LECTURE 23.


GENTLEMEN,

At the end of last lecture we were discussing the action of various hydragogue cathartics, and I mentioned that one of the most powerful was elaterium, and that, in order to obtain a constant preparation of this drug, the active principle, viz., elaterine, had been introduced into the Pharmacopœia. The dose of elaterine is so very small that it is difficult to weigh it out except by means of a delicate chemical balance, and the chemical balances which would weigh it with any amount of exactitude are so rarely to be found in druggists' shops that, in order to make a more convenient form for dispensing, elaterine has been mixed up as a powder with sugar and milk and put into the Pharmacopœia under the name of pulvis elaterini compositus. This powder contains one part of elaterine mixed with 39 parts of sugar of milk; thus its bulk is greatly increased, and it is rendered more easy to dispense. The dose of this powder is half a grain to 5 grains. I daresay you have noticed that I have as yet not bothered you much about doses, but there are some drugs the exact doses of which you must know before you go up for examination. Elaterium, elaterine, and the compound elaterine powder are examples of this, as is also croton oil. Another hydragogue cathartic, which I think I mentioned in passing, is gamboge. This is not used to the same
USES OF PURGATIVES—INTESTINAL CESSPOOLS.

extent as the others; it is necessary nevertheless that you should remember its dose. The dose of gamboge is 1 to 4 grains. Gamboge is said to be a drastic as well as a hydragogue purgative, but it has not the same power of causing irritation and congestion in the intestinal tube that croton oil has; it lies much nearer the hydragogues than the drastics.

USES OF PURGATIVES.—We may come now to the uses of aperients. First of all, you may wish to remove fecal substances lying in the intestine. Not only do these give rise to disturbances mechanically, but they may do so by giving rise to products of decomposition which are absorbed and which act as poisons to the organism. We all know what a general dread is felt of sewer gas, and whenever anybody gets ill in a house one always inquires: "Are the drains in order?" but there are many people who carry about a cesspool inside them. They do not get their bowels opened as they ought to do, the fecal masses undergo decomposition in their intestines, and then they wonder what is the matter with them. If you have to treat such patients, get their bowels open thoroughly well, and they will feel much the better for it. Frequently you may notice that patients who complain of feeling weak and low, of being unable to attend to anything, of having no interest in life, and of feeling generally utterly miserable, will become perfectly different people if you simply clear their bowels thoroughly out. One of the best ways of doing this is by means of a mercurial purgative overnight and a black draught the next morning. The action of mercurial purgatives we must consider when we come to discuss the effect of drugs upon the liver, but keeping the bowels cleared out has an extraordinary effect upon the well-being of an individual. We do not know to what extent the events of history may have depended on the condition of the bowels in kings and generals. You know that in the time of Louis XIV there was a perfect mania for taking enemata, and Louis and some of his courtiers had their bowels opened many times a day by means of enemata. This no doubt tended to prevent the effects of overeating and overdrinking. Many people who eat and drink too much would be a great deal worse off if it were not that their bowels are kept
rather loose. You will notice, I think, that in people who are accustomed to drink more alcohol than is good for them the bowels almost always tend to be loose. Oddly enough, you find the same thing in people who take opium. Small doses of opium constipate, but you rarely or never find the bowels habitually constipated in an opium-eater, and generally his bowels tend to become rather loose. Opium when injected into the veins is one of the most powerful purgatives that I know of. When I was working in the laboratory of Professor Ludwig at Leipzig, it was his custom invariably to narcotise the animals before operation by means of an injection of opium into the veins. A hypodermic needle was just stuck into the vein, and a drachm or so of laudanum was injected, but before the injection was given preparation was made for the purgative action of the opium by placing a large quantity of tow close to the anus of the animal. This preparation was very necessary, because in less than half a minute after the injection of the opium into the vein the whole of the intestinal canal seemed to be thrown into most violent action, and the whole of its contents were shot out. This is a sort of action that one would never have expected from the opium. Sometimes you find that opium has a purgative action, even in moderate doses, on your patients. I think that this action is more generally induced in one class of patient where the ordinary drugs do not act. You will find, in some women especially, that the nervous system of the bowel seems to be so delicately balanced that it leans always to one side or other, and they either suffer from diarrhoea or constipation. If they are constipated you give them a small dose of an aperient, but, to your disgust and to theirs also, you find that the small dose of an aperient has acted as a powerful purgative, and in such cases minute doses of opium may sometimes put the matter right.

I have already mentioned to you that the nervous system of the bowel contains two distinct sets of nerves, inhibitory and stimulating, so that you have these two varieties of nerves acting against one another; and the question whether the bowel remains quiet or becomes active, and whether the motions are hard or become loose, depends upon not so much actual
stimulation of either set of nerves as upon the preponderance of one set of nerves over the other.

You can readily enough see that if the nerves should be, from the nature of the patient, very nearly equal, a very slight stimulus might just turn the balance. Occasionally I have succeeded in curing obstinate constipation in such cases without any purgatives at all by giving belladonna, or by giving nux vomica, or by combining the two together. Many years ago a paper was published on the action of belladonna as a purgative, and the dose, if I remember rightly, was \( \frac{3}{4} \) of a grain of the extract of belladonna. I tried it, but I did not try it in the proper dose, and I did not get good results. My results were negative, and I was inclined to think that there was nothing in it at all; this, I believe, was simply due to my not having followed the directions. In very minute doses, I think belladonna sometimes does turn the balance, and occasionally I have obtained good results from belladonna or hyoscyamus combined with nux vomica. In cases of this sort, inasmuch as the individual peculiarity of the patient may determine the action of the drug, the best way is to begin with quite small doses and gradually work up, because if you overshoot the dose the chances are, you will not get the benefit that you desire. I believe it is in such cases as these that homœopathic practitioners have a great advantage, because they begin with such exceeding minute doses that they are not likely to overdo the effect of the drug, and so they may work up and get the bowels to act regularly.

I have found also that in the case of people belonging to gouty families obstinate constipation may exist, which yields to a powerful purgative, and then returns worse than before. In such cases the administration of salicylate of soda will tend to keep the bowels regular without any purgative whatever. By treating the general gouty state you get the local condition of the bowels improved. Then, curiously enough, meat in some people seems to have the power of causing constipation. It is not merely that the patient who takes meat eats less vegetables than before. I suppose that in some way proteids lessen the peristalsis of the bowel, and so have a constipating effect; for
sometimes when a patient cuts off meat entirely the bowels become regular, even though he takes no more vegetables than before.

Another statement has been made to me by a patient, but it rests upon his authority, and I really cannot tell you whether it is right or not. I have no doubt it is correct so far as the individual himself is concerned, but I do not think that you can take it as a general rule. He wrote to me to say that he had given up bread entirely, living upon meat, eggs, and vegetables, and that since he had cut off bread his bowels had become quite regular. I should not think this was a general condition, but it is just possible that it may occur in some individuals.

Now, by clearing away the waste products from within the body you improve the general condition, and you very often improve the appetite, and no wonder, for you cannot expect any one who is stuffed up with the products of waste to have an appetite for food. The waste products, however, have another effect. Sometimes a man who usually goes regularly to the closet is prevented by some occurrence, such as the necessity of catching a train, from going at the usual time. In consequence of this, he begins to feel a sensation of weight in the abdomen, and not unlikely a little later a sensation of distinct weight in the head comes on, followed by a headache. Although the bowels are not opened, these effects pass off, and he may remain without any motion for several days without feeling any more discomfort. But if the bowels are not opened at the end of three or four days, the symptoms are apt to return again and become more severe. Now, along with the headache, you may find irritability of temper, and the administration of a purgative will not only clear away the discomfort in the abdomen, but will clear away the heaviness in the head, and frequently remove also the irritability of temper. At the same time, it seems to restore the power of attention which sometimes is lost at the time when the head becomes uncomfortable, even although no distinct headache may be present. Sleeplessness is another condition which is not unfrequently consequent upon constipation. There are many patients who are quite sleepless if their bowels are constipated, but who get sleep
whenever their bowels are freely opened. In some cases of sleeplessness I have found that a draught in our Hospital Pharmacopoeia succeeded better than an opium draught, and you would hardly imagine a priori which draught that was. It was the haustus menthae sulphuricus cum magnesii sulphate, which contains sulphate of magnesia 60 grains, sulphuric mint draught up to 1 ounce. This given three times a day has produced sleep in cases where the patients suffered from sleeplessness. I do not know whether in them the sleep was due to the removal from the bowels of some substance which tended to prevent sleep, or whether it was due to some alteration in the filling of the abdominal vessels caused by the sulphate of magnesia; but, at any rate, sleep came on. As you are almost certain to get in your practice a great number of cases of sleeplessness, it is worth while to remember that in some of them you may be successful in inducing sleep by keeping the bowels freely open.

Then, in children especially, the temperature is very apt to rise from constipation. There are certain substances, the products of albuminous decomposition, which have the power of raising temperature, and it is quite possible that the rise of temperature in constipated children may be due to the absorption of these substances. At any rate, you will find that frequently in children there is a rise of temperature when the bowels are confined, and the same thing may be observed in many cases of disease in our hospital wards. In cases of pneumonia, especially during the stage of convalescence, and very markedly in cases of typhoid fever during convalescence, the temperature goes up if the bowels become constipated. In these cases, upon clearing the bowels gently out the temperature will fall again to its usual level.

**Effect of Purgation upon Arterial Tension.**—In the case of old people, and where there is a tendency to high arterial tension generally, purgatives are often required to keep the bowels gently open, and by this means prevent that congestion of the cerebral vessels so often giving rise to a feeling of fulness in the head, which may be possibly associated with threatening apoplexy. Now very likely you will be puzzled at one of the
statements in my “Text-book of Pharmacology,” which I have copied from Dr. Matthew Hay, viz., that the usual consequence of the administration of sulphate of magnesia to animals is to raise the blood pressure. I have no doubt that the experiments upon which the statement is founded are correct so far as they go, but you must recollect that they were made upon perfectly healthy animals, and the usual result of the administration of a saline purgative to patients is not to raise, but rather to depress the arterial tension. The reason for this is that in many cases where you administer a purgative you are not dealing with a perfectly healthy individual, but with a man under abnormal circumstances, whose pressure is probably raised, and the usual effect of the medicine is to bring it back to the normal. There is another advantage occasionally in using laxatives, and that is that you thereby prevent straining. Straining at stool tends to raise very greatly the intra-abdominal pressure, and thus to put a strain upon the vessels of the brain, and during this there is in elderly people a great risk of the occurrence of apoplexy. In persons suffering from aneurism, straining at stool is especially to be avoided, because it may cause a rupture of the aneurism; and the same thing holds good in patients suffering from ptosis with a tendency to bleeding from the lungs. Wherever there is a tendency to hernia, straining ought to be avoided, because the hernia tends to protrude. During pregnancy one must be careful to avoid straining, because it may induce abortion. It is for this reason that the caution is given to avoid aloe in pregnancy, because this drug tends to irritate the rectum. A small dose of aloe is an exceedingly useful adjunct to other drugs in producing a complete evacuation, but if aloe be given in large quantity, it has a tendency to irritate the rectum, and thus to produce straining. You may get straining and a desire to defaecate from irritation in the mucous membrane of the bowel itself, as well as from something contained in the bowel. In order to prevent straining during pregnancy, one generally gives a mild laxative, such as the confection of senna, confection of sulphur, or compound liquorice powder. The best of all purgatives is, as I have said, castor oil, if the patient can take it, and because of its safety
it is generally used by women after delivery, because it has no bad effects.

It is not always necessary to clear out the whole of the intestinal canal by a purgative, because frequently the absence of a motion does not depend upon want of power or want of action in the upper part of the intestinal canal, but upon a torpid condition of the rectum itself. This torpid condition is brought about more especially by habit. You know that poor people in the slums of London, and also in foreign countries, become used to the presence of vermin upon their bodies. Some of the patients who come to the Hospital are in such a condition with vermin that if any of you were in such a state, you would be utterly miserable and could not endure yourselves, and yet they are so accustomed to it that they do not mind. The same thing that happens to the skin happens also to mucous membranes, and while the mucous membrane of a normal rectum cannot stand very well any faecal matter pressing upon it—because it is sensitive, and reacts readily, and brings about the desire to defæcate—yet this mucous membrane may be gradually trained to bear the pressure of a large quantity of faecal matter. So by-and-by the rectum becomes accustomed to the presence of irritating matter in it, and the irritation no longer gives rise to a desire to defæcate, and thus the habit is acquired of going on day after day without evacuating the bowels, although there is in the rectum and large intestine generally enough faecal matter for enormous evacuations. Now, one of the best ways of getting rid of this tendency is, as I have said, to cultivate the habit of going regularly, but sometimes before this habit has become acquired it may be necessary to use some help, and one of the adjuncts which have been introduced of late years, and is getting very much into fashion, is the practice of using a little glycerine, either in the form of an enema, or as a suppository. When the rectum is filled with faecal matter which does not irritate it, if you simply introduce a glycerine suppository this acts as a most powerful irritant, and the rectum at once responds, the bowels are emptied, and the patient is relieved. In place of the suppository, you may simply inject 1 or 2 fluid drachms of glycerine into the bowel, and the result is the same. An old-
fashioned method of treating constipation in children was by a little bit of yellow soap; this was cut into the form of a suppository and introduced into the anus of the child. This was employed a long time before the introduction of glycerine suppositories.

When the bowel is filled higher up with faecal matter, you may use an enema consisting of a large quantity of fluid, one of the most common liquids employed being simple water or soap and water, or you may employ medicated enemata, an excellent one being that of castor oil. An ounce of oil is mixed either with soap and water, or, better still, with some thin starch mucilage. This is exceedingly good, as the thin starch seems to emulsify the castor oil better than the soap and water, and it is easier to give. This enema is not official, but another excellent purgative enema is contained in the Pharmacopoeia, the enema magnesii sulphatis, containing sulphate of magnesia, 1 ounce; olive oil, 1 ounce; mucilage of starch, 15 fluid ounces. The ordinary quantity of fluid for a purgative enema is 16 fluid ounces.

The way to introduce an enema is by means of a syringe. I show you one of the old-fashioned syringes made of metal; they have gone very much out of use now. I also show you a larger one, which may be used as a stomach-pump, and which has a nozzle for the administration of enemata also. Most of these have been displaced by the soft rubber enema syringe. In introducing the enema one should be careful to fill the syringe with fluid, and expel all air from it before injecting. The ordinary nozzle is made of bone or ivory, but I am quite sure I have seen cases of ulceration of the rectum which were produced by the pressure of a hard ivory nozzle. A much better plan is to use a soft rubber tube, which can be simply placed upon the end of the ordinary nozzle, and then introduced into the rectum, with little or no risk of any ulceration being produced. In place of the syringe one may use simply a funnel and long rubber tube attached to a nozzle, and here again the soft rubber nozzle is a most useful adjunct.

Sometimes you may wish to wash out the upper part of the
large intestine, and for this purpose it is necessary to introduce a great deal of fluid. If you inject the fluid quickly, you defeat your own object, because you thus distend the rectum and bring about a desire to defæcate, and the whole enema is returned; if you inject the fluid gently into the intestine so as to get it past the sigmoid flexure, you may fill nearly the whole of the large intestine with fluid without almost any desire to defæcate. This is to be done by putting the fluid in under low pressure, and if possible by pushing the tube far enough up to get round the sigmoid flexure. If you can push your tube so far up that it passes well into the sigmoid, you can pour in your fluid, and it runs up the descending colon, across the transverse and into the ascending colon, and still there is almost no tendency to defæcate. In this way you can pour in sometimes about two quarts of water or other fluid without giving rise to defæcation. This method is employed in cases where we wish to use an astringent high up in the intestine, where old ulcerations are suspected, or where it is desired to wash out the contents of the cæcum.

Nutritive Enemata.—There is another condition in which this method is used, and that is when enemata are employed for the purposes of nutrition. If you only introduce a small quantity of soluble nutritive material into the rectum, you cannot expect a great deal to be taken up, but if you can pour into the patients' large intestine a couple of pints or more, say of peptonised milk, you may get the patients' nutrition kept up for weeks together, although they are unable to take anything by the mouth. In cases of severe gastric ulcer, where the stomach is so intolerant that any attempt to feed by the stomach brings on a return of pain, of vomiting, or of bleeding, you may be obliged to keep your patient alive for several weeks together by the introduction of nutritive enemata. I have kept one patient on nutritive enemata for six weeks, with the result that the patient gradually laid on flesh instead of becoming thinner than before. Unless you are careful to introduce the enema under low pressure, and by a tube well up into the bowel, you may be apt to fail. The pressure should be very low; you should not have the funnel raised much more than about 18 inches above the
patient's hips, because it is the rapid distension of the bowel that tends to bring about the reflex contraction which is accompanied by defaecation. There is another little point that is sometimes very useful, viz., that the tendency to evacuate the bowels usually comes on immediately after the introduction of an enema, but if it be resisted it passes off in a very short time. The patient may not be able to resist the desire, and then the plan to adopt consists in simply folding a napkin, applying it to the anus, and keeping it pressed there for several minutes after the enema has been given. In this way I have been able to get a nutritive enema retained by a child who previously had returned everything as soon as it was injected.

The rectum forms a vehicle for the application of other therapeutic measures. In some cases a large amount of flatus accumulates in the intestine. I have already described the action of carminatives in removing flatus from the stomach and the upper part of the intestine, but every now and again you will come across patients whose belly is distended like a drum by the accumulation of flatus in the intestines, and in some instances the distension is so great that it threatens life. It drives the diaphragm up, the lungs and heart cannot work, and the patient is in actual danger of death, besides being in great pain. Occasionally one tries to remove this by the simple passage of a tube up into the bowel, so as to allow the flatus to escape through the tube. Besides this, you may inject into the intestine various carminatives, such as dill-water, or a mixture of dill-water and chloroform water, or tincture of cardamoms, but the most efficacious of all is, I think, the injection of asafoetida. We have in the British Pharmacopoeia the formula for an enema of asafoetida, which is an exceedingly good carminative. This consists of half a drachm of asafoetida rubbed up with 4 ounces of water. The quantity of water here is very much less than what is used in the case of a purgative, but it is just enough to distend the rectum thoroughly. Very frequently the enema is not made by rubbing up the gum resin of asafoetida with water, but simply by pouring a quantity of the tincture—a drachm or a couple of drachms—into the same quantity of water or of starch mucilage. Then you may wish to apply
drugs having a sedative action to the rectum. The most useful of these preparations is the enema opii, but we will consider this presently under the head of diarrhoea.

After-effect of Purgatives.—While discussing the action of purgatives, I may as well mention that frequently after a violent purgative there are three disagreeable consequences which may ensue. One disagreeable consequence is a feeling of great faintness, and we must be very careful about giving violent purgatives to very feeble persons, whether they be feeble from disease or from advanced age, or from extreme youth, because such patients do not bear them well. Where the weakness is very great, it is sometimes advisable just before the bowels are opened to give a dose of brandy, so as to stimulate the heart and prevent the faintness coming on which might otherwise occur. A second disagreeable consequence is that one part of the bowel may be pushed on into another, and it is not only in children that this is likely to take place, but even in adults a certain amount of invagination of the sigmoid into the rectum may occur. In children you are more likely to get invagination of one part of the small intestine into the other as a consequence of a violent purgative, or else prolapsus ani may occur; in adults you are not so likely to find either of these two conditions as you are to have prolapse of the sigmoid into the rectum. This sometimes gives rise to prolonged diarrhoea; so that, after the action of a purgative, a diarrhoea may come on which hardly anything seems to stop. This also we will consider under the head of diarrhoea.

Hæmorrhoids and their Treatment.—A third condition which frequently comes on after a violent purgative is piles. Piles chiefly consist in a dilated and varicose condition of the hæmorrhoidal veins; they give rise either to a good deal of pain or to a good deal of bleeding, and they are sometimes very troublesome to treat. One way of treating them which is very useful is to wash the bowel immediately after each motion, because when the anus is simply cleansed with a piece of paper, as is often the case, small portions of faecal matter may be left between the piles. In the anus of a healthy individual the end of the bowel may be level with the external surface, but when there
are piles, they may protrude and project in lumps and folds; between those folds the faecal matter settles, and there it acts as a powerful irritant. The piles are thus made worse, and the faecal matter cannot be removed by simple wiping, but if removed by washing immediately after a motion the occurrence of piles will often be prevented, and if present they will be relieved. When this is not sufficient, a local astringent may be used, and one of the best is hamamelis in various forms. The extract of hamamelis, although only recently introduced into the Pharmacopœia, is by no means a new preparation. The proprietary preparations of hamamelis are very much better than the official. They act exceedingly well, and may be applied to the piles externally by simply bathing them after a motion, or with a little bit of wool steeped in the hamamelis solution, or a little pledget may be made of either cotton wool, or, what is still better, prepared sheep's wool. This is pushed partly within the anus, so that it is caught about its middle by the sphincter ani. The hamamelis is thus applied to the piles inside the rectum by the upper part of the pledget, which is held in situ by the sphincter. The part of the pledget outside the anus has a double action, for it exerts a slight pressure on the piles, while it also keeps the hamamelis constantly applied to them. In other cases where the piles are inside the anal orifice, you may apply the pad in the same way, but putting it further in, or you may inject a little hamamelis by means of a glycerine syringe. In cases where the piles are very bad, and where the patient objects to an operation, relief is very often obtained by the application of a sort of support. Frequently men who suffer from piles have a way of sitting on the corner of a table, or upon the arm of a chair, as the pressure against the piles gives them relief from the heavy, dragging feeling which they experience. In place of this, one can get a rectal support which presses up the piles, and comes to the same thing as if one were sitting upon the arm of a chair or corner of a table.

Mechanics of Defaecation.—In the lectures on midwifery a good deal of care is expended upon the description of the method of supporting the perineum during labour. In the diagram we
will take A as the pubic bone, and B as the sacrum. You know that the axis of the pelvis strikes about the lower part of the sacrum, and in order that the child's head may be born it must be directed forwards. For the purpose of doing this, the perinaeum is supported, otherwise the child's head would strike against the perinaeum, and would protrude it without getting forward to the vulva. The same thing occurs, though to a less extent, with faeces in the rectum. In the construction of mankind there is a double provision for preventing involuntary evacuation. For example, we have first of all the sigmoid flexure, which acts as a syphon trap, and prevents the faecal matters coming straight down from the descending colon into the rectum. So long as they are in the sigmoid they do not excite peristaltic action, but whenever they get into the rectum they excite peristaltic action and a tendency to defaecate. In the same way the faecal matters in the bowel are pressed by the action of the intestines backwards during defaecation in such a direction that they do not tend to strike the anus, but to strike a point a good deal behind it. Usually the floor of the pelvis in most people is sufficiently tense and firm to turn the faecal mass forward, so that it passes out through the anus, but occasionally, especially in women who have borne a good many children, and whose pelvic floor is very lax, the pelvic floor may need assistance in ordinary defaecation just as it does during parturition. In some patients who find that they cannot readily pass a motion, a little pressure just below the coccyx is sufficient to turn the faecal mass forward and allow them to get rid of it. More especially is this the case when the faecal
masses are pretty hard, so that they do not pass very readily through the anus. Occasionally the faecal masses, by a prolonged stay in the rectum, may become so hard that they require the aid of the medical man, who breaks them down with the handle of a spoon or some other instrument, in order to extract them. Sometimes, instead of simply pressing just below the coccyx, the requisite tension may be given to the pelvic floor by the attitude of the patient. I suppose that the only people in the world who use closets of the form adopted in this country are the English and the Americans. In nearly all other countries, the position adopted in defecation is the crouching attitude, and sometimes persons who are unable to evacuate the bowels when sitting upon a closet of the ordinary form are able to do so by using the crouching attitude, just as is used in Germany, France, and elsewhere. This may be done either by telling the patients to have in the closet a chamber-pot over which, not upon which, they may sit, and thus evacuate the bowels. This seems a very slight thing to tell you, yet, oddly enough, I think one of the most grateful letters I ever had in my life was from a patient to whom I had given this simple instruction. She had been suffering from constipation for several years, and had been taking purgatives for a very long time for this disorder, but had never obtained relief. She followed my advice, and was able to get on quite comfortably without the use of purgatives.

Diarrhoea.—We may now turn from the action of purgatives to the treatment of diarrhoea.

