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by Alonzo B. Palmer.**

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MODERN TREATMENT OF
DIARRHOEA AND DYSENTERY

A. B. PALMER

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DIARRHŒA AND DYSENTERY.

MODERN VIEWS

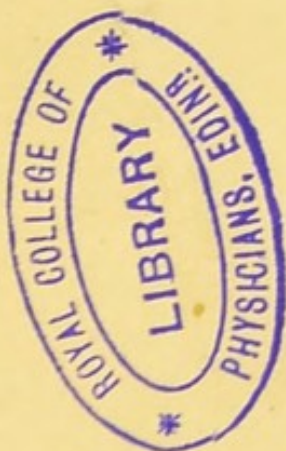
OF THEIR

PATHOLOGY AND TREATMENT.

—BY—

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1887.

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DIARRHŒA.

When a person has abnormally profuse, frequent, and liquid intestinal evacuations, not the immediate effect of a cathartic medicine, he is said to have a diarrhœa. These discharges are the result of an irritated or morbid condition of the alimentary canal, chiefly of the small intestines, and are produced either by increased peristalsis, or increased intestinal secretion, and generally by both these combined; and it is often difficult to determine which of these immediate causes is most active in the production of the effect.

As the contents of the small intestines are normally in a semi-fluid state (the fæcal matter taking a more solid form in the large intestines), increased peristalsis, by which these contents are more speedily passed off, will render the evacuations more fluid; but as the evacuations are abnormally large in amount, increased secretion is usually present.

The more remote causes producing a diarrhœa are numerous, and the disease takes a variety of forms.

It is sometimes produced by a morbid condition of the intestines, or other parts in which there are perceptible structural changes, when the diarrhœa is said to be *organic*. In other cases no structural change is discoverable, when it is said to be *functional*. It is sometimes the primary and essential disease, when it is *idiopathic*. At other times it is dependent upon

other recognized pathological conditions—is a symptom of such conditions—when it is *symptomatic*.

There are differences in the character of the discharges, in the general phenomena, and in the particular causes, which have given different names to some of the varieties.

Diarrhœa crapulosa is where the free discharges are fæcal but liquid or semifluid.

Lienteric diarrhœa is where undigested food is passed.

Bilious diarrhœa is where free quantities of irritating bile are passed.

A *critical diarrhœa* is where the free discharges occur at the crisis or turning point of some acute disease, as at the subsidence of an inflammation or a fever.

A *colliquative diarrhœa* is one occurring in the last stage of some severe disease, commonly accompanied by general relaxation and sweating, and is often terminal.

The term *camp diarrhœa* has been applied to cases occurring in armies, some of which have taken on peculiar forms, and been accompanied by special lesions, such as occurred in our civil war, and this form has been elaborately described and illustrated in the Medical History of the War.

Another form has received the name of the summer diarrhœa of adults and children; and that which occurs in children, from its peculiarities, frequency and severity, requires more particular notice.

Many of these varieties so run into each other that it is impracticable, in this account, to keep up the distinctions throughout, though some of the leading forms will require special description.

In most of the cases there is a special fluxion, or determination of blood to the intestinal mucous membrane, often resulting in a full inflammatory process, which is then an important element of the disease.

Before proceeding to a description of the different forms of the disease it may be well to present a summary of the causes of diarrhœa as a generic affection.

1. Improper ingesta. This is perhaps the most frequent cause of the ordinary sporadic form of the disease. The articles which find their way into the stomach and produce the effect are numerous and varied. Some of them will be particularly referred to as we proceed. Quantity as well as quality is an important factor, as the most innocent articles, when taken in excess, may produce diarrhœa.

2. Checking surface action by cold and dampness, causing an internal fluxion.

3. Exhaustion, debility, and relaxation of intestinal vessels and tissues.

4. Poisonous inhalations, mineral or vegetable, inorganic or organic, chemical gases or the results of putrefactive changes, sewer gases, etc.

5. Specific zymotic causes, microbes, ptomaines and leucomaines, taken in from without, or developed within the system.

6. Excessive excretion of irritating bile.
7. Obstructive circulation through the liver and congestion of the portal vessels.
8. Œdema of the intestinal membrane and irritation from retained urea, as in Bright's disease of the kidneys.
9. Pyæmia and septicæmia, and other blood-poisoning.
10. General strumous disease, and protracted suppuration.
11. Tuberculous and other inflammations and ulcerations of the intestinal membranes.
12. Critical changes in acute diseases.
13. Mental agitation, fear, anxiety, etc.
14. Typhoid and eruptive fevers.
15. Diseases of the mesentery, obstructing absorption from the intestines.
16. Reflex irritation from teething.
17. By no means the least, the intense and protracted heat of summer.

Either of these causes probably may of itself cause a diarrhœa, but two or more are often combined in producing the effect.

MILDER DIARRHŒA.

Some of the causes enumerated are slight, accidental, and transient in their action; and the discharges they induce often accomplish their removal, and are useful in their results. A diarrhœa from irri-

tating ingesta tends to cure itself, and often, so far from being suppressed, should be promoted by cathartic medicines.

The same is true with regard to various irritating materials developed in the system; and different pathological conditions of the intestinal membranes and other parts of the system are often relieved by free intestinal secretions and discharges.

The symptoms of an ordinary sporadic diarrhœa—diarrhœa crapulosa—are too familiar to require an extended description. The discharges are generally preceded by more or less abdominal uneasiness and pain, oftenest spasmodic or remitting, frequently by a headache, coated tongue, nausea, and sometimes vomiting, but with little or no elevation of temperature, unless a gastric or intestinal catarrh is present. Even when there is a mild catarrhal state, which in these cases is very common, there is but little fever, except in some cases of impressible children, and most of the symptoms often abate and sometimes speedily disappear when the free discharges occur. In such cases little interference is required. Abstinence from food for a short time, or a light diet for a day or two, may suffice for complete restoration. In other cases the symptoms continue, or become aggravated, and require medicinal as well as hygienic treatment.

The *causes* of this form of diarrhœa are repletion, over-fulness of the system, the taking of too much or improper articles of food,—such as unripe or decaying

fruit, stale fish, immature meat, rich dishes, etc.,—fatigue, exposure to cold, unusual heat, change of water and locality, temporary fits of indigestion, mental agitation, and other conditions of a non-specific and temporary character.

When these attacks are of marked severity or of more than short continuance, treatment is necessary.

This must be governed to a considerable extent by the causes which have produced the attacks. If they arise from repletion, abstinence and a light diet for a time, and saline eliminative laxatives and diuretics will be indicated. If from improper food, mild cathartics may be demanded. If there be acidity of the stomach, an alkali, as the bicarbonate of soda, or potash, should be added to the cathartic, or taken with some aromatic, or alone.

If there be much pain and cramping of the stomach or bowels, an anodyne or gentle stimulant, such as tincture of camphor, paregoric, tincture or extract of ginger, sulphuric ether, etc., should be given; and if the pain and irritation continue after free evacuations have occurred, a stronger opiate will be of great service, not only relieving present suffering but checking all the symptoms, and often leading to a speedy recovery. Indeed, if the pain be very great, the opiate may be administered at first, and laxatives would be called for afterwards.

If the tongue is much coated, and evidence of special perversions of the secretions is present, a mer-

curial, as a blue pill, a few grains of mercurialized chalk, or even a few grains of calomel with a grain, more or less, of ipecacuanha, and a few grains of soda, will be found to be of decided service, hastening a more complete restoration. As a rule, after such a dose, a laxative—a saline, a dose of castor oil, or of rhubarb and magnesia, should be given.

A warm bath, or pediluvium, and fomentations or a mustard poultice over the abdomen will often be useful adjuvants. This general course of treatment, with the avoidance of the causes, will generally be speedily successful as the disease appears in adults. If, however, it continues, there will usually be developed a catarrhal condition of the intestines, requiring management such as will be necessary in other forms of the disease to be described.

The passage of undigested food indicates the taking of improper articles, or a marked failure of stomach digestion, and the very ready passage of food through the stomach as well as through the intestines. In such cases the stomach should receive attention and such treatment as its particular condition demands. Special care of the diet should be observed, and alteratives, tonics, and astringents are often indicated. Pepsin and other artificial digestives may aid in the treatment.

A bilious diarrhœa is often useful, unloading the liver and the portal system, and much oftener needing alteratives and evacuants than any form of anodynes

and astringents. As in such cases malarial conditions are often present, quinine and other anti-malarial remedies will then be indicated.

A critical diarrhœa, as it tends to eliminate effete matters which have accumulated in the system, should not be checked unless from its profuseness and continuance it is exhausting the strength of the patient. Then opiates and astringents may be required.

SEVERER DIARRHŒAS.

In colliquative diarrhœa, stimulants and astringents seem to be indicated, but they, as well as other means, are generally inefficient. If, however, the circulation can be aroused and strengthened, and the blood-pressure increased, the discharges may be lessened or controlled.

The cases of idiopathic diarrhœa, which are most severe, most likely to become chronic, and require most careful treatment, are those which depend upon more specific causes, or result from a combination of several conditions.

The camp diarrhœa of our late war, especially that which occurred in the army at the South, was of a very severe character, often accompanied with a scorbutic condition, attended with peculiar inflammatory and ulcerative lesions of the intestines, and often becoming chronic and proving fatal in very large numbers of cases. Among the causes were insufficient and improper food, impure water, great exposure, and

abounding filth. The limits of this work will not admit of a particular account of this form of the disease, and dwelling upon it would be rather a painful reminiscence than a matter for practical guidance. It is to be hoped that a similar experience will not come to our country, at least for some generations.

The symptomatic diarrhœas, such as precede Asiatic cholera, and as accompany typhoid and the eruptive fevers, tuberculosis and other affections, are a part of the phenomena of those diseases, and are more appropriately treated of in connection with them. Our attention during the rest of this account of diarrhœa will be chiefly confined to that form often called the *summer diarrhœa* of adults and children, and which prevails by far the most extensively and disastrously among the latter-class of patients. As in this form of the disease the discharges are very liquid in character, it is sometimes called a serous diarrhœa. It is regarded by many writers as functional and non-inflammatory in the milder and briefer cases, but there can be no doubt of its inflammatory character in the severer and more protracted forms.

That which may be more appropriately called serous diarrhœa is closely allied to cholera morbus or cholera nostra and cholera infantum. It may, indeed, be regarded as a somewhat less striking form of the same affection. All of these, and, indeed, some other varieties of disease, might be included under the

designation of irritation, fluxion, and inflammation of the alimentary canal.

In this serous diarrhœa there is an irritated and fluctuatory condition of the mucous membrane of the intestines, with a free secretion of watery fluid from its surface, giving rise to frequent, thin, and copious discharges from the bowels, and sometimes from the stomach, usually accompanied by more or less pain, by thirst, by rapid emaciation and loss of strength, by coldness of the surface in some cases at first, but when continued for some days it is often accompanied with a degree of feverishness, though the extremities may continue to be cool. Occasionally there is elevation of the temperature from the beginning. The fever, when present, commonly assumes a remitting type. This form of diarrhœa chiefly prevails in our climate in the months of July, August, and September, and is more likely to occur in seasons of great heat and a still atmosphere; and it prevails much more in cities and large towns than in country situations.

In its severer forms and more abrupt attacks it is apt to be accompanied by vomiting of a more or less serous fluid, often stained with bile, thus assuming the form or merging into the condition of cholera morbus.

When it occurs in children under two or three years, it is sometimes accompanied with severe and repeated vomiting, the intestinal discharges being frequently repeated, entirely liquid, and very profuse,

with rapid sinking and often profound collapse and speedy death, constituting the conditions of cholera infantum.

It is this diarrhœal affection in its different grades which so enormously swells the bills of infant mortality in the cities and larger towns of the United States.

ETIOLOGY OF SUMMER OR SEROUS DIARRHŒA.

Between the 31st and 42d parallels of latitude, and east of the Rocky Mountains, the form of disease we are now considering prevails more than in any place in Europe or elsewhere.

In this region there is a very great range of temperature between the coldest days of winter and the greatest heat of summer; varying in different years from 75° to 140° , and there is a very high average temperature in most places within this belt for two, and sometimes three months in the summer. This great contrast of seasonal temperature seems to be a factor in the production of the disease; but a steady wave of continuous heat, night and day, for several days together, precipitates the greatest number of severe attacks.

There can be no doubt that climatal temperature exerts an influence in the production of these summer affections, but whether chiefly by the direct action of heat upon the tissues of the body, or by its influences in developing poisonous materials which find access

to it, is not so clear. It is, however, believed, and with the greatest reason, that the heat operates in both these ways. Other meteorological and telluric conditions, general and local, influence the distribution of these affections, but of these conditions, *temperature* seems to be the most important.

Carefully recorded observations were made for a series of years in several cities in the West, and a close correspondence was demonstrated between continuous high temperature for days and weeks, and the prevalence of these diseases.

Whenever a wave of high atmospheric heat continued day and night for more than five days, an outburst of summer diarrhoea and cholera infantum was the result. It was particularly noted that high temperature for a single day, or for several days with cool nights, was not followed by a particular increase of these diseases, but when the heat was continuous, and especially when at the same time winds were absent, with the consequent impairment of ventilation, attacks and relapses were numerous. If high temperature and stagnation of air continued for two weeks or more, great mortality, especially in children, resulted.

