

THE DIAGNOSIS AND TREATMENT OF CHRONIC INTESTINAL INDIGES- TION IN CHILDREN *

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This paper relates exclusively to chronic intestinal indigestion in children beyond the second year of life. It is not our intention to go into a detailed description of the condition, but rather to point out certain of its features which are of special interest and importance. Its etiology, as is well known, includes bad conditions of hygiene, food of poor quality, improperly prepared foods, overeating, eating at improper intervals, too rapid eating, insufficient mastication, defective teeth, exercise too soon after eating, fatigue, insufficient hours of rest, educational over-work, nervous influences, etc. Any and all of these conditions may result in disturbances of the gastro-intestinal tract in children who are primarily entirely normal and eventually bring about the form of disturbed digestion under consideration.

In addition to the causes mentioned it must be borne in mind that many children, either as a result of inheritance, previous acute illness or environment, suffer from constitutional debility which predisposes them to diseases of the gastro-intestinal tract.

While chronic disorders of the intestinal tract may be secondary to disturbances of the gastric digestion or the product of recurring attacks of acute gastro-intestinal disturbance, one must not lose sight of the fact that in a large percentage, if not the majority of cases, the condition is primary, and it is in this group of cases, which eventually result in the more pronounced types, that the earlier symptoms are frequently overlooked.

In the routine examination of the stools of apparently normal children, foul-smelling feces, which may or may not contain particles of undigested food, are a common finding. With these results as a guide a closer examination of the donor will often result in the establishment of other symptoms of disturbance of the intestinal digestion of which the child has never complained and which have passed entirely unrecognized.

Not infrequently, however, this condition of the stools is the only evidence one can discover, and it may continue indefinitely as the only symptom. It is well, therefore, to remember that chronic indigestion may and usually does persist for many weeks or months in a mild form, and at this stage its recognition is especially important, as therapeutic measures are much more promptly effective when applied early than in the later course of the disease.

The only satisfactory way of making the diagnosis of these milder forms, as has been indicated by the foregoing statements, is by an examination of the stools. Questioning the parents or child as to the regularity in movement of the bowels or condition of the stools is fruitless. In the first place, comparatively few parents give answers based on observation. They may insist on the child going to the toilet each day and the child may respond and have a movement, which is reported to the parent as satisfactory; but it is manifestly impossible

that the child should know the color, odor and general appearance of a normal stool—as a matter of fact, there are few adults who do—consequently the statements of the parent or child cannot be accepted as indicating the actual conditions.

Quite recently one of us referred to a fellow-practitioner, a highly intelligent adult, who was suffering from insomnia and an associated group of symptoms which are commonly included under hypochondriasis or neurasthenia. The patient stated that he had been having a normal stool each day immediately after breakfast since childhood. The stool, which was sent to the laboratory for examination, was dark-green in color; macroscopically it contained undigested vegetable and meat fiber and the odor was indescribably bad. When the patient was told the character of the stool he remarked that he knew the odor was bad, but he supposed, since this had been the odor of his stools for many years, that it was normal. This serves as an illustration of the unreliability of the patients' statements as to the character of the stools.

It is manifest, therefore, that if satisfactory data are to be obtained the stools must be examined by the physician, and not on one occasion only, but several times at intervals of some days, since it is not uncommon for the child to occasionally have fairly normal stools, even in long-standing cases.

In order to appreciate one's findings it is necessary to have some idea of the appearance of normal feces. While the consistence and form may vary within certain limits, according to the character of the diet, we consider a stool to be normal when it is of faintly alkaline, amphoteric or neutral reaction, well-formed, light or medium brown in color, and has only a slight and not a noteworthy offensive fecal odor. It should show no evidences of fermentation and only slight traces of mucus should be present. Microscopically a normal stool shows, besides vegetable cells, poorly striated muscle fibers, leukocytes, bacteria, etc., no starch granules, and, if any, only a few neutral fat globules, soaps or crystals.

