from wounds putrefaction *cannot* occur. Sir Joseph Lister found that a wound covered with cotton wool, from which all organisms had been removed, remained absolutely aseptic, on account of the germs being filtered off by the wool before the air reached the wound.

There are far easier ways of excluding micro-organisms from wounds than by filtration, but the above fact is a very interesting one, on account of the analogy that it presents to the experiment of opening the tin of Brand's essence in the presence of filtered air.

There are two great groups of organisms that occur in wounds :—

1. **Bacteria,** from the Greek word "bakterion," a rod. These consist of minute rod-like bodies.
2. **Micrococci,** from the Greek "mikros," meaning little, and "kokkos," a berry. These consist of minute round cells, often hanging together in chains.

## CHAPTER II.

### *CHEMICAL SUBSTANCES USED IN ANTISEPTIC SURGERY.*

Antiseptics—Disinfectants—Deodorants, Volatile and Non-volatile—Poisoning by Antiseptics, Acute and Chronic—Antidotes—The Ideal Antiseptic.

LET us now look at some of the chemical substances which are used in antiseptic surgery, to destroy or render inert these organisms, but perhaps it would be best, first of all, to say a word about disinfectants. By disinfectants are meant substances which destroy or render inert the contagium of any given disease. But the word disinfectant is often loosely used to include antiseptics and deodorizers, though it should be remembered that this latter class of substances only masks, absorbs, or destroys offensive products after they are formed, but does not necessarily possess any power of preventing their formation, *i.e.* they act on the product, not on the producer. Many substances are both deodorizers and antiseptics, *e.g.* sulphurous acid.

The following is a list of a few of the most important deodorants and antiseptics :—

#### DEODORANTS.

**Volatile.**—Chlorine, including chloride of lime, bleaching powder.

Sulphurous acid.

Nitrous acid.

Ozone, including solution of peroxide of hydrogen, and sanitas, the active principle of which is ozone.

Peroxide of hydrogen combined with various other antiseptics, as carbolic acid, corrosive sublimate, thymol, &c.; these are sold under the name of Kingzett's bactericides.

Iodine, including iodoform and iodol.

Volatile oils and scents.

**Non-volatile.**—Charcoal.

Quicklime.

Chloride of zinc, a preparation of which is Burnett's disinfecting fluid.

Sulphate of iron.

Permanganate of potash, a solution of which is known as Condy's fluid.

Salts of alumina. Chloralum owes its activity to this metal.

## ANTISEPTICS.

Perchloride of mercury, or corrosive sublimate.

Carbolic acid.

Salicylic acid.

Sulphurous acid.

Chlorine, &c.

Iodine, &c.

Boracic acid, including boroglyceride, which is a preparation of borax and glycerine.

Terebene, *i.e.* pure turpentine.

Chloride of zinc.

Preparations of coal tar, *e.g.* Jeye's disinfecting fluid, cresoline, &c.

Eucalyptus.
Ozone, &c.
Salts of alumina, &c.
Silicofluoride of soda, commonly known as salufer.
Condy's fluid.
Thymol.
Various gum resins, *e.g.* gum benjamin.

* * * * *

We will now look a little at some of the chief chemical substances used in aseptic surgery.

**Carbolic Acid.**—A substance prepared from coal tar; it occurs when pure in the form of colourless crystals, and in this state is called Absolute Phenol. These crystals are deliquescent (*i.e.* they readily absorb moisture from the air), they are also volatile. Its odour is peculiar and of a penetrating nature, but if the acid be pure this is not at all unpleasant. Locally it possesses a caustic action. Taken internally it is a poison except in small doses. It is soluble in water to the extent of about 1 in 15; it is, however, very soluble in alcohol, glycerine, or oil.

Carbolic Lotion.—This is usually made of two strengths, viz., 1 in 20 and 1 in 40, *i.e.* one part of phenol, or crystallised carbolic acid, to 20 and 40 of water.

Carbolic Oil.—Generally used in the proportions of 1 in 5, 1 in 10, or 1 in 20. A cleaner preparation than this is carbolic acid and glycerine.

Carbolic Gauze.—The gauze used is fine unbleached tarlatan, charged with a mixture of carbolic acid, resin, and paraffin; the resin is employed to prevent the carbolic acid from being washed away too soon by the discharge, and the paraffin is added in order to lessen the adhesiveness of the

resin. Gauze is usually prepared in lengths of six yards by one.

Carbolic Wool.—This consists of absorbent cotton wool impregnated with a solution of carbolic acid, but is not often used, as the volatility of the acid soon renders the wool unreliable.

Carbolised Tenax or Tow.

**Corrosive Sublimate, or Perchloride of Mercury.**—This substance occurs in the form of heavy white crystals soluble in water in the proportion of 1 in 16, in spirit 1 in 4, in glycerine 1 in 1½. This salt is intensely poisonous and a most powerful germicide.

Corrosive Sublimate Solution.—This is usually of the strength of 1 in 1,000, or 1 in 2,000 and is often coloured blue, in order to serve as a distinguishing mark. Of late some surgeons have been in the habit of adding a small quantity of acid to this solution, believing that this prevents the decomposition of the salt into an albuminate of mercury, which appears to be formed when the solution comes in contact with the blood.

Corrosive Sublimate Wool, Alembroth Wool.—Cotton wool impregnated with corrosive sublimate, the strength of the wool being usually reckoned at about 2 per cent. The solution used to charge the wool is not a simple one of corrosive sublimate and water, but one to which a small quantity of chloride of ammonium has been added, a chemical reaction being set up, whereby a new salt is formed called Sal Alembroth, whence the name of the wool. This wool is usually coloured blue in order to distinguish it from ordinary cotton wool. Alembroth wool is now very largely employed, and has the advantages of being pleasant to use,

of there being no fear of shaking out the chemical employed, and of retaining its antiseptic properties unchanged for any length of time.

Sublimate Gauze.—This consists of fine tarlatan impregnated with corrosive sublimate; it differs from the carbolic gauze in having no resin or paraffin in its composition, and is therefore quite soft.

Wood Wool (Hartmann's) and Wood Wool Wadding (Hartmann's) are prepared from pine wood fibre impregnated with corrosive sublimate 1 in 3,000. These are peculiarly absorbent, and therefore very applicable when much discharge is expected.

Steel instruments should never be placed in a solution of this salt, or they will quickly corrode; nurses should also be careful to remove their rings, if they wear any, whilst using any preparation of it.

**Salicylic Acid.**—This acid occurs in the form of white crystals; chemically it is closely allied to carbolic acid, but is not nearly so volatile, and in its local action is far less irritating.

Salicylic Wool consists of cotton wool impregnated with the acid, and a certain quantity of glycerine is added in order to make the acid adhere to the wool. In handling salicylic wool the nurse must be very careful not to shake it about, and in dividing it to handle it as gently as possible, or the crystals will be separated from the wool, and being very light will be scattered through the air, and cause violent sneezing and coughing.

Salicylic Silk.—This consists of silk waste impregnated with 10 per cent. salicylic acid and a little glycerine.

Salicylic Cream.—This consists of a mixture of salicylic acid,

carbolic acid, and glycerine intimately mixed together, and is used to smear round the edges of a wound, to prevent their being irritated by the discharge.

Instruments should never be placed in a solution of this acid, as they quickly oxidise and spoil.

**Boracic Acid.**—This acid occurs in the form of white crystals; it is a mild antiseptic, and has no irritating properties; it is used in commerce as a preservative for articles of food, *e.g.* meat, fish, &c.

Boracic Acid Lotion.—This consists of 1 part of the acid to about 25 of water.

Boracic Acid Lint or Cotton Wool consists of lint or cotton wool impregnated with the acid; both are usually coloured pink, to serve as a distinguishing mark. Boracic acid lint dipped into a solution of the acid is much used as a dressing for ulcers and superficial wounds.

Boracic Acid Ointment.—This consists of a mixture of vaseline, paraffin, and boracic acid.

Boroglyceride.—This is a preparation of boracic acid and glycerine. It is semi-solid and has somewhat the appearance of cream; it is employed in solution as a dressing to wounds.

**Iodoform.**—This occurs in the form of yellow crystalline scales or as a primrose-coloured powder. It possesses a disagreeable odour, which hangs about a person for a long time. It is insoluble in water, but is very soluble in ether. It is largely used as a powder to dust on the edges of wounds.

Iodoform Gauze, Wool, and Lint are employed.

**Eucalyptus Oil.**—A volatile oil of a pale yellow colour and possessing a characteristic odour.

Gauze impregnated with a mixture of eucalyptus oil,

resin, and paraffin has been used in cases in which the carbolic preparations have proved too irritating to the skin.

Eucalyptus Ointment.—Composed of a mixture of paraffin, vaseline, and eucalyptus oil. Eucalyptus oil is sometimes used in the form of spray.

**Thymol.**—This substance occurs in the form of large white crystals having an aromatic odour; it is employed in the form of solution, spray, gauze, and ointment. Thymol is not usually considered a very efficient antiseptic.

**Poisoning by Antiseptics.**—Several of the above-mentioned antiseptics are poisonous, and many cases of poisoning have been recorded in patients treated by them, some having been attended with fatal consequences. It is one of the duties of a nurse to be on the look out, and to at once report any symptom of poisoning that may arise.

The antiseptics most likely to set up symptoms of poisoning are Carbolic Acid, Corrosive Sublimate, and Iodoform.