These facts would seem to indicate that the heat produced marked effects by its direct action upon the body itself, through its indirect operations upon its surroundings, upon food and drinks and the air, upon fermentations and decompositions which it favors, and

upon the multiplication of bacteria, and the production of various organic poisons; and none of these conditions must be overlooked. In its direct action upon the body it expands the tissues and diminishes their cohesion, and otherwise changes their molecular affinities, producing greater derangements in those unaccustomed to high temperature for larger portions of the year. The conditions of temperature, it is well-known, vary the action of different agents upon the fluids and tissues of the body, and thus may favor the effect of morbid materials on the system. The heat also increases perspiration and induces a loss of saline ingredients from the blood, and this may diminish its capacity for receiving and retaining oxygen; and by the rarefaction of the air there is less oxygen in a given bulk inspired, less oxidation takes place in the system, less effete matter is consumed, or prepared for proper elimination, and less purification of the system takes place, and also it impairs the powers of digestion. In whatever way it operates, it is generally conceded that excessive heat, whether from fever or external sources, especially when constant, and continued for days, lowers vitality, and favors morbid changes.

But heat favors putrefactive changes in foods and other organic matters and the increase of nearly all forms of filth, within and without the body, and it also favors the production or multiplication of bacteria,

now regarded by many as very important elements in the causation of most infectious diseases.*

These considerations go far towards explaining the influence of the "heated term" in promoting these diarrhoeal affections.

But there are other more particular causes concerned in the production of these affections, which require particular notice.

Among these, ærial poisons—substances mingling with or floating in the air, and capable of being received into the system with it—hold a place; and the cases are numerous where exudations from decomposing organic matter, fermenting excreta and other filth, the gases from sewers, cesspools and privies, the foul air of crowded apartments, etc., have unmistakably been the causes of endemic and epidemic diarrhoea.

Impurity of drinking water—water contaminated with decomposing organic matters—with the same matters, emanations from which float in the air, is another cause. Cases where diarrhoeas have been clearly traced to this cause are too numerous to leave this an open question.

* These organisms and other poisonous materials, are supposed to have a more congenial habitat and more favorable conditions for activity in a system where effete matters most abound, and, as we have seen effete matters are more likely to be retained under the influence of excessive heat. Debility is produced by excessive heat, and persons, especially children, are the less able to resist many morbid influences. (Buch.)

Many of the same essential agents which float in the air, mingle also with the water, and the difference is in the medium which contains them, and the mode of their obtaining entrance into the system. But what the particular agents are have not in all cases been determined.

The opinion prevails, more at the present than at any preceding time, that the cause is of a specific character—a peculiar *microbe* or *ptomaine* exciting this morbid state.

The summer diarrhœa, with its exaggerations in the form of cholera morbus and cholera infantum, has striking resemblances to Asiatic cholera, and the evidence of a specific material in the production of that affection is too conclusive to admit of doubt. The analysis of these affections has given rise to the belief that some similar specific agent produces the former disease. But a wider view of the subject appears to make it conclusive that no one specific poison is the exclusive cause of the common summer diarrhœa. In this, as in other cases, different causes produce similar results. In some cases one particular cause may produce the effect; in others a different cause has been the efficient one, while in others a combination of causes has produced the result.

In a very striking paper recently read before the New York Academy of Medicine by Dr. L. Emmet Holt, great prominence is given, as an etiological factor, to the *food* and the changes which take place in it

in this class of diseases. Indeed, he regards the immediate cause to be "the putrefactive changes which take place in the stomach and bowels in food not digested, which changes are often begun outside of the body." He thinks that "nearly all the diarrhœas and intestinal catarrhs of young children are essentially dyspeptic in their origin," and a similar view is held by Henech, of Berlin. Of course many other causes are recognized as producing the dyspeptic state, but this is held as that which is most immediate in producing the morbid phenomena.

This view may be too sweeping and exclusive, but that dyspeptic states and irritating matters in the alimentary canal are exceedingly frequent conditions in this form of diarrhœal disease there can be no doubt. The recent investigations in Europe and this country respecting the alkaloid poisons called *ptomaines*, produced in various organic matters which are used as foods, have opened up a field of great scientific and practical interest. The cheese and ice-cream poisonings, which have long been known as observed toxicological facts, have now found an explanation in the discovery of a particular alkaloid by Prof. V. C. Vaughan, of the University of Michigan, which he has appropriately named *Tyrotaxon*.* This substance, the mode of its discovery, its composition, the

*The accuracy of Prof. Vaughan's investigations and the correctness of his statements have been already confirmed by others.

method of its production, and its effects will be noticed further on. But this is probably only one of a class of substances which are produced from foods, and from the fluids and other constituents of the body, particularly from nitrogenous elements, and which appear in the alimentary canal, and in other parts of the system, in sufficient quantity, and of sufficient toxic powers to produce not only diarrhœa but a variety of other morbid phenomena.

The alkaloids derived from substances undergoing putrefactive changes are called *ptomaines*, while those of a similar character, which come from changes of albuminoid matters apart from putrefaction, and in the system, from its secretions or living elements, are called *leucomaines*.

The production of many of these substances is thought, and with good reason, to be induced by the presence of microbes. It is, however, probable, or at least possible, that some of them are produced without the agency or presence of these organisms. But it is true that numerous microbes of different species are present in the alimentary canal, more abundant in the intestines than the stomach, and "the activity of the cultures is much greater the further we get from the stomach and the nearer we approach the extremity of the alimentary canal."—(Beaumetz.)

Whatever these various microbes have to do, or not to do, in the production of the various alkaloids, such microbes and alkaloids are found to-

gether in the stomach and intestines. But the peptones give most of the reactions of alkaloids, and an alkaloid has been directly obtained from the action of gastric juice on fibrin. There is no doubt that in the alimentary canal the conditions are present for the production of alkaloids, many of which are irritating; and it has been ably maintained that "micro-organisms may produce alkaloids varying according to the species of microbes observed."—(Beaumetz.)

As further stated by Beaumetz, "It is seen then that fæcal matters contain organic alkaloids having a quadruple origin; they may result from the putrefaction of absorbed albuminoid substances; they may take their source in alkaloids furnished by living organisms; they may be due to the action of gastric juice on fibrin; in fine, they may be the result of the presence of micro-organisms which exist in so great quantity in the digestive tube. We know by accurate physiological experiments the action of these ptomaines and leucomaines; we know that they determine in living organisms symptoms quite analagous to those that are produced by muscarin. They are irritable poisons of the heart, and we see developed in animals to which they are administered, convulsive troubles and papillary modifications."

Among the particular substances that have been named are leucin, tyrocine, stercorine, indol, skatol and phenol, and now, by the observations and experiments of Dr. Vaughan, tyrotoxicon. It is stated that

tyrocine and leucine may be produced apart from putrefaction by trypsin, one of the ferments of the pancreatic juice; that stercorine and its derivatives take their origin in modifications undergone by the bile, but that indol, phenol, and skatol result from putrefaction of nitrogenized substances introduced into the intestines. To these must be added tyrotoxin, which seems to be the most violent perhaps of these poisonous substances.

It appears that Prof. Bouchard is entitled to the credit of first pointing out the influence of these ptomaines in the production of disease. He says: "The poisonous activity of human fæces is very great, even when they are quite healthy. A substance obtained from them by dialysis caused violent convulsions in rabbits. Enough alkaloids are produced in the intestines of a healthy man in twenty-four hours to kill him, provided they were all absorbed and excretion stopped. There seems to be little doubt that the amount of ptomaines produced in disease is greater than in health."

Brunton, in his work on Disorders of Digestion, who makes this quotation from Bouchard, says, "most of the alkaloids which have been obtained from the decomposition of albumen tend to produce diarrhœa." Some of them are powerful irritants to the alimentary mucous membrane, and, I do not doubt, are important factors in the production of the class of diseases we are considering.

The discovery and investigations of the cheese poison—Tyrotoxicon—are among the most important recent additions to our knowledge on this subject.

In July, 1885, after investigations carried on for many months, Dr. Vaughan succeeded in isolating from some samples of cheese, which had produced alarming symptoms in many persons, a highly poisonous ptomaine to which he gives the above name. The effect of this substance was demonstrated upon himself and several students interested in the investigation. These effects were found to agree closely with those observed by the physicians who had treated the persons who had suffered from eating the cheese. The most prominent of the symptoms were "dryness and stricture of the fauces, nausea, retching, vomiting and purging. The vomited matter was frothy and the stools watery. In some there were evidences of marked nervous depression."

A few months later, a bottle of milk was examined, which had stood six months tightly closed with a glass stopper. From this was isolated the same poison. It was recognized by its crystalline appearance, which was seen in the former specimen, and by its effect upon himself.

After this several gallons of normal milk were put into clean bottles with glass stoppers and kept in a chemical work room. From time to time a bottle was opened and the milk tested for the poison with negative results until after three months, when the

same substance was found in one of the bottles. The test which had been previously applied was easily made. It consisted of filtering the coagulated milk through heavy Swedish filter paper, furnishing a filtrate colorless and acid. This was rendered feebly alkaline by the addition of potassium hydrate, and was then agitated with ether. After separation the ethereal layer was removed by a pipette, was passed through a dry filter paper, which removed a white flocculent substance which was floating in it, and the ether was allowed to evaporate spontaneously. When not clear the residue was dissolved in water, and again extracted by ether. As a little water was left from the ether sufficient to hold the alkaloid in solution, this was extracted by being left some hours in vacuo over sulphuric acid. The crystals of the tyrotoxicon then appeared.

From half a gallon of this long-kept milk was obtained a concentrated aqueous solution (after the evaporation of the ether), ten drops of which, placed in the mouth of a small dog three weeks old, caused, within a few minutes, frothing at the mouth, retching, vomiting of frothy fluid, muscular spasm over the abdomen, and after some hours watery stools. The next day the dog had partially recovered, but was unable to retain any food, and this condition continued for two or three days, when the animal was killed.

Subsequently specimens of ice cream which had produced serious illness in a large number of persons

were treated by the same tests, and the same substance found.

Various animals have been treated with the tyrotoxicon, and symptoms similar to the first were produced.

In some eighteen persons at Lawton, Mich., made ill by eating ice cream, in a specimen of which tyrotoxicon was found, the symptoms as given by the physician who attended them were as follows:

“About two hours after eating the cream every one was taken with severe vomiting, and after from one to six hours later with purging. The vomit was of a soapy character, and the stools watery and frothy. There was some griping of the stomach and abdomen, with severe occipital headache, excruciating back-ache and ‘bone-pains’ all over, especially marked in the extremities. The vomiting lasted from two to three hours, then gradually subsided, and everybody felt stretchy, and yawned in spite of all resistance. The throats of all were œdematous. One or two were stupefied; others were cold and experienced some muscular spasms. A numb feeling, with dizziness and momentary loss of consciousness, was complained of by some. Temperature was normal, and pulse from 90 to 120. Tongue, dry and chapped. All were thirsty after the vomiting subsided, and called for cold water, which was allowed in small quantities, with no bad results. After getting out no one of the victims was able to be in the hot sun for several days, and even

yet (about ten days after the poisoning) the heat affects myself. I attended twelve persons, besides being sick myself, and all were affected in pretty much the same way. Several complain yet of inability to retain food on the stomach without distressing them. The man who made the cream took a teaspoonful of it, and he vomited the same as those who ate a whole dish, but not so often nor for so long a time. All are affected with an irresistible desire to sleep, which can scarcely be overcome. Even yet, some of us feel that drowsy condition, with occasional occipital headache."

Various experiments and observations have added to the evidence of the existence of this ptomaine, as a result of fermentation in milk and its products, and of its poisonous effects, and it is found that these effects are much more marked in young than in older animals. In one case in Dr. Vaughan's experience where an infant, after taking a bottle of a particular cow's milk, had symptoms of cholera infantum, an examination of a specimen of the milk revealed the presence of the same poisonous substance.

The inference is that, as in other cases, this fermentation change is produced by a microbe, but this has not been demonstrated, and no particular species has yet been shown to be present when the ptomaine is produced.

In the case of the child above referred to, whenever for several days milk was taken, though from a healthy cow and of a normal character, the symptoms

returned, and the inference was that some of the ferment remained in the alimentary canal and caused the production of the poison when milk was introduced. This suggests entire abstinence from milk in cases of cholera infantum and allied affections.

It is of interest to state that in a cat examined after being poisoned by the tyrotoxicon, instead of a hyperæmic or inflamed condition of the mucous membrane of the stomach and intestines, as was expected, the membrane was pale and flabby.

The main facts discovered by Prof. Vaughan respecting tyrotoxicon have been confirmed by others, and one of the most important contributions is by Dr. W. K. Newton and Mr. Shippen Wallace of the New Jersey Board of Health, published in the Philadelphia Med. News of Sept. 25th, 1886. They describe an outbreak of illness in two hotels at Long Branch, in which, from one to four hours after supper, some forty persons were attacked with symptoms similar to those at Lawton, Michigan. All the persons, it was found, had taken milk from a particular dealer. It was found that the milk had been taken from the cows at noon, had been placed in the cans warm, and without any attempt at cooling was carted eight miles during the warmest part of a hot day. A specimen of the milk was examined after Dr. Vaughan's method, and the crystals of tyrotoxicon obtained, which, when given to a cat, produced like effects to those reported by Dr. Vaughan.

It is of course inferred that a ferment, presumably a particular kind of microbe, obtained access to this milk, and its warm and perhaps agitated condition favored the peculiar fermentation which produced the ptomaine.