In intestinal indigestion the stools show evidences of abnormality depending on the particular element in the diet which is being less satisfactorily disposed of. Macroscopically the stool may be unformed or only partly formed, whitish, light brown, greenish or dark brown in color, and show an increase in offensiveness referable and in proportion to the increase of the putrefactive processes. It may be semi-solid, soft or mushy, or, on the other hand, hard and dry. It may contain undigested particles of muscle or vegetable tissue, show varying degrees of fermentation and varying amounts of mucus. Microscopically the stool may show large numbers of vegetable cells, fairly well-striated muscle fibers, starch granules, and, in the cases due to disturbances of the fat digestion, excessive quantities of neutral fat, soaps or crystals.

In the cases with marked abdominal symptoms the stools may show an exaggeration of the foregoing picture. The consistence may be very loose, or watery, and the fermentation marked enough to produce almost constant bubbling on the surface of the stool and the odor offensive in the extreme.

It is well to remember one point that has been referred to, namely, that the stools are often continuously offensive without containing particles of undigested food. This condition may not necessarily indicate a disturbance of the digestion of such character as we are considering, but may be the product of practically any

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condition which will bring about a general lowering of nutrition, such as chronic infection through the lymphatic tissues of the nasopharynx or the faucial tonsils. In consequence there evidently occurs in the intestinal tract a diminution in resistance to the multiplication of the putrefactive bacteria without any material interference with its digestive function.

A careful study of the urine is of value in directing one's attention to disturbed intestinal digestion when the stools show no evidences of abnormality. The general characteristics of the urine as a rule show no changes, and, although it has been stated that there is an increase in albumin, this has only occasionally been true of the cases observed by us. We can conceive that certain changes might be produced in the functioning power of the kidneys, especially in the long-standing cases, which would result in an increased elimination of albumin. More commonly indican, phenol and urobilinogen are present in amounts depending on the degree of the intestinal putrefaction. These products may appear either alone or in combination, and, though usually associated with disturbances of the protein digestion, are sometimes present when the putrefactive process depends on other causes.

The manifestations aside from the stools may vary from practically no subjective symptoms to the most extreme clinical picture that one can depict. The symptoms are by no means restricted to the intestinal tract; in fact, the absence or mildness of the abdominal symptoms may be so striking as entirely to obscure the actual seat of the primary disturbance. The cardiovascular and nervous systems sometimes furnish the bulk of the symptoms; coldness and blueness of the extremities, fits of pallor, even amounting to syncope at times, palpitation and irregularity of the heart's action are common symptoms on the part of the circulation, and, together with the wasting, which in the long-standing cases is constant, there may be considerable anemia, which is usually, however, more apparent than real.

On the part of the nervous system there is no limit to the manifestations, and it is to these that we wish particularly to draw attention. The most common nervous phenomena are restless sleep, muttering during sleep, night terrors and sometimes insomnia. There is a general condition of restlessness and irritability and inability to concentration of effort, especially mental effort. These children are apt to do badly in their studies. They frequently drift into a clinical picture which in the adult would be defined as neurasthenia, and after this condition of nervous unbalance has been well developed convulsive seizures sometimes occur.

Not once but many times we have had these cases come under our observation, with the diagnosis of epilepsy and a hopeless prognosis as to recovery, and it is this fact more than any other which has stimulated us to present this paper, because we believe that the convulsive seizures occurring in this condition are frequently, if neglected, the beginning point of what later develops into so-called epilepsy. It has been our experience that in these neglected cases the history has shown a tendency to increasing frequency of the convulsive seizures; in other words, each convulsive seizure has rendered the nervous system more unstable and, therefore, more susceptible to insults from the toxic products which are constantly forming. The result is that the habit of fits becomes well established and eventually the resistance is so slight that the subject is to all intents and purposes an epileptic.

The relationship between chronic disturbances of the intestinal digestion and convulsive seizures cannot be too strongly emphasized. It is almost criminal to assume that, because any child has had a series of convulsive seizures lasting over a period of months or even a year, it is necessarily epileptic. Such an assumption is a most liberal contribution to the production of epilepsy.

The proper attitude to take toward a child with such a history is that there is a tangible cause for the attacks, which must be searched for through every possible avenue until it is determined and eradicated. The frequency with which it can be traced to these chronic conditions of the intestinal tract will be surprising and enlightening.