The poisoning occurs in what might be called a *chronic form*, *i.e.* it comes on gradually, being due to the too great absorption, of the antiseptic employed, into the system through the wound, skin, or mucous membrane.

It can hardly be wondered at that poisoning should thus occasionally occur, when it is remembered, that the dose of carbolic acid for internal administration is from 1 to 3 grains, that of corrosive sublimate $\frac{1}{16}$ to $\frac{1}{8}$ of a grain, and that of iodoform 1 to 4 grains, some patients being much more susceptible to the action of these drugs than others. Poisoning occurs more readily when a large surface is exposed to the action of the drug, such

as in extensive burns, large flesh wounds, and after parturition.

Poisoning by Carbolic Acid.—The urine generally gives the first proof that this drug is being absorbed into the system, although many surgeons do not consider the condition of much importance unless other symptoms supervene. The urine, which may or may not be of normal colour when passed, becomes on standing of a dark greenish hue like porter. This is known as carboluria, and in some people occurs very readily. Thus, a child of five years, who had carbolic fomentations applied to her leg for one night only, had carboluria the next morning. The more serious symptoms which may arise are vomiting accompanied by collapse, the indications of which are pallor, feeble pulse, slow and shallow respirations, and low temperature. In some cases there is an increased flow of saliva.

Poisoning by Corrosive Sublimate.—The symptoms here are mainly abdominal, viz. vomiting, colic, tenesmus, diarrhœa, and hæmorrhage from the bowel. The temperature is generally lowered, but in some cases it appears to be raised. Persons with kidney disease are peculiarly susceptible to the toxic effects of this drug. In the post-mortem examination of patients dying from corrosive sublimate poisoning, ulcers of the large intestine with much surrounding inflammation have been found.

Poisoning by Iodoform.—The symptoms here are also gastro-intestinal, viz. vomiting, &c., but the nervous system is usually affected, as is seen by delirium, hallucinations, and nervous irritability, which may be followed by collapse. In acute cases a high temperature often occurs. Iodine may often be found in the urine.

Poisoning by antiseptics may also occur in an *acute* form, due to the drug being taken internally in large quantity. Numerous cases are on record of poisonous lotions being swallowed instead of medicines, and frequently with fatal results; nurses therefore cannot be too strongly impressed with the fact that these powerful germicides are also powerful poisons, and that they must act accordingly. All lotions and outward applications should be kept in a totally distinct place from medicines, food, &c., and this is just as important in private as in hospital nursing, as the patient's friends, unaccustomed to nursing, may administer the one for the other; and as the blame will fall on the nurse, she should remember that it is as much her duty to provide against accidents in her absence as to be herself careful when present. It is well that all lotions should be put into bottles of a different shape and colour to those used for medicines.

Still, in the event of such a terrible accident happening as a patient swallowing any quantity of carbolic acid or corrosive sublimate, it may be well to just mention the treatment that the nurse should adopt while waiting for the medical assistance which she should have at once sent for.

Carbolic Acid.—This produces intense gastric pain of a burning character, felt also in mouth and throat and staining the lips and mouth white. It is followed by giddiness and shortly by collapse, stupor passing into deep coma, rapid and feeble pulse. There is generally contraction of pupils. The carbolic odour is very perceptible in the breath. Here the nurse should at once give an emetic, such as half an ounce of ipecacuanha wine or thirty grains of sulphate of zinc, and tickling the fauces will probably

help. As soon as vomiting has occurred large doses of olive oil should be administered.

Corrosive Sublimate.—A large quantity of this drug if swallowed produces a peculiar feeling of tightness and drying up in the mouth and throat, quickly followed by a burning pain extending to the stomach, and later to the abdomen. This pain is greatly increased by pressure. Vomiting, diarrhœa, melæna, tenesmus, and dysuria follow. In some cases high fever and in others collapse supervenes, and often cramps, twitchings, and convulsions. Death usually takes place in deep coma or strong convulsions. An emetic must be given at once, and after its action, albumen in large quantities, such as the whites of eggs mixed with water. This acts as an antidote by forming an albuminate of mercury in the stomach, which salt is insoluble.

Of course the above treatment should only be adopted by the nurse while waiting for the doctor, who should have been sent for at once.

**The Ideal Antiseptic.** — The antiseptic substances which we have so far mentioned are those which have been tested and are in common use, but new ones are brought out nearly every day, *e.g.* antisepsin, salol, creoline, and hosts of others. The Ideal Antiseptic has yet to be found, which would have to combine the following properties: it must be a powerful germicide, but at the same time be non-poisonous to man, unirritating to the skin or to raw surfaces, it must be soluble in water, non-corrosive to steel instruments, and must be cheap. However, a drug has been lately advocated, with which more than usually good results have been obtained, and which has very considerable advantages in that it is non-poisonous, and yet a satu-

rated solution is stronger than a 1 in 500 solution of corrosive sublimate as a germicide. This drug is the silicofluoride of soda, abbreviated into salufer. It is found that a solution of one grain to the ounce is strong enough for efficient use, and is non-irritating, though in a dry state it acts as a caustic. It is a good deodoriser for the hands, it does not affect sponges, but corrodes steel instruments. It is made up in pellets sufficient to make a pint of solution, and wool is also prepared impregnated with it. Its non-poisonous character gives great hopes that it may prove most useful in obstetric practice, and in cases which occur in surgical practice where syringing with a poisonous germicide is fraught with danger to the patient, should perchance any of the solution be retained.

## CHAPTER III.

### *ANTISEPTIC DRESSINGS.*

The Listerian Dressing—Various Forms of dressing Wounds aseptically—An Aseptic Operation—The Spray—Irrigation—Ligatures—Drainage—Septic Wounds rendered Aseptic.

Now let us look at the various forms of antiseptic dressings which are in common use, but first of all it will be well to describe the method of wound treatment known as the "Listerian method," called by that name on account of its being that dressing which after many experiments Sir Joseph Lister considered to be the one best fitted to carry out the principles involved. What these principles are have been already briefly described: viz. to exclude every form of unrest from a wound, and more particularly that form of unrest which is so specially deleterious to the welfare of both wound and patient, that of putrefaction.

The germicide used in this form of dressing is carbolic acid. It must be borne in mind that carbolic acid possesses very irritating properties, and to a recent wound the constant irritation set up by large quantities of it would produce injurious results. In order, therefore, to shield the wound from direct contact with the acid a special substance is used called protective; this consists of oil silk coated with varnish and dextrine, so as to render it quite impermeable

to the acid. Before use the protective is soaked in a 1 in 40 solution of carbolic acid, and a strip of it, just large enough to overlap the edges of the wound in all directions, is applied. It should be observed that there is nothing antiseptic in the protective itself, and that it is only used to protect the wound from the irritating effects of the acid, which would otherwise act as a cause of unrest; it at the same time prevents the edges of the wound or the stitches from sticking to the dressings. Outside the protective are placed several layers of wet gauze, *i.e.* carbolic gauze which has been soaked for a few minutes in a solution of 1 in 40 carbolic acid, and these must be larger than the protective in every direction; these two, *i.e.* the protective and the damp gauze, are called "the deep dressing." Above this are placed eight folds of dry gauze, with a layer of pink mackintosh called jaconet under the outermost layer, the rubber side of the mackintosh being placed inwards; the object of the jaconet is to prevent the discharge from soaking through at any one point and to promote its diffusion throughout the whole dressing. Between the deep and superficial dressings is often placed a quantity of loose carbolic gauze (generally known as waste), especially in cases in which much discharge is expected or in which it is difficult to fit the dressing closely to the part.

The whole dressing is next secured with ordinary or antiseptic bandages, and, finally, round its edges is applied one made of elastic, so that the dressing may be kept closely applied to the skin during all the movements of the patient, thus preventing air being sucked in beneath its edges.

Materials containing carbolic acid must be kept in an air-tight tin box, and it is usual to place in the box a small

receptacle (*e.g.* a glass ink-pot) containing some of the pure acid, and it is one of the duties of the Sister to see that these receptacles do not run dry. With regard to materials containing non-volatile antiseptics so much care need not be taken, but they must be carefully excluded from dust.

The above form of dressing was for some time strictly adhered to, and any infringement of it was supposed to be unsafe and to render the wound liable to sepsis. However, after a little time, modifications were adopted even by Sir Joseph Lister himself, which, while strictly carrying out all the principles involved and thus being equally successful, proved in some instances to be still better adapted to the exigences of the case than the original Listerian dressing. One of the first modifications to be commonly employed was that of replacing the loose gauze which was used between the superficial and deep dressings by a pad of antiseptic cotton wool, the advantages claimed for it being (1) that it is a better absorbent, (2) that it is more comfortable, (3) that it is less irritating to the subjacent skin. It is hardly necessary to place over this the seven folds of gauze, but a piece of mackintosh is used alone. It should be borne in mind that when cotton wool is employed the bandage should be drawn tighter to allow of the elasticity of the wool, and the final one very carefully applied.

Antiseptics other than carbolic acid may be used throughout, *e.g.* corrosive sublimate; and in its favour may be mentioned its cheapness, its great activity as a germicide, its non-irritating properties, and its non-volatility; it is, however, a very powerful poison, and requires to be used with great caution. The dressing would be exactly the same as the carbolic one, only substituting corrosive

sublimate for carbolic acid, and alembroth wool may be used instead of the seven folds of gauze. Salicylic acid in the form of salicylic silk or wool is often employed as a dry dressing, and not being irritating to the wound no protective need be employed; this acid is not so powerful an antiseptic as carbolic acid or corrosive sublimate.