Diarrhoea is a condition in which we find the actions of the bowels are too loose, and generally at the same time they are too frequent. You can readily understand that diarrhoea may depend (1) upon increased rapidity of movement in the large intestine, whereby the fluid contents of the cæcum are passed onwards to the anus without time being afforded for absorption, or (2) upon increased secretion from the mucous membrane, or (3) upon both diminished absorption and increased secretion acting together. Diarrhoea is frequently brought about by irritating substances. A man eats too much, more than he can digest, and the consequence is that either
he is sick and vomits it, or it passes into the intestine and brings on a fit of diarrhoea, which clears the whole of the offending matter away, and he is all right again. Sometimes, however, the whole of the irritating matter is not cleared away so quickly, and it causes irritation of the bowel, which is more or less permanent, and many cases of diarrhoea are best treated by the administration first of all of a purgative. One of the quickest ways of curing diarrhoea, due to some irritating article of diet, is to give a dose of castor oil, say half an ounce, with 7 or 8 minims of tincture of opium in it. The castor oil tends to clear out the whole of the intestinal tube, and the opium leaves a sedative influence behind. But even after the bowel has been cleared out, and the irritating matters removed, there may be irritation remaining in the mucous membrane of the intestine itself. The intestine will go on acting briskly, the mucous membrane secreting, and a watery diarrhoea continues. When this is the case sedatives may be given which will act upon the mucous membrane and muscles of the intestine. Amongst the sedatives which act upon the mucous membrane, and possibly also upon the muscles, perhaps the commonest is chalk. In the mistura cretae of the British Pharmacopœia you have finely prepared chalk suspended, with the aid of a little mucilage, in some cinnamon water and sweetened with syrup.* Its efficacy is, I think, a good deal increased by the addition to each ounce of it of 10 or 15 grains of carbonate of bismuth, which goes very well with the prepared chalk. We have in the Hospital Pharmacopœia a very good draught which is useful both for irritability of the stomach and of the intestine. It consists of subnitrate of bismuth, 10 grains; bicarbonate of soda, 10 grains; and chloroform water, up to an ounce. There is one

* Mistura cretae:—

| Prepared chalk | ... | 1 part. |
| Gum acacia in powder | ... | 1 part. |
| Syrup | ... | 2 parts. |
| Cinnamon water | ... | 30 parts. Dose, ʒi—ʒij. |

† Haustus Bismuthi, St. B. H. Pharm.:—

| Subnitrate of bismuth | ... | 10 grains. |
| Bicarbonate of soda | ... | 10 grains. |
| Chloroform water to 1 fluid ounce. |
thing to be noted about this prescription, viz., that the subnitrate of bismuth acts as an acid, and if you mix with it a good deal of bicarbonate of soda you will get the carbonic acid set free, and either the cork will be blown out, or the bottle will burst. These draughts in hospital practice are made up beforehand, so that the excess of carbonic acid has passed off, and what the patient gets is carbonate of bismuth and bicarbonate of soda partly reduced to the carbonate of soda. In private practice it is better to prescribe 10 grains of carbonate of bismuth, 10 grains of bicarbonate of soda, 10 minims of spirit of chloroform, and an ounce of cinnamon or peppermint water. Opium is one of the most powerful intestinal sedatives, and in the British Pharmacopoeia we have two preparations which are very useful for lessening diarrhoea. We have the ordinary chalk mixture which I have already mentioned, but it is an awkward thing to carry a bottle about, and frequently patients cannot take a bottle with them when they are travelling. Yet it is just when they are moving about that diarrhoea is apt to come on. So we have a very convenient preparation in the pulvis cretae aromaticus of the British Pharmacopoeia. The essential ingredients of this are the same as in the chalk mixture, although there are two or three other substances in it. The most important ingredients are prepared chalk, sugar, and cinnamon; saffron, cloves, and cardamom being introduced as carminatives, because in cases of diarrhoea you are very apt to get a good deal of flatus present and griping also. These latter drugs tend to lessen the griping and remove the flatus. Yet this powder does not always soothe the intestine sufficiently nor remove the pain and griping, but it will do this if you combine opium with it, so we have in the Pharmacopoeia pulvis cretae aromaticus cum opio. This contains opium in the proportion of one part in 40. In estimating the dose of this powder you do not reckon the amount of chalk, but base your calculation upon the quantity of opium you wish to have. You should give about half a grain of opium for a dose, i.e., 20 grains of this powder, and there is no risk at all in prescribing this.

I should mention in this connection the form of diarrhoea, to which I referred a little while ago, in cases where the sigmoid
flexure has been driven down into the rectum. There it causes a sort of protuberance, and acts as a chronic source of irritation. Unless you treat this locally, the diarrhoea will go on; and general remedies, such as those I have been speaking of, are of little use. It should be treated by the local application of astringents, such as a drachm of tincture of catechu in 2 ounces of water injected into the bowel after every motion and retained as long as possible. Another form of diarrhoea is that depending upon malignant disease of the rectum or of the lower part of the large intestine. I daresay that you know that a great deal of discussion has taken place as to whether cancer is increasing or not. There is no doubt that cancer is increasing if you have regard only to the Registrar-General's returns, but I doubt very much if it is really increasing. What is increasing is the power of medical men to detect it, which they owe to more thorough training during their student days, and also the care and attention they give to the examination of their patients. There are many cases of cancer of the rectum which pass undetected and are put down simply as cases of chronic diarrhoea. Whenever you get a case of chronic diarrhoea which resists treatment, it is a good rule always to examine the rectum. It is a disagreeable thing both for the patient and for the operator, but it is a thing in which the feelings of both should be set aside, and an examination made, because without it many cases of serious disease remain long undetected, while if they were found out a little sooner either the cancer might be cut out, or local applications might be given which would ease the patient. I have seen cases of this sort where patients came for, as they thought, quite trivial ailments, but on examination of the rectum cancer was discovered. I do not know that there is anything more disagreeable to a doctor than to have to do what once happened to me. One day an artist came to consult me. He had been working hard all his life, and had just reached the summit of his ambition, becoming recognised as the first artist in his own department in this country, and there seemed to be before him a long life of honour and wealth. He complained of a little diarrhoea, and a little pain and straining. I examined the rectum, and I found what I thought was cancer. I did not like
to tell him that he had cancer; for I did not feel absolutely certain. I sent him to Mr. Curling, who was then a great authority on diseases of the rectum, and he came back with a note saying there was no doubt about it. I seem yet to see that man going away from my door with his head bent down, and all joy and hope gone from his face. He lived on for two years, and during this time would get up during the night to work at his engraving because the pain was so great, he could not lie in bed. The diet-table which he could use was very limited indeed. There was one thing that seemed to suit him very well, and that was beef-tea custard. This is made by taking the yolks of three eggs and the whites of two, beating them up separately, and then together. Then mix with this a quarter of a pint of strong beef-tea; pour the whole into egg-cups or glasses, which are placed in hot water until it has set.
Lecture 23.

Diarrhea, continued—Matutinal diarrhoea—Diet—Effect of lime-water on digestibility of milk—Results of undigested and coagulated milk—Infantile diarrhoea—Bactericidal action of sudden change of diet—Intestinal astringents and sedatives—Astringent and anthelmintic enemata—Worms—Anthelmintics—Santonin—Irritant poisoning—Local and general symptoms—Remote effects—Action of drugs upon the liver.

Gentlemen,

Matutinal Diarrhoea.—At the close of last lecture we were discussing the effect of various diets on diarrhoea. Diet is one of the most important points in the treatment of diarrhoea, both in relation to the time when the food is taken and to the quality of the food. There is one form of diarrhoea that you are likely to meet with pretty frequently, and it is sometimes very troublesome. It is known under the name of "morning diarrhoea." The patient wakes perhaps rather early in the morning with a desire to go to the closet. It may or may not be accompanied by pain. There may be two or three motions in the morning before, or immediately after, breakfast, and these may continue at intervals for two or three hours, but after midday the patient is usually quite free from diarrhoea, and is able to walk about without any trouble whatever. Occasionally you may treat this form of diarrhoea successfully without any medicine whatever, by merely giving the patient one simple rule, viz., to take no liquid at all after six o'clock in the evening. You know that if you give a healthy person a dose of medicine at night, it tends to lie in the stomach and intestines and to work as soon as the patient gets up next morning. Now, there are certain people in whom liquid taken in the evening has almost exactly the same effect as a dose of salts taken by a healthy person: the fluid is
not absorbed, it remains in the stomach or in the intestines, and is passed out next morning when the patient either awakes or gets up.

Dict in Diarrhoea.—In all forms of diarrhoea it is generally advisable to avoid substances that are irritating either from their physical or from their chemical properties, and I may shortly say that the substances that you desire to avoid in patients who are troubled with diarrhoea are the very things that you recommend to those who are troubled with constipation. So that the rule you give is to avoid all food which will cause either chemical or mechanical irritation. In regard to chemicals you tell them to avoid all substances containing quantities of neutral salts, such as fresh fruit or stewed fruit, or much sugar. In regard to mechanical irritation the rule is a very simple one, viz.,

“Avoid all skins and bones,
Strings and stones.”

The rule is such a short one, and so easy to recollect, that patients are very likely to remember it and to stick to it. Although it is so short, it is pretty inclusive, because it takes in the skins of fish, of flesh, of fowl, of fruit, and of vegetables. Bones include those of animals, of fowls, and of fish; strings include stringy meat of all kinds, sinews, the stringy fibres of vegetables and of fruit, the stones or seeds either in vegetables or fruits. Skins are very frequently eaten indeed. For one thing, the skin of fish is a tasty thing, and patients are very likely to eat it. They do not think about it in the case of fruit, but swallow it down without more ado. In cases where the skin cannot be removed from the fruit, tell them to avoid the fruit altogether. The skin of a grape can be removed, but you cannot remove it easily from a raisin or currant; so that they must be forbidden, even though you allow the patient to eat grapes. You must remember, however, that grapes contain a good deal of neutral salts, and it may be necessary to advise patients to leave off grapes altogether. Then the skins of vegetables, tomatoes for example, must be avoided. The skin of certain fish cannot be removed and in that case the patient must avoid the fish altogether. In the case of whitebait, for instance, you have to deal not only
with skin, but with bones, and these must, of course, be completely avoided. Bones are dangerous things, not only to persons suffering from diarrhoea, but to healthy persons; and I was a good deal struck some time ago with an accident that happened to one of the porters here. After he had finished his work for the day, he was suddenly doubled up with pain. I sent him up to one of the wards at once. The pain was then in the right iliac fossa; next day it passed off, but it reappeared in the left iliac region; it passed off again, and the third day it reappeared in the rectum. The house physician examined the rectum, and found a fish-bone about 2 or 2½ inches long stuck right across the passage. Apparently it had come from the head of a cod. It was sharp at both ends, and it was impacted right across the rectum. It was lucky that it did not get impacted in a similar manner higher up in the intestines, as then probably a surgical operation would have been necessary. There is another kind of food in which you are very apt to get bones, and so it is well to interdict it to patients suffering from diarrhoea, and that is curry or hashed meat generally. In curry one is very apt to find small spicules of bones, which are not detected readily, and it is, therefore, better that this dish should be avoided.

The strings of meat, such as the fibres of beef or tendons of any kind, must be avoided. In cases of diarrhoea, one often wishes patients to take a piece of chicken, and if they eat the breast of the chicken that is all right, but if they take the legs that is all wrong, because they very often get hold of the tendinous parts in the leg, which are very indigestible, and may do mischief. Then the stringy kinds of fish are to be avoided. For example, in cases where the patients' alimentary canal is very irritable, you may allow them with perfect safety to eat small fish, such as whiting and, perhaps, soles, whereas the larger fish, such as cod, may not be satisfactory, because the fibres in the flesh of the cod are much larger, thicker, and harder, and, therefore, cannot be digested, but may pass through the stomach into the intestine, and there cause mechanical irritation. Some fish should be avoided on account of their chemical properties, for instance salmon, mackerel, and herring, because these are very rich fish,
containing a quantity of fat, and on that account are apt to disagree. Stones or seeds are very often taken unthinkingly. In strawberries, for example, the little flat seeds or achenes, which botanically are really fruits stuck on the outside of the large receptacle of the strawberry, are absolutely indigestible. One knows that prehistoric man used to eat strawberries, because in the faecal matters which have been found surrounding the houses of the lake-dwellers strawberry seeds are present. They have probably been there for thousands of years, quite undigested, just as they passed from the intestinal canal, and they are to be found to this day. Perhaps you will remember that these seeds are absolutely indigestible, if you simply think that there is a very good reason for their indigestibility, viz., that if they were digested the seeds would not propagate; the plants would not grow. It is on account of the indigestibility of the seeds that they pass through the intestines of animals or of birds, and thus travel from one part of the world to another. For example, the ocean birds may pick up the seeds of a plant in one island and convey them, perhaps hundreds of miles, to another and there deposit them.

A very good rule is to allow patients who are suffering from diarrhoea nothing that has not been passed through a fine hair sieve or that has not been so thoroughly well masticated in the mouth that it would pass through a sieve without leaving any residue. In very bad cases you cannot allow the patient the alternative. If the patient is not very ill, and is very careful, you may say that he may take various articles of diet if he will masticate them thoroughly; but if the diarrhoea is very bad, you must either give such things as would pass through a sieve without any mastication, or such things as have actually been passed through a sieve. In cases, for instance, where we know there are open ulcers in the intestine, food forms the most important part of the treatment of the patient, and there we generally put him entirely on a milk diet. Occasionally a little barley-water or some beef-tea is allowed, but very frequently one gives milk, and nothing but milk. Now, when you are putting a patient on a milk diet, it is well to remember that milk may coagulate and form firm curds in the stomach, which,
passing into the intestine, conglomerate and act as a powerful irritant. Milk does not appear to do this so much in cases of fever, probably because the secretion of the gastric juice is to a great extent suspended in fever, and, there being less acid in the stomach, the milk does not fall down in flakes, but passes in a great measure undigested from the stomach into the intestine. This, I think, is very likely the reason why so many patients, who assure you that they cannot possibly take milk when they are in health, can take it perfectly when they are suffering from typhoid fever. You will be again and again assured in your practice by your patient and his friends that when he is well he cannot take milk at all, and they want you to put him on some other food, but if you persevere you will find that in the great majority of these cases, while the fever lasts at least, the patient is able to take the milk with perfect ease and comfort. Now, in order to avoid milk becoming precipitated in the stomach as hard curds, it may be diluted either with barley-water, or, as is more usual, with lime-water or with soda-water. In cases where there is a good deal of diarrhoea, the best thing to dilute it with is lime-water, and the quantity of lime-water to be added to the milk varies a good deal according as you wish to dilute it more or less. If there is much thirst, so that you can get down two or three pints of milk in the 24 hours, apart from the lime-water that is to be added to it, then you may dilute it more freely; but where there is less thirst, you must regulate the amount of dilution according to the quantity of fluid that the patient is able to take. Sometimes when you find that if you add enough lime-water to dilute the milk thoroughly the patient will not get sufficient nourishment, you then have recourse, instead of the lime-water, to the liquor calcis saccharatus of the Pharmacopeia. The addition of sugar to water greatly increases its solvent power for chalk, and so it comes about that the liquor calcis saccharatus is about 14 times stronger than ordinary lime-water. Under these circumstances the milk can be diluted to a less degree, and it will still be rendered sufficiently alkaline not to be thrown down in the stomach in large, heavy curds, but in small flakes.

The treatment by an exclusively milk diet is useful not only
in typhoid fever, but in many cases of obstinate diarrhoea. It is likely that a number of you may be going out to India, and at any rate, even if you do not, you are certain to meet with men who have been out there or in Afghanistan, and have come back with chronic diarrhoea. In many of these cases you may give medicine till both you and the patients are sick of the treatment, and nothing will do any good until you put them on a milk diet and treat them precisely as if they were patients suffering from typhoid fever. You give them milk, and nothing but milk. Occasionally you may find that the patients are able to take the milk and go about their daily avocations, but not unfrequently it is better to put them to bed and treat them there with a milk diet, because they are not able to take enough milk to keep up their strength while they are making demands upon it by following their daily work. If you go to any of the continental spas where patients are treated not merely by milk, but by various other methods, you will generally find that when they are ordered milk directions are given for taking it which run thus:—

The patient is not to drink the milk in draughts, but he is to sip it slowly and frequently, and he is to take a biscuit in one hand and a cup of milk in the other, and to eat a little bit of biscuit between every sip of the milk.

In this way the milk is thoroughly broken up in the stomach, does not form curds, and so does not pass down into the intestine and form lumps there. Now the hardness of the lump which milk may form when taken down in a big draught at once is more than you would conceive. A number of years ago, in the casualty department, I was asked by my colleague, Dr. Wickhain Legg, to see something that a patient had brought up. It was a cake about 2 inches or more in diameter, and about \( \frac{1}{4} \) inch thick, and it had the appearance of the thick, hard felt that is used for making the soles of slippers. I thought I had seen something like this before, and so I asked her if she had drunk a lot of milk at one draught. She told me she had drunk one or two pints all at once, as she was very thirsty, and a good while afterwards she had been sick and brought up this mass. It was so hard and so big that one wondered how it had
managed to come up through the oesophagus at all. What occurred here was that the milk had coagulated in the stomach, and then the gastric juice was not able to dissolve this coagulated caseine, and the filaments of caseine had been simply rolled together by the movements of the stomach until the hard, felt-like mass of curd had formed. What happens in the stomach happens also in the intestine, and milk taken in in large draughts may cause a hard mass to form in the intestines, so hard as to be almost like a stone; the evacuation of this is a matter of great difficulty, and it may give rise to great pain and to great disturbance in the large intestine during its passage.

You have in the treatment of chronic diarrhœa sometimes to avoid giving your patients a large quantity of liquid at the same time as they are taking their solids. If they do this, what frequently happens is that the whole mass, liquid and solid, is not absorbed, but simply passes through the intestine, and the patient loses flesh because his food passes out through the intestine without being digested and without being absorbed. As a rule, in cases of diarrhœa you limit the liquid as much as you can, and allow the patient to take the food as dry as possible. But many such patients suffer a good deal from thirst, and therefore you must permit them to have a certain quantity of fluid. It is advisable to give them the fluid apart from the solids, and the best time to take it is, I think, about an hour before meals. The best form is hot water, which should be slowly sipped, and this frequently quenches thirst a great deal better than cold, and certainly a very great deal better than lukewarm water.

**Infantile Diarrhœa.**—There is a form of diarrhœa that you are sure to come across, and it will trouble you greatly. It is one of the most fatal forms of disease, and that is diarrhœa in children. I mentioned to you before how very necessary it was in cases of diarrhœa in children to attend to the condition of the feeding bottle, and to see that there was no lodgment of acid-producing bacteria, either lactic or butyric, in the bottle or in the feeding tube. But sometimes you may get the infection so far present in the stomach and intestine of the child that the milk taken at every meal becomes infected, and so the diarrhœa goes
on and on in spite of all that you can do to check the introduction of bacteria. There are so many bacteria present already in the intestine that the stoppage of a fresh supply does not seem to make much difference to your patient. In cases of this sort what you do is to try to kill the bacteria that are already present in some way or other. One way is to give intestinal disinfectants, such as, for example, calomel in small doses. One-third of a grain of calomel, repeated every three hours or so, is frequently a very useful intestinal disinfectant in these cases, and, perhaps, what is still more used is grey powder, the dose being $\frac{1}{2}$ grain or even up to 3 or 4 grains. Another medicine that is of considerable benefit is compound rhubarb powder. Rhubarb, as you know, not only has a purgative action, tending to clear out any bacteria that are already present, but tends to have a subsequent astringent action, because it contains a peculiar tannic acid known as rheotannic acid.

One of the most useful ways of stopping diarrhoea in children probably is that of altering the diet. Bacteria have the power, if you give them time, to adapt themselves to their surroundings. A number of experiments upon this point were made by Dr. Macfadyen and myself, and we found that various bacteria acquired the power of liquefying gelatine or of digesting starch, even when they were not accustomed to live upon either medium; that others that were accustomed to live upon starch acquired afterwards the power of liquefying gelatine, and lived well upon it; others, again, at first could not digest starch, but afterwards acquired the power. If you do not give them time to do this, but change their food suddenly, then the bacteria starve, and so by changing the food several times you may starve out all the bacteria present in the intestine, and thus allow the child to recover. When, therefore, it is found that milk disagrees, it may be necessary to change the child's food entirely, and give it nothing but barley-water for two or three days. At the end of this time, you may have to change back from the farinaceous to a proteid diet, and give it nothing but raw-meat juice, or white of egg and water, for a day or two more, and then at the end of this time the child may be able to take milk again.
In cases of diarrhoea in children you will not unfrequently find that the stools contain a quantity of caseine undigested, little flakes of undigested milk. Then the practice usually is to give whey instead of milk, or else to digest the milk previously, so that you give the so-called peptonised milk in place of the ordinary milk. Sometimes you may find that the so-called humanised milk is better even than the peptonised. Here, again, I must draw your attention to the fact that if you over-peptonise milk for any patient, you run a risk of bringing on diarrhoea. Whenever the milk is so far peptonised as to be rather bitter, it seems to have a pretty powerful purgative action in place of the astringent action usually exercised by ordinary milk.

Then, after clearing out the irritating substances in the intestine or removing the bacteria that give rise to the irritating substances, there may still be an irritated condition of the intestinal tube remaining. As I have mentioned to you before, in order to soothe this, we may use chalk, bismuth, and opium, and these may be administered either by the mouth or by the rectum, according to the parts that we wish to act upon. If the seat of the diarrhoea is high up in the intestine, we give them by the mouth, but if it is low down in the intestine, then we may administer them by the rectum. Besides these three, we may have to employ various astringents, and those in general use are either of vegetable or of inorganic origin. The vegetable astringents contain tannin in various forms, more especially rhatany, or krameria, kino, catechu, and logwood. These are used in the forms of infusion, decoction, tincture, or extract. Logwood is a very useful astringent, but you will find that mothers object a good deal to it because, being a strong colouring matter, it stains the child’s diapers, and these are difficult to wash a good colour. Extract of logwood is not unfrequently given in the form of a pill, but if you are using it, you must remember to be careful that the pills are freshly made, because on one occasion I saw amongst the faecal matters passed by a patient suffering from diarrhoea some small, round black things. Neither the doctor who was in attendance nor I could understand at first what they were. He discovered after-
wards that they were logwood pills which the patient had taken three months before. We could not make out where they had stayed all that time, but we came to the conclusion that they had probably lodged in some fold, most likely about the sigmoid flexure. Sometimes in cases of obstinate dysentery you may have recourse to still stronger astringents, such as nitrate of silver, sulphate of copper, or sulphate of zinc, and these may be used in the form of pills. Nitrate of silver has a sedative action not only upon the intestine, but also upon the stomach, and it is used sometimes in order to check vomiting. As I mentioned before, there is another drug which is also used to check vomiting, and which is likewise useful in diarrhoea, viz., creosote; but creosote and nitrate of silver must not be given together, for the very good reason that they form a mixture which undergoes spontaneous combustion. Nitrate of silver is sometimes more efficacious when used in the form of solution than when used in the form of pill. It is generally given as a pill when it is wanted to check either vomiting or diarrhoea, because the pill is easily taken, whereas the solution is exceedingly disagreeable, leaving a persistent metallic taste in the mouth, but now and again you may find that where the pill does not succeed the solution may do so.

Sometimes in cases of obstinate dysentery or diarrhoea large injections have been used, a quart or more of fluid being passed up into the intestine, so as to reach if possible the whole of the large intestine, and even the cæcum, in cases where ulceration was suspected there. For this purpose you may use sulphate of copper or sulphate of zinc, and occasionally nitrate of silver has been employed also. The disadvantage of the nitrate of silver is that if a large quantity be used, a good deal may undergo absorption, and you may by-and-by get that very disagreeable colouration of the skin which one very rarely sees nowadays, but which a number of years ago was by no means uncommon. Epilepsy was then treated with nitrate of silver, and being a very obstinate disease, the treatment was continued for a length of time until the patient became of a curious livid colour, with a sort of green tinge, such as you may see in an over-exposed photograph before it has been toned and fixed.
In cases where you employ such large enemata you use a very dilute solution. As a matter of fact, only a very small proportion of the substance is absorbed, its action being chiefly local. You should not begin with more than a quarter of a grain or half a grain to the ounce, gradually increasing it as you find the patient able to stand it.

Worms and Anthelmintics.—Large enemata are sometimes used also for another purpose, viz., to clear out worms. There are three kinds of worms that are very troublesome, viz., the small threadworms, the large round worms, and tapeworms. The most common of all are the small threadworms, or ascarides. They have their seat generally in the rectum, but they are not confined to the rectum, and they grow and multiply to a great extent also in the cæcum. In the rectum they cause itching and discomfort, and by getting out of it and crawling about outside the anus they often give rise to great disturbance; the child is prevented from sleeping and wastes, without any one being able to see any distinct reason why. Such a child presents a distressing but characteristic aspect, the face gets drawn, becomes pale with dark circles under the eyes, and frequently the child grinds its teeth at night, and has a habit, curiously enough, of picking its nose. These signs very often indicate the presence of worms in children, and the diagnosis is frequently confirmed by the mothers or nurses seeing the worms either in the faces or on the child’s anus. These threadworms are generally treated locally by enemata of salt and water, or of a strong infusion of quassia, or of an infusion of quassia mixed with perchloride of iron. Internally one gives santonin or santonica. Santonin, which is the active principle of santonica, is now generally employed, and as children have difficulty sometimes in taking powders, we have in the Pharmacopœia a lozenge which contains 1 grain of santonin, and ordinarily one gives somewhat about three or five lozenges. Another way of giving the santonin is to make a small sandwich of thin bread and butter and spread the santonin upon it, and then sprinkle on a little sugar. The child takes this pretty easily, as the santonin has not very much taste. It is generally advisable to give santonin at night, because if it is given during
the day it disturbs vision so much that everything the individual sees has a curious greenish yellow colour. This is supposed to be due to paralysis of that part of the visual apparatus which performs the function of perceiving purple. If santonin be used in the morning the colour will last a great part of the day, but if it be taken at night the greenish colour will disappear in about half an hour or less after the patient awakes. It is usual to give santonin for two or three nights running, and after the third dose to administer a pretty strong purgative, say a dose of castor oil or a dose of salts and senna, or a mixture that, I think, was introduced into the Pharmacopoeia especially for the purpose, but which, is not often prescribed: the mistura scammoniae. It consists of scammony in powder 6 grains and milk 2 ounces. It is just possible that this may be very efficacious, and it is well to bear it in mind, because sometimes cases of worms are very troublesome, and you may give medicines again and again until you are tired.

In adults you may find that these threadworms are also very troublesome, and that, although you wash out the rectum time and again with these injections, the worms still continue to trouble the patient. Under these circumstances it may be advisable to introduce a large quantity of infusion of quassia into the bowel, so as to wash out the whole of it, including the cæcum, regularly.

In cases of round worms one generally trusts to santonin. Now it used to be supposed that santonin was a vermicide, that is to say that it killed the worms, but apparently it does not. It does not kill the round worms, because when they are put into a solution of santonin outside the body they remain active for a length of time. It would appear, however, that santonin to some extent makes them drunk, so that they are no longer able to maintain their equilibrium in the intestine, and so they are swept out by the peristaltic movements of the bowel itself or by the purgative medicine which has been introduced. After santonin has been taken a good purgative must be given, so as to sweep the bowels well out.

The other worms which trouble patients are various kinds of tapeworms. A variety of drugs are used for these, the most
efficient probably being the oil of male fern. This is the one upon which we pin our faith, and the mode of giving it is first of all to clear the intestine out, so that the oil of male fern may have a fair chance of getting at the worm. This is often done by giving a purgative in the morning. During the day the patient should have but little food excepting milk; in the evening as he goes to bed give him half a drachm or a drachm of the liquid extract of male fern either alone, or, better still, with chloroform water. Then he may lie down at once, because the drug is liable to make him sick. Next morning administer an active purgative such as salts and senna or 1 to 2 ounces of castor oil. A curious accident whereby a patient died, and a doctor was tried for manslaughter, on account of a printer's error, once occurred in connection with this drug. In a certain book the dose of liquid extract of male fern was given not as ʒj, but as ʒj, the sign for an ounce being put in place of the sign for a drachm. The doctor gave his patient an ounce of extract of male fern; the patient was exceedingly ill, and came back to the doctor saying: "It has made me very ill indeed." The doctor said: "Oh, it is all right; you must take some more." A second dose was administered, with the result that the patient died.

