capacity, viz., the full number of cubic inches possible to be expelled from the lungs after a forced inspiration, while the manometer records the elastic tension which the air cells will stand under a forced expulsion of air from the chest, as compared with the average of a healthy man.

For one in health, the record at which the column of mercury can be held is about 100 M.M. of mercury.

This spirometer is purposely made to weigh very little, the light top of a cylinder, into which the air is breathed through the tube, being connected to the base by delicate impervious cloth in one piece. The size of this cylinder is so arranged that each rise (of the top) of one inch represents 100 cubic inches of air contained therein, and this record is plainly shown by the movement of the recording rod attached to the top of the cylinder.

In the address of the President of the American Climatological Association in September, 1890, this spirometer was brought to notice in connection with a study of the different "air pressures within the chest, due to disease." On that occasion and since, I have demonstrated the lack of a just appreciation among physicians of the worth of the spirometer.

In my report on the tuberculin treatment of consumption, made to the Colorado State Medical Society in June, 1891, I formulated some rules by which a proper ventilation of lungs can be known to exist, in order that that mode of treatment may be successfully combined with the *high altitude* cure of consumption.

In brief, nature's method of attempting a cure of lung tuberculosis by the healing means of fibrous deposit, may and often does so shut up an affected lung as to preclude its proper ventilation, which is a necessary prerequisite to the use of "Koch's" lymph. While the patient's record with the manometer approximately shows his respiratory vigor, and the amount and strength of this new elastic tissue, it is the spirometric reading combined with the bilateral measurements of the chest, which will give the valuable information desired, viz., when and how far this process of shrinkage or hardening has been established.

If the normal spirometrical record for the patient's height is only one half reached, and the movements of the two sides are as one to two, then (without some compensation from the good lung) the ventilation of the affected lung must be about nil. It is practically as bad as though there were no expansion at all of the affected side, which would surely indicate that all of the one half reduced spirometrical record in this case, came from the unaffected lung.

By "without compensation" [which, however, is probably a false supposition], is assumed to mean that the unaffected lung does its full share as in health, viz., the one half of the normal. With compensatory help from the good lung, however, the affected lung could be said to be doing from a little, up to one third, of one lung's share, or one-sixth of what the two lungs together ought to do in health.

Assuming that the above table of Hutchinson's is correct, and making the little allowance needed for the slight natural differences for the use of the two lungs in different people, and the movements of the diaphragm in respiration, then it can be asserted with much accuracy that lesser variations in the above measurements, indicate proportionately less want of ventilation in the affected lung.

To obtain accurate bilateral measurements for comparison with the spirometrical record, a good way is to mark on the patient's chest, the middle line of the sternum, and then holding, or having some one else hold the steel tape measure against the spine of the opposite vertebra, use this line as a guide in determining the difference between a forced inspiration and complete expiration on the two sides.

The above rule is illustrated thiswise: If the spirometrical record of a given individual should be 260 cubic inches in health, and it is in fact one half that, because of a contracted lung, and the movement of the weakest lung is one-fourth as compared with three-fourths of an inch on the other side, the better of the two lungs is not only not doing just exactly its normal share, but it is probably compensating for the disabled lung, the work of the two, being somewhere between all on the good side (130 cubic inches), and three-fourths there and one-fourth of this 130 on the diseased side. If the spirometrical record (say 240 cubic inches) was nearly normal, as in some very favorable cases, and the bilateral movement bore the same relation to each other as above, then the compensatory work, the unaffected lung is doing for the disabled one, would be represented by fifty or more cubic inches, because that is the difference between the normal half, 130 cubic inches, and the three-fourths, 130 cubic inches, justly attributed to this lung.

Thus every inequality in these bilateral chest movements, when compared with the spirometrical record of an individual, is an indication of lessened lung movement, which should be explained by the physical diagnosis. The spirometer may not indicate the disease but its use is so important, that the physical examination must make clear the spirometrical record of a given patient, or that examination is untrustworthy. How important then that every physician, when examining a chronic lung case, should know what the vital capacity of his patient is, that he may be satisfied himself that his conclusions are correct, as well as that he may do his patient full justice.