The nature of the case determines to a great degree the character of the dressing to be used, *e.g.* in the case of a large abscess much pus will of course drain away for the first day or two, and the best dressing here will be a large pad of antiseptic absorbent material frequently changed: in that of an excision of the breast the ordinary Listerian dressing might be used: whilst in that of the removal of a small tumour where very little discharge is anticipated, the line of incision might be dusted with iodoform, some dry boracic lint put over it, and the dressing left unchanged until the wound is quite healed. It must be remembered, as before remarked, that these various modifications of aseptic dressings, of which a few examples have been given, if properly applied, give as truly aseptic results as the one originally designed by Sir Joseph Lister.

We have already seen that the cause of putrefaction in wounds is the entrance of micro-organisms from without, and we have looked briefly at some of the chief materials used in the surgery which aims at the exclusion of these organisms, but the questions now arise:—1. How is this exclusion practically accomplished while a wound is being made or during its dressing? 2. How can these organisms be destroyed when present, as in a wound which has been exposed to sources of contamination before coming into the hands of the surgeon?

In answer to the first of these questions it will be well to briefly describe an ordinary operation performed aseptically. The skin around the seat of operation is first purified by being well washed with an antiseptic lotion, usually a 1 in 20 solution of carbolic acid; the septic dust covering the skin is thus rendered inert. Many surgeons, in order to do this the more thoroughly, will order the nurse to apply a towel or piece of lint soaked in the lotion to the part for an hour or so beforehand, as it is difficult to ensure thorough purification of the hair follicles by a mere superficial washing. If the site of operation be hairy the part is shaved previous to the cleansing. The surgeon and his assistants then thoroughly purify their hands by washing them first with soap and water, then in an antiseptic lotion, usually of 1 in 40 carbolic or 1 in 1,000 corrosive sublimate; this makes them aseptic. The instruments that are to be used or that are likely to be used are placed in a tray containing a solution of 1 in 20 carbolic acid, corrosive sublimate being never used for this purpose, as it spoils metal. Three or four towels wrung out of carbolic lotion are usually arranged over the blankets which cover the patient so that they completely surround the part to be operated upon, and form an aseptic basis upon which instruments may be momentarily placed.

If a spray be used it is now turned on, the object of it being to provide an atmosphere around the wound free from germs, an atmosphere in which the surgeon can work and can handle his instruments without any fear of contamination. The solution of carbolic acid used for this purpose is of the strength of 1 in 20, which, when mixed with the steam, produces a spray of about 1 in 40. A little

while ago the spray was employed in all aseptic operations, but of late years its use has greatly diminished, it being superseded by irrigation, *i.e.* the surgeon will squeeze a sponge saturated with an antiseptic lotion over the wound at frequent intervals so as to destroy any germs that may have fallen into it while the operation is going on. The spray saves the trouble of irrigation, and a smaller amount of carbolic acid comes in contact with the wound and less irritation therefore ensues. It is also safer than irrigation, especially if the air be more than usually loaded with organisms; on the other hand it chills the patient, obscures the view, and wets everything. In cases where there is danger of septic air being sucked into a wound, as in the opening of a large abscess, operations on the chest, &c., it is almost always used. The surgeon when operating is careful to keep the instruments within the sterilised* atmosphere produced by the spray, and if it be not used redips them into the tray of carbolic lotion each time before using them.

The ligatures used for tying bleeding vessels are made of catgut, as this substance, if rendered aseptic, becomes absorbed after a time and causes no irritation in the wound. Catgut is employed of various thicknesses, sterilised by being kept in a solution of carbolic oil 1 in 10, and before the operation is cut into lengths of about eleven inches, which should be placed in a solution of carbolic acid, to take off their oiliness and render them supple.

In order to provide for the carrying away of blood and serum, and to prevent the consequent tension that would ensue from their retention, drainage by tubes or capillarity is employed. The former is far more generally used than

* *i.e.* rendered sterile or free from living germs and their spores.

the latter, and consists of india-rubber tubing with round holes cut in it at short intervals, the diameter of each hole being about equal to that of the tubing, which is made in various sizes. If the tube project much beyond the surface of the wound it will get doubled up, its orifice compressed by the dressing, and the flow of fluid from it therefore prevented. In order to avoid the tube slipping into the wound, and so being lost, it is usual to fasten a double thread of carbolised silk to one end. Some surgeons prefer to use decalcified drainage tubes, *i.e.* tubes made from bones, generally chicken bones, which have had their earthy salts removed from them by being soaked in acid, and when thus rendered pliable, holes are cut in their sides. The advantage of these tubes is that they do not require removal, as they will become absorbed by the tissues; indeed this absorption may occur too soon, but they can be made to last longer by keeping them in a weak solution of chromic acid for some time before use. Drainage by capillarity consists in using skeins of catgut, each skein being divided into little bundles of four or five threads each, a separate bundle being brought out at several different points in the wound; this form of drainage, as before stated, is not so very frequently seen.

The edges of the wound are now usually brought together with sutures of silver wire, horsehair, or catgut, which, with the needles to be used, are of course kept in an antiseptic solution till wanted. The vicinity of the wound is finally washed with a clean solution of the antiseptic that is being used, and the dressing applied as before described.

The after dressings are carried out with the same scrupulous attention to details, thus: the surgeon and assistant

having washed and sterilised their hands, mackintoshes being arranged over the bedclothes to protect them, and a towel wrung out of the antiseptic solution placed underneath or near the part to be dressed, the spray is turned on if going to be used. An assistant places his hand over the centre of the dressing to prevent its displacement, the elastic bandage is removed, the other bandages are cut, and the edge of the dressing slowly lifted, the corner next the spray being raised first, the superficial and deep dressings are removed, the wound is inspected, and, if all be well, fresh protective and gauze are applied at once. If the spray be not used the antiseptic solution is squeezed from a sponge over the part as the dressing is raised from it. The wound itself is not syringed or its edges washed in any way, as this would only irritate it, and is quite unnecessary. After the deep dressing has been applied the surrounding parts are washed with antiseptic lotion and the superficial dressing put on, the bandaging being performed as carefully as at first.

The frequency of the dressings depends upon the nature of the case. In one where much discharge is expected, as in very large abscesses or empyemata, this is done the same evening, and may be necessary twice a day for a few days. In a case where but little discharge is expected, as in amputation of the breast, the dressing will require changing about every third or fifth day, according as stitches need removal or the tube shortening. But in cases where there is practically no discharge expected, as in osteotomies, the dressing will be left unchanged until the wound is healed, and here the dressing chosen will probably be a dry one, perhaps of salicylic silk or alembroth gauze and wool. The generai

rule is not to change a dressing unless the discharge come through, the patient complain of pain, or his temperature go up; but a carbolic dressing is never left on more than six days, as by that time all the acid will have volatilised.

In answer to the question as to how micro-organisms can be destroyed after entrance into a wound, as in a case exposed to sources of contamination before coming into the hands of the surgeon—or, in other words, how a septic wound can be made to run an aseptic course—it is far easier to prevent the entrance of micro-organisms than to destroy them after they have once entered, but the case must by no means be looked upon as one in which putrefaction must necessarily ensue. If we can only destroy the micro-organisms that have entered, and at the same time prevent any more from entering, the case will pursue a perfectly aseptic course, a course which will indeed be indistinguishable from that of one which has been inflicted by the surgeon himself, and has been free from micro-organisms from the very first.

To suppose a case of compound fracture of a limb, such as is so frequently brought into the accident wards. There will probably be foreign substances in the wound, according to the nature of the accident, and the first thing to be done is to remove them; the wound is then thoroughly syringed out with an antiseptic lotion, *e.g.* 1 in 20 carbolic or 1 in 2,000 corrosive sublimate, care being taken that the fluid reaches every recess and crevice of the wound; the surrounding skin is then purified, and it is well, if very dirty, to first carefully rub it with turpentine in order to remove the grease. Free drainage is now provided for, this being specially important in these cases, because if any orga-

nisms have been left undestroyed in the wound they will multiply and putrefaction will ensue, unless the secretion run away as soon as it be formed, when the bacteria will find a difficulty in thriving. The usual antiseptic dressing is now applied and the limb placed on a suitable splint. The splint, in a case of this sort, has generally an interruption in it, so that the wound can be dressed without interfering with the mechanical rest, which has before been shown to be so necessary to the healing of a wound. It is usual to dress the wound every day at first, in order to be quite sure that all is going on well; the drainage tube is also removed at each dressing and cleansed in a strong solution of the antiseptic used. It stands to reason that the longer time the causes of putrefaction remain undestroyed in a wound, the less probable is it that the surgeon will be enabled to effectually eradicate them, and consequently the less likely is it that the wound will pursue an aseptic course. It has, however, been found possible in some old septic cases, *e.g.* hip-joint disease with sinuses, to render them aseptic by thoroughly scraping away the old granulations, well swabbing out all sinuses with a strong antiseptic, preferably a solution of chloride zinc 20 grains to the ounce, and subsequently dressing them aseptically.

## CHAPTER IV.

### *ASEPTIC WOUND TREATMENT COMPARED WITH OTHER METHODS.*

Subcutaneous Surgery—Hindrances to Suppuration—Results of the Aseptic Method.