There are various other drugs that are employed to destroy tapeworms, such as kamala, kousso, and pomegranate. All of these are used, but the one that most often succeeds where oil of male fern fails is turpentine. It is an abominable mixture, but half an ounce of oil of turpentine with the same quantity of castor oil sometimes succeeds in getting rid of a tapeworm that has been harboured for a long time. Here I may perhaps remind you that turpentine is peculiar in regard to doses; that half an ounce or even an ounce of oil of turpentine along with castor oil is not dangerous, but that 1 drachm may be very dangerous indeed. On the other hand, 10 or 15 minims is again a safe dose. The reason of this is that with a dose of 10 minims the oil of turpentine is absorbed and passes out through the kidneys, but it is in too small a quantity to do much damage; a drachm dose will very likely be absorbed, pass out through the kidneys, and be strong enough to damage
them very materially; but half an ounce acts as such a powerful stimulus to the intestine that it produces violent purgation, and is carried out through the intestine without being absorbed, and so does not touch the kidneys. The portion absorbed is so small as to do no harm whatever.

*Irritant Poisons.*—I ought, perhaps, to mention here the effects of irritant poisons, because most of the drugs I have mentioned under the head of drastic cathartics, as well as a number of others, belong to the class of irritant poisons. For example, all caustic alkalies or strong acids and all the irritant vegetable poisons, such as colocynth, etc., may produce violent purgation. Besides these, we have such drugs as arsenic, which is a powerful gastro-intestinal irritant, and is one that is very commonly employed as a poison. In the case of alkalies, such as caustic potash, caustic soda, or caustic ammonia, a burning taste in the mouth is experienced, which often warns the patient that he is taking it by mistake. The same occurs, as I have before mentioned, with croton oil. With regard to the remedies for these cases of irritant poisoning, they naturally differ. In the instance I mentioned of poisoning by croton oil all that was necessary was to give some gruel and get it vomited again. When caustic soda, caustic potash, or caustic ammonia have been taken, the tissues of the mouth and of the oesophagus may be burnt, and the remedy that you would then employ is milk. Milk tends to soothe the mouth and the oesophagus, and forms an albuminate of potash or soda with the caustic alkalies. After it has been swallowed it may also be advisable to give some dilute acid, for example vinegar, which is always at hand, but if the local irritation produced is great the vinegar will make the mouth smart a good deal. Perhaps there is really nothing better than milk, and failing that the white of an egg or even the whole egg beaten up with a little water. In the case of acids milk and egg are also satisfactory antidotes, because they have a sedative action upon the mouth, the oesophagus, and the stomach, and further they have the enormous advantage of being readily procurable. You may sometimes be able to distinguish the particular acid that has been employed by the nature of the stain that it leaves
upon the lips. Carbolic acid, sulphuric acid, and hydrochloric acid leave a white stain. In cases where sulphuric acid has had time to act there may be a little blackening, but as a rule it is white. Nitric acid usually leaves a yellowish stain. Ammonia and nitric acid both have such an irritating vapour that they may not only give rise to erosion and inflammation of the stomach and oesophagus, but their action on the larynx may cause spasm of the glottis.

After the acid or alkali has reached the stomach pain usually occurs in the epigastrium and afterwards in the bowels. This pain is increased by pressure, and this is one of the diagnostic points between inflammation of the gastro-intestinal tract and simple spasm. In cases of ordinary colic pain is usually relieved by pressure, but in cases of inflammation of the stomach or intestines the abdomen is so tender that the patient cannot bear any pressure at all upon it. When irritant poisons have been taken reflex vomiting readily occurs. This explains why there is very often no diarrhoea, although these substances are purgatives, the irritant being rejected from the stomach and thus never reaching the intestine. In addition to the local symptoms, however, general symptoms occur, and these are for the most part connected with the circulation. There is reflex depression of the circulation. Usually the patient is pale, and feels very feeble. The pulse is often slow; sometimes it may be rapid, but it is almost always weak. The respiration may be either slow and sighing, or very quick and shallow. You can understand why it should be quick, short, and shallow. The patient is afraid to take a deep breath on account of the pain that the descent of the diaphragm produces, but if the pain be not very acute, then respiration may be deep and sighing. After this stage has passed off, you may get a reaction ensuing such as occurs in inflammation of any organ whatever, the coldness of the skin passes away, the face becomes red, and the pulse becomes full, sometimes hard, and generally rapid. Occasionally inflammation comes on, with high fever. The patient may die from the immediate effects of the poison, or may afterwards recover and suffer from constant dyspepsia, due either to destruction of the mucous membrane
of the stomach over a large area or to contraction of the pylorus from cicatrization of the ulcers caused by the irritant. We may even have death supervening as a consequence. The oesophagus may have been so much eroded by the passage of the irritant that the contraction of the consequent cicatrices closes the oesophagus entirely, thus rendering it quite impervious to food. In such cases all that you can do is to have an opening made in the stomach and let the patient be fed through that. In other instances death may result from inanition, because the whole of the mucous membrane of the stomach has been destroyed, and consequently the food can neither be digested nor absorbed.

**Action of Drugs on the Liver.**—We may now pass from the action of drugs upon the stomach and intestines to their action upon the glands connected with the intestinal canal, and first of all to their action upon the liver. You know that the liver was at one time looked upon as an organ that had very little functional activity at all—a useless organ, in fact. So long as it was supposed that the liver had nothing to do but secrete bile, this was a natural conclusion; but we now know that the bile is only a kind of bye-product, useful, no doubt, but its formation is quite unimportant in comparison with the other functions of the liver. A certain idea of the functional activity of the liver may be formed from the amount of bile it produces, but this bears the same relationship to its activity that the dust-heap outside a factory bears to the amount of work done inside. Bile is almost entirely the residual matter that is passed out by the liver, is really an excretion of the liver. But in many factories they do not throw away all the contents of their dust-heap: they sift their cinders; they throw away the ash, but the cinders are retained and utilised. In the animal economy we find the same principle of utilisation of waste. The bile formed by the liver is not all passed out in the faeces; a good deal of it remains, is re-absorbed and made to do duty again and again; and the rapidity of absorption is very great indeed. Bile injected into the duodenum may be absorbed and passed into the liver and excreted again into the duodenum in half a
minute. This statement was made by a man named Laffer* a good many years ago, and I disbelieved it, but I repeated the experiment and found that it was correct. The way this can be demonstrated is as follows: you put with the bile some substance that you can readily recognise, such as, for example, a little rhubarb. When I injected the rhubarb and bile mixed together into the duodenum of a guineapig, I was able to find the rhubarb in the bile that was excreted within a minute. Schiff found that the bile collected from the gall-duct in a dog is yellow, but if green bile from an ox be injected into the dog's duodenum, within a very short time afterwards the bile secreted by the dog's liver is tinged with green. This experiment shows that the liver has two functions: (1) it forms new bile, but (2) it has also the power of excreting bile that has already been formed and has been absorbed. If the whole of the bile be cleared out of an animal's body the liver will produce new bile. But, as the simple experiment with rhubarb shows, the liver does not only excrete the bile that it takes up from the intestine: it has the power of excreting other things. It caught the rhubarb on its passage from the intestine into the general circulation and sent it down again into the intestine. It does this with a number of substances. One often hears the comparison "as bitter as gall," but gall is not bitter if it be fresh; it is only bitter when it is old and when it contains substances to which it owes its bitterness.

* Laffer, "Inaug. Diss." (Breslau, 1873).
LECTURE 25.


GENTLEMEN,

I omitted at our last meeting to mention one method of treating diarrhoea. I show you some suppositories that are contained in the Pharmacopœia, and which form a useful means of checking diarrhoea; some contain astringents, others sedatives. The most useful of all, perhaps, is the morphine suppository, containing hydrochlorate of morphia, half a grain, made up with cacao butter. This, when placed in the rectum, tends to act as a sedative to the bowel, especially in cases where the diarrhoea depends upon local irritation in the rectum, and is much more efficacious than the same quantity of morphine would be if taken by the mouth. You must, however, always remember that when you are giving morphine by the rectum the dose is usually just double that which you give by the mouth; that in place of giving half a grain of morphine, as you do by the rectum, you would only give a quarter of a grain by the mouth. Notwithstanding that the general action of morphine upon the system is greater when given by the mouth than by the rectum, I think that even the same dose applied by the rectum is often more satisfactory in cases of diarrhoea than when given by the mouth. We have another suppository of morphine with soap, but I do not know that this has any advantage over the pre-
ceding one; both are employed for the same purpose. In sup-
positoria plumbi co. we have sedative and astringent elements
combined; this consists of acetate of lead and opium made up
with cacao butter. Each suppository contains 1 grain of opium
and 3 grains of acetate of lead. The advantage of it is that
we have the sedative action of the opium and the astringent
action of the acetate of lead, which latter tends to reduce any
congestion and swelling that may be present in the mucous
membrane of the rectum, and at the same time, if there be any
ulceration present in the rectum, the acetate of lead helps to
form, as I mentioned before, a pellicle over the surface, and
thus assists the ulcer to heal. We have also suppositories of
tannic acid, and tannic acid with soap, also with carbolic acid,
but the tannic acid is not so useful in cases of diarrhoea; it is
used more for internal piles than for its action in diarrhoea,
although it may exert a useful astringent action in this affection
also.

Where there is irritation of the bowel higher up, at the
junction of the sigmoid flexure and of the rectum, the lesion is
only reached by a suppository if you tell the patient to lie in a
particular way, viz., on the back, with the hips raised. In this
position, when the suppository melts it flows upwards to the
upper part of the rectum. You may, however, introduce an
ointment high up into the rectum by means of an ointment
introducer. This is a sort of syringe made of wood; into it you
can introduce any ointment you like, only it must not be too
hard; in fact, it should be made rather soft. To the ointment
bismuth, or lead, or opium may be added, or, any ingredi-
ent you please. Having placed the ointment in the intro-
ducer, you adjust the piston, and then insert the nozzle of the
instrument well into the rectum, and by working the piston a
quantity of ointment may be applied to the rectal wall. If
you wish to apply it still higher up the rectum, you can put
over the end of the nozzle a soft indiarubber tube, and then push
the tube well up. The ointment will in this way travel up the
tube to the end of the rectum, and it may thus be applied
directly as high as the sigmoid flexure. You may even with
care introduce the ointment by means of this apparatus well
into the sigmoid flexure in cases where you suppose that an ulceration is present. The soft rubber tube passes pretty readily as far as the sigmoid. It is rather a difficult thing to know how far you are able to pass it up. I have passed it so far up in a patient that I have felt it directly under the ribs on the left side, and I was disposed to think from this that I had got the tube through the flexure and up into the ascending colon, because I could feel it in the left hypochondrium, at the place where the colon is normally present. Talking it over with one of my colleagues, he said, “This is not the case; you no doubt felt the end of the tube there, but the reason is that the tube pushed the sigmoid before it.” At any rate I have seen very good results from the application of sedative ointment by means of the large tube. The tubes I generally employ are from a quarter of an inch to half an inch in diameter, and if they are well greased they generally pass up without causing any pain whatever, unless there happens to be some ulcer present, when, of course, you require to be careful, as in passing over the surface of the ulcer pain may arise.

Action of Drugs on the Liver (continued).—At the end of the last lecture I was telling you that the liver has a double function: that of forming bile and that of excreting bile; and that the bile which is usually vomited has a bitter taste, but bile which is freshly formed has no bitter taste whatever. This we know from cases where fresh bile has been vomited up, and also from cases where there has been a biliary fistula, so that the bile flowed from the liver as quickly as it was formed. In such cases the bile has usually a golden yellow colour, and has been quite free from any bitter taste. The bitter taste is in all probability due to some bitter compound produced during the process of digestion, which is absorbed by the liver, and is again re-excreted in the bile. This bitter compound being formed continually, though slowly, in the stomach or intestine, and being continually re-excreted by the bile, you get at last an accumulation of the bitter substance, whatever it may be, which gives rise to the intensely bitter taste which is usually attributed to bile or gall. We know that if we peptonise milk too long, we get a bitter substance formed, and in all probability something
of this sort gives its bitterness to bile. One does not know whether it is the accumulation of these bitter substances in bile that gives rise to some extent to so-called bilious headaches. The constant recurrence of such headaches at periodical intervals seems to indicate that there is a constant formation of something which goes on either until it is excreted, or until its formation is stopped.

**Bilious Headaches.**—Now in cases of bilious headaches, as probably many of you know from sad experience, a person feels perfectly well for ten days, a fortnight, or a month, and then very likely a headache comes on, during which there is absolute loss of appetite, and which terminates in violent vomiting, during which a great deal of bile is evacuated, and with it a quantity of the bitter substance contained therein. For some little time afterwards the person who has had the headache is immune, one may say, and he may do for the time many things that at a later period he could not do without the certainty of bringing on the headache. For example, a man who has had a sick headache of this sort may, for several days afterwards, drink wine or beer, sit up late at night, go to a theatre, or strain his eyes at a picture-gallery, without bringing on a headache, although later on, when there has been time, as one may imagine, for the bitter substances to accumulate, he would certainly bring on a headache by doing any of these things.

Now in all cases of sick headache there seem to be two factors: a general condition of the body and a local cause determining the pain to the head rather than to any other part of the body. One of the most common of the local factors is disturbance of the eyesight. I should say in 19 cases out of every 20, perhaps I ought to say in 49 out of 50, the exciting cause of so-called bilious headaches is irregular vision, due either to inequality of the two eyes, or to astigmatism. So that although the liver probably has a considerable part to play in the production of headaches, yet, if you can remove the determining factor, you may get rid of the headaches. In all cases where there is general disturbance of nutrition, the point that is apt to suffer is the weakest point, or the point that is most exercised. In persons who lead sedentary lives, and who
use their eyes a great deal in reading, the eye is apt to suffer, and the patients consequently get headache. Gouty men in the upper classes find that the general gouty tendency is apt to settle locally in the great toe. I daresay you can readily see why; the joint of the great toe is probably the joint in the whole body that is subjected to the greatest amount of work, because at every step you take this joint is put into action, and you are constantly standing upon it, so that it is almost never free from pressure or exercise. Many men use the joint of one toe more than another, so that you may get gout inclining to one foot or the other according to the amount of exercise given to each. But in a number of the patients coming to hospital we do not find that it is the toe which suffers, but the hands, fingers, or wrist, because many of these patients are during a great part of the day engaged in avocations in which the joints of the fingers and wrist are constantly employed. For example, I saw the wrists become very much affected in the case of a man engaged in polishing furniture. In other cases you may find that the shoulder-joint becomes more affected, but this is not a common thing, because the shoulder-joint is not very much used. I have, however, seen the shoulder-joint affected in a painter whose work was not exactly that of painting, but of distempering and whitewashing, and the shoulder-joint was the one he used most, because he had to swing his arm with the big brush in distempering the walls.

Now, in curing sick headaches, nature seems to get rid of the accumulation of bile, or of substances contained in the bile, in two ways. (1) It causes sickness and vomiting, and thus a quantity of old bile is eliminated, and at the same time (2) the patient is made to starve; he is very often unable to take food for 24 hours, and if he does take it the whole of it is brought up without being absorbed. Physicians long ago used to imitate nature by giving an emetic, and I have very little doubt that in many cases it did a great deal of good; but emetics, like bleeding, were overdone, and so they have fallen very much into disuse. Curiously enough, one patient of mine told me that when she had sick headache if she retched, even without vomiting, she did herself a great deal of good. You can
readily see how this would come about. In the efforts of retching, the liver and gall-bladder were pressed between the diaphragm and the abdominal walls, and the bile was squeezed out of the liver and also to a great extent out of the gall-bladder. In most patients it would have been evacuated through the mouth by vomiting, but in this case it seemed to be evacuated into the duodenum and then passed away in the motions. Now-a-days the plan adopted by nature in this case is the one which we generally follow in the treatment of so-called biliousness, and in place of giving an emetic we, as a rule, administer a purgative. But all purgatives have not got the same action. There are some which do not seem to relieve biliousness; they give copious motions, and yet patients feel the same dulness, heaviness, and discomfort that they did before. Other purgatives, again, seem to clear bile away, and the patient after their administration feels bright, lively, and well. The difference between the effect of these purgatives seems to be this: that they do not all affect the same part of the intestinal canal. Aloes, for example, tends to act more especially upon the rectum; and sulphate of magnesia tends to wash out the whole bowel. Neither the aloe nor sulphate of magnesia, however, seems to have the power of relieving biliousness, and one of the most common ways of relieving it is by the administration of one or two drugs that are supposed to act upon the liver itself by clearing out the bile.

Cholagogues and Hepatic Stimulants.—Drugs may affect the liver either directly or indirectly. For example, some may stimulate the liver to increased action, so that it will pour bile more quickly out into the duodenum. The drugs that stimulate the liver to increased formation of bile are termed "cholagogues," or "hepatic stimulants." Perhaps one ought to say rather hepatic stimulants, because the term cholagogue is often employed to designate those drugs that clear the bile not merely out of the liver, but out of the body. More properly we might term those cholagogue purgatives, but this is rather an awkward term, and very often it is shortened down to cholagogues. There are some drugs that stimulate the liver to increased secretion, causing the formation
of more bile without stimulating the intestine at all. One of the most marked of these is salicylate of soda, which, perhaps, has a greater action upon the liver than almost any other drug with which we are acquainted. It tends to make the liver secrete a more watery bile, and to secrete it under higher pressure than the normal liver does, so this is perhaps the hepatic stimulant \textit{par excellence}. Other drugs have an action not merely upon the liver itself, but upon the intestine as well, and these tend to act more especially as cholagogues. But you can readily see that if the bile has been secreted it will pass down into the duodenum, the jejunum, and the ileum, and be absorbed again, unless something be given to stimulate the action of the bowel. If you take a drug like salicylate of soda, which acts only upon the liver, you will have the liver secreting more bile, but the bile thus secreted will undergo absorption. If you use a mixture of perchloride of mercury and calomel, you will probably get a double action, viz., increased secretion from the liver, due to the perchloride, and increased action of the duodenum, due to the calomel, which will tend to hurry the bile onwards and prevent re-absorption, but still a quantity of the bile may undergo re-absorption in the lower part of the intestinal canal. So that if you wish to get the maximum elimination of bile, probably one of the best means that can be employed is to give a small quantity of perchloride of mercury to stimulate the liver, some calomel to act upon the duodenum, and then in addition a dose of some saline, which will sweep out the intestinal contents. When this is done the patient generally feels a great sense of relief, and all the disagreeable symptoms which are put down under the head of biliousness are relieved.

\textit{Action of Mercury on the Liver}.—A great question has arisen as to the real action of mercury upon the liver. It has been long looked upon as a cholagogue, and all the various forms of it are supposed to have a cholagogue action. One of the reasons for this is that mercurials, especially when followed by salines a few hours afterwards, tend to relieve all the symptoms of biliousness. They not only relieve the disagreeable symptoms felt by the patient himself, but when the eyes show a little icteric tinge this disappears also after the administration of a
mercurial purgative. Some years ago the question was subjected to an experimental research. The way in which this was done was this: a ligature was placed upon the bile-duct of a dog, so that the bile from the liver, instead of passing into the duodenum, went into the gall-bladder. Into this a cannula was inserted, so that the whole of the bile which was secreted by the liver was obliged to flow outside into a receptacle. After the administration of various drugs, it was found that several of them had the power of increasing the quantity of bile formed in a given time. One of the most powerful is, as I have said, salicylate of soda, and this drug differs from some of the others in this respect: that it has been tested, not only in animals, but in man. It has been tested in a case where a permanent fistula had formed in a patient, and it has been found to have the power of increasing the secretion of bile. Amongst other drugs that increase the flow of bile in man are perchloride of mercury, and several other vegetable products increase it also. Aloes, which, I told you before, acted specially upon the rectum, appears also to act upon the liver. Aloes and colocynth are the two most important ingredients in the compound colocynth pill, which is a very favourite purgative pill, and you can now readily see why it should be, because it tends to clear away a quantity of the residual bile as well as to clear out the faecal contents of the intestine.

Rhubarb is also a useful hepatic stimulant, although not so powerful as colocynth, and here, again, in ordinary practice we find that patients are very fond of taking the compound rhubarb pill, containing rhubarb and aloes. But this does not suffice for all patients, and a number of them will take, in addition, either a mercurial pill once or twice a week, or one of the newer substances that have been introduced as substitutes for mercury. Amongst those, perhaps, the most commonly employed is podophyllin, and since Rutherford's researches on cholagogues were made, euonymyn and iridin have come to take a permanent place along with podophyllin, because they also stimulate the liver, and do not cause so much griping as podophyllin. We find colchicum and ipecacuanha also amongst the drugs which cause increased secretion from the liver. The
latter has long formed a favourite ingredient of dinner pills, and colchicum, as you know, is one of the drugs most commonly employed in cases of gout.

We have, in addition to these vegetable cholagogues, various salines, especially the phosphate of soda and the sulphate of soda. Both of these tend to cause increased action of the liver, but a number of salines have besides the power of increasing the peristaltic action of the intestine. You can readily see that if you sweep away all the bile that is formed, and that is poured into the intestine, you will get a smaller quantity poured out from the gall-bladder, and more especially will this be the case if, by the action of your purgative, you sweep away not only any bile that may be present in the intestine, but you sweep away substances from which bile may be formed, viz., all the half-digested food, which would tend to yield biliary products. There is one other drug that I should mention as being a useful hepatic stimulant, because it is so very much used in cases of so-called biliousness, and that is nitrohydrochloric acid. We have a draught in the Hospital Pharmacopoeia which is very much used indeed, and contains 10 minims of nitrohydrochloric acid along with 10 minims of spirit of chloroform, 20 minims of tincture of oranges, and an ounce of water. This is a first-rate hepatic stimulant, and seems also to act as what may be termed a powerful "pick-me-up," especially when combined with about 10 minims of tincture of nux vomica. This gets rid of a great many of the discomforts which are caused by dyspepsia, and which one frequently puts down to so-called inaction of the liver.

Toluylendiamine.—There are some other drugs that tend to cause a tremendously increased secretion of bile, and I may mention particularly toluylendiamine, but instead of making the bile more watery, as the salicylate of soda does, this drug toluylendiamine causes an increased secretion of solids in proportion to the water, so that the bile becomes exceedingly thick, and will not flow through the ducts, and therefore gives rise to jaundice, although the ducts may be quite patent, and although there may be no distinct obstruction. In some cases I have used toluylendiamine as a hepatic stimulant in place of sali-
cylate of soda, and I thought I obtained some good results from it, although the accurate study of the action of drugs in patients is very difficult, because there are so many fallacies. You can thus readily see that retching may possibly be beneficial in cases of jaundice by simply squeezing the liver and driving the bile, mixed with mucus, out through the hepatic duct into the intestine.

Mechanical Removal of Bile.—Sometimes you may actually press the bile out from the liver or gall-bladder by mechanical manipulation. I have, on one occasion at least, succeeded in doing this by gentle pressure on the gall-bladder. This, however, must be done very gently, otherwise you run a risk of doing mischief. In cases where the obstruction does not consist simply of a little mucus or thickened bile, as in ordinary catarrhal jaundice, but is due to a stone which is impacted in the gall-duct, you may do a considerable amount of mischief, and I do not think it is a very safe procedure.

Gallstones.—In cases of gallstone, one generally tries to lessen the irritability of the duct and cause it to relax by the administration of sedatives, such as the compound spirit of ether or so-called Hoffman’s anodyne, morphia or opium in various forms, and belladonna. All these tend to relax any spasm of the gall-duct, and thus to allow the bile to flow more freely through, and any calculus that may be present to pass. Salicylate of soda may be beneficial by increasing, to a certain extent, the pressure of the bile behind. The administration of this combined with a mercurial purgative is very serviceable, for by its means one can keep the liver well cleared out, and thus relieve any tendency to jaundice. If you want your patient to receive the maximum benefit, you must pay attention to the way in which the purgative is administered. Sulphate of soda, as I have mentioned, has a certain stimulant action upon the liver, but this is greatly increased if, instead of being drunk down in one large draught, it is taken in repeated sips, and for this purpose one generally sends patients suffering from gallstones to Carlsbad. The reason for the selection of Carlsbad is that people will do there what they will not do at home, and another reason is that they are not allowed to do
there as they like. Their mode of life and what they eat are completely regulated by the doctors. In many health resorts patients who do not like to obey orders might disobey them if they please, but in Carlsbad they cannot do so. At Carlsbad the patients' mode of life is pretty much as follows: they get up about six o'clock in the morning, and they go out without any food to the Sprudel, which is the large well where the hot saline springs bubble up, and here they fill their glasses, and walk round and round the promenade for nearly an hour, and at every two or three steps they take a sip of hot Carlsbad water. In this way they get through three or four tumblers in the course of the promenade; then they go to the confectioner's and have a small cup of coffee, and on the way there they buy a small roll or two, and this they eat without butter along with their coffee. Then they will rest for awhile, and after midday, perhaps, go for another walk, and probably take some more water, after which they will have an evening meal, and then go to bed. The food eaten at meals is also regulated. One day I went into a restaurant in Carlsbad, and looking through the bill of fare, I said: "I would like this." The waiter said: "Are you under treatment, sir? The doctors here do not usually allow it, and if you are under treatment you cannot have it without special leave from your doctor." In most other places you simply have what you like, but in Carlsbad you cannot have it. Patients go there for the purpose of getting well, and so they willingly go back to Carlsbad, because they feel the benefit of it, although they would be unwilling to be kept so strictly at home. It is almost impossible to treat them in the same way as at Carlsbad, so we send our patients there.