Authors, by their lack of appreciation of the mechanical conditions within the chest made known by the spirometer, or by ignoring the subject altogether, have greatly injured a useful instrument, as well as the profession they would serve.

I have intrusted this instrument to Messrs. C. Truax & Co., of Chicago, to perfect and supply to the profession, and I have tried to protect them as far as possible in carrying out this work.

SYMPTOMATOLOGY AND TREATMENT OF SUMMER COMPLAINT.

Lecture delivered at the Fourth Special Course of the Chicago Policlinic.
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The most prominent symptoms in summer complaint are those connected with the bowels. The diarrhœa is characterized by stools which differ from each other greatly, as to number, consistency, color, and odor. Of the several phases of the stools, the odor is the one to which I wish to call particular attention. It is indeed remarkable with what certainty the stools may be divided by their odor into putrid stools and acid stools. Occasionally the stool will be described as having an intensified fecal odor, or

smelling like old wood, but it is evident that such odors are but variations of putridity. The acid stools derive their odor from the presence in them of various members of the fatty acid group, all of which have arisen from fermentation of carbo-hydrates. The putrid stools, on the other hand, can only arise from fermentations of albuminous materials. I told you in my last lecture that we know of no poisons that can be produced by the fermentation of the carbo-hydrates, alcohol excepted, that can produce symptoms on the part of the nervous system, but that all the poisons that we know of, which are capable of producing symptoms through the medium of the central nervous system, and which may be formed from foods, are nitrogenous poisons. Let me recall some of the nitrogenous poisons: Every alkaloid which a vegetable contains is a nitrogenous product; morphine, quinine, atropine, the whole long list of vegetable alkaloids contain nitrogen; the long list of animal alkaloids, the ptomaines and leucomaines, contain nitrogen; every one of the toxalbumins contains nitrogen. The stools of putrid diarrhœa are liable to contain nitrogenous poisons. Why? Because putrid products can only occur from the fermentation of nitrogenous material. It does not follow because a stool is putrid that it contains poisons, but it shows that it has been formed by the fermentation of proteids and therefore probably contains poisons. If, on the other hand, it is sour, it shows that fermentation has been maintained by the carbo-hydrates, from which such poisons cannot be elaborated. Baginsky says that one stool may be sour and the next one putrid, the next one sour, and so on, from the various forms of fermentation that may go on in different parts of the intestinal canal at the same time. Theoretically this is true but practically it is not. When we find a child passing putrid stools it continues to pass putrid stools for several days, and when it passes sour stools it continues to pass sour stools for several days. The acid form is a milder form of the trouble, it produces agents which act locally only, whereas the putrid form produces agents which act through the central nervous system, therefore if we are able to transform a putrid diarrhœa into an acid diarrhœa we eliminate certain definite sources of danger. We may have a putrid and a sour fermentation going on at the same time, the sour fermentation being masked by the more pungent odor of the putrid fermentation. But the putrid fermentation is an indication of danger. My friend Dr. Rachford of Newport, Ky., has called attention to the fact, that if we have fermentation of proteids with the formation of poisons, whether there happens to be putridity or not, there will be symptoms referable to the central nervous system, and therefore if we have such symptoms due to poisons formed in the intestinal canal, whether with or without putrid stools, we should treat the case in the same manner as I shall teach you to treat putrid stools.

We may have stools which are large and watery, we may have stools which are small and more or less coherent. The stools may be characterized by containing blood and mucus, they may be accompanied in their passage by pain, or by straining, or by bearing down, *tenesmus*; they may be characterized in color by being pale or yellow or green or brown, but every one of these changes is referable to the variations in the fermentations in the bowel. It seems

certain that the green stools of summer complaint are due to certain chromogenic bacteria, but the green stools are by no means the worst.