I have deemed so extended an account of tyrotoxicon and its effects justifiable from its scientific and practical importance, its novelty, and from its being an American, a Western, and a Michigan discovery.

Notwithstanding the numerous facts and considerations to which we have referred, there is much yet to be learned, but enough has been established to lead us to hope that future investigation along this course will throw great light upon the pathology and treatment of many diseases, and especially those of the alimentary canal.

As there are analogies in the phenomena of summer diarrhœa, cholera morbus, and cholera infantum, and those of Asiatic cholera, it may be presumed there are analogies in their causations, and when the etiology of the latter is more positively determined, we may hope that the causes of these affections will be better understood.

We should, however, constantly bear in mind the important fact, that very different causes may produce very similar effects and that a combination of causes may be essential to many results which occur.

Demonstrating the influence of microbes and ptomaines will not exclude other influences in the

production of a disease. The various cathartic medicines, however different in their origin and composition, produce similar effects upon the intestines.

MORBID ANATOMY.

The pathological changes in summer diarrhœa require a brief notice. The morbid appearances after death, in acute cases terminating speedily, are not apt to be great. Though there is doubtless a fluxion or determination of blood to the intestinal mucous membrane in the disease, the free watery discharges unload the vessels, and after death a mucous membrane much congested during life may have blood recede, and the evidence of that congestion disappear. But the membrane is often left reddened and is sometimes softened. The softening, however, is thought often to be *post-mortem*, and it is not always easy to determine whether it is so or not. Sometimes marked changes are not observed even after a considerable continuance of the disease.

The pathological conditions which some regard as most essential are impairment of the tonicity of the tissues, change in the vaso-motor nervous influence upon the vessels, without the establishment of an inflammatory process; but the irritating cause of the disease is apt to produce a catarrhal condition, and protracted cases of severity very often present evidences of developed inflammation. It is usually catarrhal, but a diphtheritic state is sometimes found.

When inflammation is present the appearances do not materially differ from muco-enteritis from other causes. These we need not here describe. When feverish excitement occurs, with tenderness of the abdomen, and especially if there are mucous discharges, we have evidence of the existence of inflammation. It is located in the small intestines, mostly in the ilium, and often extends to the large intestines; indeed, the inflammation is often first and chiefly at the cæcum and the sigmoid flexure of the colon. When a case becomes chronic there is generally marked intestinal catarrh, and sometimes ulceration. There are in these chronic cases often black deposits in the membrane, its coats are thickened, viscid mucus is present, and denudation of the epithelium, as well as more decided ulceration, followed by atrophy of the intestinal walls; and sometimes other changes are found. But in some cases, even of the much protracted diarrhœa, only slight changes are perceptible.

The *leading pathological states in reference to treatment* are the presence of irritating materials in the digestive canal, a lowered vitality of the whole system, a deranged action of the organic nerves, the accumulation of effete and poisonous matters in the blood and tissues, and an increase of irritability of the intestines and stomach. The vital affinities are disturbed, and the tonicity of the whole vascular system is lowered.

The morbid excitability and lowered tonicity of

the mucous membrane favor a rapid influx of blood to that membrane and a correspondingly rapid effusion or exudation of serum derived from the blood and poured into the alimentary tube. The material of the discharges is thus furnished, and the reflex excitement of the muscular coat results in the free and often forcible and explosive expulsion of the diarrhœal fluid. Any irritating material, the presence of bacteria, ptomaines, or leucomaines, improper or undigested food from the stomach, changed bile, other modified and irritating secretions, or other impressions made upon the membrane directly, or indirectly through the reflex nervous system, as from teething or from morbid impressions on other parts of the body by leucomaines or other irritating materials or conditions, increase the afflux and discharges, and the primary phenomena of the disease are induced. The loss of the serum of the blood with its saline ingredients produces other morbid results, sometimes obstructed capillary circulation, collapse and speedy death. Other glandular secretions, salivary, urinary, and hepatic, are often diminished, perverted, or more completely obstructed, the blood becomes thick, impure, and deprived of some of its important elements, it circulates with less freedom, particularly in the smaller vessels, its oxygenation is impaired, and the train of phenomena, primary and secondary, characterizing the disease, is produced. The inflammatory lesions of the intestines, so often following, give rise to feverish symptoms with their

consequences; the brain, from deficient nutrition becomes exhausted, or perhaps poisoned by retained secretions or narcotic ptomaines or leucomaines, and the morbid circle is complete.

When vomiting, as in cholera morbus and cholera infantum, is so active and persistent as to prevent fluid taken into the stomach from being retained and absorbed to supply in any considerable degree the place of the fluid which is lost from the blood, collapse and death may be speedy, especially in young children with but moderate powers of endurance.

When, however, after the expulsion of irritating matters, the discharges can be controlled, reaction, as in most cases of cholera morbus, may speedily take place, liquid nourishment may readily supply the losses of the blood serum, and comparative health may be soon restored. But in many cases after the vomiting and more profuse purging are checked, and reaction in the general tissues and functions has occurred, the lesions of the intestines and perhaps poisonous materials in the alimentary canal and the blood and tissues are left. Large patches of the intestinal membrane may be denuded of their epithelium, hemorrhagic infarction may have taken place, a low inflammatory condition and excited feverishness are induced, the diarrhœa continues, though with less profuse discharges; and the continuance of the oppressive heat, filthy atmosphere, and food which is improper or not digested, may bring on an increase or continuance of the symp-

toms, and the patient may linger and slowly recover or succumb to the disease.

The *course* is variable, from a few days to weeks, and the prognosis in the severer forms of this disease in children is always grave, though many recover under proper treatment; while in the summer diarrhœa and in cholera morbus of previously healthy adults, under prompt and proper treatment, the prognosis is very favorable. The cases almost invariably recover, and generally quite speedily.

Occasionally, however, in adults the vomiting and purging continue, or speedily go so far that fatal collapse occurs; or poisonous materials are retained, the brain functions fail from deficient capillary circulation or apparent narcotico-acrid poisoning, ptomainic or uræmic, and the patient dies comatose.

One condition, not unfrequently occurring in children in protracted cases, requires special notice. From inanition and exhaustion, and perhaps from leucomanic poisoning, the child falls into a state of stupor or coma, with half open and congested eyes, cool nose, cheeks, and extremities, sunken fontanelles, slow breathing, and a shriveled expression. A state similar to this sometimes occurs at an earlier period of the disease and after the diarrhœal discharges are abruptly checked. The symptoms in both of these cases have received the name of hydrencephaloid. Their resemblance to those of acute hydrocephalus has suggested this title, but the history is quite differ-

ent, and there is depression instead of prominence of the fontanelles. It is very important that the two conditions should not be confounded, and also that a distinction should be made between those cases which occur late in the disease, chiefly from inanition and exhaustion, and those which take place at an earlier period, and which are probably due to poisonous impressions. The indications for treatment in the different cases will by no means be the same. They may be quite opposite.

The symptomatic phenomena in summer or serious diarrhœa, and its exaggerations of cholera morbus and cholera infantum, have frequently been referred to in what has preceded, and the clinical phenomena are so familiar to practitioners of experience that no further or detailed description of them is required.

The discharges vary somewhat in color and consistence, and sometimes in general character. At first they are fæcal, but thin, soon becoming watery, are more or less copious, and often discharged with more or less explosive force. The color is pale or yellowish, often scarcely staining a diaper, but sometimes darker, not unfrequently quite green. The green color of the stools, by some formerly spoken of as "calomel stools," is caused by bile, chiefly the bilirubin, acted upon by other intestinal contents. In some cases the discharges become more mucous or possibly shreddy, and then muco-enteritis must be regarded as present, and the large intestines as particularly in-

volved. In rare cases briny discharges are noticed, the small quantity of blood producing the appearance usually comes from the hyperæmic condition mostly of the small intestines. When ulceration occurs pus is in the stools. In all the varieties of discharges undigested particles of food, coagula of milk, colored or not, are liable to be found, according to what is taken into the stomach and the degree of its digestive power.

The amount of pain experienced is variable, the failure of strength and flesh is rapid, thirst is generally marked and the appetite impaired, though in some chronic cases it becomes voracious and requires rigid control.

TREATMENT.

The practical object of all medical investigation, study, and teaching, is the prevention, alleviation, and cure of disease. As summer diarrhœa, with its closely allied affections, inflicts so much suffering and is such a frequent cause of premature death, the very great importance of understanding its most successful management, prophylactic and curative, hygienic and medicinal, must at once be apparent. The practical causes of few diseases are better understood and more controllable than those of this, and preventive measures are first to be considered.

It is a mere truism to say that the prevention of a disease consists in avoiding, removing, mitigating, or counteracting its causes. In order to the accomplishment of this most important object such causes must be understood, and hence so much space has been devoted to their discussion.

Of the causes concerned in the production of this disease, climate and locality, the great contrast in temperature between winter and summer, and particularly the constant and protracted high temperature of the "heated term" in our latitude, and especially in our cities, where the stone pavements, the brick walls and the narrow streets intensify and maintain that temperature, bear a prominent part.

The climate we cannot change, the meteorological

conditions are beyond our control, but we can direct those under our care to change their locality, to leave the heated pavements and brick walls for the open country and cooler situations; we can lessen the temperature of the body by bathing and producing artificial currents of air; we may reduce the temperature in apartments by artificial means, where the means can be commanded and patients cannot be removed; and we can regulate the clothing, the drinks and the food so as to produce and retain the least amount of heat.

Many city and village residences are furnished with hot-air flues and registers for supplying heat from furnaces in the winter. It has been suggested, and the plan seems feasible, that these flues and registers may be connected with refrigerators for supplying cool air in the extreme heat of summer. A power fan would perhaps be required to force the cool air into apartments. A degree of coolness of air might be produced by taking it from a deep cellar, or passing it through sprays of water, or through rooms containing quantities of ice, or chilled by chemical refrigerating processes. It is possible that in the near future some system of this kind may be introduced into many houses, and become a *curative* as well as a preventive remedy in this disease; and its effect as a luxury, all who suffer the discomforts of excessive heat would appreciate.

But excessive heat is only one of the factors, and it largely produces its effects by acting on the sur-

roundings, and not alone by acting directly upon the body itself.

Poisons arising from filth, the decomposition of organic matters taken in by the air or by water and food, must be avoided. These can be prevented, or at least greatly mitigated, by proper hygienic measures, which space will not allow to be here discussed in detail. But if, for any reason, the production of these poisons is uncontrollable or uncontrolled in a city, the patients, or those who have reason to fear attacks, should "flee to the mountains" or the seaside, or to some healthy location in the country. But it should be remembered that though filth is likely to be less abundant and widespread in the country than in the city, yet an abominable privy containing putrefying filth stored for many years, or a scarcely less offensive cesspool, may be near a country residence and its well; or a *collection* of such horrors may render a village more unsanitary than the large city.

But improper food, contaminated milk, and indigestible or irritating ingesta of various kinds, which are such prolific causes of diarrhœa, especially in children, must be avoided with the utmost care. Milk is the natural food of all young mammals, but they naturally take it from their mothers, not from other species of animals, and directly from its source. Unfortunately, when a considerable period intervenes between its coming from the udder and its being taken into the stomach, it readily undergoes certain

fermentative changes, especially in hot weather, and those changes are liable to produce substances of an irritating and poisonous character, as we have seen. In cities the milk not produced from improperly fed and cared-for cows, is brought from considerable distances in the country. This may be diluted with impure water, or adulterated by foreign substances; but changes are more likely to occur and prove injurious, from a contaminated atmosphere or from want of absolute cleanliness in the management of the cans and other vessels in which it is received and transported. Into these, fermentation germs obtain access and are retained, and produce changes which render it unfit for human, and especially for infant food. As a rule, the mischief to the milk occurs between the cow's udder and the human stomach, and the prevention of these diseases from milk will consist not only in obtaining it from a properly fed and healthy cow, but in its proper care from its source to its use. Pails, cans, pans, and nursing bottles and tubes must be absolutely clean, and by the frequent use of boiling water and whatever other means may be necessary, the possibility of the presence of specific ferments must be prevented. This alone will secure immunity from unwholesome changes in milk and its products. The difficulties of accomplishing this are great, perhaps impracticable, especially among the poor in cities, and hence the prevalence of diarrhœas among cow's-milk-fed children, compared with those that are nursed by

temperate, properly fed, and healthy mothers. But to whatever extent it is possible, by avoiding the causes, to prevent these diseases, they do occur, and that too most abundantly, and require professional treatment.

All the means of *prevention* which have been stated are *curative* as well, when the disease has occurred. It will, therefore, be apparent that one of the first duties of the physician, when called to see a case of summer diarrhœa, is to enquire into the diet and general surroundings of the patient, and give special directions respecting them. In the case of adults the same general principles are applicable in the treatment, but as children are so much more frequently affected, the disease, as it appears in them, will be in mind in most of the statements which will follow.

If in a nursing child, the question will arise, Shall the nurse be changed? In a large majority of cases in common life this cannot be done, and very often it should not be.

This must be left to the possibilities of the case and the discretion of the physician. Indeed, in some, perhaps most cases, for a short time at least, the child should not nurse at all. If there be ferments in its stomach and bowels, which will develop injurious materials from the milk, whether from mother or cow, it will be better that milk be withheld and some other food substituted. This is particularly the case in bottle-fed children. This point the physician may not be

able positively to decide. But if the milk evidently disagrees, there must be a change. Dr. Holt, of the New York Infant Asylum, to whose paper reference has been made, lays down the rule that "in children under two years not fed at the breast, it is better to *withhold milk entirely*." He adds: "Peptonized milk is very much less likely to disagree than either condensed milk or fresh cow's milk. But in many, even this caused an aggravation in the intestinal symptoms.