THE treatment that has been already described may be strictly called aseptic wound treatment, and it is important to note the distinction between this treatment and the treatment of wounds by antiseptics. The object of the former is to exclude every cause of putrefaction, the object of the latter is to more or less interfere with the causes of putrefaction; we might almost call the one the "method by exclusion," the other the "method by interference." The methods which experience has dictated for the carrying out of the aseptic treatment have been already described, both as introduced by Sir Joseph Lister and as subsequently developed by himself and others.

It will be best to now briefly consider a few of the various ways whereby wounds have been and still are treated by antiseptics, applied without any idea of totally excluding micro-organisms, *i.e.* the methods by which the causes of putrefaction in a wound can be best checked. Now this is no new question; it dates far back into the days of the detergent fluids, medicated plugs, and antiseptic balsams of the ancients. In fact at one time there was hardly any

surgeon who did not possess a special powder or fluid of his own invention with which he treated all wounds alike, the composition of which was based upon his own pet theory as to the cause of putrefaction in wounds.

In all forms of wound treatment other than the strictly aseptic, it has proved all-important that the discharges should not be allowed to accumulate in the wound, because organisms once having entered will there find a favourable soil for their rapid development and multiplication, and putrefaction will occur with equal rapidity. It will be remembered that drainage was insisted upon when dealing with the aseptic treatment, but while in that case tension and consequent irritation were the evils to be avoided, in this case most disastrous consequences may ensue, not only to wound but also to patient. To this end drainage by means of tubes and counter-openings is employed, and is followed by good results if carried out effi ciently, the secretion being conveyed away almost as soon as it is formed, and thus organisms are unable to thrive.

Another method often combined with free drainage is to add some antiseptic substance to the wound, and thus establish a soil upon which organisms will be unable to grow. Both these methods are much employed at the present day, and the antiseptic used is not only applied as a wash to the surface of the wound, but is frequently syringed into its interior, those mostly in vogue being carbolic, boracic, and sulphurous acids, perchloride of mercury, tincture of iodine, alcohol, chloride of zinc, sanitas, terebene, Condy's fluid, &c.

Some surgeons, in order to keep their wounds surrounded by an antiseptic fluid, keep the part immersed for longer or shorter periods in a bath containing a solution of some

antiseptic. Some employ what is known as the open method, which acts by allowing the fluid parts of the discharge to evaporate, thus leaving a dry crust over the wound, and micro-organisms not obtaining sufficient moisture are thus hindered in their growth.

The attempt to do away with the evils which were supposed to result from the access of air to wounds originated what is known as subcutaneous surgery. As already seen, this effects an ideal wound (*vide* page 10), its aim being to make as small an external wound as possible, and that situated at a distance from the internal one. As an example, the case might be cited of the division of a tendon. Here the surgeon inserts a very small knife at some distance from the part that he wishes to cut, pushes it along under the skin on the flat, turns it to right angles, divides the tendon, again turns the knife to its original position, and withdraws it, thus leaving only a minute puncture, and that at some distance from the divided part. This minute puncture is immediately closed with collodion and a small piece of lint. It will at once be seen that the application of subcutaneous surgery, though eminently successful, is necessarily very limited.

Nurses must not gather from the foregoing remarks that evil results must necessarily ensue if a wound be not strictly treated in an aseptic manner. This is far from being the case; many wounds do very well not treated with aseptic precautions, but there is no absolute certainty that they will do so.

Healthy tissues themselves form a barrier of resistance against the entrance of micro-organisms; if this were not the case every wound not treated aseptically would suppurate.

The fact is, the more health and vitality the tissues possess the less likely is suppuration to occur, whilst on the other hand the less health and vitality they possess the more likely is suppuration to occur. A clean cut on the face of a healthy person, with its edges accurately apposed, will probably heal by first intention, no matter how it be dressed, if only "rest" be secured to it.

Healthy granulations also afford a very effectual barrier against organisms; but if the granulations become unhealthy, or get broken down by mechanical unrest, septic absorption may quickly ensue.

Cleanliness and good ventilation are absolutely essential in carrying out the various forms of the treatment of wounds by other than the aseptic method, because, as none of these various forms affords any certain guarantee against septic absorption, it is of the utmost importance that the tissues of the patient and the granulations of his wound be kept in as healthy a condition as possible.

Any treatment except the aseptic, though often successfu and producing good results, signally fails in many instances, *e.g.* in operations involving large joints, in the treatment of psoas abscesses, &c., which surgeons other than those performing operations in an aseptic manner still look upon with dread.

Let us now shortly compare the aseptic method of wound treatment with all other methods, bearing in mind that the former differs from all other methods in the rigorous exclusion from wounds of all causes of sepsis, putrefaction, therefore, being positively *unable* to occur.

| Aseptic Method. | Other Methods. |
| --- | --- |
| 1. Result certain. | 1. Result uncertain. |
| 2. All treatment based upon a definite principle. | 2. No definite principle. |
| 3. Independence, to a great measure, of extraneous surroundings. | 3. Dependence, to a great degree, on extraneous surroundings, *e.g.* cleanliness, ventilation, &c. |
| 4. Constitutional condition of patient of not much importance. | 4. Constitutional condition of patient of very great importance. |
| 5. Certain operations once looked upon with dread, now undertaken with perfect confidence. | 5. Certain operations still looked upon with dread and hardly ever undertaken. |

Finally, let us look at the differences between a large septic wound and one that has been kept aseptic throughout, considering also their several effects upon the patient.

In the first instance—

(1.) The temperature after the second day usually rises, corresponding to the amount of surgical fever that sets in, often reaching 102° or 103°, and remaining above normal until the inflammatory action has subsided.

(2.) There is a varying amount of constitutional disturbance, the patient not eating or sleeping well.

(3.) There is a good deal of pain.

(4.) Any effused blood in the wound decomposes.

(5.) There is a copious discharge of a purulent nature.

(6.) The edges of the wound are swollen red and surrounded by a pink halo.

(7.) The wound heals slowly, and the scar is conspicuous.

In the second instance—

(1.) The temperature, which may perhaps reach 99° or 100° the first evening, after this as a rule remains normal; there is no inflammatory reaction.

(2.) There is no constitutional disturbance, the patient eating and sleeping well throughout.

(3.) There is not much pain.

(4.) Any effused blood in the wound does not break down but organises and becomes replaced by new tissue.

(5.) There is very little discharge, and what there is, is serous.

(6.) The edges of the wound are pale, and there is no surrounding swelling.

(7.) The wound heals quickly, and the scar is not very conspicuous.

## CHAPTER V.

### *DUTIES OF THE NURSE.*

Sponges — Mixing the Antiseptics — Preparation of the Patient — Watching the Patient — Temperature Charts — Psoas Abscess — Accidents — Poultices — Disinfection — Isolation.

An intelligent nurse who has given her attention to the preceding pages, in which the theory of asepticism has been discussed, along with its practical application to surgery, will no doubt have discovered that the subject is one full of deep interest, and that it is also one in which the fundamental principles are at any rate reasonable, and after all to some degree comprehensible. What is really needed is the *intelligent interest*, oftentimes years of so-called experience being utterly lost on account of the lack of just this one thing. The writer knew a nurse who had enjoyed every practical advantage in aseptic surgery, had seen numerous operations, assisted at their later dressings, and by virtue of experience proclaimed herself a first-class surgical nurse, well versed in the aseptic treatment of wounds. This same nurse, because a surgeon used an antiseptic to which she was unaccustomed, instantly classed him as a disbeliever in all aseptic methods, and thought that it now did not matter how careless she became in the subsequent dressings of his cases. This showed a grave defect in her intellectual train-

ing, and it is hoped that enough has already been learnt to show how narrow her knowledge of the question was.

When the aseptic theory was first formulated, as has already been shown, a certain fixed kind of dressing, which satisfied the requirements of the theory, was advocated, and wisely so. Safety at first lay in the strict following of details which experience had proved to fulfil these same requirements, but as science advanced modifications soon crept in, with the result that almost every surgeon practising aseptic surgery now has his own method for carrying out the principles of this said theory.

As yet no definite rules have been laid down for the nurse, because it has been the aim of the writer that the nurse should first of all thoroughly grasp the theoretical side of the question, so that she may herself be enabled to frame her own rules and her own duties under any given circumstances. These must of necessity differ very widely, *e.g.* when acting as nurse in the theatre of a hospital with assistants and dressers in attendance; here the sponges will be under her care, and probably nothing else. Again, she may be sent to a private operation case, where, besides surgeon, assistant, and chloroformist, there will be no one; here, if she be up to the mark, much more will be left to her, and she must set both her wits and her hands to work. Again, she may be in a small country hospital, where, besides the operating surgeon, there may on an emergency be no one present except herself; here, if she have mastered the preceding pages, she will be enabled to act as a very efficient assistant, *i.e.* as far as aseptic details go.

Under any circumstances the management of the sponges will fall to the nurse, and she should act as follows. Before

the operation the sponges must be placed in a solution of the antiseptic to be used—generally 1 in 40 carbolic or 1 in 2,000 corrosive sublimate—and immediately before being required must be squeezed quite dry with the hand, and put into a clean basin ready to be handed to the surgeon. Sponges when given back to the nurse must first have all blood squeezed from them into an empty basin; they must then be washed in a basin containing a large quantity of the antiseptic solution, and finally rinsed in a third basin which also contains some of the antiseptic solution; then squeezed as dry as possible and handed back. Should a sponge accidentally fall on the floor, it must be put on one side, and not used again during the operation. After use, all sponges should be well washed in soda and water, rinsed in warm water, and placed in a 5 per cent. solution of carbolic acid or a very weak solution of sulphurous acid.