In many cases where the stools are green, due to the growth of certain chromogenic bacteria, we have no general systemic trouble, but on the other hand, where we have rather innocent looking stools, nothing but a little rice water discharge, our patient is seriously ill. In every such case of cholera infantum there has always been putrid stools at first, and they are no longer putrid, simply because everything has been washed out of the bowel. My own experience is, that brown stools are the most foul in point of odor, and the most apt to be accompanied by severe symptoms on the part of the general nervous system. The variations in color are unquestionably due to the variations in growth of the microorganisms in the intestinal canal, but may sometimes be due to the food. Mellin's food, for instance, produces a brown stool, but such stools are innocent. Some of these patients have fever and some have not. Why? Simply because in some instances poisons capable of producing rise in temperature are formed, in other instances poisons of this kind are not formed, so in one case we have fever and in another we do not. Fever is then purely an accidental condition. Again, we will have on the part of the brain such symptoms as convulsions. But convulsions are not due, I take it, to simply the draining away of the serum which the large number of movements has produced, but to the production of a convulsive poison, something that can produce convulsions, something like strychnia. I do not say that strychnia is elaborated in the bowel, but a poison having a somewhat similar action. Another point of importance is the question of coma in these cases. Some years ago, when I treated these cases exclusively by opium, I used occasionally to find a little one with what I considered opium poisoning. Later, after I had stopped using opium, once in a while the same kind of case would occur. On questioning the mother I would find that no opium had been given outside of my direction, and something else must be at fault. I see several such cases every year, characterized by contracted pupils, stupor, sometimes coma, by slow respiration and slow pulse. Now there has been formed in the bowel of that child a poison which acts like opium and produces these symptoms. How shall we get rid of it? I have invariably given the nitrate of potash and water, and in the course of two hours, invariably profuse urination has occurred and with it all symptoms have disappeared; in other words, the poison has been washed out through the kidneys. Here, then, is one set of symptoms which is evidently produced, so far as clinical information can teach us, from something developed in the bowel. Again we have patients troubled with insomnia, and it is likely that this sleeplessness is caused by poisons produced in the same general way. Now, let us take up the question of depression, for that is the most important one. Our little patient is weak, the fontanelle has sunken, the eyes have sunken, the skin is cold and the pulse indicates collapse. Now to what is that due? Is it because the baby has had four or five or a dozen stools that day? No. If you had given the baby sulphate of magnesia there would be the same loss of serum. Would the child be in that shape? No. There is another element there besides the number of stools. I believe the mere number of stools is of secondary importance. The question of loss

of fluids we have been taught to think much of—too much indeed. But let us suppose we had introduced a motor depressant into this child's blood, say conium or curare, what would have happened? Almost the same condition of collapse. It is evident that the collapse has been produced by some poison, and not simply by the number of stools that have been passed. If we believe the collapse to be due wholly to the number of stools we would most rationally proceed to stop the stools; we would give the child opium, tannic acid or anything to stop the flow from the bowels. But if it is due to a poison that has been formed in the intestine, what are we to gain by stopping the number of stools? Nothing. We may even do damage by retaining in the bowel the source of the trouble. I beg of you, then, to regard summer complaint as presenting various phases, but due entirely to poisons formed in the intestinal canal. On the other hand, we find that sour stools cannot produce poisons of this kind, but still we have movements from the bowels, and we can only explain the phenomenon on the ground that the products of acid fermentation are directly irritating to the mucous membrane of the bowel and act by locally stimulating the bowel, by locally increasing its functions. But remember that such irritations do not and cannot produce collapse; that they do not and cannot produce coma; that they do not and can not produce convulsions; all the serious conditions are thrown to one side and only the local ones of increase in the number of stools and pain remain. Now then, here comes in the explanation of Dr. Rachford. If these depressed conditions occur, no matter what the number of the stools may be, the trouble is due to poisons formed from nitrogenous material. If we can stop the proteid fermentation, even if we have to leave an acid fermentation, we shall make a decided gain for our patient.