* * Again and again have I seen relapses brought on when milk was added to the diet in cases where the stools had been practically normal for two or three days. Our 'no-milk diet' comprised the following articles: Wine whey, chicken and mutton broth, Mellin's food with barley gruel, expressed juice from rare beefsteak or roast beef, and in a few cases raw-scraped beef. With this variety we usually had no difficulty in dispensing with milk."

There are cases where healthy breast milk should be continued, and in others, especially older children, good, fresh milk from a healthy, properly cared-for cow should be a basis of the food. Often it should be diluted with lime water, and still oftener it should be scalded, with the addition of *thoroughly-cooked* farinaceous substances, so as to prevent the milk from coagulating in larger masses, and thus present a smaller surface to the digestive fluid. Doubtless, in some cases some good, freshly-prepared beef extract, partly digested artificially, will be better. In some

cases, especially in older children, a portion of solid food will agree better. Tender beef or mutton, pounded to a jelly and freed from fasciæ by scraping, salted and given raw, or but slightly cooked, will often agree well. Cleanliness in everything, as fresh, pure air as possible, cool sponging of the surface when the weather is very hot, a cool room, carrying the child to a park or onto the water, removal to the country, mountains, or seashore in protracted or in more acute cases, if the patient is not too weak to be moved, and it be practicable, will be required. All these are measures not to be neglected, when it is possible to have them followed out. But among the masses of the people, especially among the poor of large cities, pecuniary and other family considerations will render some of these means out of the question.

With regard to the exclusion of milk from the diet, no invariable rule can be properly adopted. Although in some, perhaps in many cases, the fermentation of milk and the production of tyrotoxicon or other ptomaines, either without or within the alimentary canal, are important factors in the production of these affections, yet they are not present in all, and perhaps only in a minority of cases, and the time has not come for an authoritative exclusion of good fresh milk from the dietary of every child affected with summer diarrhœa. Farther observation and experience must decide the proper course in this respect in different cases.

In regard to the treatment by medicines, several indications are presented.

Professor Dujardin-Beaumetz states in his work on New Medications, "That man in the physiological state necessarily produces poisons, more or less virulent, and the condition of health for him consists in their regular and rapid elimination by the different eliminatories of the body, and particularly by the intestines and kidneys; nor must I omit to mention the liver, which has for its function the destroying of a certain number of these toxic alkaloids. But let some circumstance come to interrupt this equilibrium—let the liver cease its functions; let the glomerati of the kidneys become obliterated; let too active an absorption take place from the intestines, whether by abnormal shedding of their epithelium, or by the presence of ulcerations, or want of power on the part of the digestive ferments sufficiently to stay the production of putridity—in all these cases there may ensue a pathological state for the relief of which we may be called upon to render assistance. * * *

"The physician can and ought to interfere to combat these intestinal septicæmias, and he attains this end in employing two kinds of medicaments—one kind which has for its object to prevent putrid fermentations from developing in the digestive tube, and to destroy the toxic elements which are found there; another which has for its end the favoring of the rapid elimination of these matters from the intestines."

In various diseased conditions the occurrence of these morbid processes, and the production of these morbid materials are increased, hence the importance which for one I have long insisted upon, of eliminative treatment; and hence also the high estimate by preceding generations of evacuative treatment. Some of the former generation of physicians may undoubtedly have carried their views too far, or resorted to too violent measures for carrying them out; but that there was a basis of truth and good sense in their views and practice there can be little question. Says Beaumetz: "Substitute for the words *peccant humors*, *atro-biliary humors*, the words *micro-organisms*, *alkaloids of putrefactions*, and you will understand the importance which the physicians of the olden times attached to this group (cathartics, etc.,) of medications."

From all the facts which have been stated in the preceding pages, there can be no doubt that these principles apply, in a greater or less degree, to the diseases we are considering.

In Dr. Holt's excellent paper he groups the indications of treatment of these affections under the following heads:

1. To clear out the bowels.
2. To stop decomposition.
3. To restore healthy action in the intestines.
4. To treat the consecutive lesions.

He says nothing of the indication for directly

arresting the discharges; but although the discharges, when going to a certain extent only, are remedial and useful, they often pass that limit and become the source of immediate danger, and need to be controlled. They take the serum from the blood, often to such an extent as to render it thick and incapable of free circulation in the capillaries and also to prevent its proper oxidation—in fact, to exhaust the system and produce collapse, just as excessive purging from a drastic cathartic may do; and this excessive action, especially in cholera morbus and cholera infantum, and also in profuse watery diarrhœa, furnishes a most important indication for prompt and energetic treatment.

Again, the morbid sensitiveness and irritability of the mucous membrane and the pain, resulting in shock to the system, need soothing, and the strength and vital powers need sustaining under the depressing and exhausting influences. The indications for medication, which seem to me to be presented, are the following:

1. To remove irritating materials from the alimentary canal where the evacuations are not profuse and watery, and to modify the secretions.
2. To stop decomposition and the production of irritating substances.
3. To allay morbid irritability of the alimentary canal, arrest too profuse and exhausting discharges, soothe pain and procure rest.
4. To restore tonicity and healthy action in the

intestines and the general system—nervous, vascular, secretory, and trophic.

5. To treat the consecutive lesions and any distressing accidental symptoms which may occur.

The means for fulfilling these indications are various, and need to be applied, especially in children, with great care and discrimination.

It is impossible to specify the details of treatment best adapted to all individual cases, especially to state the extent to which each item of treatment is to be carried. This must depend upon the discretion and judgment of the physician.

The first indication is to be met by an emetic in those rare cases where there are evidently irritating matters in the stomach. Sometimes the free drinking of warm water may be sufficient, but in other cases a proper dose of ipecacuanha may be best.

It is generally advised that if constipation has existed, or there be evidence that undigested food is in the intestines, a cathartic should be given to begin with. But unless there have been very free and watery discharges, and even if there have, but without serious exhaustion, a laxative should be administered. If there are no decomposing and irritating ingesta, there are altered secretions probably undergoing putrefactive changes which should be removed. In my judgment a moderate dose of some mercurial, calomel, blue mass, or chalk with mercury, or possibly a small dose or two of the bichloride, as perhaps a more effi-

cient germicide, should be given, followed by an efficient dose of castor oil, to which may be added a few drops of spirits of camphor, of paregoric, or of some stomachic, given in some agreeable vehicle, as a little orange juice and water, or in some warm coffee to render it less offensive to the palate and stomach.

If, however, there is severe vomiting so that there is no prospect of the oil being retained, a free injection of pure water into the bowels, placing the patient in a position so that it will extend as high as possible into the intestine, will tend to remove the irritating matters. A free evacuant effect is desirable, as thereby not only are irritating matters removed from the membrane, but germs that would excite morbid changes are removed and the absorption of foul matters into the blood may be prevented.

A dose of castor oil alone may be sufficient for the cure of mild cases, provided great care of the diet is taken and strictly enforced for some days after. Whether the mercurial acts more as a germicide, or by its modification of the secretions, I am very sure, (and this conclusion is sustained by the opinion of most practical physicians,) that when not carried to the extent of producing irritation by itself, its action is beneficial. The doses may usefully be repeated from time to time, often in connection with alkalies, or with very small doses of ipecacuanha. An occasional impression of a moderate dose of castor oil may be ad-

vantageous in protracted cases, and where the mild mercurials are used.

These evacuants are used on a similar principle as that of the washing out of a wound or an abscess before other dressings are applied.

But perhaps the most rational, and, as is now alleged by many, the most successful treatment, is that which is intended to fulfill the second indication—that of arresting decomposition and the production of irritating or poisonous substances in the intestines. If these diarrhœas are produced by germs and their products, morbid ptomaines, then germicides and antiseptics are certainly called for, providing articles that produce these effects will not of themselves do as great harm to the organism. Such articles, it is averred, exist; and they may be introduced either by enemata or by the mouth. Substances which are introduced in either way must be those which are but slightly irritating or toxic. Several have been recommended and used. Beaumetz mentions salicylic acid, boric acid, cupric sulphate, and finely powdered charcoal from poplar wood, suspended in water, for injections, but gives the preference for use by the mouth to charcoal powder, iodoform, and carbon-bisulphide water. Powdered charcoal will deprive the stools of bad odor, but it does not destroy organic germs, and has to be given in inconveniently large doses to produce much effect.

Iodoform is powerfully disinfectant and aseptic,

but is too irritant for general or prolonged use. Beaumetz greatly prefers the carbon-bisulphide water, which he says he has employed with great success. His formula for use is:

℞ Carbon-bisulphide, 3 vi.
Water, ℥ xvi.
Spts. of peppermint, gtts. xxx.
M.

This should be put into a flask of some twenty ounces or more capacity, and, after being shaken and allowed to settle, eight, ten, or more tablespoonfuls of the water should be given to an adult during the day in rather frequent divided doses. Its continued presence in the canal is desired for continued effect. The bisulphide water should be further diluted with water, milk, or some simple drink when taken.

Under this treatment Prof. Beaumetz declares "the infectious diarrhœas disappear." He has also used it in typhoid fever, in what he calls "putrid dyspepsia," and in dilatation of the stomach; and neither in his hospital or private practice has he seen untoward accidents from its employment. It is cheap, and he declares that "in modifying putrescent intestinal processes it has been proved to be possessed of efficacy above all other medicines."

I am not aware that it has been tested in the summer diarrhœas of this country, but as a new and promising method of antiseptic intestinal medication, I could not omit stating the testimony in its favor.

The antiseptic remedy extensively and most successfully used by Dr. Holt, after much experimentation with various drugs, is the salicylate of sodium.

Creasote, oil of naphthol, salicin, naphthalin, bichloride of mercury, as well as the salicylates, also resorcin, chloride of potassium and benzoate of sodium, have been used by different physicians in these bowel complaints with a view to their distinct antiseptic action, and with greater or less alleged beneficial results; and Dr. Holt thinks that the beneficial effects of bismuth, calomel, the mineral acids, chloride and sulphate of iron, and the nitrate of silver, and beneficial effects he says they have, are due more to their antiseptic than to any other property they possess. But he seems to think that a dose of castor oil to begin with, and salicylate of sodium after, pursued through all stages, with strict attention to diet, nearly always avoiding milk, are about all the means required for the treatment of the summer diarrhœa of children. He compares different methods of treatment with this, and shows a marked superiority in results in this special method over others used. His statistics are indeed very remarkable. Out of 81 cases—not selected, but taken as they occurred—60 were cured, 14 improved, 6 unimproved and 1 only died. He states that those put down as “improved” were some of them “greatly improved,” and all would probably have been cured had treatment been continued longer. Some of the most striking cures were in cases of long standing.

The cases not improved passed into the hands of others, some of them being seen but once, and in some of them it was thought the directions were not carried out.

For the class of cases treated, mostly in dispensary practice in the city of New York, the results were almost marvelous. As will be observed, the treatment was directed chiefly to the fulfilling of his first two indications—that of clearing out the bowels, and of stopping decomposition—though he claims that the third indication, that of restoring healthy action to the intestines, was to a considerable extent fulfilled by the salicylate.

Dr. Holt seems to begin his treatment with a dose of castor oil, though the disease has continued for almost any length of time, and the patient is very much reduced. He then gives the salicylate of sodium in doses of from one to three grains to children from three months to three years of age, repeated every two hours. In these doses the aqueous solution has but little taste, and can readily be given in the food or drink.

In addition to the salicylate, if there is severe vomiting, omitting the oil, he washes out the intestines by an enema of pure water at the temperature of 65° F., elevating the hips and gently manipulating the abdomen, and using sufficient fluid to reach the ileo-cæcal valve, which he finds to be a pint in a child six months old, and two pints in one of two years.

The oil he regards as unnecessary when, after two or three fæcal evacuations, the discharges consist of almost pure serum, large in amount, alkaline in reaction, and odorless.

As a summary of Dr. Holt's views, which, from their consistent character and the remarkable results of their application, I thought worthy of being so fully presented, I quote the following:

"1. Summer diarrhœa is not to be regarded as a disease depending upon a single morbid agent.

2. The remote causes are many, and include heat, mode of feeding, surroundings, dentition, and many other factors.

3. The immediate cause is the putrefactive changes which take place in the stomach and bowels in food not digested, which changes are often begun outside the body.

4. These products may act as systemic poisons, or the particles may cause local irritation and inflammation of the intestine.

5. The diarrhœal discharges, *at the outset* at least, are to be looked upon as salutary.

6. The routine use of opium and astringents in these cases is not only useless, but, in the beginning particularly, they may do positive harm, since, by checking peristalsis, opium stops elimination and increases decomposition.

7. I do not deny nor undervalue opium in many

other forms of diarrhœa than the one under discussion.

8. Evacuants are to be considered an essential part of the antiseptic treatment.

9. Experience thus far leads me to regard naphthalin and the salts of salicylic acid as the most valuable antiseptics for the intestinal tract."

Farther and more general experience may prove that the treatment already mentioned will be so successful as to supplant all other remedies in the treatment of the ordinary summer diarrhœas; but specific, single, and uniform methods of treatment of different diseases have so often been put forth as nearly uniformly successful though afterwards found in the hands of others to be either failures or adapted to particular cases only, that in this case other remedies than those mentioned require to be noticed.