The fact that certain children suffering from chronic disturbances of the intestinal tract show more marked nervous phenomena than others is difficult to explain. The relationship of these symptoms to inherited weakness of the nervous system or to inherited tendencies which result in nervous instability is very commonly emphasized. We find certain writers describing under the headings of neurasthenia, nervousness, lithemia, chronic gastro-intestinal disturbances, chronic intestinal indigestion, constipation, etc., practically the same varied group of nervous symptoms. While neurasthenia is not accepted by some pediatricists as occurring in early life, it is by others, and, as to etiology, it is usually defined as hereditary and acquired. We are probably all willing to admit that we are not born into the world endowed with the same amount of nervous resistance. Unquestionably each individual differs from others in this respect, and some have very little nervous resistance. These latter are the ones defined as the hereditary neurasthenics. Their nervous force is so limited that the slightest variation from the normal routine of life results in the production of nervous symptoms; indeed, it is said that these may occur without an exciting cause. These cases are described by some pediatricists as of easy recognition even in early infancy through the occurrence of such reflex phenomena as abnormal tendency to fright (as starting on the occurrence of any sudden noise), abnormally light sleep, continuous crying day and night, etc.

Acquired neurasthenia is usually attributed to overstrain, either mental or physical, and to certain emotions. These latter causes are rarely active in children and, therefore, one must assume that in early life the large majority of instances of neurasthenia are manifestations of a hereditary weakness unless certain other factors, not active in adult life, are capable of producing neurasthenia in children.

It seems to us that this group of nervous symptoms which is common to so many disorders in early life should be classified either as neurasthenia caused by the conditions with which they are associated or that the term "neurasthenia" should be restricted to an exceedingly small group of cases or eliminated entirely from the category of diseases of child life. We incline to this latter view because we believe that the instances in which these nervous manifestations exist, apart from all exciting causes, are practically unknown. They may be dependent on any one of a number, such as bad environment, adenoids and enlarged tonsils, defects in vision, and the chronic disturbances of the gastro-intestinal tract. Unquestionably this latter group is more largely responsible for the nervous phenomena of children than any of the others, and this is especially true of chronic intestinal indigestion. In certain children the nervous

system may be especially susceptible because of hereditary deficiency; in others the prolonged action of toxic products on the nerve centers results in an acquired susceptibility with the production of the same phenomena.

In either event the fact remains that in chronic intestinal indigestion there is a large group of nervous symptoms which are dependent on the toxic substances, which are absorbed or retained in consequence of the abnormal conditions of the intestinal tract—a fact which we daily demonstrate by bringing them under complete control by correcting the intestinal condition.

The important point to bear in mind is this causative relationship, since there is grave danger of accepting the nervous symptoms as the disease without endeavoring to determine the primary condition and relieving it. Probably all of us have been inclined to look on this condition of nervousness associated with chronic intestinal indigestion in early life as the internist has looked on neurasthenia in the adult, viz., as often more or less hopeless from the therapeutic standpoint. This attitude has made the handling of these cases difficult.

We have shown a tendency to neglect them. The bad results of such neglect are far-reaching. The longer the condition lasts the more numerous and fixed the symptoms become. These children often pass out of childhood into early youth and on up to adult life, becoming more fixed in their ill health and correspondingly more neglected as the treatment of their condition becomes more difficult. They swell the number of so-called cranks, hypochondriacs, neurasthenics and hysterics among adults, a large percentage of whom could have been given comfortable, useful lives if the true nature of their condition had been recognized in childhood.

Aside from the symptoms referred to these cases of chronic intestinal indigestion sometimes manifest another group of symptoms which may be misleading from the standpoint of diagnosis.

Distention of the abdomen does not develop in all instances, but in the cases in which the nutrition of the muscles suffers the abdomen may be greatly distended. The thinning out of the abdominal muscles lessens the support to the abdominal contents; this lack of support, together with the weakening of the intestinal wall and the putrefactive processes within the intestine, brings about a ballooning of the abdomen which may become extreme; when vomiting of toxic origin, which may persist for some days, is added to these symptoms the clinical picture of tuberculous peritonitis is strongly suggested and sometimes eliminated with considerable difficulty, especially the fibrous form. The only satisfactory evidence on which peritonitis can be excluded is the history of the case, continuous observation over a period of weeks, the absence of the characteristic doughy or infiltrated feeling of tuberculous peritonitis, and the absence of masses within the abdomen, signs which may, however, be entirely lacking.