If the nurse have to prepare the solutions of the antiseptics, she must carefully measure them. Carbolic acid is usually sent up from the dispensary, or in private practice can be obtained from a chemist of the strength of 1 in 20; and for the sponges, &c., equal parts of this and warm water are measured and mixed in the basins. If corrosive sublimate be employed, for convenience' sake it is often made up of the strength of 5 grains to a drachm of distilled water, and usually coloured with blue litmus to prevent any mistake. As 5 grains to a pint of water would approximately make a solution of 1 in 2,000, it follows that one drachm of this concentrated preparation will make one or two pints of lotion, according to the strength required. Of course the above concentrated solution is exceedingly poisonous, and the nurse must take extra precautions, both when using

it and afterwards in putting it away into a safe place. The nurse must provide two towels soaking in the antiseptic solution, and when the surgeon is ready she must wring them out and hand them to him.

The foregoing remarks apply to a nurse under any circumstances, but for those engaged in private nursing it will be best to mention a few extra details. The nurse generally goes to the patient's house the night before the operation, and should make arrangements as much as possible overnight to prevent hurry the next morning. It is well to have boiling water near at hand at the time of the operation, so that if the surgeon should bring a spray it can be quickly got ready. There should be at least two large cans of warm water for the dilution of the antiseptics to be employed, and a large measuring glass, as if the surgeon bring his antiseptic lotions with him they are sure to be concentrated, and will require dilution, according to orders. Three large basins will be needed for the sponges, as before described. A separate table or wash-hand stand should be set aside for the surgeons, with two or three basins, carbolic or terebene soap, a nail-brush, a plentiful supply of water, and beneath it a large pail to receive dirty water. For the operating table, two dressing tables tied together answer very well, and of course a folded blanket, new mackintosh, and clean sheet placed upon it, with a pillow for the head, on the side of which should be put a towel, and near it a small basin. The carpet should be protected by pieces of oilcloth if possible, and under the table should be a tray with sawdust, *i.e.* in most large operations. About a dozen towels should be put ready, and it is well to provide an oblong shallow pie-dish for the instruments, in case the surgeon do

not bring a tray with him. It is wise at the very beginning to put a basin containing a clean sponge and some of the antiseptic lotion on one side ready for the surgeon at the close of the operation to finally clean up before applying the dressing. The surgeon usually brings the dressing with him ready prepared, but in the subsequent treatment it is often left to the nurse. A box of safety pins should always be at hand.

It is well to dress the patient in a flannel shirt or dressing gown with warm stockings, and to provide small blankets for covering him when on the operating table, over these being placed mackintoshes, to protect them from getting wet by the spray, if it be used. In this case the nurse must shut the windows in its vicinity and herself move quietly, as otherwise a draught will be created and the spray be diverted from its proper destination. If the nurse have to hand to the surgeon the deep dressing which may have been put to soak in the lotion, she should be careful to squeeze it dry, as otherwise when the pressure be applied the lotion will soak into the superficial dressing and tinged with the serous oozing will rapidly make its way to the edge.

After the patient has been put to bed the nurse must endeavour to secure as much rest for him as possible, and to that end it is best not to be too anxious to administer food, as until the stomach has recovered from the disturbance caused by the anæsthetic it cannot perform its usual functions, and if food be given too soon, vomiting will probably follow, which not only exhausts the patient but also may act as a cause of mechanical unrest to the wound. Of course patients differ much; one will have no nausea

whatsoever, while in another it may last for days, even requiring active treatment. The two points to which the nurse must pay special attention are, firstly, the coming through of the discharge, and secondly, the loosening of the bandages. If the first should happen (unless it appear of a bright red, which would indicate hæmorrhage, and when she should at once send for the surgeon), she should place a small piece of gauze dipped in carbolic solution over the place, and over this, bandage a pad of antiseptic cotton wool. In the second instance she should apply a fresh bandage over the old one to make it fit closely, as otherwise unfiltered air will pass under the loosened dressings direct to the wound.

A careful note must be kept of the temperature, and should it suddenly go up the surgeon ought to be at once informed of the fact. Small temperature charts are supplied in books of twenty-five or fifty at a small cost, and the nurse will find them most convenient, if she take a sufficient interest in her cases to make her wish to keep a permanent record of their temperatures. In preparing the subsequent dressings the nurse must be very careful not to let them come in contact with dust, to avoid which she should cut them out on a large clean mackintosh, wrapping them in the same when finished, unless indeed she be fortunate enough to possess an air-tight tin box. A large square biscuit tin answers fairly well. The same piece of jaconet if properly cleansed may often be used several times, but the nurse should be careful to hold it up against the light to see that there are no pinholes in it.

Should the surgeon, finding that the nurse understands both the theory and the practice of the aseptic wound

treatment, trust her with some of the later dressings of the case, she must fully bear in mind the grave responsibility that rests upon her, and endeavour in every possible detail to put in practice the principles that she has learnt.

Every one knows that it is difficult to keep up any great interest in the treatment of very long cases; their very sameness causes laxity to creep in without great watchfulness on the part of the nurse. One of the best instances of this is a psoas abscess opened aseptically, and for the first few weeks as zealously guarded as an excision of a joint. What happens? The surgeon gets an extra busy day, the nurse is experienced, he trusts her, and she dresses it. No evil results, and again it is left to her, until finally it passes almost completely into her hands. One day, perhaps months later, the temperature goes up—stays up—the surgeon examines the wound and finds the pus malodorous, septic. How is this? Nurse "had done everything just as usual, it could not therefore be her fault," she says. But if the first part of this book has been thoroughly understood she will not be quite so confident; she will take herself to task, and probably she will finally remember some apparently insignificant slip which at the time she had thought could not matter. But the evil done cannot now be undone, and this she knows full well; and it can hardly be wondered at, that, with the possibility of such mishaps, the vast majority of surgeons absolutely refuse to trust any nurse to dress aseptic wounds.

A nurse may occasionally be in such a position that on her will depend the immediate treatment of an accident, as in the country, where the patient may have five or six miles to ride before reaching the hospital, or in a cottage hospital,

where the surgeon, being non-resident, would have to be sent for, and might not arrive for some little time. Her ordinary surgical training will have taught her how to improvise splints for a fracture, or how to arrest hæmorrhage by means of a tourniquet; but supposing that it be a case of compound fracture or of a large flesh wound, ought she to endeavour to render the wound aseptic? Undoubtedly she ought; she should remove all particles of dirt from the wound, syringe it out with an antiseptic lotion, cover it with a piece of lint or rag dipped in the lotion, cleanse the surrounding skin, not forgetting soap and turpentine if necessary, remove the guard, and apply an antiseptic dressing. The case can now await the surgeon's arrival, the nurse feeling that she has done all that she can to prevent sepsis occurring.

If after an operation the nurse be given the instruments to clean, she should be very careful in the case of forceps and instruments possessing teeth to brush them well with a small brush, *e.g.* a toothbrush; they should all be thoroughly washed in soap and water, and afterwards in clean water, knives being treated separately from all the others.

Some surgeons think highly of the poultice treatment of wounds, and an antiseptic one can be made by placing a piece of lint soaked in an antiseptic lotion on the wound overlapped in every direction by oilsilk or jaconet, and bandaged on. A preparation is also sold under the name of eucalinum which is used for the same purpose; it consists of the leaves, seeds, and oil of the eucalyptus combined with crushed linseed.

**Disinfection.**—It may be well to say a few words on the

subject of disinfection. What are the duties of a nurse if called to a case of infectious disease, *e.g.* scarlet fever? If she arrive on the scene early, the first thing to be done is to remove all the superfluous articles in the room or rooms which are intended to be occupied by the patient and nurse. One might just mention that if possible one entire floor, preferably the top one, should be entirely given up to the case. Carpets, curtains, bedhangings, stuffed chairs, &c., should be removed, as also all the contents of drawers that are not going to be used; in fact, the fewer the articles of any description that are left in the room the better.

All minor cooking, *e.g.* warming up beef tea, milk, &c., should be done upstairs by the nurse, as also the washing up of cups, plates, &c. All soiled linen should at once be placed in a disinfectant solution, *e.g.* carbolic acid 1 in 40, or chloride of lime two ounces to the gallon. All the motions of the patient before being thrown down the w.c. should be disinfected, especially in cases of typhoid fever or choleraic diarrhœa.

Many doctors order a sheet to be hung up over the doorway to be kept constantly wet by means of carbolic acid or other disinfectant; by far the best way to manage this, especially if the case is likely to last a long time, is to have a proper isolation sheet.

Of course the nurse herself must keep away from the friends of the patient; indeed, she must regard herself as just as liable to carry contagion as the patient would be. The nurse should change her dress before going out for a walk, should be careful not to sit on public seats in company with children, and not to use conveyances more than is really needful.

When the patient is pronounced well by the doctor, how should the nurse set herself to work to get rid of infection?

First, with regard to the patient, give him a warm antiseptic bath of Condy's fluid, sanitas, thymol, or carbolic acid, using carbolic or sanitas soap; the hair being thoroughly washed and carefully dried, envelop him in a warm blanket that has not been in the infected room, have him taken into an adjacent room and clothed in fresh clothes. The patient having once left the room should not be allowed to go near it again.