Operation.—In cases of jaundice, where the condition causing the jaundice is beyond the reach of drugs you have recourse to operation. Operations are now frequently performed for the removal of biliary calculi, and very often this is the only way in which you can cure your patient. I believe that one of the chief reasons why calculi form in the liver is simply that the liver does not get sufficient water to make the bile watery enough; the bile becomes too solid, and then concretions form. If a
patient comes to you complaining of symptoms of gallstone, and you ask him how much water he takes, the probability is that he will say, "I hardly ever touch water; I am not a thirsty person." Again and again you get the same answer, until you begin to conclude that the absence of thirst is a cause of gallstones; and, in order to prevent gallstones forming again, one of the best things you can do is to tell your patients to take water regularly. Now a lot of cold water taken at a draught is very apt to lie heavily upon the stomach, and patients do not like it; but if they sip hot water it has not this effect. The best time for patients to take the water is when they rise in the morning or when they go to bed at night, if they cannot be induced to take it at other times during the day as well. A very good time to take it is about an hour before meals, the advantage being that instead of the water diluting the gastric juice, as it would do if taken either with or immediately after a meal, it is absorbed into the system before the meal is taken, and then it is secreted again in the form of gastric, pancreatic, or intestinal juice, or possibly bile. At the same time, water taken before meals tends to wash out of the stomach the residue of the former meal, and thus the patient starts with a clean stomach. Little or no fluid with meals is frequently a most useful prescription in cases of dyspepsia, but plenty of hot water tends not only to prevent the formation of gallstones, but to lessen rheumatism and gout. By giving the hot water on an empty stomach you do good to the liver without damaging the stomach. By the simple prescription of hot water you may sometimes be able to keep your patients for years together free from gallstones.

If the bowels are at all constipated, it may be advisable to let the patient take half a teaspoonful or a teaspoonful of Carlsbad salts or some other salts in hot water in the morning just after rising.

Diabetes.—But, as I said before, the formation of bile is but a small part of the function of the liver. It has another most important function—viz., to act as a coal bunker to the body, to store up the carbohydrates during digestion, and to give them out slowly into the circulation during the intervals. In some
cases, the liver does not seem to have the power of carrying on its normal function of converting soluble sugars into insoluble or sparingly soluble glycogen, and then allowing the glycogen slowly to dissolve out or be converted into sugar, and pass into the body. Thus you occasionally find that the carbohydrates which are absorbed from the intestine, instead of being stored up in the liver, pass right through it into the general circulation, and thus are carried to the kidneys and excreted. We then get glycosuria, or diabetes. This disorder may be treated to a great extent by proper feeding. If you cut off all sugars and all foods that will yield sugar, you can generally stop the excretion of sugar in the urine, or at least you can greatly reduce it. The rules, therefore, in a case of glycosuria are:—Cut off all sugars; cut off all starches, because those will be digested, and yield sugars; cut off all articles of diet that will yield either sugar or starch. You will thus cut off all bread, all farinaceous food, all roots which contain starch, such as potatoes; and in the acute form even carrots and turnips, parsnips and artichokes, are debarred. The ordinary rule is that the patient may take fish, flesh, fowl, or eggs, may, in fact, eat anything that comes from the animal kingdom with the exception of the liver, which either in fish, flesh, fowl, or shell-fish is to be avoided. He may take also all green vegetables, but vegetables that are white, such as cauliflowers, parsnips, and potatoes, are to be avoided. There is a considerable dispute as to the advisability of giving milk. In many cases I think it is not only advisable, but necessary. The reason for cutting it off is because milk contains a certain amount of lactose; but I do not think that lactose is upon the same level as glucose or maltose. Lactose may be allowed in certain cases when the other forms of sugar would be very inadvisable indeed.

Now there are one or two drugs that seem to have a great influence upon the liver in tending to lessen glycosuria. Whether it is that the drugs tend to enable the liver to convert the sugars into the form of glycogen or not I cannot say, but the drug upon which we place most reliance in such cases is opium, or one of its derivatives, morphine or codeine. The latter is, perhaps, more frequently employed, because it does
not tend to make the patient so sleepy, nor does it tend to constipate the bowels so much as opium or morphine. At the same time, opium and morphine sometimes succeed when codeine fails. Another drug that is very useful is bicarbonate of soda; and in cases of glycosuria we often send patients to Carlsbad, where they get the carbonate of soda along with the sulphate of soda, or to Vichy, where they get the carbonate of soda without the sulphate. It would thus appear that carbonate of soda plays an important part in the treatment of diabetes, because the two springs to which we send our patients both contain carbonate, but do not both contain sulphate. Carbonate of soda given at home is very useful. Innumerable other drugs have been used for the purpose of treating diabetes. The salts of uranium have recently been employed by Dr. West, and in his hands they seem to have had good results; but they do not apparently act equally in all cases, nor should we expect that they would. So that you may fail in one case and succeed in another, and practically the one drug upon which we pin our faith is opium in one form or another.

Rôle of the Pancreas in Diabetes.—The pancreas is another gland that is closely associated with diabetes and glycosuria, and indeed it is probable that a good many cases of glycosuria are due to imperfect action of the pancreas. It is supposed that the pancreas not only pours a digestive juice into the duodenum, but pours out into the lymphatics a secretion which contains a glycolytic ferment. At the same time that the pancreas is pouring out into the duodenum a secretion which will convert starch into sugar, and will thus supply the body with sugar, it is pouring out into the circulation another ferment which can break up sugar so as to render it capable of combustion in the body, and thus enable the organism to utilise the sugar which is being absorbed from the intestine. It has been supposed that the want of this glycolytic ferment is the cause of glycosuria in many cases. I am just now trying the effect of pancreatic tabloids in a case of diabetes with the object of supplying this substance, but the treatment has not been continued long enough for me to say whether I shall succeed or not. Twenty-three years ago I attempted to supply a glycolytic ferment to
diabetic patients by feeding them on raw meat, because I supposed that it was more likely to be present in the muscles than in any other part of the body. Therefore I administered muscle-flesh as a medicine and not merely as a food, and in order to prevent the destruction of the ferment, which would have occurred through cooking, I gave the meat raw.* I was not able to cure the patients by this method of treatment, and gave it up after a while. It is possible that if it were tried again more extensively good results would follow. At any rate, before many years have passed, I doubt not we shall be able to treat diabetes much more successfully than at present.

**Action of Drugs on the Pancreas.**—Now the pancreas may be stimulated by the introduction of food or of ether into the stomach, and it is affected by drugs very much in the same way as the salivary glands. Atropine paralyses the secretion both of the salivary glands and of the pancreas, and pilocarpine stimulates them both. Iodide of potassium tends to cause in many cases swelling of the salivary glands, but it does not seem, so far as I know, to have had any very distinct effect upon the pancreas. But one reason for this not having been noticed, I think, is that the pancreas lies so deep, and its functions are so difficult to discern from the outside that no observation has been made. On one occasion, however, after prescribing iodide of potassium to a patient, I was glad to see improvement within about three or four days, but afterwards he complained of pain in his abdomen, and, upon taking one finger and pressing all over the abdomen, I found, to my astonishment, that when I joined together the various points where he complained of pain on pressure I simply marked out upon his abdomen the outline of the pancreas. I therefore came to the conclusion that in this case the iodide of potassium had caused some tenderness of the pancreas, as it frequently does in the salivary glands.

There are some cases which you will meet with in your practice where the motions are of a perfectly white colour, almost

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like arrowroot, and frequently they are not loose, but are rather tenacious, and form a curious rolled shape, almost like that of a snake coiled up and ready to strike. I saw one of these cases a number of years ago, and was very much astonished to find that the patient had no symptoms of jaundice whatever, and I wondered greatly what had become of the bile. There was no yellowness of the conjunctiva, no bile to be found in the urine, and apparently none to be found in the faeces, which were absolutely white, and I came to the conclusion that this man's liver must have struck work entirely. However, I had the faeces analysed, and then it was discovered that these white faeces, although apparently quite free from bile, actually did contain a considerable quantity of bile. The reason that they were white was, they contained a large quantity of the fat from the milk he had been taking. Although I did not get a post-mortem, because the man recovered, yet, comparing this case with others, I was inclined to think that the patient's pancreatic duct had got plugged, that there was no secretion coming from the pancreas, and so the fat remained quite untouched, and really covered over the bile which was present in the faeces. I really did not know very well what to do for this patient, but it was quite clear that all the fat he was taking in the milk was useless, so the first thing to do seemed to be to try and utilise the fat by giving the pancreatic juice which was absent. Now you know that to a great extent the pancreatic ferment is destroyed in the stomach, so that if you want to give the pancreatic ferment the best way is to administer it a good while after the meal, just about the time when the food will be leaving the stomach and passing into the duodenum. You may, perhaps, introduce the pancreatin still better into the bowel in a keratin capsule. Keratin is quite insoluble in the acid juices of the stomach, but is readily dissolved by the alkaline juice of the intestine. A very enterprising firm of druggists, at my suggestion, made a form of digestive tabloid which seems to be likely to be useful in such cases. The external part contains pepsin, and the internal part contains pancreatin, which is surrounded by a keratin capsule. The pepsin becomes dissolved in the stomach, and acts as a digestive ferment, while
the pancreatin in its keratin capsule will pass through the pylorus with the food into the duodenum. In the case I have referred to maltine proved very useful by supplying to a great extent the diastatic ferment which ought normally to have been supplied by the pancreas.

We may now pass on to the question of treatment by foods, and amongst others to the milk diet, of which I have just been speaking. In that case the milk diet was to a considerable extent not utilised, because the pancreatic ferment was absent. In cases of weak digestion, we now partially digest the milk before it is taken by the admixture with it either of pepsin or pepsin and hydrochloric acid, or by the use of pancreas or of pancreatic tablets, which have come very much more into vogue of late years, because they are more convenient than mixtures containing acids and pepsin. When milk is not digested, in whole or in part, before it is given, it may be precipitated in the stomach in whitish flakes, which are not readily soluble. In digestion with pepsin, a bitter product seems to be formed to a larger extent than with pancreatin, although this may also yield a bitter product if the digestion be continued too long. Milk seems to contain in itself almost all the ingredients that are wanted for life, and a man may live upon milk for a long time without anything else. An exclusively milk diet, however, does not seem to be sufficient to keep a man in active work, but when he is lying in bed, as in cases of typhoid fever, we find that he progresses perfectly well on the milk diet. As I explained before, we frequently find that patients who cannot take milk when they are well and walking about take it perfectly well when they are confined to bed, especially when they have high fever, as in typhoid.
LECTURE 26.


GENTLEMEN,

We were discussing at the end of last lecture the use of milk as an article of diet. I said that milk may be looked upon as an almost perfect article of diet, inasmuch as it contains the various substances requisite for the nutrition of the body, and in right proportion. The proportion at least is right for children; in adults you may find that the proportion needs to be varied, and even in children the proportion of ingredients contained in cow’s milk does not always suit. In some cases also we find that the digestive power of the infant is insufficient, and we may require either to give along with the milk some substance that will enable the infant to digest it or else to digest the milk before it is taken into the stomach. The same thing holds good also for adults, and occasionally we are obliged, in place of giving crude milk, to peptonise it. Now you can readily see how very disadvantageous it will be either to a child or to an adult to have, in place of good, healthy milk, milk which has begun to undergo decomposition from the presence of bacteria in it. Occasionally people forget that milk which is to all appearances perfectly fresh may contain bacteria, and although one portion of the milk which is kept outside in a cool place may remain apparently sweet, yet another portion
of the same milk when put into a warm stomach will undergo change, and will become sour or even putrid in a comparatively short time. I think I have seen a patient killed by milk given in this way. On smelling the milk which was put ready for the patient's use in a jug, one could readily notice that, although it was not what you would call sour, it was what is termed "on the turn." It was just beginning to get sour, and although, being kept outside the window, it had slowly undergone the change, yet after the patient drank it it became rapidly sour. The patient, who was suffering from pneumonia, got indigestion in addition, with great flatulence and hiccup; this interfered still further with his respiration, and he soon died. He might have died even if he had been fed upon perfectly good milk; but at any rate the sour milk appeared just to turn the balance and destroy his last chance of life. So it is well in cases where you are feeding patients with milk to be careful that it is fresh. There is some doubt as to whether it is advantageous to boil milk or not. To boil milk certainly tends to kill any bacteria in it and thus to lessen the chance of its becoming sour. On the other hand, boiled milk is not so pleasant to take, and with some people it does not agree so well. Boiled milk as a rule is said to be more constipating than fresh milk, and so it is frequently employed in cases where there is a good deal of diarrhoea; but if fresh milk be used properly it does not as a rule tend to cause diarrhoea, and in cases of the bill diarrhoea of India, which I have spoken of before, fresh milk is perhaps the better of the two. It would be very hard to keep patients upon boiled milk for three months, but I think you may keep them upon fresh milk for that time.

Now the constituents of the body as shown in milk, or perhaps, as they are more easily remembered, in an ordinary meal, may be said to be (1) proteids, (2) fats, (3) carbohydrates, and (4) salts. We shall have to refer to these not merely in connection with nutriment, but also with another class of drugs to which we shall pass presently: viz., the so-called alteratives. If you take an ordinary meal such as a man will get in the City you will find (1) the proteids are represented by a beefsteak or a mutton-chop; (2) the fats by the fat which is supplied along
with the meat or by the butter which is usually given; (3) the carbohydrates by the bread or potato; and (4) the salts by the salt which is given in the salt-cellar and by the salts which are also contained to a large extent not only in the meat, but in the bread. A healthy man is able to utilise all those different parts of the food; but in certain cases we find that patients are perhaps unable to take a particular kind of food or to utilise it after they have got it. More especially do we find that many children and a considerable proportion of adults are unable to take fat, at least unless it is given in certain forms and with certain precautions. If any one of you were asked to swallow down a pat of butter, especially on a hot day and on an empty stomach, you might object and say it would make you sick, and possibly it might; but if you were to take that same pat of butter and spread it on a piece of bread it would not make you sick. The following question was once asked me by Professor Kronecker, of Berne: "Supposing you had a pat of butter and two pieces of bread to make a sandwich, how would you spread the butter so as to make it most palatable? Would you spread it just on one piece of bread and stick the other over it, or would you divide the butter into two parts and spread one on one-half of the sandwich and the other on the other half?" According to him, the butter would be most palatable if spread on both pieces of bread, because you thus get it in a finer state of division than if you spread it on one slice only, and it is the fine state of division of fat that frequently makes it digestible and palatable when it would be nauseous if taken in bulk. You know that a boy at school very often gets big bits of fat from boiled mutton which makes him sick, and if you happen to look at the vomited matters you will probably find the reason why. The hot mutton fat has run together, and you get great blobs of fat in the vomited matter. But that same boy could probably eat with perfect impunity and very likely with relish the same mutton fat if it were allowed to get cold, because when cold it becomes hard, so that when he eats it he is obliged to break it down thoroughly. Probably at the same time he would be eating a bit of bread with the mutton fat, and thus he would get it into a very fine state of division, so that he
would digest it, and it would not make him sick at all. Therefore a fine state of division of the fat has a great deal to do with its digestibility, and whenever they get fat well divided people as a rule are able to digest it. In milk we find that fat forms very fine globules, separated from each other by a little membrane consisting of proteid matter which surrounds the globule. There seems, however, to be not only a certain difference in the mechanical conditions of fat, but a difference, to some extent, in the chemical nature of fats which makes one kind more readily digested and more readily assimilated than another. An old nurse when speaking to Weir Mitchell said: "Some fats is fast, and some fats is fleeting, but cod-liver oil fat is soon wasted." By this she meant that if you feed people upon certain fats they remain fat for a length of time, while other fats are more readily dissipated, and the plumpness they produce soon disappears. Cod-liver oil fat is soon fleeting, and a patient or a child that is rendered plump by feeding upon cod-liver oil soon gets thin if the administration of the fat be stopped. In all probability it is just this mobility, as one may term it, of cod-liver oil that makes it such an exceedingly good nutrient. It is readily put on, and it is readily put off, and between the time it is put on and put off it is probably quickly taken up by the cells of the tissues. In cases, for example, where a patient is suffering from chronic bronchitis, the cells of the lining membrane of the bronchial tubes are quickly thrown off, and although they multiply quickly, they do not get time to mature. Instead of forming regular epithelial cells, they are thrown off in the form of what one may term indifferently leucocytes, undifferentiated cells, or pus corpuscles, and one may say that the reason why they do not form regular cells is that they have not time to take in sufficient nutriment and to grow and develop. But if you supply such cells with fat which may be more readily taken in and assimilated than that which they usually get they may possibly grow into regular epithelial cells. Whether this be the case or not I cannot tell you, but practically you will find that the remedy par excellence not only for consumption, but for chronic bronchitis, is cod-liver oil. The patients in the casualty department of this Hospital, though they may have
become perfectly weary of taking cough mixtures, will come again and again for cod-liver oil, because they say it eases their cough and lessens the phlegm at the same time; so that not only is the general condition of the patient improved, but the local condition of the respiratory passages also is greatly benefited by the cod-liver oil.

Amongst the proteids of food we have a large number of different classes of albumins, albumoses, and so on. The carbohydrates we have already been discussing under the heading of diabetes, and I have mentioned to you that diabetes is supposed to depend to a great extent upon the power of the liver to utilise the carbohydrates being lessened or destroyed. The salts we may take up more fully when considering "alteratives," because there is more known about the variation in salts than there is really in regard to the amount of salts circulating in the body. The chief salts in the body are chlorides, phosphates, and sulphates of sodium and potassium, the salts of sodium being chiefly present in the liquids, and the potash salts being present in the solids. You will remember this, perhaps, if we simply compare the body to the world at large, and regard the sea as the blood of the world and the solid land as its flesh and bones. We know that sodium chloride is the chief salt in sea-water, but potash salts prevail on land, land plants containing them to a large extent. The liquids of the body contain sodium; the solids of the body contain potassium; and we find that the potassium is present not merely in the solid organised tissues which are aggregated together, as in the muscles, but also in the solid parts of the blood, viz., the corpuscles, whereas it is chiefly sodium salts which are present in the plasma.

Now, in certain cases of disease, as I have mentioned, there is an inability to utilise carbohydrates, which pass out in the urine in the form of sugar, instead of being stored up for awhile in the body and then burnt off, passing away in the form of carbonic acid and water. This shows that there is an inability in the body to utilise carbohydrates, and, perhaps, I ought to say there is an inability in the body to oxidise them, because they ought to be oxidised into carbonic acid and water and thus to leave the organism. But the same inability to oxidise, to
destroy, and utilise foods is shown in an inability to utilise pro-
teids. You sometimes find that there is a want of power in
certain individuals to utilise the carbohydrates at some periods
and to utilise the proteids of food at others. This is very
marked indeed in many cases of gout, where you find that at
one time the gouty man passes a good deal of sugar in his
urine, but the urine at that time is free from uric acid and is
otherwise quite healthy. At another time the same man will
pass no sugar in his urine, but he will pass a large quantity of
uric or oxalic acid. You may find crystals of oxalate of lime,
and say the man is suffering from oxaluria, or you may find
a large quantity of uric acid, and say that the man is
suffering from a uric acid diathesis or gout. In the same
individual you may get alternations. Some of these gouty
people have occasionally a great tendency to lay on flesh; they
become enormously stout, and this is a condition that is fre-
quently associated with an inability to utilise the carbohydrates.
The man who is suffering, not from true diabetes, which is, as a
rule, a wasting disease, but from gouty glycosuria, not only
passes a large quantity of sugar in his urine, but lays on flesh
to a tremendous extent. Sometimes you may find that flesh is
laid on, and people become enormously stout, although they do
not pass any sugar in their urine.

Treatment of Diabetes, Glycosuria, and Obesity.—Now the
treatment for cases of diabetes or for gouty glycosuria is to give
the patients only such foods as they can utilise and to cut off
sugars and starches. You allow gouty glycosurics and diabetics
fat ad libitum. In cases, however, of extreme obesity, whether
it be connected with glycosuria or not, the treatment usually
resolves itself into cutting off the carbohydrates and limiting
or even cutting off the fats. Therefore, you see, the treatment
for diabetes, glycosuria, and for obesity is very much the same,
with the exception that the treatment for obesity is more strict
than even for diabetes. The chief difference between the two
is that, in addition to cutting off sugars and starches in a case
of obesity, you cut off fat also, which you don't do in the case
of a diabetic.

Banting's and Salisbury's Methods.—You can readily see, how-
ever, that this treatment really amounts to partial starvation. One of the means of reducing obesity is what is known under the name of "Bantingism," and that practically comes to be feeding almost entirely upon proteid diet: upon fish, flesh, fowl, and eggs, with perhaps a small quantity of green vegetables. This diet, I may say, is very fairly useful in reducing obesity, but it has one great disadvantage: that it is not a system of starvation only, but it leads to the accumulation in the body of the products of proteid waste. In consequence of this, it has been modified, and, I think, with advantage, by Salisbury, whose plan is to give, like Banting, a proteid diet, but at the same time to wash out the waste products that might otherwise tend to accumulate in the body by giving the patient large quantities of water. So that, in treating a very fat patient on the Salisbury plan, you give him meat, fish, flesh, fowl, and eggs, but an hour before each meal you tell him to drink a large tumbler of hot water. This treatment is often a very satisfactory one, and many patients are greatly delighted at the results, and it is a very good plan indeed, I think, for the treatment of very fat people, whether they be gouty or not.

But there are a lot of gouty people who are not fat; they are very thin, and in their case you must follow a different plan of treatment. It seems very odd that you should have two plans of treating gout absolutely dissimilar. One plan is that which I have mentioned of putting the patients upon a meat diet, plenty of all sorts of proteids, but cutting off sugars and starches. This does very well for the fat people, but not for the lean gouty people at all. In them you also limit the diet, but in a different direction. You limit the amount of proteid material, and try to put them as far as possible on a vegetarian diet. You see, the plan of treatment simply comes to this: that in both cases, in the fat and in the lean, there is an inability to utilise all the food, but in some of them the inability seems to extend chiefly to the sugars and fats, in others to the proteids. Therefore in the case of lean people suffering from gout you cut down their butcher's meat and give them plenty of fats and carbohydrates—really a vegetarian diet. In some cases of gout this answers very well indeed. Under the head of "vegetarian diet," how-
ever, one generally allows a certain latitude, and while you cut off the red meat, or cut it down to a minimum, you generally allow the patients fish and fowl, because in a great number of cases you find they simply will not go on without them; they must have some proteid material.

When speaking of alcohol, I mentioned that it had a tendency to lessen the processes of oxidation in the body, and, as a rule, in cases such as those I have mentioned, alcohol is disadvantageous. When people are cut off entirely from alcohol, they sometimes become so depressed that you are obliged to allow them something, and in such cases alcohol pure and simple, that is to say without the admixture of ethers or of salts such as we find in wines, is better than wine. We therefore allow them a little brandy, or a little whisky, with either plain water, or some effervescing water, and in cases of gout you frequently find that the use of alkali along with the water is advantageous. The alkalies that are chiefly used in gout are potash and lithia, the idea being that the potash salts of uric acid are more soluble than the soda salts, and so pass out of the body much more quickly. In the case of gout, however, as in a great many other troubles, a good deal of the mischief is due to the want of elimination; the patients do not drink enough water to remove the soluble residues of tissue waste from the body. These accumulate, and give rise to all sorts of discomforts, but by making the patient drink hot water at home, or sending him to such watering-places as Homburg, Baden-Baden, Wiesbaden, Carlsbad, Vichy, Aix-les-Bains, etc., where by getting baths and massage and drinking the waters, he gets his tissues well washed out, and comes home well.

_Diet in Bright's Disease._—In cases of Bright's disease, we very often have to put the patient on a somewhat strict diet, in order to lessen the work which the kidney has to do as much as possible. This is done by prohibiting the patient from taking any strong soups, or any essence of meat, and by limiting the quantity of butcher's meat or eggs which he takes as much as practicable. The reason of this is that strong soup contains simply the extract of meat, and this, although a most useful stimulant, has very little nutritive power. It has all to pass
out from the body through the kidney, and thus more work is put upon the kidney, to the disadvantage of the damaged organ. Cut these things I have mentioned out of the patient's dietary, and you lessen the substances that will produce urea. You must, however, give small quantities of proteids to supply the normal waste of the body, as well as to make up for any loss of albumin from the kidneys. But here you must draw a marked distinction between different forms of albuminuria. In some cases of albuminuria, you find that a large quantity of albumin is present in the urine, and then it will not do to cut off entirely the proteid matters from a patient's diet, because he will be much weakened unless this loss is made up to him somehow. But in cases of gouty kidney, where the elimination of solids is imperfect, and where the patient frequently passes large quantities of water of a very low specific gravity, you may cut the proteid matter down almost to a minimum, and the patient gains great advantage thereby. I was once called to see a patient for angina pectoris. He was a wealthy old man, with about £70,000 a year, and he had a doctor whose only care was to attend to him. I went down into the country, and when I saw the patient I said, "This is not angina pectoris; it is renal asthma." "But," said the doctor, "he has no albumin." On examining the urine, I found what I thought was likely to be there, viz., a very low specific gravity, and a very slight trace of albumin. I cut down the old gentleman's diet to less than that of a pauper, and fed him upon oatmeal porridge, bread and butter, and so on, cut off meat entirely, and the old gentleman improved very much. Unfortunately, I had just then a very severe attack of ague, and was obliged to go away, and shortly after I left town I heard that he was dead. I have very little doubt that it seemed to the doctor in attendance, and also to the man who was called in consultation afterwards, that it was very hard that this very rich old gentleman should be treated worse than a pauper, because his diet-table was a great deal less than that of a pauper. So long as he reduced the amount of food which he took to the level of what his kidneys could excrete, he remained well, but directly he took more than his kidneys could excrete he failed and died. You must draw this distinc-
tion between these two classes of albuminuria, and draw it pretty sharply.

Diet in Cardiac Disease.—Then, in cases of cardiac disease, you will sometimes find that a milk diet answers exceedingly well; that if you put a patient with bad mitral disease, failing heart, enlarged liver, and dropsical legs upon his back, and treat him precisely as you would a case of typhoid fever, you will get great improvement. One of the reasons for this appears to be that the lactose in the milk acts really, to a certain extent, as a diuretic, and that the patient, under the influence of rest along with this action of the lactose, passes abundance of urine, the dropsy diminishes, and the man becomes very much better.