The third indication of my enumeration, that of allaying irritation of the alimentary canal, arresting too profuse and exhausting discharges, soothing pain and procuring rest, may be met without interfering with the proper evacuant and antiseptic treatment described.

After very free evacuations, whether from the cathartic or spontaneous, and when they become and continue watery, profuse, and exhausting, whatever else is done opiates should be given. They must be used with great caution in young children, very small proportionate doses being borne, but they are often

quite essential. In adults with profuse and watery diarrhœa, especially if accompanied with repeated vomiting, severe pain and cramps merging into cholera morbus, they must be used promptly and freely. In no disease is any article of medicine more demanded. Immediately after an act of vomiting, if from a quarter to half a grain of morphine be dropped far back upon the tongue and a spoonful of water taken after it, these violent, distressing and dangerous symptoms will often be speedily controlled. If necessary, however, the dose may be repeated, perhaps in smaller quantity. A very efficient way is to give it hypodermically, adding to a quarter of a grain the $\frac{1}{120}$ of a grain of atropine. What would be quite as effectual and would fulfill other indications than the mere arresting of the too profuse discharges, is a powder consisting of two grains of opium, two grains of camphor, a few grains of calomel, and fifteen of sugar of milk, rubbed up into an impalpable powder, dropped into a small spoonful of water and swallowed, with a little sip of water after. Only very small quantities of fluid should be taken in such cases, just enough to moisten the passages, however great the thirst, lest vomiting be excited and the medicine, too much diluted to be efficiently applied to the coats of the stomach, be rejected before it has produced its effect. Attention to these points is essential to the best success. The repetition and modification of these doses must be governed by the effects. This treat-

ment will not interfere with the use of antiseptics—will indeed enable them to be retained and accomplish their object. In milder cases either of the diarrhœa or vomiting, the opiates may be unnecessary, but in the cases supposed they are demanded.

In other cases, where there are great restlessness and pain, and where there is inflammatory irritation, their judicious, not routine, use will be beneficial. Their object will be not to arrest discharges unless they are excessive, but to allay irritation and procure rest. If the opiates are supposed to prevent irritating matter in the intestines from passing off, they should be discontinued, and if necessary a laxative—castor oil, etc.,—given.

But in the case of diarrhœa should the salicylate—a trial of which I can but recommend—fail, the various other means which long experience has taught the profession to believe to be useful, may be resorted to. The probability, or at least possibility, of ferments being the chief agents, in many cases at least, of specific summer diarrhœa, should be borne in mind, and the evacuant and antiseptic treatment should not be neglected wherever thought to be indicated and found in the prevailing cases useful.

I cannot doubt that in many cases occasional small doses of mercurials in combination with soda, and to which, where much irritability of the mucous membrane is present, an opiate is added, will serve a good purpose. Many prescriptions will be found in

the books from which selections may be made and adapted to the cases. As examples: \mathcal{R} Calomel, three grains; bicarbonate of soda, ten grains; and sugar, thirty grains, divided into twelve or fifteen powders for a child a year old, one given once in from three to six hours, until the discharges show the coloring of bile.

Another: \mathcal{R} Calomel, three grains; acetate of lead, three grains; opium, one grain, and sugar half a drachm, divided into twelve powders for a child of six months, into eight powders for one of a year, etc., repeated in a similar manner when the discharges continue pale, watery and free.

For a child one year old such anodyne and slightly corrective and arresting prescriptions as the following are favorites with some: \mathcal{R} Deodorized tincture of opium, sixteen minims; subnitrate of bismuth, two drachms; syrup, two fluid drachms, and chalk mixture, fourteen drachms; mixed and shaken thoroughly; a teaspoonful given once in two to four hours. Or the tincture of opium with bismuth and cinnamon water without chalk, given in a similar way. Or: \mathcal{R} Subnitrate of bismuth, two drachms; Dover's powder, nine grains; divide into twelve powders, one every three hours.

The following prescription combines an antiseptic with an opiate: \mathcal{R} Carbolic acid, three grains; glycerine, two and a half drachms; camphorated tincture of opium, one ounce, and cinnamon water, one ounce

and a half. Of this from twelve to twenty drops may be given to a child from eight to twenty-four months old, in a little water once in from four to eight hours.

Almost any of these prescriptions may be alternated with doses of salicylate of soda, or various combinations with other medicine may be made.

In cases in children of active vomiting and purging of a serous fluid, with great thirst, depression, and tendency to speedy collapse, constituting cholera infantum, early and appropriate treatment is most urgently required. The irritation is intense, the discharges are profuse, the serum of the blood is being rapidly lost, and an impression upon the living tissues seems demanded. Though the storm may have been raised by poisonous ptomaines, it will rage too often until the craft is broken up or submerged, though the exciting cause has ceased to act. With such a flood of liquid discharge it does not seem probable that poisonous ptomaines can in any quantity remain, and if they do their antidote will not for a sufficient time act upon them. We must in these instances endeavor to allay the irritation and arrest these profuse discharges, or death will follow in many cases. I know of no remedy so likely to allay this storm as the preparations and combinations of opium. It cannot be questioned that too free a quantity may be injurious and fatal. Here the judgment and skill of the physician will be tested. On the one hand is the immediate danger from the discharges, and on the other that of a fatal

narcotism. The free injections into the bowels, as advised by Dr. Holt, may be tried. This may allay the excitement. We may hope it will. But if the injections immediately pass off with an explosive force, and the loss of serum continues, what then? Opiates must be tried, carefully and watchfully, but promptly. I know of nothing more likely to answer the indication than the combination of opium, calomel, and camphor, reduced to an impalpable powder, with sugar of milk, and given in an appropriate dose according to the age of the child, in a small quantity of water immediately after an act of vomiting. The heat of the stomach will sublime or evaporate the camphor, and by its intimate incorporation with the opium and calomel, these articles will immediately be diffused over the stomach, and their impression is most speedily produced. The dose will be a matter to be carefully estimated, and its repetition will depend upon the effect observed. As soon as a marked anodyne or commencing narcotic effect is produced, it must be discontinued, and if too profound, atropine, coffee, or quinine may be given to lessen its dangerous narcotic effect. After these violent symptoms are controlled the case is to be conducted like one of severe summer diarrhœa.

But unfortunately the opiates, however combined and administered, do not always arrest these discharges. A child may be profoundly narcotized while the discharges still continue. Death is not an unfre-

quent result under the opiate and every other form of treatment, and it is this fact that so greatly increases the bills of infant mortality in the large cities of our country. The bromides of sodium and potassium have been advised for allaying irritability, and when brain symptoms appear they may be of much use.

Various astringents have been added to the remedies already mentioned in the more violent and also in the milder cases. They are more applicable in cases that have continued for some days. Tannic acid is the chief active principle in the vegetable astringents, and it may be used in its natural combinations in those astringents, or by itself, or in various artificial combinations. We find good natural combinations in geranium maculatum, in matico, in hamamelis, in coto bark, and other vegetable substances. These articles have not as much reputation in any form of diarrhoea as formerly, and in many cases where they have been recommended and given, their beneficial effects are doubtful.

The mineral astringents which have been most used are preparations of chalk and bismuth—the latter being the more efficacious—the astringent preparations of iron, particularly the liquor ferri nitratis—an excellent remedy in many protracted, debilitated, relaxed, and anæmic cases. It may be given alone, properly diluted, or in a combination like the following: *R* Tincture of columbo, three fluid drachms; liquor ferri nitratis, half a drachm, and simple syrup,

three fluid ounces. A teaspoonful of this may be given once in from three to six hours to a child of one year.

In protracted cases the nitrate of silver has been given by the stomach, but when we consider that the principal morbid condition is in the lower part of the intestines, we can hardly suppose that the small quantity that could be given in this way would reach and locally affect that part.

Quinine, in some cases acting as a tonic and perhaps as a germicide, often has a most decidedly beneficial effect; and when a malarious influence is present its administration in free antimalarial doses, but not long continued in such doses, is more important and beneficial—more curative to the diarrhœa—than can readily be imagined by one who has not witnessed its use in such cases.

But I have omitted to mention one combination which, in subacute and chronic cases of this and other forms of diarrhœa, has markedly relieved many patients, and given me great satisfaction for a long period. The formula has been varied in the proportions of its ingredients, but a common one is as follows:

℞ Oil of turpentine and tincture of opium, of each three drachms; pulverized gum acacia and white sugar, of each four drachms, and camphor water, three ounces. Of this, made into a *perfect emulsion*, a tea-

spoonful is a proper dose for an adult, and a proportionately smaller one for children.

It will often be proper to put less laudanum into the mixture for children, or to substitute paregoric. The dose should be repeated once in from three to six hours.

In cases of offensive discharges, from fifteen to twenty-five drops of carbolic acid have often been added to the mixture, and other antiseptics may be incorporated in the emulsion. The turpentine is itself antiseptic, and its influence upon a subacutely inflamed, or an irritable and relaxed mucous membrane, is often markedly beneficial. In an emulsion with the gum it is likely to traverse the whole length of the canal, as its odor is frequently detected in the discharges.

The restoration of tonicity to the intestines and the general system, besides the means already mentioned, may require a continued course of hygienic management, and of tonic medicines. The strictest attention to diet, the careful management of clothing and the avoidance of improper exposure, and a change of air and scenery, a sojourn in the country, among the mountains, or lakes, or at the seashore may be required. A combination of various tonics, into which strychnine enters, will often produce decidedly beneficial results. The exercise must be carefully regulated, very quiet at first and gradually increased; the

surface should be kept active by proper bathing and frictions, and the mind diverted and amused.

The last indication—treating the consecutive lesions—it is sometimes a difficult matter to fulfill. The lesions most likely to occur are chronic inflammations, abrasions, and ulcerations of the mucous membrane of the intestines.

Dr. Holt says he has settled upon three things as valuable:

Firstly, as careful attention to the *diet* as during the acute stages.

Secondly, the continued use of antiseptics.

Thirdly, washing out the whole large intestines every day with pure water at a temperature of 65° F., or with weak antiseptic solutions, or astringent solutions. Of the antiseptics he prefers benzoate and salicylate of sodium; of the astringents the nitrate of silver and tannin.

The condition in many cases resembles that of chronic dysentery, and that will be more fully considered in a subsequent part of this volume.

The condition which is spoken of as *hydrencephaloid* has been mentioned and its symptoms pointed out. Its proper treatment consists in supporting measures, increasing the digestive function by pepsin and other means, and the use of genuine, not spurious, stimulants and tonics.

In these cases alcohol in various forms is often advised and given; and while by its immediate im-

pression on the stomach it may arouse a condition of temporary excitement, yet as a means of more permanently supporting the force of the heart and the general vital functions, I can but regard it, in most cases, as worse than useless. Both physiological experiments and careful clinical observations have confirmed in my mind this conviction. If given at all it should be in such small quantities as not to interfere with peptonization, as it will materially retard it if in the stomach it is of the strength of from five to ten per-cent., and it will stop it if in more than ten per-cent. If good results, or at least stimulation results from alcohol, it is from the immediate impression upon the gastric membrane, and not from its absorption and action upon the heart. Its action upon this organ by its application through the blood is paralyzant and not stimulating. (*Anstie, Ringer and Sainsbury, Martin, Davis, etc.*)

Quinine in small or divided doses, hot coffee, hot, fresh, well salted beef tea, or mutton or chicken broth, and various stomachic stimulants are less objectionable and more lasting in their sustaining effect.

In the preceding pages the object has been to give as full an account of the different forms of this very frequent and important disease, especially the light thrown upon it by recent investigations and experience, as the limitations of space, and the time and patience of busy physicians, for whom the work is chiefly intended, will allow.

PART SECOND.

DYSENTERY.

The term dysentery, according to its original signification, means "difficulty of an intestine;" but it is used to designate an inflammation of the colon and rectum, producing pain and straining at stool, called tormina and tenesmus, with scanty, mucous and bloody discharges, usually occurring frequently, but with a moderate amount of liquid or fæcal matter; and these symptoms are accompanied by more or less prostration and fever.

The dysenteric phenomena may be produced by a variety of causes, and may be associated with different conditions.

A simple intestinal catarrh, when it involves the lower bowels, will induce dysenteric symptoms. By the word "dysentery," however, as commonly used, and especially if qualified by prefixing the other term, "epidemic," something quite different from a simple recto-colitis, produced by irritating articles of food, by drastic medicines, by taking cold, or other accidental causes, is understood. When produced by less obvious causes, especially as it occurs epidemically or endemically, it is a more distinct and specific disease—a general affection with special local manifestations, evidently zymotic in its cause, and resembling in this respect Asiatic cholera and the specific fevers.

The simple non-specific varieties of recto-colitis are not included in this account. Our attention will be chiefly confined to Specific Dysentery, which is by far the most common form of the disease.

This, as already intimated, is a febrile and inflammatory affection, generally, and I believe justly, regarded as zymotic, or dependent upon a poison operating on the principle of a ferment. It is defined substantially by Jaccoud as "an ulcero-membranous transmissible recto-colitis, characterized by tenesmus, griping, and repeated discharges of muco-sanguinolent matter, and a general state more or less grave."

This specific disease may be either sporadic, endemic, or epidemic in its occurrence; and its severity varies much in individual cases, and in the general characters of different endemics and epidemics. The sporadic cases, as a rule, are less severe than the others, though some endemics are very mild, while others are very severe and fatal, and the more widespread epidemics are generally grave.