Now as to the treatment proper. It consists of two general steps: first to remove the cause, second, to repair the damage done. These two steps apply to almost any disease, but particularly to this one.

First, remove the cause. How? We have found that the cause is due to certain fermentations going on in the bowel; let us get the poisons out of the bowel. How? by the use of laxatives first. To empty the bowel of a baby, gentlemen, is a work of art, it is not a simple thing. We can give a dose of castor oil and have a certain number of stools produced; we can give a dose of calomel and have a certain number of stools produced, but we are by no means certain that we have emptied the bowel of the child. Don't forget this point; it is exceedingly important. I shall refer to it again. My preference by way of preliminary cathartic is calomel in grain doses four hours apart until three grains are taken. I give a child six months old one grain of calomel every four hours until it has taken three doses. Sometimes a child may be having eight or ten stools a day; you give it calomel and it will be brought back the next day with a report of four or five movements instead of the increase you had reason to expect. I cannot explain this phenomenon, but it occurs with sufficient frequency to attract attention. The actual number of stools will be diminished under the action of the cathartic, and what is more, the child will be better, irrespective of the number of stools. Sometimes the number of movements will be very much increased; the child will be having four

or five a day and after taking the calomel it will have eight or ten or more and yet be better. I have never seen any bad results from the use of calomel, although bad results are reported under such circumstances, but I have prescribed it so many times and given it to so many babies under these circumstances that I have no hesitation in giving it in the quantity mentioned to a child six months or older; the quantity need not be increased for older children. If too large a dose is given it is simply swept out of the system, there is no such thing as giving too much in order to purge freely. But understand, that the calomel empties the bowel only partially, and by no means does it always get everything out. What shall we do next? To still further empty the bowel I would recommend the use of copious injections of water, and they can be introduced either with or without the aid of a rectal tube. The quantity of water to be put into a child's bowel is something to be considered. In one method of irrigation, the water is allowed to run in and out at the same time. By that means only the lower part of the bowel can be washed. My plan is to fill the bowel with water, I want to reach the cæcum, because there is where most of the trouble lies, where the greatest amount of damage has been done, where the autopsies prove that most of the poisons have been absorbed. Because there is where we have the most ulcers, and no matter whether we have enteric disease or dysenteric disease symptomatically, the actual lesion is in that part of the colon. I put into a child a year old a quart of water at a time, and it will hold it. This seems rather a large quantity, but patient after patient I have had in my clinic, brought before the class for the distinct purpose of showing them how much water a child will hold, and it is remarkable how much they will take. I set the quart as a limit; a half gallon will nearly fill an adult's colon. But some judgment must be exercised with regard to the quantity used; if you have reason to believe that the bowel is badly ulcerated and liable to be torn because of pressure, you should not put in such a quantity of water, but in an ordinary acute case you can put a quart in. A fountain syringe is the safest means of introducing the water. When it is in it runs out again, of course, as soon as you take away the tube. But the bowel does not completely empty itself at once. The mother will tell you that the child passes about a pint and then stops, and the remaining water will come away in about twenty minutes or half an hour. Do not put into the water you use to wash the bowels, any poisonous antiseptic; do not use bichloride of mercury to wash the bowels, because you might have enough of it stay behind to produce poisonous symptoms. It is not needed; clean water is quite enough. The object of the water is to wash out the bowel and clean out the little loculi. You remember in the large bowel there are little pockets at one side which form convenient places for fecal matter to lodge in, and when we give a brisk cathartic like calomel, it strikes right past these pockets and does not clean them out; but with the slow washing out of the bowel the water will seek out these pockets, and clear out their contents. Very frequently these masses of retained feces are the sources of the poisons. This illustrates the substantial identity of putrefactive constipation and summer diarrhoea, and justifies their being included under a single term.