There is one other symptom to which we wish to call attention, and that is a peculiar form of dyspnea which we have somewhere seen aptly described as "sighing respiration." This symptom is most marked after meals and especially after the evening meal or when food is taken immediately after severe exercise. It is associated with a feeling of epigastric distress or pressure and consists of inability to get a sensation of satisfaction from respiratory effort. It is usually associated with increased distention of the abdomen, especially the distention of rather sudden origin. The child will take a full deep inspiration, which is followed by a sighing expiration.

It sometimes becomes almost continuous for a period of days and in older children we have seen it produce considerable alarm. Exercise will sometimes increase it, but generally it lessens abruptly or entirely disappears when the attention is distracted by occupation. On what this symptom depends we are uncertain. Whilst usually associated with increase in the abdominal distention, the latter rarely seems sufficient to mechanically interfere with the proper function of the intrathoracic organs. It would seem to be more properly attributable to some toxic effect on the centers of respiration and probably always exaggerated by psychic influences.

Edsall has suggested that since in gastro-intestinal conditions marked acidosis is not uncommon it is entirely possible that a "subacidosis" may overstimulate the respiratory centers sufficiently to produce this symptom.

Haldane and Priestly have shown that carbon dioxide is the normal stimulant to the respiratory center. It has also been shown that other acids may have the same effect. Therefore it is not a lack of oxygen but the presence of carbon dioxide and other acids that produces respiratory effort.

Beddard, Pembrey and Spriggs have shown that in the coma of diabetics carbon dioxide tension may not be increased and that the blood can still absorb carbon dioxide freely, but that slightly excessive amounts of carbon dioxide in the respired air cause great excess of dyspnea.

Since this dyspnea is very often controlled by alkalies, and since acid intoxication is known to exist in diabetic coma, the authors referred to conclude that the organic acids produce the Kussmaul breathing by acting as respiratory stimulants.

In the light of these conclusions, and because of the striking similarity between the sighing respiration of intestinal indigestion and the Kussmaul breathing, the suggestion of Edsall would seem to provide the correct explanation.

TREATMENT

Coming now to the treatment of chronic intestinal indigestion, we would say that it divides itself into the following heads:

1. Absolute control of the patient—which means the full cooperation of the mother and nurse.
2. Hygienic treatment.
3. Dietetic treatment.
4. Medicinal treatment.

Unless one has the full assistance of the caretakers in carrying out measures of treatment, failure is a foregone conclusion. The first step in the treatment, therefore, consists in securing such cooperation. This can usually be done by a full explanation of the nature of the disease, its chronicity, the dire results which will inevitably follow neglect of the condition, by placing of a large share of the responsibility of treatment on the mother or nurse, where it rightly belongs, by the promise of cure if they cooperate, and by making them understand in the beginning that the treatment must be continued not over days or weeks, but months, and that drugs will be but a small factor in accomplishing results.

If the confidence of the attendants is thus obtained, the most important feature in the treatment is accomplished. In the children of the poor and ignorant, seen in the hospital clinics, one can obtain better results—in fact, one might say that the only way in which one can get thoroughly satisfactory results is—by placing them

in the wards of the hospital for several weeks, as the conditions necessary for treatment cannot be secured in their homes.

Patients of this class unfortunately will only too often relapse after they have returned to their home environment. Much can be accomplished with such patients, however, by following them up in their homes through the medium of social workers or visiting nurses.

Hygienic measures are very important. Life in the open air, for its stimulating effect on the circulation and general toning effect, must be insisted on, and the sleeping-rooms must be cool and ventilated through wide-open windows. Properly regulated exercise is important, but this should be largely in the open air and always short of fatigue. Children must be required to eat slowly and masticate their food thoroughly, the common habit of bolting food to get away to school or to games being one of the causes of this condition. A period of rest should intervene between the taking of food and indulgence in active exercise. Very little, if any, physical exercise should be permitted after the evening meal. Long hours of sleep obtained by early retiring are essential.

The skin of these children is usually dry and inactive. It must be stimulated to do its work as an organ of elimination by the use of daily baths, rubbing, and unguents, preferably with olive oil.