It is not easy, or perhaps possible, to distinguish some specific cases which occur sporadically from mere accidental or non-specific recto-colitis, though a difference, in cause at least, exists. The common causes of the non-specific disease may perhaps determine an attack of the specific variety when a zymotic influence is present, and it is possible the former may pass into the latter. In this respect the resemblance to Asiatic cholera is striking. In this latter disease,

when the specific cause is prevailing, special irritating causes may precipitate an attack. Thus a cathartic, improper ingesta, etc., may cause a development of the disease that would not occur but for these co-operating conditions.

The same is true in regard to dysentery. When the tendency, or presumed poison prevails, some will be attacked without any apparent coöperating causes, while others will require such additional influences to bring on the disease.

Etiology. In treating of the causes we must first recognize this specific zymotic influence, probably of a bacterial nature, possibly of a cosmic origin, but respecting which we have no precise information. Certain *practical* facts respecting the genesis of this disease, however, seem sufficiently established. The specific cause frequently coincides with that of paludal or malarial fevers; but this is by no means always the case, as some of the most severe endemics or local epidemics of dysentery have prevailed where malarial fevers are unknown. Organic, and particularly animal matter, in a state of decomposition, together with certain climatic influences, are among the causes of the disease; but by what particular process they produce it is not known. The spread of the disease is favored by crowding, insufficient or improper food, and excessive fatigue. Attacks are precipitated by lying on moist ground without proper protection, especially in the night; by the arrest of transpiration, by means of cold

and moisture in any situation; and by direct irritation of the mucous membrane, as from improper food and drinks, from unripe or spoiled fruit, ices, etc.

It is generally stated by authors that dysentery occurs oftener in moist hot weather, and this may be true as a general fact; but within my observation in the rural districts of the West, it has appeared as a local epidemic in several instances with the greatest severity in hot and *dry* seasons and places.

Heat of the atmosphere is an important factor in its production, and it is most frequent in our climate in August and September, but often extends into October, when there are hot days and cool nights. In all climates it is more frequent in camps and in large armies. It occurs at any age, but oftener in the extremes of life, and it is more frequent and disastrous among the feeble and intemperate. Any of the unfavorable hygienic conditions which produce diarrhœas favor the production of dysentery, and these need not here be repeated. It is classed among the *filth* diseases, and filth is now supposed to produce its effects chiefly by favoring the production and multiplication of specific poisons of a living or, at least, organic character.

In the countries particularly subject to it—in the hot regions where it is endemic—these unfavorable hygienic influences, aided by the climate, produce the epidemics which so often spreads destruction and desolation in armies, fleets and cities.

The disease in this epidemic form usually first attacks the individuals most exposed to bad hygienic influences, and then others who come within the influences of what appears to be the poison, which many regard as being multiplied by the prevalence of the disease.

Whether the poison is actually multiplied in the bodies of the sick, as is evidently the case in small-pox, scarlet fever, and other strictly contagious diseases, is not positively determined; but that it is not exhausted or destroyed in the body of the patient is presumed; and many believe that it exists in the excretions, and that the dysenteric discharges are capable of communicating the affection to others.

The poison may be received by the alimentary canal or the respiratory organs. The disease varies greatly in severity in different epidemics, general or more local, and when prevailing over a large region it is often much more severe in some localities than in others, even when such localities are but a few miles, or, in some cases in cities, but a few streets apart, and where the general conditions of the patients seem to be the same.

Independent of crowding, epidemic dysentery often appears in villages, or in sparsely settled farming neighborhoods, where there are no special appreciable hygienic conditions different from those that exist in other localities free from the disease; but in such cases the severe local prevalence is generally

preceded by sporadic cases, the disease gradually increasing in the number of attacks and in the severity of the individual cases.

Not only does it differ in severity in different cases, when there is a general prevalence of the disease, but it differs in its type and in respect to particular symptoms in the different localities. For example, some years ago, when the disease was prevailing quite generally over a large region in Western Massachusetts, nearly all the cases in a particular neighborhood were attended with decided, and often very profuse, hemorrhage from the bowels; while that peculiarity did not exist in other neighborhoods but a few miles distant. This is not a solitary instance of such particular deviations from the ordinary type generally prevailing. Facts of this kind tend to show that a special poison or influence is operative in producing the disease, and that it is more intense or of a more active or different character in some localities than in others.

The question of *contagion* in this, as in some other diseases, is not an easy one to decide. The difficulty depends partly upon the particular signification given to the term, and partly upon the complicated character of the facts. If by a contagious disease is meant one produced by a poison generated in the body of the person affected with the disease, and communicated to others, producing the same affection, which is ordinarily produced in no other way, there is

no sufficient proof that dysentery is contagious; indeed there is abundant proof that it is not. But if by contagion is meant the transmission of a disease from a sick person to a healthy one by a product emanating from a sick person, whether generated or multiplied in the body, or merely passing through it, and if it is admitted in this definition that the disease is often produced in other ways, then it is possible, and even probable, that dysentery is contagious and that the contagion is in the alvine discharges, and consists of low forms of organisms. The period of incubation of the poison is thought to be from two days to two weeks. This subject, as well as others of a similar character, awaits further elucidation. How far, and in exactly what respects, sporadic and even accidental dysenteries differ from endemic and epidemic forms of the disease has not yet been determined. Unlike the diseases most clearly and characteristically contagious, one attack of dysentery, so far from conferring immunity from a future one, rather predisposes to a recurrence.

Pathological Anatomy. The structural changes properly belonging to the disease occupy the large intestines, and are usually most intense in the region of the sigmoid flexure of the colon. Their chief seat is in the minute glands of the mucous membrane and the (intervening) intertubular connective tissue. Diseased conditions, especially in scorbutic cases, may extend to the small intestines.

There are not unfrequently complicated cases, and secondary lesions are often found. Dysentery may be complicated with typhoid and typhus, and often with malarial fevers; with congestion and obstruction of the liver, especially in hot climates and seasons, and in malarial regions; with scorbutus, as in our late army experience; with tuberculous and syphilitic conditions; and, as I observed in many cases in Chicago, with epidemic cholera—dysentery often following attacks of that disease. As secondary lesions we have abscess of the liver from absorption of pus or septic matter, or the formation of emboli carried to that organ; disease of the mesocolic glands; perirectal and pericolic inflammation and abscesses; peritonitis, sometimes from ulceration and rupture; and contraction and obstruction of the intestines from the contraction of cicatrices after ulceration.

The special intestinal lesions, during the progress of the disease, are :

1st. Hyperæmia, and exudations of mucus and blood, involving the mucous surface of the colon and rectum, the hyperæmia being more intense near the follicles.

2d. Inflammation in the tubular follicles.

3d. Inflammation in the solitary vesicles.

4th. The tissue is infiltrated with a sero-sanguinolent material, which is most abundant in the sub-mucous tissue, but may extend to the cellular and muscular coats; the mucous surface is denuded of its

epithelium, while in some cases an exudate is poured out upon the surface, which tends to a sort of organization and the formation of a false membrane.

5th. In the more severe and protracted cases, suppuration and ulcerations appear; destruction occurs at points in the false membrane and the proper tissues, involving the mucous membrane and its glands; and in scorbutic cases the ulceration extends often to the small intestines.

6th. Sometimes casts of the intestines are formed from the false membrane, and are occasionally thrown off in larger or smaller tubes, segments, or patches.

7th. In the severest cases, ecchymoses, extended suppurations, and sloughs of the general tissue occur, and a dark and ragged disorganization results.

The ulcerations, which seldom take place before the end of the second week, have different modes of production.

They may arise from suppuration of the follicles, or from compression of the vessels by the interstitial exudate, which destroys nutrition in points and causes necrosis. In the latter case, the exudate and the necrosed point will be thrown off together, and the ulcerated borders are irregular; while in the suppuration of the follicles, the small resulting ulcers are more regular. In either form the ulcer may spread and penetrate all the coats of the intestine and induce peritonitis. In other cases, or in studying the ulcera-

tive process more minutely, it will be found that in the process of ulceration there will be:

1st. Intumescence and softening of the solitary glands, and a breaking down of their structure by one or other of the processes before named, resulting in small ulcers.

2d. The ulcers spread, and groups of these glands, with intervening tissue, become destroyed, and erosions are left.

3d. There will be submucous inflammation and effusion, causing deeper ulcerations.

4th. Intertubular inflammation, and inflammation at the base of the glands occur, followed by ulcerative processes.

5th. Submucous abscesses sometimes form and possibly rupture into veins, but oftener they make their way through the mucous membrane, and the pus is discharged with the mucus, blood, and fæces, leaving an ulcer in the place of the abscess.

6th. When a croupous exudate, which may be poured out during these processes, is sufficiently organized, it may undergo an ulcerative process.

When ulcerations of the intestines occur, the disease lingers and may become chronic.

In chronic cases, atrophic and contracted conditions of the intestines involved often result, the cicatricial contractions, after extensive ulcerations, often become permanent, impairing perpetually their functions.

Lesions of Peyer's glands and of the mesenteric glands sometimes take place, and generally atrophy of the glandular parts of the intestinal canal; lesions of the serous membrane and of solid organs, not only of the abdomen, but of the thorax, from pyæmia or embolism, may follow and seriously complicate dysentery.

Complications of disease of the liver are frequent, especially in hot climates and malarious regions; the liver disease, by obstructing portal circulation, sometimes becomes a cause, and at other times, by pyæmia or embolism, occurs as an effect of dysentery.

Statements respecting the conditions of the blood in this disease vary widely, and it is presumed, therefore, that its state differs in different cases.

In the recent elaborate pathological work of the late Dr. Fagge of Guy's Hospital, London, the views of Virchow and other German pathologists are endorsed, dividing the disease into two pathological varieties, "Catarrhal and Diphtheritic." The latter term does not signify the presence of the specific disease, diphtheria, but that an exudate occurs, resembling the diphtheritic membrane.

In the catarrhal form the projecting folds of the mucous membrane are most reddened, and as the disease is continued, are often pigmented. The membrane is swollen, the solitary glands are enlarged, often presenting whitish points with reddened rings around, the submucous tissue much thickened from infiltration, sometimes with suppuration beneath it

There is a diffused inflammatory process over the membrane, and ulcers are formed by a breaking down process over collections of pus cells.

In the severer cases small sloughs of the follicles occur, and larger ones between the glands, and the patches of the membrane not destroyed will often present a bluish-red color, covered with gray or greenish mucus. The ulcerated surfaces have their floor on the submucous tissue, and have a yellowish color at the base.

The "diphtheritic" form is an inflammation with a plastic exudation within and upon the surface of the membrane. The whole thickness of the intestine is infiltrated from the first, the serous surface is injected, and the intestine hard and massive, with a reddish fluid within it, and grayish-red deposits in spots on the surface.

The lower part of the ilium is often involved, and the colon lined with deposits, broken by fissures, presenting a dry, granular, and hard appearance, often dark and stained with the intestinal contents. In this condition the proper tissue elements are scarcely made out from the infiltration of bloody, fibrinous, and purulent matter. In this some assert that bacteria are mingled. In time, from this deposit in the mucous tissue, its structure is destroyed, eschars appear, which break down into shreds and patches, and when thrown off leave dark green or brown ulcers.

The catarrhal and diphtheritic exudates are often

side by side in the same case, and indicate different degrees of severity, rather than specially distinct forms of disease.

Abscesses form in the submucous tissues and may burrow deeply, extending into the muscular coat, and, rarely, perforating the serous membrane. Larger faecal abscesses may form and extend far. These intense forms of the disease are frequently fatal, and some are necessarily so, when going on to these stages.

In the simpler mucous forms the abrasions and ulcers may heal, without serious results. In the severer forms a ragged tissue, dark with discolored blood, even quite black from sulphuretted hydrogen, presents itself, and a chronic morbid state is apt to follow where death is not speedy. A case may become chronic, though not often, without ulceration or abrasion.

There may be atrophy of the coats causing marked attenuation of the intestine in both forms, and where ulcerations have healed the cicatricial tissue, as already stated, may contract and cause more or less constriction of the bowel. Such sequelæ may vary in continuance and injuriousness, some being permanent and finally fatal.

These lesions, more common in epidemic and endemic cases, may occur in those which are sporadic, thus showing that there is not so broad a distinction between the forms as might be supposed.

It is undoubtedly the fact that all the anatomical lesions described have been found by different investigators of the pathology of dysentery, and at different times and places these different lesions may be expected to occur. Though the different causes will be likely to produce modifications of characters in the phenomena, pathological and symptomatic, and also to require modifications of treatment, yet many of the same general characteristics are present in all the forms of the disease, giving it a distinctive place in medical nosology.

But there are different particular types of the disease, dependent upon the general condition and activity of the system. There are 1. Acute inflammatory or sthenic forms where there is no special depression; and 2. Asthenic, adynamic, or typhoidal forms where there is special depression of the vital powers and actions, the cases tending to malignancy whatever the form of local changes. In relation to these general tendencies there are numerous gradations, requiring modifications in management difficult to be specified.

Cases occurring in connection with malaria, in hot or more temperate regions, in special localities and with different special surroundings, will present different general tendencies, and these must be observed in prognosis as well as treatment.

Symptoms. The leading symptoms of this disease have been indicated in what has preceded. Its mode

of approach varies in different cases. In ordinary cases prodroma occur, presenting often for one, two or three days the symptoms of a common intestinal catarrh. There are disturbances of digestion, uncomfortable sensations in the abdomen, lassitude, and often slight chills and fevers. During this period there is apt to be a diarrhœa. At first the discharges are fæcal and perhaps watery, but soon they become scanty, mucous, painful, and tinged with blood. These discharges increase in frequency and painfulness, but diminish, perhaps, in amount; a degree of weakness and prostration occurs, sometimes decided, and at others more moderate, and the characteristic disease is fully developed.