Tonics.—Still in many cases we find that, whatever diet we put a man on, he does not recover; he continues to feel limp, low, and weak, and patients who have these feelings come to us and say, “Oh, doctor, I want a tonic.” Now the name “tonic” comes from the string of a bow. When the string is drawn tight in the bow, then it is “in tone;” when it is loose, then it is “out of tone;” and the patient feels very much as a bow-string might be supposed to feel when it is unstrung, or, as a lady one day expressed it to me, and I thought very nicely, “she felt like a collar after all the starch had been taken out of it;” and what a tonic is wanted to do is, as it were, to put the starch into people again (Figs. 129, 130). A good deal of this feeling of lack of tone is not due to want of material in the body. We find that a fire burns low not only from want of coal, but still more frequently from getting choked up with ash, and if you want it to burn briskly, you do not merely throw coal on, but you take the poker and stir the ash out. In perhaps nine cases out of ten among your wealthier patients it is not the coal-scuttle that is wanted, but the poker, to clear out the waste products, and frequently a patient after a blue pill and a black draught, which have cleared away a lot of residue from the body, will feel a great deal brighter than if you had given him a bottle of champagne.

There are various classes of tonics, named according to the organ upon which they are supposed to act. We have, for example, gastric tonics acting upon the stomach; blood tonics,
or haematinics; acting upon the blood; vascular tonics, acting upon the circulation; and nerve tonics, acting upon the general nervous system. Amongst the gastric tonics are those which increase the appetite or strengthen the digestion. More espe-

![Fig. 129.—Before a tonic.](image1)

![Fig. 130.—After a tonic.](image2)

cially we class as gastric tonics those that increase the appetite, and the chief amongst them are vegetable bitters, which, when given before meals, frequently cause a craving appetite. This we have already discussed. But along with vegetable bitters we frequently find that the addition of an acid, especially of nitro-hydrochloric acid, is useful, and one reason for this may be that nitro-hydrochloric acid, as I have before remarked, has an action upon the liver, and tends to increase the secretion of bile. Whether this is really so or not I cannot tell you, but there is no doubt whatever that this acid has got a great reputation as a tonic, and is a very efficient one. The haustus acidi nitro-hydrochlorici of our Hospital Pharmacopoeia, especially when combined with 5 or 10 minims of the tincture of nux vomica, acts most satisfactorily as a tonic. Vascular tonics we have already discussed so thoroughly that at present, I think, we may pass them over; nerve tonics are those used where we wish to stimulate the nervous system, and more particularly, perhaps, the cerebral function, and the tonic par excellence in
this department is nux vomica, or strychnine. Occasionally we find that various forms of phosphorus, and sometimes preparations of arsenic, are useful in this condition as well, especially in cases of prolonged nervous debility.

Weir Mitchell Treatment.—One of the most efficient methods of treatment of nervous debility, however, is that adopted by Weir Mitchell, and this simply consists in taking as little out of the patient and putting as much into him as you possibly can. In cases of general nervous debility, or neurasthenia, you frequently find that the patient is restless, perhaps irritable, does not sleep, and gets thinner and thinner. The plan of treatment there is to put the patient to bed away from friends, and isolation is one of the most important factors in the Weir Mitchell treatment. In cases where I have tried it without isolation, it has generally failed. You put your patient away from her friends with simply a nurse, or still better with two nurses, one for day and one for night; you give food at regular short intervals, and while keeping the patient in bed you supply the changes in the body which will lead to appetite by giving massage. Massage is a powerful tonic, because it takes the place of exercise for those who cannot take it. We all know that when a man is stout and out of sorts his friends often say to him: “Oh, if you would only go out and take plenty of exercise, you would get rid of all those uncomfortable feelings.” But the patient often cannot take exercise. You get, for example, a big, flabby woman, about middle age, and you tell her to take exercise, and she says: “But, doctor, I cannot.” Her muscles are not sufficient to carry her big, fat body about, and she is quite unable to take exercise. Then you get another patient who says: “I cannot take exercise because my heart is so weak. Whenever I take it, I have a pain in my side.” That is quite true; he cannot take exercise. There are lots of others who can not, and there are a good many more who will not, and for them you supply exercise by means of massage, which, as I have before mentioned, consists in the twofold plan of kneading the muscles, so as to squeeze the waste products out of them, rubbing them on into the lymphatics, and then, in addition
to kneading and rubbing, you may tap on the muscles or on the skin, so as to accelerate the flow of blood from the heart to the periphery, to the skin, and to the muscles. In this way you get all the vascular changes that occur during exercise without fatigue, and you give the patients the benefit of this exercise either when their skeletal muscles are too weak, or when their heart is too weak, to allow them to take it in the ordinary way. This plan of treatment also increases the red blood corpuscles, and in cases of anæmia we find that under massage and diet the patients improve greatly.

Hæmatinics.—Red blood corpuscles contain proteid matter, fat, iron, and potash. Sometimes cod-liver oil tends to increase the formation of blood corpuscles, and so you get rid of anæmia, but amongst the so-called hæmatinics perhaps the most marked is iron in one of its various forms. The ancient Greeks, whenever they found a person was suffering from weakness and paleness, used to put a sword into a trough of water and then make the man drink the water. It was supposed that the sword had some sort of virtue of its own that entered into the man and gave him strength, and so it did, especially if it was well rusted. For if you put a piece of steel or iron into water it gradually does become rusted, and the steel steadily, though slowly, dissolves, and thus the water becomes ferruginous. The Greeks were quite right in their method of treatment, but as a rule we find this to be a rather slow process, and we usually prefer to give our patients some natural ferruginous water or various preparations of iron in the form of a pill or draught. One of the most favourite pills is the pilula ferri, which really contains carbonate of iron. There is in the Pharmacopoeia an iron pill made with the carbonate—the pilula ferri carbonatis—in which saccharated carbonate of iron is formed first and then mixed with confection of roses and given to the patient. But this pill has not found so much favour as some other pills which are in the market. So in the last edition of the Pharmacopoeia we have an attempt to imitate more nearly a formula which had been found practically to be very satisfactory in the treatment of anæmia, and you will notice that in the pilula ferri we have the sulphate of
iron and the carbonate of potassium mixed together. When this is taken into the stomach there will probably be a reaction between those two. Whether it is just the small quantity of potash along with the iron that tends to supply another ingredient in the corpuscles I do not know, but the pilula ferri, such as we have in the last edition of the Pharmacopoeia, is very satisfactory. In another of the older preparations, viz., the mistura ferri composita we also have a mixture of potash and iron. This is not to be confounded with another old preparation which is a good deal used, viz., the mistura ferri aromatica. The latter is interesting as being a preparation compounded according to rules which the student is told he must not follow. You are often asked at examinations what are the incompatibles of iron, and you are told in lectures and text-books that amongst them is tannin in any form, and very often people do not take the trouble to say why tannin is incompatible with iron. There is no real incompatibility; the two agree very well as far as the patient's treatment is concerned. The incompatibility consists in this, that if you mix tannin and iron, you get ink, and patients do not like to drink ink as a rule. Still we have in the Pharmacopoeia a mixture which is known as mistura ferri aromatica, in which there is red cinchona bark, which yields tannin, and this along with the iron forms a tannate of iron, giving a black colour to the mixture which is often known as Heberden's ink. This mixture then really contains a tannate of iron as its essential ingredient.

Another favourite mixture is the one to which I have already referred, the mistura ferri composita, and which used to be known as Griffith's mixture. This contains, just like the pilula ferri, sulphate of iron and carbonate of potassium as its essential ingredients. Both the pill and the mixture are exceedingly good, but one of the best of all preparations of iron probably is what is known as steel drops; that is to say, a solution of the perchloride of iron either in the form of the liquor ferri perchloridi, which is a watery solution of the perchloride, or of the tinctura ferri perchloridi, which is an alcoholic solution. In the great mass of cases of anaemia which come to this Hospital, perhaps one of the most satisfactory medicines
you can give is the haustus ferri cum quassia.* It is put in the Pharmacopoeia as haustus ferri cum quassia, but you will always see it in the surgery as “H.Q.C.F.,” the reason of the late alteration in the title being that the iron is the essential ingredient in the mixture, but still people, somehow or other, stick to the old name, and say “quassia and iron.” We have here 15 minims of the solution of perchloride of iron and an ounce of the infusion of quassia. There are two infusions which do not give any black with iron, because they contain no tannin, viz., calumba and quassia, but one very frequently gives other infusions with iron. For example, one often gives infusion of gentian, and this becomes rather black, but still it is perfectly useful as a means of treatment.

There is another point that I must mention in regard to anæmia. In many cases you get good results from the administration of alkalies. A simple alkaline treatment often does the patient a great deal of good. I do not know whether it is by supplying alkalies to the blood, or improving the digestion, but very good results are obtained by using them in anæmia.

Pernicious Anæmia.—There is one form of anæmia which is usually regarded as incurable: the so-called pernicious anæmia, in which you find that the blood corpuscles are much altered in their shape and in resistance. They become less elastic, and are easily distorted; they diminish in number; and the patient gradually gets paler and paler, perhaps not much thinner, but weaker and weaker, and finally dies. This is looked upon as an absolutely incurable disease, and when a patient recovers after presenting the symptoms, people are apt to say that it could not have been pernicious anæmia, because if it had been he would have died. However, I have seen a case which presented the symptoms so markedly that everybody who saw the patient said, “This is a case of pernicious anæmia,

* Haustus ferri cum quassia, St. Bartholomew’s Hospital Pharmacopoeia:—

Solution of perchloride of iron, 15 minima.
Infusion of quassia, to 1 ounce.
and the patient is sure to die." The patient did not die, and so possibly the diagnosis was wrong; but he was apparently going downhill as quickly as he could go, and everybody expected he would die in a few months. I advised that he should take beef marrow, and under this treatment he quickly recovered, and is now, I am glad to say, perfectly well. The idea of feeding a man on beef marrow was that the marrow is a substance in which blood corpuscles are formed. I forget at this moment who introduced it, but I think Professor Fraser, of Edinburgh, had a good deal to do with it, if not with the actual devising of the treatment. In the case I have just mentioned, the patient was not able to take the beef marrow; but an extract of it was administered, and this seemed to have the desired effect. When you are able to persuade the patient to take beef marrow, the best way is to make a little sandwich of thin toast—have it toasted pretty hard and have it pretty hot—and then spread the raw beef marrow between the pieces of toast. It then takes the place of butter, and the patient can get it down; but if you set a patient down before a marrow-bone with a spoon, before he is half through he begins to say he is sick of it, and will not have any more. The marrow-bone must not be roasted or cooked in any way, otherwise you destroy its effect. Where patients cannot take the raw marrow in this form, you may get them to take an extract of it. It may be rather doubtful as to whether this raw marrow is to be regarded as a haematinic, or whether it should be classed under another head: that of an alterative.

ALTERNATIVES.—By alteratives we mean those drugs which gradually alter and improve any morbid condition of the body without producing any evident external sign. If we give a dose of purgative medicine, we see that it is doing something; if we give a diuretic, we see that it is doing something; if we give an emetic, we see that it is doing something also, and we do not wonder so much that the patient recovers under the influence of such drugs. But if to men suffering, let us say, from rheumatism, we give iodide of potassium continuously, we do not see that the iodide is doing anything. It is not causing any greater evacuation of the bowels, it is not causing vomiting, it
is not causing diuresis, and yet the patient's joints are gradually getting soft and more flexible under its use. There is no very evident external sign of the action of the drug, and yet it is making the patient better; so that those drugs which have this effect are known as alteratives. We may class the alteratives very much according to the different constituents of the body which they alter. We find in proteids, for example, that the most essential element is nitrogen, and you can readily see that if in every proteid we could replace either the whole or part of the nitrogen by some other element which would take its place, we should alter the constitution of the individual organs and tissues and the body generally. In the same way as we were speaking before of the fats, if we can replace a solid fat by one that is more labile we shall alter the constitution of those parts of the body which contain fat, and the same is the case with carbohydrates and with salts.

Now, nitrogen being the most important ingredient of proteids, we have various drugs which act as alteratives, and belonging to the same chemical group as nitrogen. For instance, in place of the nitrogen, we can put in phosphorus or arsenic, and both phosphorus and arsenic are very powerful alteratives. Perhaps more experiments have been made on the action of phosphorus than upon any other of the substitutes for nitrogen, and so we know rather more about the way in which it possibly acts as an alternative. You probably know that after phosphorus has been given either to an animal or to a man in poisonous doses, when the immediate irritant effects have passed off, secondary symptoms result. You will, perhaps, remember it more easily if I give you a case. In Vienna servant-girls sometimes wish to put an end to their lives, and the way they do it is this—they buy several boxes of lucifer matches, scrape off the heads, mix them with water, and then drink the contents of the tumbler. The first thing that happens to them is probably that they feel sick, get a pain in their stomach, and then vomit. The vomited matters often have a peculiar smell of phosphorus, and if seen in the dark are luminous. The patient is taken to the hospital, and, after vomiting for awhile, begins gradually to recover, the symptoms pass off, and people
are inclined to think she has done herself no harm, but two or three days afterwards she begins to feel not so well. If the liver be then touched, it is found to be tender and enlarged, and then her face and eyes begin to get a yellowish tinge. Perhaps she vomits again, and before many days are over she becomes comatose and dies. The post-mortem examination is held, and then the liver is found to be excessively fatty and friable; the heart also, instead of being red and firm, as the heart ought to be, is perhaps almost entirely converted into fat; and you find the same tendency to fatty degeneration in all the various organs of the body. Now, Voit was very anxious to find out how this happened. He said: "Where does this fat all come from? It may have come," he thought, "from the food." So he got some dogs, and excluded this source of fallacy by giving them no food. He administered phosphorus, and still they died with fatty degeneration. Clearly the fat did not come from the food. Then it occurred to him that it might have come from other parts of the body, from which it might have been absorbed into the circulation and deposited in the liver and heart, so he not only gave the dogs no food, but kept them until the whole of the fat had been absorbed from the other parts of the body. He then gave phosphorus, and still they died, showing signs of fatty degeneration, as before. It was evident, therefore that, as the fat had come neither from the food nor from other parts of the body by absorption, it must actually have been formed in the liver and in the heart, where it was found after death, by a transformation in the constituents of those organs. You know that when a body has been long under water the muscles are converted into a sort of fatty substance known as adipocere. It occurred to Voit that the fat in the liver and in the heart might be due either to increased formation of fat within the liver and heart from their proteid constituents, or to lessened combustion of fat thus formed, or to both. He thought that possibly fat was, ordinarily formed in the heart and in the liver, and not burnt off when the animal was taking phosphorus. He first of all tested the amount of urea passed by the dog, and he found that it was enormously increased. It was quite plain then that the phosphorus had
greatly increased the tissue change going on in the liver and in the heart and other organs. At the same time, however, he found that there was less oxygen taken up by the animal and less carbonic acid given out, so that the action of phosphorus upon the body was to diminish combustion, and, at the same time, to increase tissue change.
LECTURE 27.


GENTLEMEN,

We were considering last time the various substances which have a so-called alterative action, and I mentioned that alteratives take the place of certain constituents in the normal tissues, and by this replacement modify the processes of nutrition. One of the most important ingredients in the normal tissues is nitrogen, and its place can be taken by phosphorus, arsenic, or antimony. When phosphorus is administered to an animal it causes a large amount of fatty degeneration in the various organs and tissues of the body. These undergo fatty degeneration partly from increased transformation of proteids into fats, and partly from the diminished combustion of the fat which is thus formed. Now the fatty degeneration which is observed after the administration of phosphorus is a toxic action, but the same thing may be utilised in its lesser grades for its therapeutic action; for fatty degeneration is one of the means by which solid exudations are absorbed in the body, and we find that the administration of phosphorus or of arsenic in various forms tends to help the absorption of certain exudations. More especially is this noticeable in cases of catarrhal pneumonia, where the alveoli of the lungs, instead of being filled with fibrinous exudation and some leucocytes, become filled with
proliferated epithelial cells. In ordinary pneumonia you would get during the inflammation an exudation simply of fibrinous material with some leucocytes, and this, although solid for several days, at the end of the fever quickly undergoes what is termed "resolution," or, I believe one might almost say, a process of self-digestion; so that this solid exudation becomes liquid again and is quickly absorbed. But in cases of catarrhal pneumonia, in place of this fibrinous exudation with leucocytes, we get a number of proliferated cells, which are very much more resistant, and which remain unchanged for a length of time without undergoing disintegration, solution, and absorption. The danger of this exudation remaining is that it affords a nidus for the tubercle bacilli, and the longer it remains in the lung
the longer does the danger persist. Therefore one of our greatest desires in a case of broncho-pneumonia is to get rapid absorption of the substance which has been exuded, and for this purpose we try to hasten the processes of nature. In natural resolution, this exudation undergoes fatty degeneration, solution, and absorption. By giving such alteratives as will quicken the process, we lessen the danger of phthisis to which the patient is exposed. The substances that are usually employed are not so much phosphorus in its free form as the hypophosphites of lime and soda, which are very frequently given in cases of catarrhal pneumonia, and sometimes arsenic is administered for the same purpose.

I have already mentioned, I think, that phosphorus is not unfrequently employed for another purpose, viz., that of a cerebral tonic or cerebral nutrient, because it is supposed that phosphorus, forming, as it does, an important constituent of nervous tissue, is a useful nutrient in cases of nervous atony. Nitrogen, as I have said, may be replaced by arsenic, and probably this is to some extent the reason why arsenic is not only used to cause absorption in such cases as I have mentioned, but is frequently given as an alterative in gout and in the various forms of disease which owe their origin to a gouty substratum. Gouty people are very liable to suffer from various forms of disease, and you may find the different members of a gouty family all complaining of different things, and yet the whole of their symptoms are due to gout. One member of a family, for example, complains of gouty eczema, with irritation of the skin; a second complains of dyspepsia where there is no organic disease, but simply irritation in the stomach; a third complains of neuralgia, a fourth of asthma, where still you have nothing to see, only irritation; a fifth complains possibly of his liver or tendency to jaundice, a sixth of a tendency to pass uric acid gravel, with formation possibly of renal calculi or stone in the bladder; and a seventh may have well-marked gout in the toes. In all those cases you may find that arsenic is a useful remedy; and it seems very odd sometimes that one should use arsenic for so many diseases, all of which have apparently nothing whatever in common until we
come to ask the question: "To what do they owe their origin?" and then we learn that they owe it to the gouty tendency. By altering the gouty tendency through the administration of arsenic, we are sometimes able to cure these different diseases.

**Animal Organs and Extracts.**—But both phosphorus and arsenic sink into insignificance when we compare their power with that of some protoid substances themselves, because different proteids have an extraordinary power one over the other, and the health of the body appears to depend upon the proper adjustment of the proteids in its different parts. These proteids if set free in too large quantities at once from some organs would act as poisons to the body, while in small quantities they would tend to keep it in health. When we find that some part of the body becomes atrophied which usually ought to be functionally active, and to send through the body by means of the circulation various products of its functional activity, we are able in some cases to supply the material that ought to have been furnished by the atrophied gland.

*Myxœdema.*—The most marked example of this is probably the thyroid. When the thyroid is active, we find that the organism generally is healthy, unless there be some other reason for disease; but when the thyroid becomes atrophied, a very curious change takes place. The subcutaneous cellular tissue becomes filled with a sort of gelatinous substance nearly allied to that in the umbilical cord, and the accumulation of this substance gives rise to a very peculiar appearance of the patient. The face is swollen, the eyes are puffy, and from the swelling of the face the lips are thick and immobile, so that the patient has some difficulty in speaking. There is generally a very high colour just over the malar bones, but the rest of the face is pale and pasty-looking. At first sight you are apt to think that this is due to renal disease, but when you come to examine the urine you find, to your astonishment, that there is no albumin present. This condition is generally known by the name of myxœdema, and, till within the last few years, there was no remedy known for it. The remedy one used to employ was chloride of ammonium, which did a certain amount of good, but was only slightly curative. Now, however, by simply giving
either the dry thyroid in the form of tablets, or a glycerine extract of the thyroid, we find that the symptoms of myxœdema quickly disappear; the fulness of the face diminishes, the patient regains his or her normal outline, the lips become thinner, much more mobile, the speech becomes easier, and the thickness and immobility of the hands, which are also symptoms of the disease, go away. As a rule, you find that this cure is not permanent, and that the administration of the thyroid requires to be kept up, but after you have got the patient into a fairly normal condition the return of the disease may be prevented by smaller doses. One could hardly expect that you would completely cure your patient without requiring to continue the medicine, because the gland is atrophied which ought normally to have gone on supplying this material to keep the tissue change in the body right. It no longer yields the material that is requisite for the proper nutrition of the body, and so necessarily you must, to a certain extent, go on supplying it artificially.

Addison’s Disease.—There is another disease in which we find also a very marked change in the nutrition, viz., in disease and atrophy of the supra-renal capsules. In this disease the patient becomes exceedingly dark, patches of pigment are to be observed upon the mucous membranes, the weakness gradually increases, digestion becomes very poor, there is very often great and constant nausea and vomiting, and the patient gets weaker and weaker until finally he dies. For this disease there was formerly no remedy, and I do not know that we can say we have absolutely succeeded in getting one yet, but under the influence of tablets of supra-renal capsule the symptoms have in some cases, at least, appeared to become very much modified, and the patient very much better.

There are various other extracts that have been made from different parts of the body, and have been used in medicine. The most notable of those is extract of testicles, which was introduced first of all by Brown Sequare for general malnutrition and weakness. This substance appears to be not really a proteid, but an amine; but there is even now a considerable amount of discussion as to the chemical nature of the active
principle of the extract of testicles. There is no doubt whatever that in some cases this extract really has a very powerful stimulating action, but its popularity is distinctly less than when it was first introduced by Brown Seaward. We have had also extracts of brain, which have been supposed to have a stimulating, and at the same time soothing, influence upon the nervous system. In cases of nervous weakness, where this weakness has either showed itself in languor and apathy, or, from want of inhibitory power as excitability, the extract of brain has been said to be useful. Extract of kidneys also has been employed in the treatment of kidney disease, and just now I am trying tablets of pancreas in the treatment of diabetes. Tablets of pancreas have been used before for the treatment of diabetes, but those that I have succeeded in getting made are on a somewhat different principle from the others. They contain a large quantity of a glycolytic ferment, and I have some hope that I shall thereby succeed in getting the sugar, which is not utilised by the diabetic, burnt up and used for the wants of the body. Its passage unchanged out of the body would thus be arrested. But none of these animal products seem to be able to hold their ground as remedies to the same extent as the thyroid, and certainly none of them have anything like such a marked action as the thyroid gland.

First Attempt at Organotherapy.—The practice of eating raw portions of animals, or of dead foes, in order to obtain certain faculties or remove morbid conditions, has prevailed from time immemorial amongst savage tribes, and the Bushmen of South Africa are accustomed, after killing a venomous snake, to swallow its poison, in order to render themselves immune from the effects of a bite. This practice of a tribe of savages has recently been shown by Fraser to be based on no mere fancy, but in all probability on careful observation, and to agree with the results of the most recent experiments on the subject of immunity from the effect of snake venom. All these practices may be looked upon as examples of organotherapy.

But the first instance in which portions of a raw organ have been scientifically administered to a patient with the view of curing a disease, as I mentioned in a lecture here some
time ago,* was, I believe, the attempt I made in this Hospital, in the winter of 1873, to cure diabetes by the administration of raw meat. In the "British Medical Journal" for January 3, January 10, and February 21, 1874, I published some papers on the causes and treatment of diabetes, and showed that sugar is probably destroyed in the healthy muscles, and its appearance in the urine is due in certain cases to the want of the ferment by which it ought to be broken up and utilised in the muscles.

I may here give a few short extracts from the third of these papers ("British Medical Journal," February 21, 1874):—

"In view of these facts, we are, I think, justified in believing that the sugar which is present in the blood becomes converted by the aid of a ferment in the blood, muscles, and probably lungs also, into lactic acid and glycerine, and then undergoes combustion, thus sustaining the temperature of the body. Supposing, however, that this ferment is deficient, a greater or less proportion of the sugar will not undergo conversion into acid, and will then remain unconsumed, as in Ludwig and Scheremetjewski's experiment.

"Some time ago I tried to separate this ferment from muscles by Von Wittich's method, by glycerine, but was only partially successful.

"Several months ago I attempted to increase the decomposition of sugar in diabetics by supplying the ferment which I supposed to be wanting. Since sugar is probably decomposed chiefly in the muscles, the ferment which splits it up is probably contained to a much greater extent in them than in any other part of the body. By giving the patients raw meat, we may hope that the ferment contained in it will be absorbed from the intestine into the blood, and there act on the sugar. It is necessary that the meat be given raw, for the heat to which meat is exposed in cooking completely destroys all ferments. The patients on whom I tried this plan of treatment were under the care of Drs. Black, Andrew, and Duckworth; and I take this opportunity of expressing my thanks to these

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gentlemen for the readiness with which they afforded me the means of making observations and their kindness in supplying me with every facility, as well as to Messrs. Russell and Sawtell for the assistance they rendered me. The meat was finely chopped up in a sausage-machine, mixed with pepper and salt, and was either spread upon bread and butter, German fashion, or was made into a paste with bread and milk. Shortly after I began the treatment of one case, I learned from Dr. Duckworth that it had been tried empirically with complete success by the captain of a merchant vessel, who had prescribed for himself. In the cases treated in the Hospital, however, no cure was effected, although in certain of them there was some temporary benefit.”

The reason for this failure probably is that the muscle ferment, or enzyme as it would now be called, is one of those which become changed in the intestinal canal or during absorption; and if one is to obtain any definite results it must be administered by subcutaneous injection. The great obstacle to this mode of treatment is that even now, after a lapse of 23 years, chemistry has not advanced any further in regard to the muscle enzyme than when I made my experiments, and does not yet enable us to separate the enzyme.

In one of the best and most recent books on physiological chemistry, by Neumeister, the author says, “Finally, the presence of an enzyme which forms lactic acid as well as of one which decomposes myosinogen, or forms myosin, may be inferred from the apparently spontaneous changes already described which occur in muscle plasm obtained by Kühne’s method; but exact proof of the existence of these ferments is still required.”