The kidneys must be kept active by the free use of water, which will also contribute to the lessening of constipation when it exists. Regularity in the evacuation of the bowels is necessary, especially in the presence of constipation. The child must be guarded against too close consideration of its symptoms, a result which is often brought about by undue anxiety on the part of the parents. Its environments must be cheerful and free of gloom. It must be relieved from all occupations which are depressing, especially from overwork in school.

Defective conditions in the teeth must be corrected and disturbing adenoids or tonsils removed, but only after the treatment has been continued long enough to bring about some improvement in the general health, and then by quick operations.

The nature of the diet depends to a large extent on the character of the indigestion. This can only be determined, as has been previously pointed out, by a careful study of the stools. If any one element of the diet has been badly handled, it must be withdrawn from the dietary, temporarily at least. Generally speaking such patients will do better in the beginning on a very much restricted diet, restricted even beyond the caloric needs in the individual case. One of the commonest errors in the treatment is the tendency to overcome the poor nutrition by full feeding. Obviously such a course is comparable only to adding fuel to the flames. These children are already the victims of too much food, and what their digestions need is not increased work, but rest. This can usually be most satisfactorily accomplished by the administration of a milk diet in some form. Where fats are badly handled, it is sometimes necessary to use diluted or even fat-free milks, and in some cases properly prepared buttermilk is useful. The milk diet should be continued until the stools give evidence of satisfactory digestion, after which the diet may be gradually extended, studying the stools the while and bearing in mind the elements in the food which have been poorly disposed of.

Usually the diet can be gradually advanced until a general well-rounded diet equal to the needs of the

individual child has been reached. The heaviest meal should be given in the middle of the day, and the evening meal should be very light, as these children rarely sleep quietly on a full stomach.

It seems almost needless to say that all foods of recognized indigestibility should be permanently excluded and that the pernicious habit of eating between meals should be forbidden. Tea and coffee and other unnecessary and disturbing substances must follow the same course.

The use of drugs in this condition represents the least important part of the treatment. There is no specific, and, therefore, whatever drugs are given must be directed to the relief of certain symptoms.

We have used the so-called intestinal antiseptics for the control of putrefactive processes, but with entirely negative results. In the beginning of treatment and occasionally thereafter, a course of calomel followed by colonic irrigation will do much to relieve this feature of the disease. The intestinal washings seem especially effective in the cases with loose, watery, foul-smelling stools.

For the frequently associated constipation, one need rarely resort to the use of drugs. The free use of water on rising, evacuation of the bowels immediately after the morning meal, together with properly applied abdominal massage, and later the free use of green vegetables and laxative fruits, will invariably control this symptom.

As a temporary measure, we prefer olive oil enemas and non-irritant suppositories to laxative drugs. In the emaciated patients with marked abdominal distention, temporary mechanical support to the abdominal wall, together with muscle exercises directed to improvement in the tone of the abdominal muscles will contribute to the relief of constipation.

The bitter tonics, which are given more for their toning effect on the gastric mucosa than for their general effect, are the only tonics which are indicated. In short, if the conditions which are active in the causation of the disease can be controlled in the manner indicated under the preceding headings, the clinical picture will usually clear up without the necessity of drugs.

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ABSTRACT OF DISCUSSION

DR. H. L. COIT, Newark, N. J.: I have seen a number of cases that correspond to this clinical picture, and it is well to remember that many cases of so-called epilepsy are amenable to treatment. Most of the cases I have seen have been referred to me by physicians who thought they had epilepsy to deal with. Physicians are too ready to use medicine in treatment of intestinal indigestion in children, without proper attention to the diet. I think we should study these cases carefully and question the mother closely, in order to determine the dietetic errors. In the treatment, an important part is the correction of the diet. It may be that milk is used with red meats, or milk is used at breakfast with fruit and sugar. In addition we find over-feeding the rule, with the consequent putrefactive intestinal decomposition. In these cases there are restlessness, sleeplessness, indicanuria, fits of uncontrollable anger and foul-smelling stools. We cannot remove the results of putrefaction with carbohydrate diet alone, nor with calomel, or castor oil, but I think that we can do it by the use of bichlorid of mercury. Corrosive sublimate was abandoned by the surgeon because it became an albuminate which was insoluble, and the same is true when given by the mouth, but when it is given with hydrochloric acid it probably reaches the intestine, although it may there be changed into some other salt which finally alters the malodorous character of the intestinal contents. It should be given with the tinc-

ture of the chlorid of iron and with considerable glycerin an hour before the ingestion of food in small quantities.