Next, with regard to the room or rooms and the infected articles contained in them. Even during the illness, as in a case of scarlet fever or small-pox, the nurse can do much to prevent the scattering of germs through the air by repeated inunctions of carbolic oil into the skin of the patient (of course the doctor's permission is to be first obtained); this hinders to a great degree the scales of epithelium and scabs from getting all about the room.*

The best disinfectant that we possess is heat; this, if of sufficient degree, will destroy any germs or their spores; but heat is not an agent that can be easily employed without special facilities for doing so, and mattresses, feather beds, eiderdown quilts, &c., can hardly be disinfected at home, and should be done either by the sanitary officer or by one of the firms who undertake to disinfect such articles. The first thing that the nurse must do is to have the bedding, &c., done up ready for the man to take away; they must not, however, be removed from the room until the man is actually ready for them.

* Many doctors much prefer antiseptic baths to oily inunctions.

The best aerial disinfectants are chlorine and sulphur dioxide. The way to apply them is as follows. Shut the chimney register and paste some thick brown paper over the fireplace, so as to totally occlude it; next stuff up all the chinks in the window frames with cotton wool, putting a bit in the keyhole, and paste brown paper over the wool. Next, by a little judicious management with the existing nails and hooks in the room, rig up with thin rope or blind-cord a series of clothes lines, and then proceed to hang upon them all the articles of clothing that require disinfection, all drawers being then taken out and stood up separately on the floor. If chlorine be used, chlorate of potash and hydrochloric acid are the materials generally employed; if sulphur dioxide be used, common flowers of sulphur and a little methylated spirit are employed. As being cheaper, sulphur is generally chosen. First, find the cubic area of the room; this is easily obtained roughly by multiplying its length, breadth, and height together, *e.g.*, say, the h. = 10 feet, b. = 8 feet, and l. = 15 feet; 10 × 8 × 15 = 1,200; the area of the room will be 1,200 cubic feet. Then allow 4 ozs. of sulphur for every 100 cubic feet, so that a room of this size would require, roughly speaking, about 3 lbs. of sulphur. Place the sulphur in an earthenware saucer; but if the room be large it is best to divide the sulphur into two or even more parts, and to construct a separate little apparatus for each. Arrange the saucer over a bath or pail of water by means of a pair of old tongs partially opened, or any piece of old iron; pour on a little methylated spirit, light it, and quickly leave the room, remembering not to leave behind the bottle of spirit or matches. Of course if there be more than one apparatus each must be lighted

before leaving the room; after shutting the door, paste some paper over the cracks at the sides and top, and place a damp sheet at the bottom of the door. At the end of twenty-four hours enter the room, open the windows, door, and fireplace register, and leave them so for another twenty-four hours.

The articles of clothing, &c., may now be taken down from the clothes-lines, and after soaking in a disinfectant be sent to the wash. The floor should be scrubbed with carbolic soap and solution of carbolic acid, the walls re-papered, and the ceiling whitewashed. The above precautions are absolutely necessary in cases in which the germs of the disease are very tenacious of life, *e.g.* in scarlet fever, although they may be quite unnecessary in some other cases of infectious disease.

With regard to the nurse herself, she should have a disinfectant bath, including the hair, and all her clothes will also require a thorough process of disinfection. The dress that she has constantly worn in the sick-room should either be burnt, or boiled for some time and then steeped in a solution of carbolic acid for several hours.

An ingenious and ready method of disinfection has lately been invented, in which cones made of carbon, containing the antiseptic required, are employed. These cones are composed of carbon mixed with an oxidising substance, and are hollow. In the centre of the cone is placed a small glass flask to hold the substance to be volatilised. When required the cone is placed upon a plate and lighted at the top; the carbon casing slowly burns, heating the liquid in the flask from above downwards, this being vaporised and given off into the air at a high tension. The cones contain

a great variety of substances, but the only reliable ones for disinfecting after contagious disease are those containing mercuric chloride or sulphurous acid; these, however, being such powerful poisons, can only be obtained by a nurse through a medical man.

## CHAPTER VI.

### *ANTISEPTICS IN MEDICINE.*

The Internal Administration of Antiseptics—Whooping Cough—Diphtheria — Phthisis — Scarlet Fever — Enteric Fever — Medicated Vapours.

A NURSE of an inquiring turn of mind will doubtless ere this have wondered whether micro-organisms, having once entered into the system, can be followed and destroyed by any germicides which may be given internally. On this point there exists some difference of opinion; antiseptic remedies, such as the sulphocarbolates and the hyposulphites, if given in large doses, seem to have proved useful in some cases of sepsis, but the great difficulty is to get enough of the antiseptic into the system to kill the germs and yet not enough to kill the patient; and many surgeons look upon drugs given in this way as practically useless.

In medical cases antiseptics are perhaps seen at their best in such diseases as whooping-cough, diphtheria, and phthisis.

In whooping-cough much success has followed the internal administration of carbolic acid, given regularly for two or three weeks, combined with the inhalation of the vapour of cresoline.

In diphtheria, corrosive sublimate given internally has

been very highly spoken of; as a topical agent, hyposulphite of soda may be used as a gargle and paint.

In phthisis the only chance of really reaching the bacteria is to use inhalations systematically for prolonged periods; usually eucalyptus, creosote, or carbolic acid are employed. If the patient be persevering with the treatment the number of bacilli in the sputum will rapidly diminish, and at the same time there is often a corresponding improvement in the general health.

In scarlet fever carbolic acid has proved of great service, but in order to be effectual it seems necessary that it should be administered in such quantities as to produce carboluria. Some practitioners believe that the drug is useful as a prophylactic against this disease. In enteric fever also the systematic internal administration of carbolic acid has been followed by excellent results, its success being probably due to its germicidal action on the typhoid bacillus. One doctor reports a series of 116 cases treated by this acid without a death.

A convenient method of producing antiseptic and other medicated vapours is by means of the carbon cones before mentioned, some of the most serviceable being those containing terebene, eucalyptus, iodine, thymol, and pinus sylvestris. It may be mentioned that as pleasant deodorants, perfumed cones are prepared of carbolic acid and lavender, &c.

## CHAPTER VII.

### *ANTISEPTIC MIDWIFERY.*

Lying-in Hospitals—Puerperal Septicæmia—Sapræmia—Infection—Precautions to be adopted by a Nurse—Hæmorrhage—Rules for Monthly Nurses—Ophthalmia—Cleanliness in the Nursery.

BEFORE closing this little book it may be well to say a few words upon the subject of antiseptic midwifery, as at the present time it is engrossing a good deal of attention. A nurse should not look upon her training as complete until it have included some in practical midwifery, for it is a branch of nursing which is almost sure to be of use at some time or another, especially if she should go to India or one of the colonies.

The many lying-in hospitals now open for the admission of pupils provide training either for one month or three, the former for those desiring only sufficient training to enable them to act as monthly nurses, the latter for those who at the expiry of the time go up for the Obstetrical Society's diploma in midwifery, and thus become qualified midwives. Some workhouse infirmaries also admit pupils for the necessary training.

Probably a nurse will say, "But surely this is a natural process, and why should we want to bring in aseptic measures at all; in olden times people managed with little or

no aid of any kind, certainly without such skilled aid as this would imply." This is quite true; but with the growth of civilisation—giving as a rule a larger fœtal head, and the deterioration of physical calibre and hardiness, owing to the sedentary occupations of girls living in cities, whose pelves are markedly smaller than those of girls brought up to an active country life—much more interference is required than formerly, thus rendering the patient more liable to the introduction into her system of germs from without.

The parturient woman is also peculiarly susceptible to infection, and in the crowded cities of to-day it stands to reason that she requires more protection than if living in a country village, where a case of infectious disease would be heard of and therefore guarded against at once. But the condition of the lying-in hospitals years ago, compared with that of to-day, affords perhaps the most complete proof possible of the immense value of the use of antiseptics in midwifery. Dr. Playfair mentions that in 1760, 1768, 1770 nearly all the patients in some of the lying-in institutions in London died, and frequently the hospitals had to be closed entirely on account of the frightful mortality. In 1885 the General Lying-in Hospital (London) could report that out of 1174 patients only eleven had died during the last five years. The same result has been noted on the Continent since the adoption of antiseptic measures.

But the nurse may well ask, "What did all the patients die from?"

Of course hæmorrhage, shock, &c., may have had a few victims, but *puerperal fever* was the enemy which has been so long the bugbear of the obstetrician, and which proved so disastrous to the vast majority. It may truly be said

that puerperal fever has now been conquered by aseptic principles properly carried out.

What is puerperal fever? Practically speaking, it is identical with septicæmia and pyæmia occurring in a surgical patient. Both arise from the absorption into the system of micro-organisms from without through an abraded surface, and setting up by their multiplication and growth the constitutional symptoms which are so much dreaded.

It is important to remember that in a parturient woman the denuded surface open to absorption is so large and has such an increased blood supply that poison may be absorbed with intense rapidity into the system, and the patient be beyond reach of assistance in a few hours.

The first symptoms of septicæmia in a lying-in woman may be noted at any time, occasionally even before labour is completed, or as late as the fifth or sixth day. It rarely occurs after this, as the abraded surfaces will have begun to heal, and their granulations prove of themselves a barrier to the entrance of micro-organisms, as already seen when considering surgical cases.

The first symptoms usually occur on the second or third day after delivery, and vary with the severity of the attack. Just as in malignant scarlet fever the poison absorbed may be so virulent, causing such intense constitutional disturbance, that the patient succumbs in a few days, or even in a few hours. The cases which occur in an epidemic form in lying-in hospitals are of this variety. In cases of this kind the patient has a very high temperature which persists throughout, rapid pulse and breathing, general collapse, delirium, vomiting, diarrhœa, tympanites, hiccough, and suppression of lochia. The blood seems to be pro-

foundly altered, and in a post-mortem examination great congestion of the internal organs with ecchymoses is found.