In other cases the onset is more sudden, the characteristic slimy and bloody discharges occurring at once, accompanied in the severe and adynamic cases with speedy prostration, a small but accelerated pulse, sometimes coldness of the extremities, a condition suggestive of, and sometimes merging into, collapse. In rare cases a fatal result is reached in two or three days; but usually in the severe forms the disease continues on, when a fever is developed, generally remitting, with evening exacerbations.

There are in nearly all cases more or less pain in the abdomen, especially in the course of the colon, and always a frequent desire to go to stool, with the characteristic tenesmus in the act. There is a sense of pressure or fulness, as from a foreign body in the rec-

tum. It is felt there more than in the colon, as common tactile sensibility is, for physiological reasons, greater there than in other portions of the intestinal canal.

Sometimes the matter discharged resembles a thick jelly or "frog's spawn," or a liquid containing grains of sago. By the second or third day, if not before, the stools generally become markedly bloody. The thick mucus and blood are intimately mixed, being poured out from the surface together, and the discharges often present the appearance of pounded flesh.

In milder cases of the catarrhal form the mucus may be simply tinged with blood, but containing epithelial débris; and after continuing from one to three days, the discharges may spontaneously cease and the patient soon recover.

In the more severe cases, especially the diphtheritic, the blood in the stools is apt to increase, and fragments of false membrane often appear.

When the attack is not preceded by a diarrhœa and fæcal matters are retained, they sometimes form into round, hard masses called scybala, which occasionally appear in the stools. These, by some authors, are represented as frequent, but they have not been found so in my experience. When present, they are a source of additional irritation.

When the discharges are mostly pure mucus, or mucus with fresh blood, they are nearly odorless; but

later, especially in hot climates, the fæcal matter may become more abundant, the discharges assume a dark color, containing solid débris, fragments of decomposing membrane, with bilious and other secretions, partly liquid, and sometimes very offensive. This offensiveness may be the result either of decomposition of false membrane, or of necrosis of the mucous surface. When from the latter cause the indication is very grave.

The frequency of the stools varies, sometimes depending upon the self-control of the patient. There may not be more than eight or a dozen in twenty-four hours, or the patient may feel impelled to remain on the vessel almost constantly.

The bladder, from its proximity to the rectum, is sympathetically irritated, and vesical tenesmus and strangury occur, and in men past middle life, complete retention of urine is not infrequent. In children particularly, there is apt to be much irritation about the anus; and eversion of the mucous surface, and even prolapsus of the rectum from the repeated straining, sometimes occur.

Weakness and depression of the patient are usually marked, the features are expressive of severe suffering, and in protracted cases the eyes are sunken. The tongue is variable, but usually coated, and in the typhoidal cases it is dark with sordes upon the teeth and gums; and in nearly all cases the abdomen is contracted.

The mind in ordinary cases remains clear, but in the low forms there is apt to be delirium; subsultus tendinum, general trembling, and in children convulsions sometimes occur. Such symptoms are reflex or from blood poisoning, and are not evidences of structural lesions of the brain.

Vomiting early in the disease and at more advanced periods not infrequently occurs, sometimes the result of reflex irritation, at other times in consequence of gastric catarrh, and in still other cases from a profuse and regurgitating bilious secretion. In the latter case the vomited material is yellow or dark, and bitter, and its ejection often affords relief. When the matter vomited is a colorless fluid, when there is no gastric pain or tenderness and the tongue is not red, the vomiting is reflex and is not of serious significance.

The *continuance* of dysentery is variable and the result uncertain. Mild cases may last from only two or three days to a week. The tendency in such cases is to self-limitation and early recovery. Very severe and malignant cases may also have a short course, soon terminating in collapse and death. Most cases, however, continue from one to three weeks, some a little longer, and others become chronic, with the ulcerations and other graver lesions mentioned in the account of the morbid anatomy, to which the patient finally succumbs; while still others recover, though often incompletely, after a long continuance of the disease.

In the sporadic form it seldom terminates fatally, and even in ordinary epidemics in temperate latitudes, a large proportion of cases recover. In exceptional epidemics, and especially with children, the mortality is very great. Some of the more unfavorable symptoms are unusual depression, briny or very offensive discharges, involuntary evacuations, very great and extended tenderness, delirium, coma or convulsions, any evidence of sloughing, or of markedly typhoidal symptoms.

The particular causes of death are various, and the consideration of these causes may aid in the prognosis, and afford indications of treatment.

Death in the early stages is usually caused by the severity of the inflammatory and febrile shock; by the blood poisoning often present; by the sloughing of the intestines which sometimes occurs; and by the exhaustion from the pain and the discharges. In the more protracted cases the patient may be worn out by the continued suffering and discharges, and the want of proper nutrition.

Various accidents may occur, causing death, in cases where the general course of the disease has not been exceptionally severe. These accidents occur in a small proportion of cases, however, but in a sufficient number to prevent the prognosis in cases of considerable severity or continuance from being certainly favorable. They are perforation of the intestine from ulceration; pyæmia and septicæmia from involvement

of some of the numerous veins of the lower intestines, resulting in the production of pus and septic matters in the portal vessels; the formation of emboli from the same cause, with secondary suppuration in the mesentery and liver, and sometimes in the lungs and elsewhere. After ulceration in the protracted cases, cicatrices may form and contract so as seriously to interfere with the functions of the intestines.

Catarrhal diarrhœa sometimes follows dysentery, and relapses are liable to occur and to be grave. Death may result from free intestinal hemorrhage, though this is rare, and occasionally from peritonitis without perforation.

As sequelæ, in addition to occlusion, abscess of the liver, and other results already mentioned, perityphilitis and periproctitis, paralysis of the sphincter ani and other muscles, and a general marasmus may occur.

The dysenteries of warm countries, and of hot seasons in malarious regions, have some peculiarities. The disease, as a rule, is more violent; its progress is marked by greater periodicity of the fever; there are more frequent relapses, and serious complications of disease of the liver—congestions, phlegmonous and catarrhal inflammations, and jaundice—and diseases of the spleen are more likely to take place. In such localities the disease is also more likely to pass into a chronic state.

Chronic Dysentery.—This is more likely to occur

where there have been repeated attacks and the patient has become exhausted; where the hygienic conditions are bad, and where the patient has been neglected or exposed. Soldiers attacked in the field where proper nursing and care are impossible, are in danger of having the disease assume a chronic form; but in some epidemics serious lesions take place early and induce in a modified form the continuance of the disease. In such cases there are usually deep ulcerations, extensive denuded surfaces, from previous sloughing, and a general depraved condition of the system. Cases, however, have occurred where chronic dysentery has proved fatal after many months of suffering where no ulceration or positive abrasion was found.

Where an acute attack assumes the chronic form, after three or four weeks there is a mitigation of the symptoms; the evacuations are less frequent, but they persist; they may become fetid, are often of a yellowish color, are very slightly bloody; the pain and tenesmus cease or become very slight; there is generally a voracious appetite, but emaciation continues; the eyes, instead of regaining continue to lose their expression; the voice becomes husky, broken, and high-pitched; the tongue, often smooth, glazed, or fissured; the skin, inelastic and wrinkled; the abdomen flattened; and death not unfrequently follows from exhaustion, or from a sudden occurrence of an acute attack. Its duration is from some months to two or three years; and, when it is once fully established with

the dysenteric cachexia, it is exceedingly difficult to manage, and in many cases it resists all treatment, and death results, such ulceration of the intestines and disorganized conditions of the general system having occurred, as to render death in some cases only a question of time.

Diagnosis.—The diagnosis of dysentery is not usually difficult; the entire symptoms taken together will make the case plain. It is distinguished from diarrhœa by the character, the small quantity, and the difficulty of the discharges in dysentery, and by the absence of fever in simple diarrhœa. It is distinguished from simple hemorrhage by the absence of mucus in the discharges and of tenesmus. From hemorrhoids or fissure, together with diarrhœa, by the absence of the febrile symptoms, by the history of the case, and by an examination which will demonstrate the presence of these local affections. It is distinguished from typhoid fever with intestinal hemorrhage, by the peculiar characteristics of typhoid, by the free discharges, by the tympanitic abdomen, and the absence of mucus in the evacuations, and an absence also of the tenesmus and other special evidences of dysentery.

According to Dr. Koch, bloody material is often found in the intestines of patients dying of epidemic cholera, and in some rare cases of cholera, dysenteric discharges immediately occur after reaction, in cases that recover; and not unfrequently (or at least this is

the case in some epidemics of cholera) in a few days after reaction, marked dysenteric symptoms take place and continue as in the usual course of the disease. There is no danger, however, of confounding an attack of Asiatic cholera with one of dysentery. The respective symptoms are sufficiently distinctive to prevent a mistake in diagnosis.

The general prognosis in dysentery, as already intimated, is very variable as it occurs in different climates, localities and seasons. In some endemics and epidemics a very large proportion—nearly all—recover, while in others, many die. In sporadic cases a large proportion usually recover, but as the severer lesions sometimes occur in these, they are occasionally fatal.

In my experience in Chicago in 1852 and 1854 in cases of dysentery following cholera, the results were not as unfavorable as might have been supposed. A very large proportion of the cases ultimately recovered.

In cases of dysentery complicating malarial fever, as occurring in the Northwestern States, the prognosis *under proper treatment* is very favorable, but without such treatment it is very grave. All diseases where malaria bears a part are more influenced by treatment than are the same diseases when free from such malarial complication.

Treatment. Notwithstanding the long history and common occurrence of dysentery, there is still

much diversity of opinion among writers and practitioners as to the best modes of treating it. This will not be surprising when the different forms which the disease may assume, the different surrounding influences, and general condition of patients, the complications which may exist, and the different stages of the disease in which treatment is applied, are all taken into the account. No routine course of treatment will be applicable to all cases. The causes, the general tendency of the cases, the particular vital power of the patient, and the different varieties of the disease, the different stages, kinds, or degrees of the anatomical changes going on, must all be considered in the management of cases.

It will be well briefly to review these different kinds, degrees, or stages of pathological changes.

The different forms of the disease recognized by Virchow and other German authors as *catarrhal* and *diphtheritic* dysentery, whether these be regarded as different species of the disease, or simple varieties depending chiefly upon the degree or severity of the same inflammatory process produced by the same essential causes, have an important influence upon the symptoms, course and prognosis, and should have upon the treatment.

In the first stage or degree of the disease, the mucous membrane is hyperæmic, œdematous, and thickened, and the secretion from its surface is changed, but scanty. There is soon, however, a freer

secretion of mucus and blood, with corpuscular and sometimes organizable or diphtheritic exudate, and infiltration and destruction of the epithelium of the membrane. In the third degree of change, there are ulceration, suppuration, more infiltration and of a lower type, and sometimes submucous abscesses; and in the fourth, or more severe degree of the disease, there is sloughing of the inflamed membrane.

Besides, the mesocolon and mesentery with their glands are generally hyperæmic and sometimes suppurating; and other complications are present, such as the morbid conditions of the liver, which have been mentioned, any of which must modify the indications; and therefore it would seem no uniform plan can be adapted to all forms, stages, and degrees of the disease.

The cause, if it can be ascertained, must be taken into the account. If the cause is simple and consists of irritating ingesta, these must be removed, and soothing measures adopted afterwards.

If an attack depends upon sudden checking of the action of the skin, a diaphoretic would be indicated. In the specific and epidemic varieties various causes of the kind just mentioned may have coöperated in precipitating attacks, and will require attention in treatment.

Then in judging of the necessity of treatment and the value of remedies, the "natural history" of the disease should be considered; and it should be

borne in mind that in a large majority of sporadic catarrhal cases of moderate intensity, the tendency is to a spontaneous termination in a few days by self limitation.

Prophylactic measures should not be neglected when the disease is prevailing. Cleanliness here, as in all zymotic diseases, should be secured. Every source of putrescence should be removed or avoided; care should be taken of the diet, and over fatigue and exposure should be avoided; and it certainly will be safer to isolate the sick as much as convenient, to thoroughly disinfect the stools—by no means to allow them to remain exposed in the room—to disinfect, or remove at once, soiled linen or other articles; to secure free ventilation, and to observe all the ordinary rules required in other diseases suspected of being infectious.

In the mild variety of ordinary or catarrhal cases, especially if free fæcal evacuations have preceded, rest in the horizontal position, a warm bath, or sponging of the surface with warm water, to which is added a little soap or alkali, proper clothing, with a very plain, simple, unirritating diet which will leave but little residuum, taken in moderate quantity—such as scalded milk with a small quantity of thoroughly cooked farinaceous material, corn-starch, tapioca, rice, farina, etc.—and demulcent drinks, may be all that will be required.