**Exercise and Massage as Alternatives.**—Now you can readily

see that if in place of giving artificially an extract of a gland or of a part of the body, or by giving the substances that have been derived from it, whether these be of the nature of amines or alkaloids, we can manage to get from a part of the body which is still present in the organism more of its waste products than before, we shall alter the nutrition, not only of that part of the body from which we obtain these substances, but of the rest of the body as well. It is for this reason that exercise and massage are to be looked upon to a certain extent as alteratives, because by massage or exercise we remove from some parts of the body the waste products which they form, and which, by going to other parts of the body, modify the nutrition of them also. For example, if a man takes exercise, he forms in his muscles various waste products. These, if allowed to accumulate in the muscles themselves, are poisonous to the muscles, but when they pass on to other parts of the body they have a useful stimulating action. This is, of course, well known, because we are accustomed in cases of fever, and weakness, and debility to give to our patients the extract of muscle in the form of beef tea, and we find that it has a useful stimulating action. We may also get the extract of muscles removed from them and carried to the brain, where it will act as a stimulant, by putting our patients through a course of exercise, or by passively removing these substances from the muscles by means of massage, so that both exercise and massage are to be looked upon as useful methods of alterative treatment.

Iodide of Potassium as an Alterative.—We find further that by alterations in the salts of the body we are able to produce a marked alterative action as well. One of the most powerful alteratives in our possession is iodide of potassium. By its administration we alter the salts of the body in two ways. We increase the amount of potash as compared with the amount of soda, and potash by itself, either as an iodide, a carbonate, or a citrate, has got an alterative action, because we change the proportion of the potash in the body, and thus we modify the processes of tissue change. But the alteration produced by the administration of potash is comparatively small when compared with the alteration caused by the iodine.
In the normal body we have, as you know, a very large amount of chloride of sodium. If we replace the sodium by potassium and replace the chloride by iodine, we completely alter tissue change. Wherever we find, then, that there is a tendency to thickening in any of the fibrous tissues, we generally apply iodide of potassium. We use it as an alternative in rheumatism, and this is such an exceedingly common condition that iodide of potassium is very largely employed; we administer it for the chronic forms of rheumatism rather than for the acute, because in the latter, with high fever and pain, we usually give salicylate of soda. Iodide of potassium, however, is not only useful in removing the thickening due to chronic inflammation; it has a peculiar power of eliminating from the body various metallic salts which may have settled in it, for example salts of mercury and salts of lead. In cases of lead poisoning we give iodide of potassium, which, first of all, tends to form a soluble compound with the lead, and to bring it into the circulation; from the circulation it passes out of the body through the various eliminating channels. The same is the case with mercury when it has been given for a long time, and when iodide of potassium is administered it is found that a much larger proportion of the mercury may be observed in the urine than before. The reason is that here, as in the case of lead poisoning, a soluble compound has been formed between the mercury and the iodide, and the mercury that had previously been stored away in the solid tissues gets into the circulation, and is again eliminated.

Mercury.—There is a disease in which mercury is very much used, viz., syphilis. Mercury is generally employed in order to destroy the syphilitic virus, that is the syphilitic bacillus and its products, and thus to check infection. It is, therefore, given in the primary stage, that is to say shortly after the inoculation, when the primary sore is present, to destroy the bacilli; it is given in the secondary stages of the disease, when the mucous membranes and the skin are affected, and in which the bacilli are present and active; but it is not so much given in the later stages, say some years afterwards, because probably the bacilli are then all destroyed, and the conditions then present in the
body are really the results of their previous action. For the removal of these we generally trust to iodide of potassium, but it has been noted that iodide of potassium alone sometimes does not succeed. When it has been given in cases of tertiary syphilis in which mercury had not been previously administered, it has been found to fail, whereas when subsequently combined with mercury it has succeeded. It is supposed, then, that in some of those cases of tertiary syphilis iodide of potassium does not act really by itself, but that it frees from the tissues mercury which has been lying dormant in them perhaps for many years, and that the good results which are certainly observed are due, not to the iodide of potassium alone, but to this drug plus the mercury.

Mercury has a very considerable power of destroying or breaking down recent fibrinous adhesions, and it is utilised to a certain extent in the treatment of adhesions in the eye. It used to be employed very largely in the treatment of pleurisy and pericarditis, where fibrous adhesions threatened to form between the two layers of the pleura or of the pericardium and thus to restrict the action of the lungs or heart. In cases of peritonitis it has been used to remove adhesions which would limit the action of the intestines. It has fallen very much into disuse, but, I think, rather undeservedly, and its disuse is due, like that of many other things, to its having been abused. It used to be given to such an extent as really to destroy the patient's health utterly; it was pushed on until profuse salivation was obtained, and at one time it was supposed that the more the patient was salivated the better was the result likely to be. This, we know, is untrue; we know that by continued salivation you simply weaken the patient without doing him very much good, and in all cases where you administer mercury the point to carry it to is simply until the gums shall begin to show a little soreness, and the flow of saliva to be slightly increased. A metallic, or, as patients sometimes call it, a coppery taste, a soreness of the gums, a stickiness of the teeth, a slight increase in the flow of saliva, and a disagreeable smell in the breath, are the indications that the physiological action of the mercury has been obtained, and whenever these are induced
you stop the administration of the drug entirely, or greatly lessen the dose.

**Antipyretics.**—We may now pass on to another class of drugs, which is a very important one, viz., antipyretics. These are substances which lessen the temperature of the body, and more especially which bring down the raised temperature in fever.

We may lessen the amount of heat in the body by simply cooling it down by the application of external cold: by cold washing, cold sponging, or cold affusion, by which we mean sitting the patient in a bath and pouring cold water over him, or by leaving him in the bath with cold water, or by the application of ice-bags to various parts of the body. We may do it also by the simple use of cold air. In place of covering our patient with blankets, we may simply cover him with one sheet. Now you will find that a great many patients and their friends object to the use of a single sheet because they are afraid of catching cold, and no doubt there is a certain amount of truth in this objection. Even doctors have got a belief in their minds—and I think there is some reason for it—that sudden changes may, even in a feverish patient, tend occasionally to bring on a chill, with congestion of some internal organ, and therefore one does not like to run the risk of any chill. Whenever we get the patient's temperature rising very high, we simply take off all the clothes except a single blanket and just let him lie under a cradle, with the blanket kept off him by means of the cradle, so that it does not come into contact with the skin. Then you may have the end of the blanket not coming quite down to the end of the bed, and you thus get a more or less free current of air under the bedclothes, and the patient is kept fairly cool. Another way is to hang on to the cradle a little bag containing ice, so that as the ice melts the air under the cradle is kept cool.

But the loss of heat by conduction from the skin or by radiation is very slight compared with the loss of heat caused by evaporation, and so in cases of high fever you keep the patient's skin moist by simply sponging him all over and then putting the cradle on. In this way you get a considerable evaporation
from the skin, and the patient’s temperature is considerably reduced. Instead of making the skin moist by external application of water, you may make it moist from within by increasing the secretion of sweat, and this is very frequently done indeed. One of our most favourite remedies is acetate of ammonio, either alone or combined with various other things, and especially one of the best is spirit of nitrous ether. Half a drachm to one drachm of spirit of nitrous ether with half an ounce of the liquor ammoniac acetatis, every two hours or so, forms a favourite mixture, and one of its advantages is that it does not pull down the temperature suddenly, as some of the newer febrifuges do, but simply cools the patients slowly and does not depress them in the way that some of the other drugs do. Another drug which tends to cause the skin to become moist is antimony, and antimony used to be used very commonly indeed in cases of high fever, although it is not nearly so much employed now. We have somehow got into the way of leaving it alone, more especially on account of its depressing tendency. Occasionally we find that a combination of opium with ipecacuana answers well as a febrifuge, especially when there is a good deal of restlessness and sleeplessness present in the patient; 10 grains of compound ipecacuanha powder, or Dover’s powder as it is usually called, given at night will sometimes enable a patient to throw off a feverish cold. Under the influence of the drug he falls asleep, the skin becomes moist, the cold disappears, and he awakes quite well the next morning.

Quinine and Coal-tar Products.—Some of the drugs which are used to lessen temperature are much more powerful in their action than those which I have just described. Amongst those generally employed is first of all quinine in large doses, which acts chiefly by lessening the production of heat. Then come various other products, antipyrin, phenacetin, etc., more or less allied to quinine in their chemical constitution, which act chiefly by increasing the loss of heat from the body. These have been obtained in consequence of the endeavours of chemists to make quinine artificially. When the price of quinine was sixteen shillings an ounce, it was quite clear that anybody who could produce it artificially would make a fortune, and many
chemists attempted to do this. They failed to make quinine, but in the attempt to do so they came upon the aniline colours and various aromatic compounds; so that, although they cannot yet make quinine artificially, they have put in the market a great number of drugs which have a similar power to that of quinine, and some of them even surpass it in various respects. There is no drug yet that touches quinine as an antiperiodic, destroying the malarial poison; but various substitutes for quinine can reduce the temperature in fever more than it will do, and they have also the power of lessening the pain of neuralgia to a much greater extent than quinine itself. The chief substitutes that are employed are antipyrin, phenacetin, and antifebrin. Thallin, resorcin, and a great many others have also been introduced, but experience has shown that these are not so good as phenacetin, antipyrin, and antifebrin. We have some of these introduced into the Pharmacopoeia. Antipyrin is a proprietary drug, and the framers of the Pharmacopoeia objected to put in the names of proprietary substances, so they called it phenazon. It is generally known, however, by the name antipyrin. There is a certain advantage in the name phenazon, for sometimes you are able to prescribe it to patients who are unaware that it is the same as antipyrin, which is known by everybody, and is much used without reference to a medical man. Sometimes when you wish to prescribe it the patients say they are afraid to take it, because it lowers the action of the heart, but you know it will do them good, and you prescribe it under the name phenazon.

Phenacetin is a drug that has an action very much like that of antipyrin, but it is less soluble and less depressing. All these drugs have the power of depressing the action of the heart, and in large doses they may prove dangerous. In addition to this, they lower the temperature so quickly that they take away rapidly from the heart the stimulus which is given to it by the warm blood which is circulating through it. I showed you before that if you cool a heart down you slow the beats and render them more feeble, and by rapidly reducing the temperature of the body you tend to weaken the heart, and so when large doses of these drugs have been given they tend
sometimes to produce a condition of collapse. All of them have a tendency to alter the constitution of the blood, and in very large doses they may produce a curious condition in which a good deal of methæmaglobin and perhaps hæmatin is formed, with a tendency to lividity. Curiously enough, most of the cases of collapse that have been observed from the administration of moderate doses of antipyrin have been in women during the menstrual period. It would almost seem as if during this period there is such a change in the nutrition of the woman's organism that antipyrin and phenacetin seem to act more quickly upon the blood and to produce methæmaglobin; so it is well to be careful about the administration of these antipyretics in cases where a woman is menstruating. In addition to their power of lowering the temperature by their action upon either the tissues or the regulating centres in the brain which lower the temperature, they cause increased secretion of sweat, and sometimes this secretion, which is usually advantageous by tending to lower the temperature, is disagreeable to the patient.

**Diaphoretics and Sudorifics.**—The drugs which cause a slight stimulation of the sweat glands and a slight increase in the secretion of sweat are called "Diaphoretics," but when they cause sweat to pour out from the glands, and render the body wet instead of merely moist, they are termed "Sudorifics." One of the most rapid sudorifics is probably hot air, and in cases where you wish to get the sweat glands to act very rapidly you put the patient in a hot air bath. Here also we find that the application of hot air has a useful general action and many people who suffer from gout or rheumatism are greatly benefited by a Turkish bath, say once or twice a week. In a Turkish bath the bather goes into a dressing-room, where he removes his clothes and girds a towel round his loins. From this he passes into the first warm room, where he sits down and has a glass or two of water brought to him, which he drinks. Under the influence of the water internally and the hot air externally, he begins to perspire, but if he does not do so, he generally goes on into a warmer room still and stays there until the sweat begins to burst forth. He then goes back to the first warm
room, where, after sitting for awhile, he is subjected to a certain amount of massage, and then either doused with tepid water or put into a plunge-bath. In this country the plunge-bath is more generally used, but in some other countries the cold bath is not used. They simply give you a tepid douche, and then, having dried you, lay you out in the dressing-room, to remain quiet for awhile before putting on your clothes again. The effect of the bath is usually to soothe the nerves, to increase muscular power, and to lessen any pains that may be present in the joints.

Now, the skin and the kidneys have a sort of complementary action. The more water the skin excretes, the less are the kidneys called upon to eliminate. In cases where the kidneys tend to be inactive we supplement their action by increasing that of the skin; in cases of renal disease you frequently use sudorifics in order to remove water from the body. You may put a patient suffering from kidney disease into a hot air bath, such as the Turkish bath, or you may employ a hot air bath by simply putting the patient into a kind of box, which is closed up to the neck, and in which you have hot air placed, or, in place of this, you may seat the patient upon a chair, and put underneath it a small spirit lamp, covering both patient and lamp with a blanket, so that the air under it is gradually warmed, and the patient begins to perspire. When he is confined to bed you frequently use the cradle, and hot air is passed in under the cradle from a special apparatus. When this cannot be obtained, a spirit lamp may be placed just over the feet, but care must be taken lest the clothes get on fire. Another way is occasionally to pass steam in from one of the ordinary bronchitis or croup kettles, and this has the effect, at the same time, of moistening the air, and so tending to cause the skin to act.

There is another form of bath that is sometimes used, and is known as the Russian bath; but this is a much more trying form of bath than the Turkish. In the Turkish you have hot air, but it is dry; in the Russian bath you have steam. In some of the Russian baths on the Continent you have to go up a series of steps, and as you ascend the air gets hotter and
hotter, and sometimes, after you have got past the first or second step, you cannot breathe until you get a sponge dipped in cold water and hold it over your nose. Under the influence of the hot vapour, perspiration is brought on freely. After awhile you are taken out, and quite cold water is thrown upon you. In Russia, I believe, they throw some sort of cover round them, and have a kettle steaming underneath it. After getting themselves into a state of profuse perspiration, they are accustomed to rush out and roll themselves in the snow, and then go back again to where the steam is generated. This bath has much to recommend it, but it is more trying and much less agreeable than the Turkish bath.

Hot water taken internally frequently causes the skin to act very freely. Salts of ammonia have a powerful diaphoretic action, and one of the most common that we use is acetate of ammonia, which I have already mentioned as being a useful febrifuge. Another thing that sometimes tends to cause action of the sweat glands is alcohol in various forms, but the action of alcohol is much less than that of spirit of nitrous ether, which has simply the effect of dilating the vessels generally, but if the dilatation of some vessels is assisted by local applications, the nitrite affects them more than others. If we keep the skin warm, spirit of nitrous ether will dilate the cutaneous vessels, and will act as a diaphoretic; if the skin be cold, the nitrous ether will again dilate the vessels generally, but it will affect the vessels, not of the skin, but of the internal organs, and especially those of the kidneys. Thus more blood passes to the interior of the body, and less to the skin, and so, instead of increasing the secretion of sweat, the spirit of nitrous ether increases the action of the kidneys, and thus acts as a diuretic.

Pilocarpine is a drug which has the power of stimulating the secretion from the sweat glands, and it acts upon them frequently by stimulating the ends of the secreting nerves. It acts also upon other glands in the same way.

Antihydrotics.—We will now pass to another class of drugs: those that tend to stop secretion of sweat; and these are called "Antihydrotics" or "Anhydrotics." The secretion of sweat
sometimes becomes so excessive as to be exceedingly disagreeable to the patient, and you will find that many patients are under the impression that sweating is a very weakening thing. But you all know that if a man goes into the cricket field or on to the football ground and sweats profusely, it does not weaken him. If he be weakened at all, it is not by sweating; it is by the over-exertion which caused the sweating. Now, it is the same thing in disease. You will find that patients, and perhaps some doctors, are under the belief that sweating in phthisis is an exhausting thing. There can be no doubt whatever that if a phthisical patient awakes early in the morning sweating profusely, he feels very weak. But it is not the sweating that causes this; it is the condition of the patient that has led both to the sweating and to the weakness. Now, in order to understand why a patient should feel so weak, we had better consider why people sweat at all. Usually the secretion of sweat is started by stimulation of the nerves which supply the glands. The nerve centres from which the nerves proceed, and from which the stimuli to them originate, are situated in the spinal cord. One of the most powerful stimulants of all nervous tissue is a venous condition of blood, but ordinarily the part of the nervous system which is most sensitive to this stimulus is the respiratory centre in the medulla oblongata. As soon as the blood which circulates in the healthy medulla begins to become venous in the slightest degree, the respiratory centre responds immediately to the stimulus, the respiratory movements become deeper or quicker, the absorption of oxygen and elimination of carbonic acid are increased, and the blood is brought to its normal condition again. When the respiratory centre is dulled by drugs or by fatigue, it does not respond to the stimulus of venous blood, and you find that as the blood becomes more and more venous other centres get stimulated.

Perhaps the very best description that was ever given of the action of opium was written many hundred years before the Christian era by an old Greek, Nicander, of Colophon, who describes in most characteristic language how the opium caused the patient to become quiet, and how the movements of respiration became feeble, the red face became livid, and the
drops of sweat stood upon the forehead. If any of you have had occasion to watch a patient die, you will have noticed that the so-called death-dews, the drops of sweat upon the forehead, appear just at the time that the nails begin to turn bluish, and the lobes of the ears and lips become livid. The reason is that the respiratory centre is failing, and even the powerful stimulation it receives from the venous blood circulating in it is unable to bring it up to its normal activity; consequently the respiratory movements are not increased, and

![Diagram](https://via.placeholder.com/150)

**Fig. 134.**—Diagram to illustrate the action of antihydrotics. The secretory nerves passing to the sweat-glands from the sweat-centres in the spinal cord have been represented as a single nerve for the sake of simplicity.

the venous blood stimulates other nerve centres which are usually less sensitive to it than the respiratory centre is. Amongst these is the sweat centre in the spinal cord, so that in healthy persons in whom the respiratory centre is dulled by opium, or in dying persons, where the respiratory centre is failing, the increased venosity of the blood will bring on a profuse secretion of sweat. This secretion is due to stimulation of the secreting cells through their nerves, and is quite apart from any increased supply of blood. When a man is playing
in a football match or in the cricket field, the secretion of sweat is usually accompanied by a flow of blood to the skin which supplies the materials for the secretion of sweat, but this increased flow is not necessary, and the secretion may take place without it.

Now you can readily see that in ordinary people when they go to sleep the respiratory centre is no more feeble than the other centres, and so, although it may require a somewhat increased stimulus to act, yet it still retains its normal place in relation to other nerve centres, and will answer to the stimulus of venous blood sooner than they. But in a patient who is suffering from phthisis, where there has been a good deal of cough, and where the respiratory centre has consequently been undergoing excessive stimulation during the day, it will get more tired, and so during the night the respiratory centre may not react to the increased amount of carbonic acid in the blood in the way that it ought to do, and then the patient will awake sweating profusely. It occurred to me that if this explanation of the sweating in phthisis were correct, one ought to be able to stop the secretion of sweat, and also prevent the weakness which usually accompanies it by the administration of a powerful respiratory stimulant just before the patient goes to bed. I accordingly tried strychnine, which I thought ought to act, and I found that by giving it I could arrest the secretion of sweat in phthisis and stop the debility which usually accompanies it. At the same time, strychnine had a disagreeable action in this way: that its stimulating effect upon the respiratory centre remained during the day, and so, the respiratory centre being more easily acted upon, the irritation in the lungs caused more cough, so that, although the sweats were stopped, the use of strychnine was not without its drawbacks.
LECTURE 28.


GENTLEMEN,

At the end of the last lecture I told you that the administration of strychnine, or nux vomica, at bed-time stopped the night sweats in phthisis, but had the disadvantage of increasing the cough during the day. In order to lessen this untoward effect, I combined some opium with the strychnine, but upon the whole I did not find that even this combination was quite so useful as atropine, which is the drug upon which we chiefly pin our faith in cases of sweating in phthisis. Atropine has the most powerful action of almost any drug we know in stopping the secretion of sweat, because it paralyses the ends of the secreting nerves in the sweat glands, and in consequence of this the skin becomes completely dry. But atropine has another action: it is a central stimulant at the same time that it is a peripheral paralysant, and it stimulates the centre for respiration; it also lessens irritability of the nerves proceeding from the lungs to the respiratory centre. It is thus a very useful drug indeed in cases of phthisis, tending to lessen both cough and sweating. We generally give it in small doses in the form of a pill, and you will find that there is in our Hospital Pharmacopoeia a pill which is commonly prescribed in cases of night sweat in phthisis. This is the pilula atropinae,* which

* Atropine, gr. \( \frac{1}{10} \)
Spirit Rectified, \( \frac{1}{10} \) minim.
Liquorice Powder, 2 grains.
Treacle, a sufficiency.
contains only \( \frac{1}{10} \) th of a grain of atropine made up with rectified spirit, liquorice powder, and treacle. It does not matter very much how the pill is made up, but you should notice that the dose of atropine is a very small one. If you give more than \( \frac{1}{10} \) th of a grain you are apt to get disagreeable results, viz., the atropine, instead of limiting its action to the part of the body which you desire, acts upon other parts as well. In consequence of this, you get not merely stoppage of the sweat, but stoppage of the saliva, making the mouth dry and giving the patient great discomfort. The dryness of the mouth is not only uncomfortable, but it leads to a condition of thirst, so that the patient wishes to be frequently drinking. At the same time the patient may have a slight difficulty in swallowing. Sometimes you will notice that this small dose of atropine does not act the first night after you have given it, but you get the sweats stopping the night after. This would appear to show that the action of atropine is not due merely to a paralysing action upon the ends of the secreting nerves in the sudoriparous glands, because if it were so you ought to get the action of the atropine most marked within a few hours after it had been administered, and yet perhaps it is 24 hours afterwards that you get the action most marked. Therefore it seems that the action of atropine in stopping the secretion of sweat is not a direct one, but is rather an indirect one, and we may suppose that it is to a great extent due to a stimulating effect upon the respiratory centre. Whether this be so or not, there is one thing to be borne in mind, which is that atropine is the drug that you generally employ in cases of night sweats in phthisis. Many substitutes have been employed, but atropine still holds its own as being the most satisfactory. If you find that in certain cases the salivary glands are too much affected by it, so that you cannot stop the sweat without stopping also the saliva and rendering your patient very uncomfortable, you can have recourse to other drugs; that is to say, you may use such drugs as I have mentioned, a combination of strychnine and opium, or you may employ Dover's powder, which, although a sudorific in healthy people, tends to check night sweat in phthisis probably in the same way as the mixture of strychnine
and opium. The reason appears to be that in Dover's powder (compound ipecacuanha powder) we have a combination of opium with ipecacuanha, which, as you know, is an emetic, and powerfully stimulates the respiratory centre and the vomiting centre as well. In small doses ipecacuanha stimulates the respiratory centre, which is a part of the vomiting centre. When you give it in larger doses its influence spreads over a greater area in the medulla, stimulating the whole of the vomiting centre and causing brisk emesis; so that the active principle of ipecacuanha has got the name of emetin.

Another condition that is apt to bring about sweating, as everybody knows, is increased temperature. Now increased temperature in phthisical patients, as in others, is apt to bring about sweating, and it is just possible that in some cases you may find that the rise of temperature coincides with the sweating, or perhaps I should say that a pretty sharp rise of temperature precedes the sweating, and that the sweat brings down the temperature. In all those cases you must bear in mind that the sweat may to a certain extent be beneficial by allowing the excess of heat to be eliminated from the body by evaporation, and that the sweating is thus a natural termination to the fever which we frequently find in cases of phthisis; so that it is not advisable to check the sweating completely in every case. But you may check the sweating in such cases indirectly, not by giving a regular anhydrotic, but by giving an antipyretic, such as quinine. This will, in cases of phthisis where the sweating is severe and is preceded by a sharp rise of temperature, prevent the sweating by preventing the rise of temperature. Antipyrin or phenacetin may also be used for the same purpose.

Now it may seem here as if we were blowing hot and cold, because antipyrin and phenacetin are both powerful diaphoretics, and of themselves tend to cause diaphoresis in healthy persons, and yet you know they check sweating in phthisis. The reason is simply this: you are not giving those drugs in phthisis for their action on the sweat glands; you are giving them as antipyretics when the rise of temperature begins, in order to prevent it from rising so high as it would otherwise
do, and by thus checking the fever you prevent the sweating which it would induce. You, as it were, keep the temperature down by allowing gentle diaphoresis to go on for a length of time instead of allowing great sweating to go on for a short time. So that in cases of phthisis, or in cases of any other fevers, you may check the sweating by checking the rise of temperature.

Diuresis and Diaphoresis Complementary.—Now, as I mentioned to you before, the kidney and the skin have functions which are complementary to one another, because when one does a great deal the other does less, and if we can throw more work upon the skin, we throw less upon the kidney, and vice versa. The kidney has got a most important function to fulfil, because through it the products of tissue waste are chiefly eliminated. Of course we have a small amount of tissue waste eliminated by the skin. You do find a certain quantity of urea in the sweat, especially under conditions where the kidney is working insufficiently, but the amount of solids eliminated by the skin is small. The skin chiefly acts by eliminating water and by regulating temperature through the evaporation of this water. The function of the kidney is to eliminate water and the products of tissue waste. But it has not only to eliminate water and to eliminate solids: it has to eliminate them in varying proportions, regulated according to the needs of the body. Supposing a man is taking a walk on a hot day, the exercise of walking causes increased production of heat in the body, along with increased formation of muscular waste. Under such conditions, a good deal of water is necessarily lost by the skin in the mere effort of nature to keep down the temperature of the body. But if so much has gone off by the skin, and the supply of drinking water is scanty, so that he cannot get very much to drink, what is to become of his tissue waste? The muscles are doing three things. They are not merely conveying the man over the ground, but in the process of doing so they are generating an amount of heat which, if it were prevented from radiating or being conveyed off from the body in other ways, would raise the body to a fever temperature, and might kill the man. At the same time, they are
generating products of waste which, if they were to accumulate in the body, would certainly prove injurious. So he has to keep down the temperature, and this he does by the skin, by radiation and evaporation; he has to eliminate the products of his waste, and, as the skin does not do this sufficiently, he has to do it by means of his kidneys. But if he has little water, barely sufficient to supply his skin, and if his kidneys were to excrete a lot of water at the same time, the consequence would be that the man would soon become excessively thirsty, his tissues would be deprived of water, and he would become ill, or even die. To prevent such a catastrophe, it is necessary for the kidneys under such circumstances to excrete a large quantity of solids in proportion to the water. They have to excrete the solids, but they have to retain the water, and when you examine the urine passed by a man under such conditions you will find that it is high-coloured, of very high specific gravity, and contains an exceedingly large proportion of solids.