Now we have gotten this bowel clean, apparently

so at least, by means of the preliminary purge and the washing. So far so good, but we have only taken out of the bowel the larger mass of material there present, we have not washed it clean. You could not sterilize in that way a test tube, and much less so complicated a tract as the bowel. You have not got it clean but you have got the bulk of the material out and you have removed the bulk of the poison, but the germs remain behind, at least enough of them to set up the trouble again. Our baby will probably seem better, some of the symptoms have disappeared and the child is undoubtedly better, but we want to kill the germs there, we want to kill the particular germs that are producing the trouble. How can we do it? We have at our disposal a large number of intestinal antiseptics, the best among them are unquestionably calomel and bismuth. The calomel which we have originally given acts as an antiseptic, but its action is only temporary, it does not and can not sterilize the bowel. If we wish to use it still further as an antiseptic we will give minute doses of one-tenth or one-twelfth of a grain every three or four hours, but the results will be only partially satisfactory. Next to that our best antiseptic is bismuth and to employ it successfully as an antiseptic we must use it in massive doses. The dose of bismuth, like calomel, is not to be measured with great accuracy. I usually give a dose of ten to fifteen grains three or four times a day to a child six months or a year old. Bismuth does not produce any systemic effects, but you want to give enough to produce an effect in the intestinal canal, and two or three grains of bismuth are not enough. There is one objection to bismuth. Besides being an antiseptic, it unquestionably is, to a certain extent, an astringent. Many times I have thought the diminished number of movements following the use of bismuth were due to the curative effects of the drug and that the poison had been destroyed, but I have reason to believe that it was really due to the astringent effect of the bismuth, and this effect in the early stage of the treatment is not desirable because it retains the poisons we want to get out. Then we have naphthalin, salol, resorcin and a whole host of drugs of that type, but they are unsatisfactory. Fortunately we have a much better means at our disposal. Suppose we have a diarrhoea and the stools are distinctly putrid; we know there has been fermentation and that the germs producing it are living on proteid material, so we simply keep that kind of material out of the bowel and starve the germs; there you have the keynote of the whole method of feeding. Starve the germs, do not try to get them out with chemicals because you cannot do it. You accomplish something in that way but you cannot kill them all. But when the child has a putrid diarrhoea you must keep away from it all proteid material, keep away meat, fish, milk and eggs. Keep away those foods which are capable of undergoing putrefaction. Meat would not be given to a child of that age; fish would not be given to a child of that age; eggs would possibly be given, but milk would most certainly be given. Milk has been the chief diet of this child before it was taken sick, and the proteids of milk are what the germs in that intestinal canal are best adapted to live on. Above all things stop milk; that is the first thing to do when you have a putrid diarrhoea. Do not be led into giving milk because the books tell you that it is a bland and non-irritating diet. That means nothing. We

are not trying to save that bowel because it is in an irritated condition, but we are trying to prevent the formation of poisons, and therefore we will keep out of the bowel material from which they can be formed, and that is in this instance proteid material. Now if we have to keep proteid material out what shall we put in? Anything which cannot support the obnoxious germs; anything which will starve them out and still be food for the child. The books tell us that in severe cases we should stop all food. If we stop all food we can certainly starve the germs but it strikes me we are going to starve our little patient also, and put a strain upon him that is unnecessary. If we must take away meat, fish, eggs and milk let us give him the starches and sugar. Many years ago Moore, of England, advised that these cases be fed on cane sugar exclusively. Such a diet is right, but you don't need to limit them to cane sugar; give them starches. I take a child six months old with putrid diarrhoea and give it arrow root, or rice, or crackers, or baked potato, but not milk. But you look surprised to hear me advocate potatoes and crackers—solid food in diarrhoea. When we have the theory of this disease that I have attempted to give you, that it is not due simply to an irritated condition of the bowel, why not give solid food? I assure you, from a personal experience of several years in this matter, that solid foods act most beneficially. Milk is a solid food; it is not liquid. It is only liquid before ingestion. The first thing that happens to it in the stomach is coagulation, so that it is probably more irritating from a mucous membrane standpoint than any amount of starch. We are told these babies cannot digest starch because they have no salivary secretion and no distinct pancreatic secretion. I will admit the physiological statement that their salivary and pancreatic secretions are both deficient, but I deny the other statement. It has been assumed that because these two secretions are deficient, that infants cannot digest starch; but we all know of babies who have been given arrow root from their birth, and who have digested it perfectly. We all know that babies can and do digest starch; they do it daily. Why, there is hardly a secretion in the body but is capable of digesting starch so that it can be absorbed. Right here I wish to be understood that I do not advocate starch as a continuous food for infants, but I am speaking of its use for temporary purposes; it does help that child along when it is poisoned; it does serve a purpose with that child when we want to take away other kinds of food, and in giving starch we have the advantage of not depriving that little one of all food. How about predigesting the starch? We do not need to predigest the starch; the great bulk of children can digest starch, particularly the small amount necessary for our purpose.