DR. CHARLES GILMORE KERLEY, New York: I agree with everything Dr. Hamill has said, but I want to emphasize one point that I think he did not emphasize sufficiently, and that is, the matter of rest in the type of child he discusses. All of the lower animals lie down and sleep or take a rest after a full meal if they have an opportunity, and their digestive function is carried on better. When an animal has to work after a full meal, the digestion and assimilation are not so good. This has been demonstrated time and again. We all know how much exercise is taken by children, especially children of school age. The amount of energy expended in their work is tremendous, and the energy that is expended in play cannot be utilized in the digestion of food. When we have wasted energy in a child we have invariably indigestion, malassimilation, malnutrition and neurasthenia. Keep these children in bed in the morning, and let them have their breakfast in bed and give them a modified rest-cure. Then let them run about and play like normal children until luncheon in the middle of the day. Then have them rest again for an hour and a half and then allow them to run about until 6 p. m., when their evening meal is taken, and then to bed. In that way the child gets all of the rest required and he conserves his vitality for the processes of assimilation and growth. If we let these children lead a child's life and see that they get sufficient rest, they will not get into the condition described by Dr. Hamill. One of our greatest errors in the management of young children is in permitting the extraordinary amount of work they do from morning until evening. If you don't believe that, take one of your own children and weigh him, and then give him this rest and weigh him at the end of a month, and you will find that the child will gain a pound or more.

DR. L. T. ROYSTER, Norfolk, Va.: Has Dr. Hamill made any observation at all in the matter of temperature during the convulsive seizures in the class of cases he mentions? Does he consider the temperature, either positive or negative, in any way suggestive of the diagnosis between that condition and epilepsy? I have asked a number of neurologists in this country that question and none of them seems to have thought of it to the extent of making an observation.

DR. H. M. McCLANAHAN, Omaha: The valuable thought in this paper to me was the possibility of intestinal indigestion and consequent toxemia leading to epilepsy. I have in mind a little girl who had repeated convulsions as often as once a week. She had chronic intestinal indigestion of the mucous type. After following out the course of treatment suggested by Dr. Hamill that child has absolutely recovered and more than six months have elapsed since a convulsion occurred. I am thoroughly convinced that, though the trouble was not true epilepsy, it was leading to epilepsy; and I am convinced that the convulsions were due to some toxins in the blood from the intestinal putrefaction. I believe more than most of you in the value of drugs, and I hope that I shall never become a therapeutic nihilist any more than I am a social nihilist, but I think that when the mother is given a drug to administer in these cases she is far more apt to carry out your treatment than if you depend absolutely on hygienic treatment. In the presence of constipation, especially the mucous type, the use of phosphate of soda is of value, although its value is not great compared with that of rest and a correction of the diet.

DR. E. E. GRAHAM, Philadelphia: In considering the nervous symptoms Dr. Hamill speaks of, we should not lose sight of the fact that a convulsive seizure in a child is brought about by an entirely different cause from a convulsive seizure in an adult. In children the convulsion is commonly of reflex origin, while in the adult it is commonly the result of some organic disease of the nervous system. This only adds force to the statement that chronic gastro-intestinal disease may originate and produce epilepsy in the adult. The probability of convulsions due to brain injury in an adult is very remote, while it is very common in children. For many years I have made a study of the cases in which convul-

sions developed in infancy, and that study has proved to my mind conclusively that the young child who has a convulsion is very commonly the one who later develops epilepsy, and that probably the convulsion, due to gastro-intestinal intoxication, is the origin of the late epilepsy. In other words, a certain amount of damage to a child's nervous system predisposes it to epilepsy. Any condition that is chronic for months or years and predisposes the child to convulsions certainly establishes a future condition that will predispose that individual to epilepsy. This paper is valuable because it deals with a condition with which we are all brought into contact, though it is a type of trouble that the large majority of us are apt to overlook.