Let the same man take a walk on a cold winter's day. He loses much heat by radiation and conduction, does not require to lose much heat from the skin by evaporation, but he wants to get rid both of water and of the products of tissue waste. Let us suppose that just before he has started he has taken a good breakfast, including several large cups of coffee. He wants to get rid of the excess of water and tissue waste; the skin will not do very much to help him here, because it is a cold day, the evaporation from the skin is very slight, and the whole has to get out of the kidneys. Here, therefore, he has to pass urine containing not only a certain proportion of solids, but a large amount of water. Sometimes, therefore, a man has to excrete a lot of solids and little water, at other times a lot of water and little solids. Well, we have got a curious arrangement in the kidney for meeting these difficulties, but there is one more difficulty that the kidney has to surmount. I have spoken just now only of water and solids, but the kidney must not excrete all solids equally, for sometimes one kind of solid is in excess, and another is scanty. One day, for example, a man takes a lot of lemon squash, and in the lemon squash he has got a lot of citrate of potash. He is thirsty, and perhaps drinks a good
deal of it, so that he ingests a lot of potash. The kidney has to select from the salts brought to it by the blood and put out more potash than soda that day. Another day, instead of lemon squash, the man takes a lot of hot soup, and adds salt, i.e., sodium chloride, to it; that day he ingests more sodium, and the kidney has to make a different selection, and to pass out a larger proportion of sodium than of potash. The kidney, therefore, has to make a selection, sometimes to excrete much water, sometimes much solids, and at other times to make a selection amongst the solids. Not only has it to select between the different kinds of inorganic salts, but it has to select between the various organic products that are presented to it. So, you see, it is a very complicated function that the kidney has to perform, and we find that it has a very complicated structure. It will make the matter clearer to you if I give you a simple sketch. The artery conveying the blood to the kidney (Fig. 135) breaks up into a number of capillaries, and from these comes a vein. These capillaries seem to act the part of a large filter, and here, just as you would put an ordinary filter into a funnel, so this filter (the glomerulus) is put into a funnel, which is the capsule. From this we have a tube passing, which is elongated and narrow, so as to present a considerable resistance to the passage of fluid along it. Fluid is excreted from the capillaries of the glomerulus, and then passes along through the tube, but, as you see, there is a considerable resistance opposed to its flow, so that there is a good deal of time afforded for re-absorption of water in cases where this may be necessary. If the pressure be great the water will rush rapidly through, and there will be little time for re-absorption, so that the urine which will be excreted when there is a high pressure in the glomerulus and abundant transudation through its capillaries will be of low specific gravity, and will contain a large proportion of water and a small proportion of solids. But as the urine passes through the tubules the water is partly re-absorbed, and probably there is partly also an alteration in its composition from further excretion of solids as well as absorption of water. The two parts of the kidney have got a blood supply of different kinds. The blood in the glomerulus
has been altered in its composition by a lot of watery fluid exuding from it, so that the blood which passes out into the vein is very considerably more concentrated, and is somewhat different in its composition from what was present in the glomerulus. This venous blood goes circulating around the tubules of the kidney, and from the venous blood apparently substances are taken up by the cells of the tubules and excreted into the tubules, while, at the same time, it is probable that other substances are taken up from the tubules and returned into the venous blood. We have further in the vasa recta an arrangement by which both solids and water can reach the tubules, and thus supply material for secretion, or absorb from
them without going through the glomeruli at all. You see then, that in the kidney we have a complicated apparatus which excretes water when it is too abundant, and which retains water in the body where it is necessary, and yet allows of the solids passing out. We have at the same time an apparatus for the selection and excretion of solids.

**ACTION OF DRUGS UPON THE KIDNEY.**—Sometimes we wish to cause an excretion of water, and sometimes an excretion of solids; occasionally we wish to do both. The drugs which we use in order to cause increased secretion by the kidneys are termed “Diuretics,” and we have three classes of diuretics, just as you might expect, viz.:

1. Those which act upon the blood.
2. Those which act upon the circulation.
3. Those which act upon the tubules.

Naturally, one of the most efficient diuretics, through its action upon the blood, is water. If a man drinks a large quantity of water he is bound to pass a pretty large amount of urine. Sometimes the amount of water passed by a patient appears to be very greatly in excess of what he drinks. A patient of this sort was sent to me some time ago, and the doctor who had been attending him was much puzzled. The urine was certainly very watery, and the doctor found that, according to the statement of the patient and the patient’s mother, the boy was drinking somewhere about 20 ounces of water per diem, and that he was passing over 100 ounces. I told the doctor that the thing was simply impossible, and that the boy was trying to cheat. The doctor at first was disinclined to adopt this view, but there was no other way out of it. It was quite impossible that the boy could manufacture 80 ounces of water in his body daily, and so the doctor began to examine more closely, and he found out that the boy was simply trying to cheat both his mother and the doctor.

In addition to water, certain salts are useful as diuretics, and more especially salts of potash. The salts that are generally used are the acetate, the citrate, and the nitrate. The nitrate, as we will presently find, has an action upon the circulation as well
as upon the blood. Urea is a very powerful diuretic. We do not quite know how certain of our diuretics act, but there is no doubt clinically that small doses of calomel and a blue pill are occasionally very useful diuretics, and it is quite possible that they act indirectly upon the kidney through their affecting tissue change in the liver and producing substances which act as diuretics. Then we have a number of drugs which act upon the circulation, and you can readily see that you can increase the circulation of the kidney in two different ways. Firstly you can increase it by raising the pressure in the aorta as you can do experimentally by putting a ligature upon it or compressing it, or as you can do more easily, without any operation, by giving a drug which will contract the arterioles in the body generally. Thus more blood will be driven into the kidney, and the pressure in the glomeruli will be higher. In consequence of this, nearly all the so-called vascular and cardiac tonics which raise the blood pressure are diuretics up to a certain point, but if you push any one of them too far its contracting action upon the capillaries or arterioles will be manifested not only in the limbs and intestines, but in the

![Diagram](image-url)

*Fig. 136.—Curves showing the effect of erythropoiesis upon the blood pressure and secretion of urine. From "Phil. Trans.," vol. clxvii. At first both rise, but after a certain point, while the pressure continues to rise, the amount of urine secreted diminishes, and when the pressure reaches its maximum the secretion stops entirely.*
branches of the renal artery as well. It will cause the renal artery to contract until too little blood passes to the kidney to maintain the secretion of urine, and then the secretion of urine will be completely stopped exactly in the same way as if you had put a ligature around the renal artery. The renal artery, under ordinary circumstances, takes a great deal more blood to the kidney than the kidney requires to maintain the secretion of urine. If you put a clamp on the renal artery in a dog and tighten it gradually by a screw, no change takes place in the secretion of urine until you have got past the 1/16th of the ordinary diameter of the renal artery. It is 27 years since I saw the experiment, but if I remember rightly the calibre of the renal artery may be reduced to 1/16th before the secretion is much changed, and to about 1/4th before it is stopped.

Secondly, you can readily see that diuresis will likewise occur, if, instead of raising the general blood pressure and driving more blood into the kidney, you can dilate the renal arteries and induce more blood to flow into the kidney, while the general blood pressure remains much the same.

We increase the amount of blood going to the kidney either by driving more blood in under higher general arterial tension or by allowing more blood to flow in by dilating the vessels of the kidney, and so we get diuresis from two classes of drugs which have an entirely different action upon the circulation: we get diuresis from so-called cardiac and vascular tonics, which raise the blood pressure and drive the blood into the kidney; we get increased diuresis from vascular dilators, which lower the blood pressure generally, but dilate the vessels of the kidney, and allow more blood to flow in. Sometimes we get the best results in increasing the secretion of urine by combining those apparently entirely different classes of drugs. We may combine such a drug as digitalis, which contracts the vessels and drives more blood into the kidney, with such a drug as nitrate of potash or spirit of nitrous ether, both of which have the power of dilating vessels and by acting specially upon those of the kidney secure for it a larger amount of blood.
As I mentioned before, the class of cardiac tonics and vascular tonics is a very large one. We have belonging to it not only digitalis, but strophanthus, convallaria, adonis vernalis, erythrophleum, and a whole lot of others, amongst which I must mention more especially sparteine, because this is a drug which acts very much like digitalis and is contained in a very common diuretic, viz., broom-tops. There is another, soillain, the active principle of squill, which has a similar action, and squill is very often given in combination with digitalis as a diuretic in dropsy. Indeed, one of the most favoured diuretics in dropsy is a combination of digitalis, squill, and blue pill. The mode of action of the blue pill here, as I have said, we cannot exactly tell, but both blue pill and calomel have got a peculiar power of increasing diuresis.

Amongst those which attract blood to the kidney are the nitrites which all have the power of dilating vessels, nitrite of ethyl, nitrite of methyl, nitrite of amyl, nitrite of butyl, and so on. Nitro-glycerine has a similar action. The organic nitrite which is chiefly used is nitrite of ethyl in the form of spirit of nitrous ether, and it is one of our most common and valued diuretics. The nitrates seem to have a similar power to the nitrites. They do not act so powerfully, but they act for a longer time, and so we find nitrate of potash, which modern researches have shown to have the double action of affecting the composition of the blood and of dilating the renal vessels, has long been known as one of the very best saline diuretics.

Then we have another class of diuretics which seem to affect the secreting structure of the kidney. There is one drug which probably has a powerful action in two ways, and that is caffeine. You know that caffeine in its chemical composition is nearly allied to uric acid and belongs to the same chemical family. Caffeine, like urea, has a powerful diuretic action, and probably tends to act first of all, as a cardio-vascular tonic, and, secondly, upon the composition of the blood and probably also to some extent upon the kidney itself. It is found that caffeine has the power of causing an increased secretion of solids as well as of water from the kidney, and it probably causes this
both through its effect upon the blood-vessels and upon the tubules. It does not seem to cause any inflammation of the tubules. There are some drugs, however, which have an action upon the kidney corresponding to that of drastic cathartics upon the intestine. You will remember that a dose of croton oil given to an animal or a man causes great catharsis, and that if the animal be killed shortly afterwards the intestine is found to be very much congested. In small doses it produces diarrhoea, but in large doses it causes inflammation of the intestine.

**Volatile Oils.**—Now there are several drugs which have a similar action upon the kidney. They tend to cause increased secretion and diuresis in small doses, but in large doses they tend to cause inflammation of the kidney and complete stoppage of the secretion of urine. Amongst the most important of those are some of the volatile oils, and more especially oil of turpentine and the volatile oils closely associated with it, such as oil of juniper and oil of savine. Cantharides also has got a powerful stimulating action upon the kidney; it tends still more than oil of turpentine to cause inflammation of the kidney structure, with stoppage of the secretion of urine. It is frequently found that a combination of diuretics, like a combination of purgatives, acts better than any one alone, and we have in our Hospital Pharmacopoeia one which, you will find, is very useful indeed in cases of dropsy, viz., the Haustus Scoparrii Compositus.* You will readily see that if you wish to get a diuretic acting thoroughly well you had better mix together something to act upon the blood, something to act upon the circulation, and something to act upon the kidney structure itself. We have in the draught I have mentioned first of all the tartrate of potash, a saline diuretic, which alters the composition of the blood; next decoction of broom, which, as I have mentioned, contains spartein, which increases the flow of blood to the kidney; and last of all spirit of juniper, a drug which acts upon

* Potassii tartratis, gr. xx.
  Spiritus juniperia, m. xxx.
  Decocti scoparrii, ad 3i.
the tubules of the kidney, and which in a large quantity would give rise to inflammation of the tubules, but which in a small quantity appears simply to stimulate them to action, and so, under the influence of these three, we get a large secretion of urine taking place from the kidney.

Uses of Diuretics.—We use diuretics for the purpose of removing water from the body in cases of dropsy. The dropsy may depend upon either disease of the heart or disease of the kidneys themselves. Where it depends upon disease of the heart, we frequently find that the dropsy tends to disappear as soon as we can get the heart into a proper state, so that mere rest in bed, by restoring the balance of the circulation and allowing the veins to become emptied and the arteries to become filled, will often tend to make the kidneys act without any drug whatever. In such cases the recovery of the patient is greatly quickened by the use of cardiac tonics, such as digitalis either alone or combined with a cardiac stimulant such as nux vomica.

In other cases we wish to remove not merely the water from the body, but solids also, as, for example, in fevers. We then frequently give abundance of water, quite contrary to the old notion of restricting water, and we often give the patients a drink which is exceedingly grateful to them, and which, at the same time, tends to remove from the body a number of the products of nitrogenous waste which might otherwise tend to accumulate. I do not know how many years ago it is that this draught was first used, but people had no idea then how it acted; they only knew that patients liked it, and felt the better for it. It was called the “Imperial” Drink—Potus Potassii Tartratis Acidæ. It contains acid tartrate of potash 60 grains, a sufficiency of sugar, and boiling water. Put one or two fresh lemons in this, and stir occasionally till cold; then strain and give it to the patient. Here you observe we have acid tartrate of potash, which acts as a refrigerant, increasing the secretion of saliva, and thus tending to lessen the feelings of heat in the patient, as well as to lessen the thirst. At the same time it acts as a diuretic, and clears out the waste products which are apt to accumulate in the tissues from the high temperature.
There are certain adjuncts to the action of diuretics. Supposing that you have a patient with an abdomen which is nearly filled with fluid, what will be the consequence? One can see from the tight, shiny skin of the abdomen that the pressure which distends it is great. But this pressure, being due to fluid or gas, does not act only on the abdominal walls. It tends to act equally in all directions, and to compress the abdominal contents as well as distend the parietes. More especially the ureters will be compressed, and their walls so squeezed together that fluid will flow through them with difficulty. This will cause backward pressure all through the tubules, and thus restrain the secretion of urine (Fig. 137). Moreover, there will be pressure, not merely upon the ureter, and thus indirectly upon the kidney, but the pressure will be exerted directly upon the kidney itself, and will tend to squeeze the blood out of it and prevent the entrance of arterial blood into it, so that the secretion of urine will be mechanically arrested (Fig. 138 C). In such cases you may give digitalis and tartrate of potash, or nitrate of potassium and squill, or broom-tops until you are tired, because these things will not act in the face of mechanical pressure. In order to remove the mechanical pressure, you must first of all tap the abdomen and allow the fluid to run out, so as to lessen the pressure upon the ureter and kidney, and then you may expect your drugs to act. Even when we have no great pressure upon the tubules or upon the kidney itself, we may have backward pressure from the venous system (Fig. 138 B). Supposing that we were to tis
a vein as it issued from the glomerulus, the consequence would be that this vein would gradually get larger and larger, press more and more upon the arterial capillaries, lessen the flow through them, and thus diminish the secretion of urine.

Thus we find that in cases of bad cardiac disease, and especially of mitral regurgitation or mitral obstruction, the urine becomes very scanty, high-coloured, and very often contains a considerable amount of albumin. Now in such cases it may be necessary to lessen the congestion in the kidney before you can get your diuretics to act. We, therefore, very frequently employ adjuvants, one of the best being free purgation from the intestine, which tends not only to remove fluid from the

![Diagram showing venous congestion and obstruction of the ureter or tubules on the kidney.]

A, normal kidney, with artery in the centre of the hilus. The artery ends in a glomerulus from which a urinary tubule passes into the ureter, which is shown passing out of the hilus below the artery. The renal vein is shown above the artery in the hilus. B shows congestion of the vein, with consequent compression of the artery and tubules; C shows obstruction of the ureter and tubules.

abdomen, but to lessen venous pressure. The drug most commonly used is compound jalap powder, which contains acid tartrate of potash, jalap, and ginger. The reason for this combination I have already given (p. 410) when discussing the action of purgatives. Sometimes in place of this you may use elaterium, in the dose of $\frac{1}{4}$ th of a grain. Gamboge is sometimes employed, but very much less than jalap powder. You may occasionally lessen venous congestion in the kidney by altering the circulation by the application of a counter-irritant, such as a blister to the loins, or, still better, by dry cupping over the loins; but if the congestion be very great you frequently find good results by wet cupping over the loins.

**Albuminuria.**—In many cases we find that disease of the kidneys is accompanied by the presence of a large amount of albumin in the urine. We can often lessen this considerably by diminishing the amount of albuminous material that the
patient is taking, and, as I told you before, in cases where the kidney structure is very much gone, you must adjust the amount of proteid material that the patient takes to the level of the kidney; but where there is a large amount of albumin passing out through the kidney you must not cut down the proteid material too much, lest you starve the patient, lest you allow more albumin to pass away than he can supply by his food. In many cases we find that limitation to a milk diet is very useful, the lactose in the milk tending to act of itself as a diuretic, washing the kidneys out and lessening the congestion that might otherwise be there. We find, however, that, as a consequence of albuminuria, we are very apt to get general degeneration of the blood, a form of anæmia. Nor is this to be wondered at, because we find in albuminuria that one of the constituents of the body, the albumin, is slowly draining away. To make up for this, we are likely to have increased destruction of blood corpuscles. We get, as a matter of fact, anæmia resulting from albuminuria. We find also in many of these cases that, if we give iron, not only does the destruction of blood cease, and the patients begin to be of a better colour, but, for some reason or other, the albumin in the urine becomes diminished. One of the favourite mixtures in cases of albuminuria is acetate of iron with acetate of ammonia. The acetate of iron is frequently given with acetate of ammonia or with acetate of potash, both these drugs going very well with it.

Lithæmia.—In cases where small quantities of water are passed, there is a tendency for the solids to be deposited whenever the water cools, so that sometimes a patient passes urine which, although it may be perfectly clear at the time it is passed, becomes very turbid indeed so soon as it gets cool in the chamber-pot, and then a thick deposit of urates frequently falls. But sometimes the deposit falls before it reaches the chamber-pot. It falls either in the kidney itself or in the bladder, giving rise to renal or vesical calculus.

It is to be borne in mind that the most universal solvent in the world is water.

There are other things more powerful on certain occasions; nitric acid, for example, will dissolve copper or silver in a way
that water will not, but there are many things that nitric acid will not touch and water will. So that, in cases where you wish to get solution of a calculus or to prevent the deposition of a calculus either in the kidney or in the bladder, it is advisable to tell your patient to take a large amount of water. The water may be either hot or cold. Cold water is pleasanter in summer, but in winter and spring a large quantity of cold water is apt to lie heavy at the stomach, whereas, if you give it to the patient as hot as he can comfortably drink it, it is quickly absorbed and quickly excreted. Thus it tends to prevent the deposition of any solids in the urinary passages, or to dissolve any that may have been already deposited.

*Direct and Indirect Alkalies.*—In cases where the deposit tends to be of an acid nature, it is sometimes advisable to give with the water some alkaline substance. We have two divisions of "Alkalies"—a class of drugs which render the urine alkaline. Some of these are called direct, and others indirect, alkaline remedies. The direct ones are those which have a direct action both upon the gastric juice and upon the urine. As a good example we may take carbonate or bicarbonate of soda or of potash, which neutralise the gastric juice, and render the urine alkaline also. The indirect are those which have no neutralising action upon the juices of the stomach, but render the urine alkaline, and as an example of these we may take the citrates, acetates, or tartrates of potash, soda, or lithia. Although these are neutral salts, they undergo a change in the body, and become alkaline. Citric, tartaric, or acetic acids, when combined with a base such as potash or soda, become burnt up in the body, most probably in the muscles. Thus the neutral salt is converted into a carbonate, which, as you know, is an alkaline salt, and it passes out as a carbonate in the urine, rendering it neutral or alkaline. Sometimes alkaline bodies tend either to render the urine less irritating, or the bladder less susceptible to irritation. About the middle of last century a certain Mrs. Joanna Stephens possessed a secret remedy for stone, which was so celebrated, and was reckoned so valuable, that the British Parliament purchased it in 1739, for the public benefit, from the old woman for £5,000. When they had got the secret, this
valuable remedy was found to consist of calcined egg-shells, soap, and some aromatic bitters, so that its essential ingredients were neither more nor less than a little carbonate of lime with a little phosphate. In cases, therefore, of irritable bladder, where there is a stone suspected, along with a tendency to uric acid deposit, the administration of some lime-water or carbonate of lime may be useful along with carbonate of potash or soda. Although I have not yet definite experiments to bring forward in proof of my supposition, yet I suppose the reason of this to be that the lime in the process of excretion has a sedative action upon the bladder similar to that which it exerts on the intestine in cases of diarrhoea.

Hydrotherapy of Lithæmia.—There are certain waters which in one way or another are exceedingly useful in causing the stones to be passed either from the kidneys or from the bladder. There are two springs especially, one in France and one in Germany, to which it is the custom to send patients suffering from calculus in the kidney. The one is Contrexéville, and the other is Wildungen. Contrexéville is simply the centre of a large group of watering-places. Quite close is another one, Vielle, which, though it may be as good as Contrexéville and cheaper to live in, is a very slow place, and a little further off is a still slower place, called Martigny-les-Bains. Contrexéville contains chiefly an alkaline water, but there is a little iron present in the water both here and at Wildungen. The proportion of iron is very small, and I asked one of the doctors at Wildungen what action he supposed the iron would have. He said that, although he could not prove it, he thought that in cases where there was a stone in the kidney the iron tended to act as an astringent upon the walls of the ureter, and lessened any inflammatory or irritative thickening that had taken place in them, so that the stone slipped more easily into the ureter and passed more easily through it. Whether this be so or not, there is no doubt about the fact that both at Wildungen and Contrexéville patients pass stones to an enormous extent. I am always afraid of quoting the number of stones passed by one patient whom I sent to Contrexéville. I said one day it was 80, but in looking up my notes I found it was over 100 in less
than three weeks. They were naturally small, but still the number was very great. He seemed to have simply cleared out the pelvis of his kidney, and he remained perfectly well for two or three years afterwards. Then, having another slight attack, he went back to Contrexéville. There are certain drugs that are supposed to dissolve stones, but I doubt very much if there is anything that will dissolve them excepting distilled water or salutaris water, which is one of the best things you can make the patients drink, but what you have to attend to chiefly is that they drink a large quantity rather than any particular kind of water.
LECTURE 29.


GENTLEMEN,

In cases of renal calculus, where you are unable to persuade the patients to go to either of the places I have mentioned, you may gain very good results by allowing them to drink the Contrexéville or Wildungen waters at home, although this plan is not quite so successful. In addition to excessive concentration, there are two conditions of the urine which tend to bring on the formation of stone, viz., (1) excessive acidity and (2) alkalinity. The most important of all is a concentrated condition of the urine with very little water compared with the solids, and, as I mentioned before, one of the best remedies for removing a tendency to calculus is hot water. But in certain cases you find that the urine is excessively acid, and that there is a tendency to the formation not of urates, but of free uric acid, which is much less soluble in water than urates are. You can readily convince yourself of this fact by taking some urine containing uric acid, or even containing such acid urates as are usually deposited. Add to this a little liquor potassae, and you will find that the urine will clear up, the neutral urates being much more soluble than either the uric acid or the acid urates. You can see this taking place in a test-tube, and to some extent you can imitate it in the living body. When you get a patient who is passing a quantity of water containing a thick sediment, you can generally clear it up by administering to the patient
some alkali, and, as I mentioned before, you can give either
direct or indirect alkalies. The direct alkalies, such as liquor
potassae or the carbonates or bicarbonates of potash, soda, or
lithia, will neutralise any acid in the stomach as well as in the
urine, while citrates, acetates, or tartrates, which are indirect
alkalies, will not have any effect upon the gastric juice, but will
undergo combustion in the organism and be passed out as
carbonates, rendering the urine alkaline. In this way you aid
the solvent action of the water, and you prevent the deposition
of calculi, especially those consisting of uric acid.

Phosphaturia.—But there is another condition in which you
tend also to get deposition of calculi of another kind, and
that is when the urine has a neutral or even alkaline reaction,
for these phosphates become insoluble and are deposited as a
whitish sediment. Sometimes the acidity of the urine is so
slight that the deposition of phosphates takes place even in the
bladder, and many patients come to the doctor complaining
of this condition, and say that there is something very far
wrong with them, because they are passing water which looks
like milk, not after standing only, as urine containing urates often
does, but it has this appearance, and is quite turbid and thick,
at the moment that it is passed. Now many people believe
that this deposition of phosphates depends upon the presence
of an increased quantity of phosphates in the urine. This is
not the case at all. In many such instances the amount of
phosphates is actually less than normal, but they are deposited
because the acidity of the urine is less than normal, so that the
phosphates are no longer kept in solution. Here again you can
dissolve these phosphates in a test-tube by simply adding a drop
or two of acid, but it is not so easy to imitate this process in
the living body. It is perfectly easy to render an acid urine
alkaline, but it is by no means easy to render an alkaline urine
acid. Frequently this condition is more or less of a normal
process. In very many people during the process of digestion
so much acid goes into the stomach to dissolve the food that the
corresponding amount of alkali which goes back into the blood
increases its alkalinity so much that the urine which is secreted
from it becomes alkaline (Fig. 139). This phase has been termed
the "alkaline tide." You will frequently find the urine passed by healthy people a couple of hours after a meal quite neutral or even alkaline, and during digestion there is very apt to be a deposit of phosphates in the urine.