I told you that milk was bad for this condition; how about peptonized milk? Peptonized milk is worse. Why? I know some of you have used peptonized milk, and in some cases with good results, but I wish to assert that if you did get good results in those cases, you could have gotten better results in some other way. This preparation is generally bad. In the first place, it is peptonized by means of a pancreatic ferment. If you will experiment, by putting some hard boiled egg in a solution of pepsin, and hydrochloric acid, and leaving it over night at the temperature of the body in a suitable oven, you will find that it has not only digested completely, but

that it has a peculiar odor that is not unpleasant; but take the coagulated egg albumin and put it with trypsin in an alkaline solution, and subject it to the same conditions, and you will find, as you open the incubator, that it has a distinct fecal odor. If you leave it a few hours longer, the fecal odor will become stronger, and in a few more hours the odor will be unbearable. The mass has become putrid. Now the action of trypsin upon proteid material is to break it up in such a way that the germs of putrefaction can thrive therein. They thrive readily in the products of tryptic digestion, but not readily in the products of peptic digestion. The milk partially peptonized by this pancreatic extract, is only in a better shape to undergo putrefactive changes when it reaches the stomach and bowels. If you put it into a perfectly healthy alimentary tract, no harm will occur; but if you put it into a bowel that is already contaminated with putrefaction-producing microorganisms, you have only helped those microorganisms to the extent to which you have digested that food. Understand, I do not say that there are no conditions in which peptonized milk may prove useful, but am merely condemning its use in the putrid diarrhoea of infants.

Now about sterilized milk. It is practically pure so far as germs are concerned, but just as soon as the sterilized milk reaches the infected intestine, the germs there begin to develop in it; not so readily, perhaps, as in unboiled milk, but just as certainly as in any other kind of milk. Sterilized milk, therefore, is not the proper food in putrefactive diarrhoea, because it has essentially the same chemical composition as any other milk, and it is the chemical composition that is guiding us at present, and not its bacteriological condition. Sterilized milk, therefore, should be used solely as a preventive; if we start with a healthy child and feed it sterilized milk, we run that much less chance of introducing pathogenetic microorganisms into the intestines, but after they are once there, it has no power to get them out. Milk from the mother's breast does just as much damage as milk from any other source. Other things being equal, I would rather treat an acute case of diarrhoea in a bottle baby than in a breast baby, because I can give the bottle baby just what I want to. Frequently I would take the baby from the breast for thirty-six hours, keeping up the mother's secretions by the breast pump, and feed the baby as I would like to; but we cannot always do this, and where I cannot do it I find that I do not get as good results in treating diarrhoea in breast fed babies as in bottle fed babies; I cannot cure them so quickly because I cannot feed them right. Such a procedure is only necessary in severe cases.

How long is it necessary to withhold proteid food in acute diarrhoea? Twenty-four hours will usually suffice to correct the odor of the stools; at the end of that time stools which have been rotten will have lost their putrid odor, usually, and at the end of forty-eight hours they will certainly have lost their putridity. But it is desirable, where possible, to withhold proteid food for several days after the stools have lost their putridity. In chronic cases, where there is already ulceration of the intestine, the putridity is maintained by something besides the intestinal contents. Let us say the putridity has ceased, what will occur? Almost always the stool will become sour; in other words, an acid fermentation

which has been going on in addition to the putrid fermentation continues, so that we still have left a cause for diarrhoea, but we have transformed a diarrhoea which was capable of causing nervous symptoms into one which is only capable of producing local symptoms in the bowel; we have transformed a dangerous trouble into one comparatively simple. That is what has been gained by the method of feeding.