In the less acute forms the disease may manifest itself in a very insidious manner; a rigor may occur, but after it the patient may express herself as feeling quite well with the exception of a headache, which appears to be an almost constant feature. The temperature will go up with the occurrence of the rigor to perhaps 103° or 104°, after which it will probably subside to about 100°, but only to again rise with subsequent rigors. Rigors are not, however, invariably present, and the temperature may be high throughout, with but slight remissions. The following symptoms generally occur at some period of the case: vomiting, diarrhœa, profuse perspirations, parched furred tongue, later on becoming brown, arrest of lochia, or if not arrested of fœtid odour, diminution and often total disappearance of the milk; if hiccough or excessive tympanites are present the prognosis is very bad. The disease if protracted may last for months, and jaundice, pus in the joints, thrombosis, white leg, pneumonia, and pericarditis may appear.

There is a variety of poisoning which may attack the puerperal woman called by Dr. Matthews Duncan *sapræmia*, which differs from the ordinary form of septicæmia, in that the poison absorbed is incapable of multiplication, so that the cause of infection being removed the patient will at once recover. It generally arises from the retention within the genital canal of decomposing matter, *e.g.* a portion of the placenta or membranes, causing a high temperature and quick pulse, but upon the uterus being well syringed out rapid improvement will occur,

although the process may in some instances require repetition before the patient is quite well. Although this condition is described, its treatment should never be undertaken by a nurse or midwife on her own responsibility, as uterine irrigation is never free from possible danger. It is a proceeding which is usually carried out once for all, and may be followed by the introduction of an antiseptic bougie into the cavity of the uterus, *e.g.* Ehrendorfer's iodoform bougie, which takes three or four days to melt. Sapræmia has also been found in very poor patients where the linen has been left unchanged.

It is usual to divide the sources of puerperal fever into—

(1.) Where the poison originates within the patient herself—*autogenetic.*

(2.) Where the poison originates outside the patient—*heterogenetic.*

However, on consideration it will be evident that, sepsis being always due to micro-organisms, the source of infection must strictly speaking be always heterogenetic.

A blood-clot or piece of placenta are *per se* quite harmless, but admit micro-organisms, and they at once become fertile beds of sepsis. Many cases are on record of ruptured extra-uterine fœtations which, becoming encapsuled, have remained for years harmless in the patient's abdomen, because no micro-organisms have gained access to them.

The conditions in the patient herself favourable to the occurrence of puerperal fever will now be mentioned, then the different ways in which the micro-organisms may be conveyed to the absorbing surfaces, and finally the

measures which if properly carried out are a safeguard against this truly terrible disease.

The conditions in the patient herself—

(1.) Retained blood-clots, portions of placenta or membranes.

(2.) Sloughs of the genital passage from pressure of the fœtus or instruments.

(3.) Lacerations and abrasions of the genital tract, *e.g.* ruptured perinæum.

(4.) Excessive loss of blood.

The chief ways in which micro-organisms may be conveyed to the absorbing surfaces are—

(1.) The hands of the accoucheur.

(2.) The instruments used, *e.g.* forceps, catheter, vaginal syringes, &c.

(3.) The hands of the nurse.

(4.) The sponges used for washing the genitals.

(5.) Improperly washed diapers, sheets, mackintoshes, &c.

(6.) Inattention to cleanliness, primarily of the genitals.

The patient during the puerperium is peculiarly liable to the infection of scarlet fever, diphtheria, erysipelas, or perhaps of any zymotic disease, but especially of the three mentioned. She is also peculiarly susceptible to the influence of sewer gas, noxious exhalations of any description, or infected water supply. Any one of these may produce septicæmic symptoms and death of the patient.

What precautions should be adopted by the nurse before, during, and after a confinement?

(1) Before.—The nurse must be certain that she herself is free from sources of danger to the patient; she should

not have been nursing any infectious or septicæmic case, or have been in contact with any one suffering from these diseases. She should pay particular attention to personal cleanliness, and should take baths (including the hair) frequently. Her under-linen should be often changed, and her indoor dress be of washing material; after nursing a septicæmic case it should be burnt, or at any rate washed in a strong solution of carbolic acid and afterwards boiled for some hours. It is best not to wear cuffs in the room, and to have the dress sleeves made to button, so that they may be rolled up to the elbow when attending to the patient.

When arranging beforehand with the patient, a nurse would do well to inquire if there be any particularly bad smells in the house and if the drainage be good. If possible the room chosen should be removed from any near proximity to the water-closet or bath-rooms. If the patient be in circumstances to do so, the nurse should advise her to obtain some antiseptic diapers and an accouchement sheet, —which are burnt after use—such as may now be obtained at several places, and the mackintosh should be scrubbed with carbolic acid if it have been used before. The patient should also possess an enema syringe fitted with a new vaginal tube; the latter can now be obtained made of glass, and is both cheap and clean. The nurse must provide herself (*i.e.* if she be going to act as midwife) with some antiseptic lubricant for examinations, and the best to use for this purpose is glycerine containing half a grain to the ounce of corrosive sublimate. This is far better than vaseline or oil, as glycerine parts with its antiseptic more readily. A solution of some antiseptic is also necessary, *e.g.* carbolic acid 1 in 20, sanitas, tincture of iodine, or Condy's fluid.

The nurse when travelling about will find it very convenient to have pellets of salufer or lotiforms of corrosive sublimate; the latter consist of pellets of coloured cotton wool saturated with a strong solution of corrosive sublimate, so arranged that one lotiform to a pint of water will equal a solution of 1 in 5,000. Crystals of permanganate of potash are also convenient to carry about.

(2) During.—The nurse should bear in mind that there are certain conditions which may occur during labour which would predispose the patient to septic absorption later on. Many a patient has developed septicæmia through sloughing of portions of the genital track by the long pressure of the fœtal head, which would have been averted had the midwife sent earlier for a doctor, who would probably have applied forceps. No examination must be made until the nurse have thoroughly washed her hands in soap and water, using the nail-brush freely, have rinsed them in an antiseptic solution (preferably corrosive sublimate 1 in 5,000), and finally smeared the index finger with antiseptic glycerine. This rule holds good both during and after labour, whenever the nurse touches the genitalia. If labour be protracted, it is well to cleanse the vagina with a douche of warm Condy's fluid, this being secondarily beneficial to the infant, as leucorrhœal discharge often gives rise to ophthalmia.

As a precaution against hæmorrhage there can be no objection to the midwife administering *after* delivery (never before) a drachm of the liquid extract of ergot. It is hardly necessary to insist upon the importance of preserving intact the perinæum. In primiparæ some lacerations about the fourchette are inevitable, but by a judicious retardation of the progress of the head, with the orthodox support of the

perinæum, any rupture of magnitude may almost always be prevented, and the midwife will have secured to her patient one less risk of septic absorption. The placenta and membranes must be very carefully examined to see that they have come away entire, and in cases of attached placenta it is wiser to send for a doctor, as the danger of leaving any behind is great.

After the third stage of labour is completed efficient contraction of the uterus must be maintained by pressure, all bloodclots being cleared out before using the antiseptic vaginal douche, with which it is well to conclude all cases of labour. The nurse should never syringe with corrosive sublimate except under medical direction, as in patients affected with kidney disease the effects might prove most serious, and even in a healthy woman, if some were retained, the results might be fraught with danger.

(3) After.—When the patient has rested a little time, the nurse must be careful to remove all soiled linen from under her, placing a small draw-sheet beneath. While the lochia is abundant she must provide her with clean diapers every four hours, preferably the antiseptic ones before-mentioned; she should syringe the vagina twice a day for a week and once a day afterwards, and frequently wash the external genitals; it is well not to use a sponge for this purpose, as it is so difficult to clean, a fresh piece of absorbent cotton wool each time answering admirably. Artificial sponges are now made, consisting of absorbent cotton wool and cocoanut fibre, enclosed in a covering of absorbent gauze. In the centre of the pad is placed a thin capsule containing an antiseptic, *e.g.* corrosive sublimate, eucalyptus, &c. Before use the pad is given a sharp squeeze, which breaks the cap-

sule and releases the antiseptic. After use the pad is burnt. The antiseptic solutions best suited for syringing and external washing are one of Condy's fluid, sufficient of the Condy being added to make it of a pale pink; one of iodine, one drachm of the tincture being added to a pint of water; one of sanitas, two ounces to a pint; a solution of carbolic acid 1 in 80, or of salufer 20 grains to the pint. The nurse will be wise for the first week to admit no outside friends into the sick-room, not only because of their effect on the nervous system of the patient, but also because it is impossible to be sure that they have not been in contact with infectious disease, *e.g.* in omnibuses, trains, &c.

Having now briefly looked at some of the chief points for the midwife to bear in mind when conducting a case, it will be well, even although it will involve some recapitulation, to give some rules equally applicable to monthly nurses, the substance of which was recommended by various obstetric physicians at a recent Medical Conference:—

(1.) No nurse who has recently attended, or been in contact with, a case of scarlet fever, erysipelas, diphtheria, puerperal fever, or any infectious disease, should undertake to nurse a puerperal woman.