DR. JOHN LOVETT MORSE, Boston: I merely wish to emphasize the importance of regulation of the diet in the treatment of these cases. The only way in which the diet can be accurately regulated is by having the mother keep an exact account of what the child eats, both as to quantity and quality, and by repeated examination of the stools. In this way only can we determine exactly what the cause of the condition is. The only feasible way of disinfecting the intestine is by changing the bacterial flora, and this can be done only by changing the food. I want especially to emphasize the value of the carbohydrates in changing the flora in these conditions. Changing the intestinal contents by the carbohydrates changes the flora, inhibits the growth of the organisms, which thrive on proteids, and hence prevents the formation and absorption of the products of the decomposition of proteids. When Dr. Coit spoke of protecting the bichlorid by hydrochloric acid, I wondered how many inches down the intestinal tract it would go before it was neutralized.

DR. FRITZ B. TALBOT, Boston: There is a general impression that it is a very difficult procedure to make an examination of the stools. From three to five minutes are required to make the examination, and it gives important information concerning the digestion of fat, starches and meat. I have been impressed by the fact that an excess of meat and starches is relatively uncommon and that an excess of fat is common in these cases of intestinal indigestion. The reason for this is that fat is the component of the food, which the parents are more likely to give in excess to a child who is run down.

DR. SAMUEL M. HAMILL, Philadelphia: Dr. Kerley is probably right in believing that I did not sufficiently emphasize the importance of rest in the treatment of chronic intestinal indigestion. He believes in prolonging the night's rest by giving these children their breakfast in bed. I am inclined to believe that in these cases many hours of consecutive rest result in the accumulation of toxic products which are very depressing in their effect. It is my custom, therefore, to have these children get up at a comparatively early hour, and, in order to secure a satisfactory total rest for the twenty-four hours, to have them rest at later periods of the day. I think that rest is so important that I sometimes have these children separated from other children by sending them to the country in charge of a nurse, where they can be under better control and where a quiet restful life is possible. I have not studied the temperature curve in the cases having convulsions, but I do not believe it would prove of value in the differential diagnosis from epilepsy.

As to Dr. Graham's remarks, I am perfectly willing to admit that children are more susceptible to reflex influences than are adults, but I do not believe the convulsive seizures in these cases are of a purely reflex nature. They are of toxic origin, as are the other symptoms.

I do not want Dr. McClanahan to believe that I am a therapeutic nihilist. I give drugs to these patients, but it is exceedingly important to emphasize the fact that drugs are overemployed and that they are frequently given without the slightest indication. I realize that it is desirable to console the mother by giving some medicine to the child, and I think we can do this honestly by prescribing some valuable drug, but we must make her realize the limitations of drugs, for unless we emphasize the necessity for general hygienic treatment the mother will neglect this and pin her faith to the drugs.

Dr. Morse spoke of the value of getting a record from the mother of the exact dietary of the child. I never treat a child without doing this, and I think it is exceedingly important. I secure not only a list of the various foods administered, but also a statement of the amounts of each food.

The examination of the stools, as has been suggested by Dr. Talbot, is not a difficult procedure, and one can gather much valuable information from the macroscopic study alone. The microscopic examination is important, but not so much so as the macroscopic. The sooner we realize that the examination of the stools is an easy procedure, the sooner we shall employ it as a routine measure.

NITROUS OXID AND OXYGEN ANESTHESIA *

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The advances in the use and perfection of nitrous oxid anesthesia since the report of the Anesthesia Commission on this subject, at the meeting of 1908, seem to consist of the following:

1. The employment of this agent, with modifications, as the routine anesthetic in several of the large clinics of this country.

2. The demonstration clinically and experimentally of the advantages of nitrogen oxid and oxygen over ether, in the prevention of shock, the conservation of immunity and its value in the case of the handicapped patient (Crile).

3. The establishment of rebreathing of nitrous oxid and oxygen for two or three minute periods, as harmless and beneficial, with the great reduction in cost of this anesthetic (Gatch).