I think this will give you, in a general way, my idea of how to remove the cause. Remove it by purges, remove it by washing out the bowel, remove it by antiseptics, and above all by starving out the germs by withholding their proper food.

One other thing: that is washing out the stomach. It frequently happens that we cannot by all these means at our disposal control things as we would like to, and it becomes necessary to wash the child's stomach. Washing the stomach, particularly where vomiting is present, is of great service, but you are not required to do it very often. I have had comparatively few cases in which it was absolutely necessary, but I believe if I had resorted to it more frequently I would have had better results, would have cut short more cases. But it is a very troublesome measure. Washing out the bowel is an easy matter, and can be done by the mother, but washing out the stomach is something you must do yourself.

The question of the treatment of vomiting in these cases is to be considered. The vomiting is probably not due, not always at least, to local conditions, but most likely it is due to the poisons produced by the various fermentations present, and it disappears when the poisons are removed. When it is present, however, it is a very serious complication, as it prevents us putting anything at all into the child's stomach. If persistent vomiting is present, we should always wash the stomach by means of the stomach tube, and this often gives relief.

We have removed the cause, how shall we repair the damage done? Ordinarily, with the removal of the cause, the child promptly recovers. But the matter is different in a severe case where the child has been seriously ill from a sharp attack of cholera infantum, and at the end of a few hours of illness is in a state of collapse; sunken eyes, sunken fontanelle and pale, cold surface; rolling the eyes about, opening the mouth, showing the dryness of the lips, etc. What shall we do? Evidently, in such a case, there is no time for delay, the damage is too severe, the poison must be directly combated. We will of course stop all food at once, because we cannot run the risk of doing that child further harm; particularly would we stop milk. We would wash the bowel as far as we could, for a double purpose, the one to remove from the bowel as much offending material as possible, although but little will be found; the other, to supply some of the fluids which have been lost. The water used should be as warm as can be borne. The peculiar depression must be combated by all possible means. First, by external heat in the shape of hot baths and hot blankets wrapped about the child to stimulate it. Opium here is of great value; so also is belladonna; it directly counteracts the poison present, it is a stimulant to this particular condition. Another thing: if it is possible to get fluid of any kind into the child, do it. Why? Because that fluid will pass out again through the bowel, possibly through the kidneys, and as it goes

it will wash out some of the poison which is doing the harm. Our object in a case like this is simply to support life. We cannot attack the case on the lines I have given you before; we must counteract the poisons as well as we can by heat, belladonna, opium in small quantities and by washing out as far as we can through the process of elimination.

In chronic cases, those which have lasted three weeks or more, the greatest good is accomplished by regular daily lavage of the bowels. The use of intestinal antiseptics, particularly bismuth, is of considerable service. In long-continued cases, laxatives can only be used occasionally. While the diet is to be directed on the same lines as those already laid down, it need not be adhered to so absolutely.

We all have our type cases of which we make much. Among mine is one which I should like to relate to you now: A rachitic baby, which had been under my observation for regulation of diet, was suddenly taken with convulsions. Apparently the bowels were in a pretty fair state at the time. The convulsions commenced at 4 o'clock in the morning, and lasted until noon. I first saw the child about 8 A.M. The temperature then was 102° in the rectum. I suspected the bowel as the source of the trouble, and endeavored to empty it. I gave the child calomel by the mouth, washed the large intestine, and gave by the rectum a small dose of croton oil in emulsion. Quite free purgation ensued, but the convulsions continued, and I was forced to think that they had their origin in some other cause, most likely the onset of some infectious disease. I was finally reduced to the necessity of administering chloroform to control the convulsions. In the afternoon the convulsions returned, and the temperature rose very rapidly until it reached $107\frac{1}{2}^{\circ}$. Cold baths and antipyrin were employed without success in combating the temperature. What was making this temperature? Just before the little one died, it passed a mass of the most putrid feces I ever smelled. There was the source of the trouble; it was absorbing poison from this mass, and if I had continued trying to empty the bowel, possibly I could have saved that child.