(2.) A nurse must never touch the genitalia of a lying-in woman, or make any application to them, without first washing her hands, never forgetting the nail-brush, and rinsing them in a solution of corrosive sublimate or other efficient antiseptic.

(3.) A nurse before making any examination, and these should be as few as possible, must first wash her hands, rinse them in the sublimate solution, and

then smear the index finger with antiseptic glycerine.

(4.) All catheters, vaginal tubes, syringes must be kept in a solution of corrosive sublimate. Before use they must be greased with antiseptic glycerine, and after use be thoroughly washed in hot and cold water and then replaced in the antiseptic solution.

(5.) All diapers, &c., must be removed from the sick-room as soon as possible after use, and all utensils after being washed should be rinsed in an antiseptic solution.

(6.) Unless distinct orders be given to the contrary, the vagina should be syringed twice daily for the first week, and once a day till the lochia have stopped, with a solution of Condy, carbolic, salufer, sanitas, or iodine. Care must be taken that the vaginal tube be not inserted more than two or three inches, and that all air be expelled from the syringe before use.

(7). A basin containing two pints of solution of corrosive sublimate (of about 1 in 5,000) should be kept in the room, in which the nurse or doctor can rinse their hands before attending to the patient.

It may be well just to remind the nurse that the infant's eyes must not be neglected, as new-born infants are specially liable to an inflammation of the conjunctiva known as purulent ophthalmia, which is exceedingly infectious, and which, if not properly treated, may go on to the total destruction of the sight. As soon as the child is born the eyes should be washed; some doctors recommending its being done whilst waiting for the cord to cease pulsating. If there be the

slightest suspicion of ophthalmia the nurse must, from the very beginning, carefully wash the eyes with an antiseptic lotion every two hours, burning the rag employed after each application. The lotion generally used is one of corrosive sublimate, 1 in 2,000, or an astringent lotion of nitrate of silver half a grain to the ounce; but unless the eyes rapidly improve the nurse should lose no time in calling in a doctor.

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**Cleanliness in the Nursery.**—Before leaving the subject of antiseptics, the writer would like to say a word to her readers, especially to monthly nurses, on antiseptic cleanliness in the nursery. Now antiseptic cleanliness in the *nursery* is just as important as in the *surgery*. Thrush, diarrhœa, gastro-intestinal attacks, and wasting, when occurring in the infant, are nearly always due to the presence of micro-organisms, which, when swallowed from the feeding-bottle, give rise to fermentation in the stomach, and the development of noxious gases; a consequent diarrhœa and vomiting being set up by the efforts of the stomach and intestines to rid themselves of their offending contents.

A micro-organism called the Oidium Lactis, found in particles of milk undergoing putrefactive changes, is closely allied to, if not actually identical with, the one to which aphthæ or thrush is due. The above facts will surely be sufficient evidence that a great many of the diseases of infants are preventible by strict antiseptic cleanliness.

This is not the place to speak of infants' hand-feeding in detail; but such a frightful mortality of infant life is due to this cause, that the writer would advise any nurse who has to bring up children by hand to master a few sound physio-

logical principles on the subject, to direct her proceedings.

But to return to the feeding-bottle, which must be looked upon by a nurse as a possible "fertile bed of sepsis." Milk is a substance which, under general conditions, undergoes putrefactive changes very rapidly. It is to guard against this tendency that the nurse must be on the alert.

All milk intended for children's use must be *boiled*. This destroys any germs, infectious or otherwise, which may be present, and hinders to some degree the rapid development of putrefactive changes.

The remains of an infant's meal must never be allowed to remain in the bottle for the next time, or be poured back into the jug containing the day's supply.

The washing of the feeding-bottle is, after all, the great matter of importance, as its tubes and teat afford many a corner where a drop of milk may remain hidden unless searched for by a most vigorous and determined nurse.

Feeding-bottles without any tubes are greatly to be preferred, but there is more difficulty with them in regulating the quantity of milk taken into the infant's mouth, and therefore they are a little awkward. The fittings should be of glass or china and not of cork, as the latter substance is very difficult to clean properly.

After each of the child's meals the bottle must be thoroughly washed in warm water, rinsed, and then placed in a basin of cold water, large enough for the water to entirely cover the bottle. Hot water must then be squeezed through the fittings till it comes through quite clear.

The fittings must then be taken to pieces, and the tubes rubbed through the fingers throughout their whole length,

the teat being treated in a similar way, till when placed in clean water no milky taste or odour can be detected. These must then be placed in the basin of cold water.

This washing must take place *immediately* after the bottle has been used, remembering that any part of it having once become foul, *i.e.* putrefaction having been set up, it is almost impossible to properly cleanse it.

Nothing has been said about bottle-brushes, as they have been proved dangerous, through the bristles becoming loose, remaining in the bottle or tube, and being sucked into the infant's mouth and throat. The whole washing must, once a day, be done with soda. A little bicarbonate of soda (about a teaspoonful) in the basin of cold water in which the bottle is kept is advisable in hot weather.

* * * * *

The writer must now say good-bye to those nurses who have patiently read, and she hopes profitably digested, the preceding pages. She will feel sufficiently repaid if any amongst them have had a new line of thought and study opened out to them, and have gleaned some foundation truths on the vast subject of sepsis and asepsis.

The writer also trusts that the knowledge thus gained will, in the case of each individual nurse, produce practical results in her every-day nursing duties, and she is sure that each nurse will oftentimes be able to prove the truth of the oft-repeated axiom, "Exclude germs and sepsis is excluded."

# LIST OF APPLIANCES, AND WHERE OBTAINABLE.

A NURSE may find it convenient to have a short list of places where can be obtained various articles often required by her.

**Air Beds, Cushions, India-rubber Water Bottles.**—Hancock, 266, Goswell Road, E.C.; Hooper & Co., 55, Grosvenor St., W. (Water Beds can also be hired here.)

**Antiseptic Accouchement Sheets, Towels, &c.**—Hartmann, 11, Hatton Garden, E.C.; Southall & Barclay, Birmingham (London agents, S. Maw, Son, & Thompson, 7, Aldersgate Street, E.C.).

**Antiseptic Dressings of all Varieties.**—Milne, Lady Well, Lewisham, S.E.; Macfarlan & Co., 17 and 18, North Bridge, Edinburgh.

**Carbon Cones.**—Chemical Carbon Company, 62, Holborn Viaduct, E.C.

**Catheters, Enema Syringes, Measuring Glasses, Clinical Thermometers, Sponges, &c.**—S. Maw, Son, & Thompson, 7, Aldersgate Street, E.C.

**Disinfecting Firms.**—W. G. Lacy, 24, Ringford Road, West Hill, Wandsworth, S.W.; Armfield & Sons, 15, Lower Belgrave Street, S.W.

**Eucalinum for Poultices.**—Green & Co., Tower Chambers, Finsbury Pavement, Moorgate Street, E.C.

**Feeding Bottles (the Thermo Safeguard).**—Pocock, Keevil, & Co., 72, Wandsworth Road, S.W.

**Gamgee Tissue.**—Robinson & Sons, Chesterfield.

**Isolation Sheets, to erect over Door of the Sick-room.**—W. G. Lacy, 24, Ringford Road, West Hill, Wandsworth, S.W.

**Lotiforms of Corrosive Sublimate.**—Sold in small bottles. Hartmann, 11, Hatton Garden, E.C.

**Mackintoshes, Pink Jaconet, Ice Bags, Ice Caps (Thornton's).**—Hancock, 266, Goswell Road, E.C.

**Salufer Cubes & Pellets.**—Sold in small boxes. Reynolds & Branson, Briggate, Leeds; Winser & Co., Manchester.

**Sponges, Artificial.** — Burroughs, Wellcome, & Co., Snow Hill Buildings, Holborn Viaduct, E.C.

**Temperature Charts.**—Sold in small books of twenty-five and fifty. Reynolds & Branson, Briggate, Leeds.

**Vaginal Glass Tubes for Syringing.**—S. Maw, Son, & Thompson, 7, Aldersgate Street, E.C.

**Woodwool, Wadding, &c.**—Hartmann, 11, Hatton Garden, E.C.

# INDEX.

THE END.



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# MODERN ANTISEPTICS AND ANTISEPTIC APPLIANCES.

**The B. W & Co. Artificial Sponges.**—These are supplied both antiseptic and non-antiseptic. The antiseptic sponges contain in the centre a capsule enclosing from five to thirty drops of Eucalyptia, Pinol, &c. This is covered with elastic fibre and absorbent cotton, the whole being enclosed in antiseptic gauze. The sponges are about the size of a small fist. When they are pressed sharply between the thumb and finger the capsule breaks, setting free the antiseptic, which permeates the sponge. They have been found exceedingly useful as a dressing for wounds. Medical reports show that wounds treated with these in the recent Egyptian campaign healed much more rapidly than under ordinary treatment. They are made into wound-pads by simply having a bandage attached to them.

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**Vaginal Tampons. B. W & Co.**—These were prepared at the suggestion of Dr. Fancourt Barnes, and contain in the capsules either of the following drugs : Eucalyptia, Iodine, Iodide of Phenol and Belladonna.

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**"Lanoline."**—To Professor Liebreich is due the credit of discovering that wool fat is more readily absorbed by the skin than any other. It is, moreover, antiseptic, and does not become rancid. It is, therefore, eminently adapted for applications to the skin, which absorbs it readily and is nourished by it Medicaments are much more readily taken up by the skin when mixed with "Lanoline" than with any other ointment basis. It is especially suitable for application to the hair.

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