It has already been shown that nitrous oxid is the safest of all anesthetics and the most pleasant to take; that it requires the shortest time for induction; that there is almost immediate recovery after its discontinuance, and that it has no bad after-effects. There is no stage of excitement, and excitement is absent when the patient returns to consciousness. Dentists, who have used it in short administrations for many years, state that literally millions of administrations have yielded an infinitesimal number of deaths.

It is not absolutely free from danger, however. Death can occur from its continuous administration, without admission of air or oxygen in from two to four minutes. In overdosage, death is caused by asphyxiation and cardiac inhibition. In the fatal animal experiments, sudden arrest of the heart in overdosage was observed. The danger-signals with this anesthetic are:

1. Deep and persistent cyanosis.
2. Depression and slowing of the pulse.
3. Vomiting.

Cyanosis is the first indication of trouble, and gives startling warning of impending danger. Discontinuance of gas and giving of oxygen, which should be always at hand, uniformly and promptly dissipate all danger.

Crile has shown in the physiologic laboratory that animals under nitrous oxid withstand shock-producing trauma much better than under ether. The resistance of animals rendered pathologic from infections, hemorrhage, and hyperthyroidism, likewise, was strikingly better under nitrous oxid than under ether. These laboratory observations were corroborated by the histologic examination of the primitive ganglion cells of the central nervous system.

* Approved by the Committee on Anesthesia of the American Medical Association.

Crile's recent investigations in cytology show that there is decidedly more destruction of chromatin after ether than after nitrous oxid. Again, there is no lowering of the phagocytic power after nitrous oxid, as after ether. Nitrous oxid does not reduce hemoglobin or cause any permanent blood change. There is no acetone or indicanuria as a result. Postanesthetic complications are absent.

Although oxygen was used by Andrews with nitrous oxid as early as 1868, some of the later apparatus provided for the admixture of air. Bevan employs this gas and air mixture with success, and I have used it in a series of over 100 cases. This mixture, however, does not provide such smooth anesthesia as does the mixture with oxygen. On account of the large atmospheric content of nitrogen, if enough air is used to do away with cyanosis entirely, it so dilutes the mixture that complete anesthesia is interfered with. While cyanosis is not desirable and can be prevented by the addition of oxygen, yet it should be understood that the cyanosis is not nearly so dangerous as that cyanosis produced by ether or chloroform—a cyanosis due to cardiac and respiratory depression.

It seems to have been established by Gatch that rebreathing nitrous oxid and oxygen in periods of two minutes is not only perfectly safe, but helpful to respiration, circulation and blood-pressure. Moreover, rebreathing reduces the expense greatly, which was partly responsible for the somewhat restricted use of this agent. Rebreathing seems to be more satisfactory than the continuous administration of the gas. The respirations are deeper and fuller, and the pulse is slowed by the therapeutic excess of carbon dioxide stimulating the center of cardio-inhibition. The temperature is slightly raised. The argument for rebreathing is that carbon dioxide under 4 per cent. concentration is non-toxic; that in normal and somewhat increased amounts in the blood it is the normal stimulus to the venous wall; that the abolition of venous tonus and not arterial is the primary cause of failure of circulation in shock. Carbon dioxide stimulates the cardio-inhibitory, vasomotor and respiratory centers, and an increase such as is afforded by rebreathing during gas and oxygen raises the blood-pressure and is thus an easily available preventive of shock. The loss of body heat by expired air is conserved by rebreathing and artificial warming of the gases is rendered unnecessary.

The apparatus of Gatch providing for rebreathing is extremely simple, portable and inexpensive. It has a rubber sleeve that fits snugly and conveniently over the face-piece, preventing leakage of gases and the ingress of air which checks the anesthesia. The patient can be given air or gas, with or without oxygen, and made to breathe the mixed gases to and from the bag. Even a little air allowed to mix the gases spoils the anesthesia. The apparatus has an attachment permitting ether to be added when needed for short periods, all without removal of the mask, until the anesthesia is to be permanently withdrawn. It is a very powerful etherizing device when needed.

It is not necessary to attempt to give any arbitrary percentage of oxygen. Just enough to dispel the cyanosis is the aim and, roughly speaking, a puff of oxygen in each bag of nitrous oxid that is to be rebreathed is sufficient. Keep the patient pink, is the rule. If the color cannot be kept good, it is better to give ether by the open method.