Now then, to repair the damage done, we must meet the symptoms as they come up. If the child has fever we will endeavor to meet the temperature by sustaining the child's strength with alcohol and by producing sweating. If the temperature be high you can produce sweating in several ways. One way is to sponge the body over with almost ice-cold water, then wrap the child up well; there is an immediate reaction. The skin becomes red and soon there is profuse sweating. That can be done with a baby where you could not do it with an adult. So we take the temperature down, as in any other disease, but particularly do we look to the bowels as the source of the trouble in these cases. In those cases where the temperature runs up to 106° and 107° , and which are sometimes called sunstroke, the trouble is probably always in the bowels, and you should remember that even after you have given a cathartic you are not through with the bowels until the symptoms cease.

I should like to say a word regarding the opium treatment of this disease. For a number of years I treated these cases with opium. There can be no question but that good results can be obtained many times by the use of opium. In the first place because of its stimulant effects, and in the next place

because it relieves the pain and thereby strengthens the child. If used in the shape of a Dover's powder, it acts as an eliminant and we have some of the poisons thrown out, and in general it is a direct antidote to the poison, so that the use of opium amounts to treating the poison by a direct antidote instead of treating the disease by getting rid of the poison. It is not so illogical as one would imagine, but I don't think the treatment is good; relapses, so-called, are more apt to follow the opium treatment than the plan which I have outlined.

Another thing please do not forget; that is, that you are at all times treating the baby, and not the disease. Never treat a case of putrid stools, but be kind enough to treat the baby who is unfortunate enough to have those putrid stools. We see cases where the child is passing the most abominable stools, and yet it may be well, happy and lively; don't put such cases amongst those I have asked you to treat; they are going to do well enough if you will let them alone. We must use judgment in these things. We have many cases come to us that fortunately do not present the exact conditions for interference on the lines I have laid down for you; and remember they do not need any such interference; they will get well if you wash out the bowels. You must remember that it is not simply the putridity that directs you to interfere, but the continued severe nervous symptoms accompanying it.

Suppose the stools are already sour; theoretically, you have got to keep out the starches, but what have you to fall back upon? Nothing in the world but white of egg. At one time I tried this plan, with the result that I succeeded in changing acid diarrhoeas to putrid diarrhoeas. A sour diarrhoea we can treat with bismuth and complete withholding of food, or the use of milk. The milk will keep up the sour diarrhoea because of the sugar in the milk, but it is the best we can do. Remember that a sour diarrhoea is not ordinarily dangerous. We can also give opium, and this is the place where we may want opium. The acid produces colic in the bowel and also flatulence. The gas does not cause the pain; it is the acid that causes the pain. Lavage of the bowel can also be profitably employed. The acid form of the trouble is not so amenable to dietetic treatment on the plan I have given as is the putrid form, and we must treat it on other grounds.

SOCIETY PROCEEDINGS.

Chicago Pathological Society.

Regular Meeting, April 11, 1892.

DR. C. D. WESCOTT IN THE CHAIR.

Dr. Edward F. Wells read a paper entitled

PNEUMONIC GANGRENE.

He said that Laennec, to whom we owe the first clear and precise treatise on pulmonary gangrene, met with only a few cases in all his immense experience. Andral, with unsurpassed facilities for observation, had no well defined views of his own and contented himself by saying that the very existence of this termination had been denied by some, and that in his opinion the entire subject required further study. Stokes never met with a case in childhood, but saw several in adults. Copeland observed the condition but rarely. Cullen states that the termination of pneumonic fever in gangrene is much more rare than has been imagined. Trous-