![Diagram of stomach](image)

**Fig. 139.**—Diagram to illustrate the chemical change during secretion.

You can easily see that, if the acid which has been poured out into the stomach during digestion is not readily re-absorbed, you are likely to get a more or less persistent condition of phosphaturia, and if the urine is not simply alkaline during digestion, but remains persistently so, then you look to the stomach to see if it is all right, and very frequently you find that it is dilated. If you can bring about a healthy condition of the stomach, you are likely to bring about a healthy condition of the urine. Very often attempts are made to remedy phosphaturia by the administration of mineral acids, but, as I have said before, it is by no means easy to render an alkaline urine acid. The difficulty is that, if you try to give mineral acids in sufficient quantity to make the urine acid, you are apt to damage the stomach in your attempts. One of the commonest mineral acids that is given for this purpose is phosphoric acid, because it may be given in larger
quantities than nitric or hydrochloric acid, without having any injurious action upon the stomach itself. The dose of phosphoric acid is generally 20 minims freely diluted either immediately after food or between meals. Another drug that is frequently employed, however, is benzoate of ammonia. Ammonia differs from soda and potash in this very important respect: that, though all three are direct alkalies and neutralise acid in the stomach, the salts of ammonia do not render the urine alkaline. On the contrary, they tend rather to increase the acidity. It is said that although a great portion of the nitrogen in ammonia is converted in the body into urea, yet a small portion becomes further oxidised and passes out in the urine as nitric acid. Benzoate of ammonia, therefore, tends rather to render the urine acid. Benzoic acid passes out in the form of hippuric acid, and so benzoate of ammonia is frequently used to render alkaline urine acid. More especially is this the case when we find that the alkalinity depends upon some local change in the bladder. In cases of chronic inflammation of the bladder with decomposition of the urine, the urea is very apt to be changed into carbonate of ammonia, and thus to render the urine alkaline, and in such cases the administration of benzoate of ammonia by the mouth is often employed, because the hippuric acid probably has a slight antiseptic action and is therefore useful.

A chronic condition of phosphaturia frequently occurs in persons who are debilitated. You can readily see that if the body generally is weak the re-absorptive powers of the stomach and intestine will also be weak, and so the acid, which is formed and poured into the stomach during the process of digestion, will remain in it and will not be re-absorbed. Consequently you may find that simple exercise without fatigue will greatly help people who suffer from chronic phosphaturia. It is a condition that is by no means uncommon amongst students, because very often during a great part of the day they are sitting in lecture-rooms, or attending in the operating theatre, or working in the anatomical rooms, and thus they get very little exercise. Frequently you will find that many of them pass in the middle of the morning, about two hours after breakfast, a
urine which is almost like milk when voided, and yet those same men are suffering from no disease whatever, and when they get a little more exercise they are all right. The same thing is often observed in young men who are confined in merchants' offices, or bank clerks, or those engaged in any such sedentary occupation; so that a condition which may be termed an exaggerated normal phosphaturia is very common indeed. It gives rise to a great deal of unnecessary mental discomfort, and very often leads men to believe that they are suffering from a serious disease when there is no real disease whatever. A little exercise in the open air will generally put a stop to the trouble, but if the person so suffering is unable to take open-air exercise vigorous exercise at home with light dumb-bells or light Indian clubs will probably answer the purpose. The exercise, however, should not be carried to such an extent as to fatigue the patient, because fatigue tends to increase the general weakness and thus to make the condition worse.

Effect of Diet.—You may also do a good deal to remedy this condition by means of diet. I daresay many of you have noticed that a horse's urine is almost invariably turbid when passed, whereas a dog's urine is almost invariably clear, and yet the dog's urine contains probably a very much larger proportion of solids than the horse's. But then the dog's urine is excessively acid, so that when passed warm it leaves no deposit; whereas the urine of the horse is generally alkaline, and so the urine is turbid from phosphates. This difference in the urine depends in great measure on the difference of food, and not merely on the difference of animal, the horse being herbivorous and the dog being to a great extent omnivorous. I say "to a great extent," because dogs generally get a certain amount of meat, although they are often fed partially upon farinaceous food. From a farinaceous and plant diet you get a larger quantity of phosphates and a less amount of acid, and so a person who is suffering much from phosphaturia should be induced to diminish the amount of vegetable and to increase the amount of animal food. On the other hand, if the patient is suffering from excessive acidity of the urine it is necessary to limit the animal food and increase the amount of vegetable food.
We often find that this exerts a most beneficial influence upon the secretion of urine, and thus tends to prevent the deposition of gravel or calculi in our patients.

**Action of Drugs on the Bladder.**—The bladder, which serves as a receptacle for the urine, deviates from the normal mainly in two directions, viz., (1) paralysis and (2) increased irritability. We sometimes find that patients have difficulty in passing water. This may be due to paralysis from over-distension. If you blow up an indiarubber ball you all know that after you have distended it beyond a certain point it loses its power of contraction, and the same thing occurs with the bladder as well as with another important viscus: the stomach. When either is distended too much it tends to lose its power of contracting, and to remain more or less permanently dilated. In such a case as this it is generally requisite to remove the urine by means of a catheter. But occasionally, even in apparent health, a man may lose his power of passing water, and this loss of power is of nervous origin, and frequently occurs in nervous people. I think it was Sir James Paget who very aptly applied to the condition the term of "stammering bladder;" just as a stammering tongue is unable to get out the words, so the stammering bladder is unable to extrude the urine. Curiously enough, one is often able to help this condition very easily. Suggestion has a great power of acting upon the bladder, and many men who can pass urine perfectly well if they are left to themselves cannot do so in the presence of others. If they are hurried, they very often fail to pass urine, and so it not unfrequently occurs that men whose bladders have become distended during a railway journey jump out at a station and try to pass water, but try in vain; so that they have to jump in again without being able to empty their bladders at all. Now, if you are engaged in life assurance work, you will find the same thing happening. The proposers come to you and wish to insure their lives. It is often of great importance that you should get a specimen of the urine at the time, because without having the urine you cannot complete your report upon the patient's life. In such cases, and in all others where there is a difficulty in passing water, it is useful to remember
that there is a plan which has the same effect upon man that whistling has upon horses. You know that grooms constantly whistle to horses when they want them to pass water, and if you make a noise somewhat similar to that produced by the water as it falls from a man’s penis into a urinal, you may get him to pass water. This plan is more than a century old. It was adopted by the famous Dutch physician Boerhaave. It was before the days of taps, and he used to have a screen in his consulting room, and behind this was a tall footman with a jug of water and a basin, who was instructed when the patient could not pass water just to allow the water to drip into the basin. If you can continue to make this sound in a patient’s ears, leaving him all the time to himself, he will generally be enabled to pass water; and it is a great blessing to many a railway traveller that the railway companies have in many stations put up perforated pipes, the running water from which not only flushes the urinals, but helps the hurried traveller to urinate. You must remember also what I have just mentioned, and leave the patient to himself, because if you stand beside him while the water is flowing very likely he will not be able to urinate, but if you leave him to his own devices, and allow the sound of the running water to fall upon his ears, he will do so without difficulty. There are some patients in whom the mere idea of the sound of a waterfall tends to bring on the evacuation of urine, and the application of cold water to the hands has a similar effect; so that in lavatories men usually pass water before they wash their hands, both for the sake of cleanliness and because if they were to wash their hands while the bladder was full the mere feeling of the cold water upon the hands would bring on the desire to evacuate the bladder in the middle of the operation of washing their hands. In cases where these means are insufficient, you sometimes are able to attain the object you wish and get the bladder evacuated by applying a hot sponge over the perineum in men or over the vulva in women. Sometimes in place of the hot sponge a hot hip-bath is even more efficacious, and when these means fail you have, as a rule, recourse to the mechanical removal of the urine. But there are many cases in which you wish to
avoid the mechanical removal of urine by every means in your power. For example, in cases of hysterical retention of urine you wish to do your very best to avoid introducing a catheter; and in cases of enlarged prostate it is a great boon to the patient if you can enable him to micturate without the use of a catheter.

Another condition which is just as troublesome as retention is diminished power to retain. Some patients suffer from irritability of the bladder, and in others we find absolute incontinence. Irritability of the bladder may depend (1) upon a condition of the nervous system, or (2) upon the composition of the urine, or (3) upon the condition of the bladder itself and the nerves which are contained in it. There are many people who suffer from a tendency to irritable bladder under precisely those circumstances where they know they cannot make water. So long as they know they can evacuate urine at any moment they are all right, but the moment they are shut up in a carriage, church, or theatre, and know that they cannot do so, the desire comes on at once. In such cases it is evident that the desire is purely a nervous one, and men can train themselves out of it by resisting the desire. There is no real definite substratum for the disease; it is not necessary for them to evacuate the bladder, and if they simply resist the desire several times it tends to pass away, and they get back into the normal condition.

_Increased Acidity._—In patients where there is an actual alteration in the condition of the urine or bladder this is not the case. Generally the condition of urine that brings on this increased desire is excessive acidity, or the presence of a large proportion of salts in the urine. Excessive acidity is a very common cause, and this may be counteracted by alkalies, either direct or indirect, such as I have already mentioned. In cases where a large proportion of salts is present this is easy to remedy by allowing the patient to drink more water; and although at first you would imagine that taking water would be likely to increase the frequency of micturition, it is not always so. A gouty patient comes to you and complains of a tendency to pass water very frequently, and you tell him to drink Vichy water in larger
quantities than he has been accustomed to take. Although you thereby increase the amount of water that he actually passes per diem, you lessen the number of calls to micturition, for the urine becomes less irritating to the bladder, and consequently the patient is able to hold a larger quantity of water at a time, and does not micturate so frequently. There is another point I should mention in cases of gout. You may find that the calls are very frequent, and even that the use of alkalies does not seem to lessen them to the extent you desire, but in some of those cases you may find that anti-gout remedies, such as piperazine, will tend to lessen this irritability of the bladder, and I have known it succeed when other things have failed. You may, of course, try also such substances as salicylate of soda, especially when combined with sedatives which act upon the bladder, such as belladonna.

_Vesical Catarrh._—Now another condition in which we find irritability of the bladder is catarrh of the bladder, where there is inflammation of the mucous membrane; and here we try to do two things: we try to restore the mucous membrane of the bladder to a healthy condition, and we try to lessen the irritability of the nerves in the bladder itself. We restore the healthy condition of the mucous membrane by piperazine, which will tend to remedy a gouty condition of the system, and by such drugs as benzoate of soda or of ammonia, which will tend to render the reaction of the urine more natural. We give also astringents of various sorts, such as pareira, buchu, and uva ursi, and many others containing a certain amount of tannin. Substances having an antisepic action are frequently useful, such as carbolic acid in small quantities, salicylic acid, or salicylate of soda and salol. Salol is an exceedingly useful substance, because it is split up, as I have told you before, in the intestine into salicylic acid and phenol, both of which are useful antisepsics. In cases of catarrh or of acute inflammation also we lessen the irritating qualities of the urine by diluting it by administering either hot water, or, what is more often used in its place, barley-water, or linseed tea. In cases of inflammation of the bladder linseed tea is a very favourite remedy. I really do not know whether linseed tea has any
more sedative action upon the bladder than plain water has. It is usually imagined that the mucilaginous part of the linseed is absorbed, that it passes out in the urine, and that it has a similar soothing action upon the bladder and upon the urethra to that which it has upon the throat. This is highly doubtful, but, notwithstanding, the practice of using linseed tea is a common one, and it really seems to answer as well as anything else, so, perhaps, there may be some reason for its general adoption.

**Incontinence.**—Another very troublesome condition is incontinence of urine, inability to hold water. This is by no means unfrequent in children. They often hold water well enough during the day, but when they are put to bed at night the bladder evacuates itself, the bed is wet, and there is a great deal of discomfort both to the child and everybody concerned, and naturally mothers are very anxious to stop this. Now there are various means for trying to stop the condition, and you may find it necessary to use every one of them that you know, because occasionally incontinence of urine is a thing that is very troublesome indeed to treat, and may continue in spite of all your efforts. First of all you try to get the bladder empty and keep it empty. The mother must make the child pass water before it is put to bed; it should then be awakened about an hour afterwards and made to pass water again. It has been supposed by some that incontinence of urine is really a form of epilepsy. It takes place generally during the first hours of sleep, and if you get the child past midnight without having evacuated its bladder, it will probably be all right till morning. You may give bromide of potassium as a remedy to the child, and you sometimes get benefit from it, but the drugs that seem to be most useful are belladonna and cantharides. Now those two drugs possess an entirely opposite action: belladonna tends to act as a sedative to the bladder, lessening its irritability; cantharides acts as a stimulant to the bladder, greatly increasing its excitability. Here again it would seem as if it were perfect nonsense to attempt to treat a condition by two entirely opposite remedies, and yet practice shows that they both are successful in many cases. Now the explanation of that is, we
have two different organs to deal with, or parts of organs. At the neck of the bladder, where it opens into the urethra, there is a sphincter, and in the fundus of the bladder itself there are a number of involuntary muscular fibres (Fig. 140), the contraction of which tends to expel the urine. They can hardly expel the urine if the sphincter is contracted, but when the sphincter relaxes, the urine will almost run out without any exertion on the part of the bladder, the mere pressure of the abdominal walls tending to press it out. But when the sphincter is contracted, the fundus of the bladder may contract as much as ever it can and yet not a drop of urine will pass. Now you can see that if the sphincter is insufficiently stimulated, it will remain more or less lax and will allow the urine to run out, but if you can stimulate it it will contract, and then you will stop the incontinence.

Cantharides has apparently the effect of stimulating the whole bladder—both the fundus and the sphincter—and so, although if cantharides acted only upon the fundus, it would tend to cause increased expulsion of the urine, yet by stimulating the sphincter it tends to cause retention, and thus, by giving it to a child that is suffering from incontinence, you may find that you cure the condition. On the other hand, you can see that if the fundus is contracting too strongly while the sphincter does not contract proportionally, you will have the urine expelled, and if you can give a drug which will lessen the irritability of the fundus without lessening too much the excitability of the sphincter, you will again relieve the condition, and this is apparently what belladonna does. It lessens
the irritability of the bladder, so that there is less expulsive tendency, and by using this drug or cantharides incontinence of urine is very often cured. You must, however, note that if you are using belladonna you must push it until the patient shows symptoms of poisoning. You may cure your patient before you do this, but you must be prepared to give the drug until the condition is either cured or until the patient’s pupils are dilated and the mouth excessively dry. I well remember the case of a lady who had suffered for many years from incontinence of urine. Her husband was the Director of a very large and important hospital, and she had consulted many doctors. I asked her husband when she came to me whether she had been poisoned with belladonna. He said “No, she has never been poisoned,” so I said that we must push the drug until she was either cured or symptoms of poisoning appeared. It was not necessary in her case to bring on the symptoms of poisoning, for although we gave her much more belladonna than she had ever had before, the disease was cured before they appeared. The failure in her case on previous occasions was simply due to the drug not having been pushed far enough.

**Action of Drugs on the Urethra.**—We find that in the urethra there are various abnormal conditions, especially those of irritation and of inflammation. In most cases of inflammation of the urethra there are organisms present, the gonococcus being the most frequent. In order to cure the inflammation we have first of all, if possible, to destroy the infective organism, and this is done either by medicines given generally or given locally. Two of the most common drugs which are usually given for this purpose are copaiba and cubebs. Sandal-wood oil is another drug that is very frequently employed. All these contain volatile oils, and some also resins, and both the volatile oils and the resins appear to have an antiseptic action. They are excreted in the urine, and the consequence of their administration is that the urine from the kidney downwards to the meatus becomes aseptic. The germs become destroyed by the products of the volatile oils as they pass out. Local antiseptics may also be used, such as solutions of carbolic acid, weak solutions of permanganate of potash, solutions of boric acid, and so
on. Besides this we wish to exercise also an astringent and sedative action upon the inflamed, irritable, and thickened mucous membrane, and this is generally done by means of astringent injections, one of the most common containing a mixture of opium and lead. Another very useful one contains a mixture of acetate of lead and sulphate of zinc. We have in our Hospital Pharmacopoeia several of these injections.* An old-fashioned one, which is exceedingly useful, contains a mixture of acetate of lead and sulphate of zinc, and this seems to be an entirely unchemical and unreasonable composition, because a double decomposition takes place between the ingredients, and sulphate of lead is thrown down in a thick, white, smeary mass; but in reality this is not at all an objection to it, as the solution of acetate of zinc which is formed is a very powerful astringent, and the sulphate of lead which is precipitated appears to have a local sedative action, the fine powder, or rather paste, tending to keep the sides of the inflamed urethra apart from one another. This has been imitated by the use of China clay or kaolin, the action of the sulphate of lead or kaolin on the urethra being precisely the same as that of the powder which is used in dusting babies to keep the folds of skin apart from one another and thus prevent irritation. In our Hospital Pharmacopoeia we have the compound zinc lotion containing a grain of sulphate of zinc, one of acetate of zinc, ten minims of tincture of catechu, and liquid

* Lotio Calaminæ Co.
  Calaminæ Preparata, ʒii.
  Zinci oxidi, ʒii.
  Liq. plumbi subacetatis, ʒi.
  Glycerini, ʒi.
  Aq. calcis, ad ʒi.

Lotio Zinci Co.
  Zinci sulph. gr. i.
  Zinci acetatis, gr. l.
  Tinct. catechu, ʒr. x.
  Extr. opii liquid, ʃ xxx.
  Aq. destillatæ, ad ʒi.

Lotio Zinci sulphocarbolatia.
  Zinci sulphocarbolatia, gr. iv.
  Aq. destillatæ, ad ʒi.
extract of opium. Here we have the action of the zinc and catechu as astringents and the extract of opium in lessening irritability.

**Action of Drugs on the Genital Organs.**—We may pass on now from the urethra to the genital organs in general, and we have first to take up the effect of drugs which lessen the sexual desire. The centre for the sexual organs is situated in the lumbar portion of the spinal cord (Fig. 141), and it may be excited either from the brain or reflexly by the genital organs, or from other parts. Frequently the sexual desire becomes abnormally strong, too strong indeed for the conditions under which the patients are placed; so that it becomes disagreeable, and may even be dangerous, leading them into habits that may be very injurious. Now, in order to lessen the sexual desire, we may lessen those things that are likely to excite it by lessening the irritants. We may lessen those that pass from the brain. For example, the desire may be excited by various thoughts, by books, by pictures, and so on. We lessen these stimuli by the avoidance of all such things, and we try to drive away these ideas by directing the brain to other things. We may lessen also the
sexual desire by taking care that there shall be no irritant applied to the genital organs. Occasionally an unsuspected irritant may be the presence under the prepuce of smegma that has become partially decomposed, and yields irritating organic acids. This may simply act as an irritant by itself, or it may bring on a condition of irritability in the mucous membrane which may persist after the irritation has been removed. If a condition of eczema be present it becomes still worse, because eczema is frequently associated with intense irritation and a desire to scratch or rub which is almost irresistible; and I believe that many cases which have been put down in history to unconquerable and extraordinary viciousness are simply due to eczema. In one's schooldays one used to read of Messalina and Agrippina, and of other Roman Empresses whose behaviour was simply scandalous. Now in the case of Agrippina, who used to leave the Palace of the Caesars and go to the brothels of Rome and stay there all night, having coitus with anyone who cared to come, it is obvious that the condition was not one of health, it was one of disease, and it is by no means improbable that both she and Messalina suffered from eczema of the vagina; and if they had been treated by vaginal douches of lead and opium they might possibly have remained respectable members of society, instead of being held up for the opprobrium of the world throughout all ages. This is a condition that patients will not often mention. It is only now and again that you may learn that such a condition does exist, and that the irritation in the vagina is so great as to bring on a desire either to have coitus or to rub the part, which is irresistible, and drives the poor woman nearly mad. In some cases I believe it does drive them mad, and that there are cases of suicide which are simply due to this condition. It is one, therefore, that you have always to keep your eyes open to, and in such cases you must treat the condition as you would treat eczema in any other part of the body, by soothing lotions or by soothing ointments. At the same time, you must bear in mind that eczema; wherever it be situated, is to be treated not merely locally, but generally. If it comes on in a gouty patient, you have to treat the gouty condition generally by baths, mineral
waters, alkalies, and other anti-gout remedies, telling the
patients at the same time to be careful of their diet, because in
many of those cases you may find that the irritation is
increased by various articles of food. For example, a large
amount of meat will frequently increase it, whereas if the
patient be put upon an almost vegetarian diet it will decrease.
Certain articles even of vegetarian diet do not suit, such as
sugars and certain fruits, and the patient must find out for
himself or herself what articles of diet seem to disagree, and to
bring on this condition of excessive irritability. In certain
warm countries, to avoid the local irritation that would be
caused by the accumulation of smegma, the practice of circum-
cision has been adopted; and even in circumcised persons it
has been found that, unless careful attention be given to
washing the penis, that much irritation may occur; so that
in Mohammedan countries men are obliged to wash the penis
with water if they can get it, and with sand if they cannot.
Another source of irritation may be not from the outside, but
from the inside of the penis, because irritation in the mucous
membrane of the urethra also tends to excite the sexual desires
reflexly; and so if the urine be excessively acid it tends to
excite these desires, and they may then be lessened by
diminishing the acidity of the urine by alkalies. It has been
stated also that certain salts, such as nitrate of potash and
chlorate of potash, cause such irritation of the mucous
membrane as to lead to the desire to rub the parts and to
induce boys to masturbate. One must, therefore, be careful
to avoid large doses of chlorate of potash or nitrate of potash,
especially with too small a quantity of water, because if these
salts be freely diluted they are not likely to cause any such
irritation, and so they are not likely to lead to any bad results.
I think I have already mentioned that chlorate of potash in
large doses has the power also of disintegrating the blood, and
leading to hæmatinuria, the broken up corpuscles passing out
in the urine. When the drug has been pushed to this extent
the condition of the patient is a very dangerous one, for it
shows that the drug has been given to such an extent that
recovery from its effect is very likely not to take place.
Other sources of irritation may be present in the stomach or in the intestines. Before passing to the stomach and intestines, I ought to mention also that another condition of irritability may occur outside the scrotum from eczema occurring there, and that in such cases it is well to treat the patient by putting on something that will keep the surfaces of the skin apart. This is a condition that leads to a great deal of discomfort in patients, because the irritation from the eczema is such that he cannot sleep. The easiest way of treatment is just to keep the scrotum and penis apart by means of a piece of lint about 2 or 2½ feet long and 4 to 6 inches broad, of the shape which I show you, and which is put between the legs. The penis and testicles are introduced through the hole and then the lint is fastened to a broad piece of tape or something to go round the middle, and in this way you get the penis and testicles on the one side of the lint and the skin of the thighs on the other, so that the skin of the scrotum does not come into contact with the skin of the thighs. In many instances you are able to give great relief to your patients' sufferings. When there is great irritation you can, with advantage, apply to the parts either a dusting powder, such as Fuller's earth, oxide of zinc, or carbonate of zinc, or an ointment such as ointment of zinc.

You are very likely to be asked by patients in regard to seminal emissions. Now these, as you know, but many of your patients do not know, are a normal condition. The rectum usually is evacuated once a day, the bladder is usually evacuated three or four times a day, and the seminal vesicles into which the testicles are constantly secreting semen, as they do in young men, require to be evacuated every now and again. The evacuation usually takes place once or twice a month.
There is in man, just as there is in woman, a regular rhythm, and men generally have a monthly period just as women have, but very frequently in man the period comes not once a month but twice a month. Now at their period men have an evacuation from the genital passages just as women have, and this usually takes the form of an evacuation of semen during the night. The seminal vesicles, as you know, are lobulated and there are two of them, so that occasionally both vesicles may be completely evacuated at once in a large evacuation, or one vesicle may evacuate itself one night and another the next night, or you may have several small evacuations, each of the lobules having evacuated themselves at different times. Now a great deal of harm is done to patients by a number of quack books which say that this natural evacuation is abnormal, and that it will bring on weakness, imbecility, and finally dementia and all the rest of it. One of your functions will therefore be to tell your patients that all this is perfect rubbish, and you may do them a great deal of good by simply easing their minds. At the same time there is a spermatorrhœa just as there is a diarrhoea, and the seminal vesicles may evacuate themselves too often. Now there is also a condition which gives rise to a great deal of panic on the part of many patients, and that is that during defaecation some semen or prostatic fluid passes out from the urethra. It would be a wonder almost if that were not so, because, as you know, the seminal vesicles lie right in front of the rectum, and if a hard scybalous mass is passing through the rectum it is very likely that some of the fluid contained in the vesicles will be forced out by the mere mechanical pressure. Here again what you want to do is to keep the patient's mind easy, and to keep the bowels open so as not to allow the pressure of the hardened mass to come upon the seminal vesicles.

Just as the prostatic fluid may be pressed out mechanically, so we may have irritation of the sexual organs reflexly from the intestine, and this may occur from the presence of ascarides in the rectum or from the presence of eczema or pruritus round the anus, or from the presence of piles. Moreover, we may find that the mere distension of the intestine by flatus may bring on
evacuation of semen, or may bring on erections. Erections occur during the night either with or without evacuation, and may sometimes be treated by the very simple plan of giving the patient at night before he goes to bed some bicarbonate of soda, with perhaps some gentian, rhubarb, and a little nux vomica. The nux vomica appears to be useful here, and yet it is one of the drugs that you require to be careful of in treating cases where there is any sexual irritability, because *per se* it tends to increase the sexual excitability. It is a powerful aphrodisiac, and sometimes you find that its exciting action upon the sexual organs prevents you from using nux vomica, or strychnine, as a general tonic. You give your patients strychnine, or nux vomica, and expect them to come back and tell you they are feeling stronger and better; but, on the contrary, they come back and tell you they are feeling miserably ill. Then if you make inquiries you find that it has excited their sexual passions, and the consequence has been that they have had spermatorrhœa, and they are feeling very much worse than before. Yet when given at night it may be very useful in checking erection, but its action then is not upon the genital organs; its action is in tending to prevent distension of the intestines by gas. By keeping the bowels free from irritation by faecal matters or distension by gaseous products we may reduce the chance of irritation of the genital organs during the night. Besides this, we may lessen the excitability of the nervous centres generally to stimuli, and this may be done by directing their forces in other ways. Many of you know that the athletes of ancient Greece during the period of their training for the Olympian games were nearly impotent; that both sexual desire and sexual capabilities appeared to have gone during all the time they were in training, although both might return almost immediately after the games were over. The whole energies of body and mind were devoted in these men to the training of their muscles so that they might gain the prize either for running, wrestling, throwing the discus, or anything of that sort, and so there was no energy, either bodily or mental, left for expenditure in the way of sexual congress.