If a diarrhœa has not preceded, and especially if there has been constipation, or if from any cause there

is reason to suppose that there are fæcal accumulations, or any irritating materials—microbes or ptomaines—either a laxative should be given, or what may answer the indication, though generally not as well, a large enema of some simple fluid may be administered, and repeated, should it be necessary to unload the bowels. A suitable laxative would be a full dose of castor oil with from five to eight drops of laudanum, or half a teaspoonful of paregoric, or a few drops of spirits of camphor added, as these agents in such doses will not interfere with, but sometimes promote, the action of the oil, and will modify any irritating effects. A single decided dose of the oil will operate more speedily, will sooner be over with, and produce less irritation than repeated smaller doses. The oil should be given on some warm liquid. After the operation in these milder cases, if pain and irritation continue, a dose of morphine, a Dover's powder, or some other opiate, repeated if required to relieve pain and other symptoms of irritation, will not only secure ease and rest, but, I do not doubt, will tend to allay the inflammation and cut short the disease. This, with rest in the recumbent position, and care of diet, may be all the treatment required in a mild though somewhat decided case. In a few days a cure will usually be established. A large number of cases, even during an epidemic prevalence of the disease, will sometimes be of this mild character and will terminate in this manner with very simple treatment. Many

medicines and systems of treatment have undoubtedly obtained a reputation as cures, which they do not deserve, through the recovery of these cases.

A large number of cases, however, have a different tendency. They do not result in an early spontaneous recovery. Instead of tending to resolution the inflammation persists, deeper tissues are involved, infiltrations are abundant, suppurating and sloughing processes occur, and the more serious consequences follow.

Dr. Maclean, of the British Army Medical Service in India, who has become a high authority on the treatment of dysentery, says: "Speaking from large experience, I affirm that complete restoration to health by the unaided efforts of nature is of extremely rare occurrence; the disease either destroys the patient, or passes into a chronic form." He referred to the disease as it occurs in India, where his observations were made, and yet under treatment a large percentage speedily recovers. The deaths on a large scale, as observed in the army, were 13.5 to 28.87 per thousand.

It is not always easy in our climate to determine in a given case surely, whether it is to assume a mild or grave form, and statistics of the success of treatment are apt to be deceptive. However, many cases at an early period manifest their severe character, and in some epidemics or endemics nearly all the cases are grave. Here different methods of treatment will show different results, and many observations and

estimates of the value of different modes of treatment are made.

Though it is shown that many would recover without any medical treatment, and that recoveries occur even under bad treatment, while others die under the most approved therapeutical measures, we are not authorized to infer the uselessness of medicines in this disease. Such a conclusion from these premises is by no means logical.

Treatment that is ineffectual in the severest cases of a disease may be effectual in cases somewhat less severe, but which would prove fatal without such treatment. Dr. Fagge very justly says that "it is a cardinal rule—although one which is too apt to be forgotten—that in all the worst cases of a disease a medicine may fail to produce any appreciable benefit, and yet it may be capable of curing those that tend only a little less surely to a fatal termination."

Among the various methods which have been advised by different authors may be enumerated the following:

(1) Active "antiphlogistics"—evacuants, free abstraction of blood either by venesection or leeches; (2) large and repeated doses of calomel with frequent saline purgatives, and even contrastimulant doses of tartarized antimony; (3) laxatives to secure fæcal, liquid or diarrhœal discharges, and then opium, keeping the bowels at rest as long as possible until the dysenteric discharges reappear, when the cathartic is

to be repeated, to be followed in turn by opium; (4) the persistent use of moderate doses of cathartic salines; (5) the repeated and continuous use of castor oil, with other bland oily emulsions; (6) free and continuous doses of opium; (7) large doses of ipecacuanha, some desiring to secure its emetic effect in the early stage, others trying to avoid the emetic operation, depending on a somewhat specific action to control the disease; (8) the repeated use of cold water enemas, with the internal use of a non-purgative saline, as the nitrate of potash, in moderate but continued doses; and (9) a mixed or discriminative mode of procedure, commencing with mercurials and laxatives, followed by opiates and a variety of other measures, as particular symptoms indicate.

The depleting treatment with free blood-letting can be applicable only in sthenic forms of the disease and in plethoric subjects. In such patients, when the inflammation is acute and the fever is high, a venesection, or a good number of leeches applied to the more tender parts of the abdomen or near the anus, will sometimes afford marked relief, and where blood in the system is abundant, these measures can hardly be followed by any unpleasant effects. They will be well borne at any time before much exhaustion has occurred. Bleeding, however, is seldom required, and is useful only in exceptional cases; and although in not very remote periods, this as a common method of treatment was strongly advised by men of very large ex-

perience and high authority, it can scarcely be regarded as receiving any high professional sanction at the present time.

Large and repeated doses of calomel are unnecessary, and in many cases would be very injurious and dangerous. In robust unsusceptible patients with "bilious" complications, a few decided doses, followed if need be, and as a rule, by a saline laxative or cathartic, may be of marked benefit; and in hot climates and seasons, and in malarial districts especially, a few smaller doses of some mercurial, followed generally by laxatives, experience has proved to be useful. The mercurial modifies favorably the secretions and conditions of the stomach and bowels, favors the discharge of bile, and tends to unload the so often congested liver, and to relieve the so often obstructed portal circulation. The influence of portal congestion upon hyperæmia and inflammation of the abdominal viscera is well known. In anæmic, delicate, and impressible patients, mercury must be used with great caution and in smaller doses, but with the proper precautions it may be as useful with them as with others. In addition to the above reasons for its proper use, it may destroy bacteria, which are believed by many to be the cause of the specific form of the disease.

Saline laxatives and purgatives have much authority of a high character in their favor.

In connection with mercurials as just mentioned,

and often by themselves, in increasing the watery secretion from the hyperæmic mucous membrane, they unload its vessels, and often procure more relief in this way than they cause irritation by their specific exciting effect. They operate to a large extent by endosmosis, and not infrequently produce no perceptible irritation; but their too frequent and excessive use may irritate, weaken, and depress too much, and they must be prescribed with great care and discretion. The authority of Bretonneau and Trousseau is quoted in favor of free doses of saline cathartics, but not as exclusive remedies in the disease. Trousseau, however, in his zeal for evacuants, condemns any considerable use of opium. Dr. Woodward, in the Army Medical Report, relies much on saline purgatives, regarding sulphate of soda as the best. Early given, he says, they evacuate the intestines, increase secretion, and relieve portal congestion. He condemns astringents in the active stages and uses opium sparingly. Jaccoud likewise advises caution in the use of opium.

Dr. Bartholow also regards saline evacuants as of the first importance in the early stages of the disease, before the mucous membrane has begun the process of denudation, and prefers sulphate of magnesia acidulated with dilute sulphuric acid. He says, "it serves a triple purpose; it empties the canal of retained fæces; it lessens hyperæmia by setting up an outward osmotic flow; and its after effect is astringent and sedative."

Other authorities might be quoted to the same effect, but this method of treatment is less insisted upon since the treatment with large doses of ipecacuanha has been revived. Though the salines are useful in grave cases, when properly and cautiously managed—sometimes in cathartic doses and at other times in smaller quantities frequently repeated, yet they are chiefly, if not exclusively, applicable to the sthenic cases and in plethoric and vigorous persons, to the earlier stages of the disease, and not to the cases of an opposite character. When typhoid symptoms are present, when suppuration or ulceration has commenced, when sloughing has taken place or is threatened, or whenever there are great depression and exhaustion, they do not seem to me to be indicated.

The treatment with tartar emetic, and that with persistent alternate catharsis and narcotism have few advocates and need not now be discussed. The same may perhaps be said of the exclusive use of cold water enemas and non-purgative salines; and yet there are cases, those of a sthenic character, where the cold water lavements produce relief. Very warm water enemas may also modify favorably the inflamed intestine; but the repeated teasing use of enemas is often very disagreeable and has to be abandoned, and care should be exercised in administering enemas. A soft elastic tube will be found least irritating; and the “knee and elbow,” or “knee and chest” position, if

the patient can bear to be moved, will be the best. In this position a soft tube may be introduced even into the colon, and the inflamed intestine may thus be irrigated, and often with much benefit. Foul matters certainly may be removed, and possibly the specific poison—bacterial or otherwise—may be rendered less active.

The repeated and continued use of larger or smaller doses of castor oil in nearly all stages of the disease, with other oily emulsions, is advocated by some with great earnestness. Dr. Pantaleoni, of Rome, one of the most prominent physicians in Italy, strongly advises this course, and claims almost uniform success in the treatment of dysentery as it occurs in that city, both among the natives and the foreign visitors. He gives it in doses sufficient to evacuate the bowels, and then in smaller quantities of a drachm or so, once in a few hours, giving occasionally freer doses when a cathartic effect is required. The discharges, it is alleged, are notably checked, even in the advanced stages by this treatment. Others have advocated the same or a similar plan, but my own observation of the effects has not been sufficient to enable me to express a decided opinion. The late Dr. Z. Pitcher of Detroit, well known to the profession, often used in his practice small (one or two teaspoonfuls) and repeated doses of olive oil, frequently combined with small doses of laudanum.

The use of free and repeated doses of opium has

many advocates, and few practitioners would treat a severe case of dysentery throughout, without the aid of this important drug. There are those, however, of high authority as we have seen, who condemn its general use, contending that the intestinal discharges should rather be promoted than checked; and that though it procures temporary relief from pain, patients do better without it. These views are certainly worthy of being considered, and the effects of this article may be too much relied upon. Every physician of much experience has found that it sometimes fails to procure relief from the tenesmus and frequent discharges, while it often tends to produce the retention of urine, so common in some cases, and sometimes to seriously disturb the nervous system.

But after proper evacuations, and interspersed with other agents so that the secretions from the intestines and liver are not too much checked, it often affords in proper doses great relief to the suffering; and dysenteric inflammation does not so much differ from other inflammations of the intestines that opium, acknowledged to be so useful in the latter in abating inflammatory action, is incapable of doing so in the former. It has its place, and an important one as I believe, in the treatment of dysentery, and the interests of patients will not allow it to be entirely set aside in this disease. That it may be used too freely and relied upon too extensively is, of course, not to be denied. It has, however, its proper and an important place in the treatment of this disease.

The treatment of dysentery with *large doses of ipecacuanha* has of late received so much attention, and has so much testimony in its favor, that it requires a careful consideration at the present day in any work on this disease.

In my treatise on the Practice of Medicine I said: Ipecacuanha “first obtained its introduction into practice about two hundred years ago, as a remedy in this affection, and after nearly losing its reputation as an anti-dysenteric remedy for a long period, it has now regained it, and has been extravagantly praised of late by some when given in very large doses. It is said to be very extensively used in the severe dysenteries of India, and that since its general introduction the mortality in this disease has been reduced from 79.6 per one thousand cases, to 20.15 per one thousand. It should be understood that statistics of this kind respecting the use of any single medicine or method of treatment are not to be fully relied upon in determining its value. Diseases differ greatly in their severity at different times; and often changes in hygienic conditions, or in various items of treatment, are introduced at the same time that the particular remedy is used. However, the testimony in favor of ipecac. in dysentery is sufficient to demand for it careful investigation. Dr. Maclean, of the British army in India, gives from twenty-five to thirty grains at a single dose, in a small quantity of fluid, such as the syrup of orange peel, though perhaps it is better given in a

wafer or capsule. He enjoins perfect quiet and allows no drinks for three or four hours, with a view of preventing vomiting. In from eight to ten hours it is given again in doses of from ten to fifteen grains, repeated, if necessary, for days, until the symptoms are much improved. Others advise smaller doses repeated oftener, but so as, if possible, to prevent vomiting; while others still give it so as to induce vomiting at first, but endeavor by opiates, mustard to the epigastrium, and the withholding of much drinks, to establish a tolerance afterward. Others give from thirty to sixty grains every four or five hours, and by opiates, etc., endeavor to prevent emesis. Dr. Bartholow mentions the following powder, to be taken at once:

R Ipecac, 3 ss;
Opium, gr. j;
Pulv. aromat. gr. v.—M.

A sinapism is to be applied to the epigastrium, and an enema of starch and laudanum, or a hypodermic injection of morphine, is to be given. He has used fifteen grain doses in milk, and found it often well borne; but says that not infrequently tolerance can not be established, and that the remedy must be abandoned. Jaccoud says the ancient Brazilian method of giving the medicine is the best. Make an infusion of from

3 ss to 3 ij of ipecac.
in from 3 vjss to 3 x of water.

This liquid is to be taken in appropriate free doses

once or twice during the day, and continued for several days. In consequence of the nausea ipecacuanha produces, patients are often with difficulty persuaded to take it; and its specific virtues in the disease are doubted by many, and by some denied.

Dr. Woodward, in the United States Army Medical Report, advises it in the early stages of some cases of dysentery as an emetic, but doubts its specific effects in the disease. On the contrary, according to Dr. Flint (Clin. Med., p. 284), Dr. A. A. Woodhall, of the army, shows "conclusively that it is entitled to be called an abortive remedy."

Dr. N. S. Davis, of Chicago, says: "My own experience in regard to the use of large doses of ipecac has not been uniformly favorable. On the contrary, in a majority of the cases in which I have exhibited it, the patients have not only been vomited freely by the first dose, but equally so by the second, and even by the third. And, in two or three instances, the stomach remained so irritable as to reject subsequently almost everything in the way of either medicines, drinks, or nourishment, and apparently it was the cause of an early and undue degree of prostration. In some other cases, after the first dose, the medicine was retained, and in from twelve to eighteen hours free characteristic evacuations from the bowels followed, with much relief to the sensations of the patient, but not permanent. In from six to twelve hours the intestinal discharges began again to recur, and

gradually assumed more and more of the characteristic mucous and bloody appearance; and in twenty-four hours more all the symptoms of the dysenteric disease were re-established, almost as actively as before the administration of the remedy. On the other hand, in a few cases ipecac treatment has been followed by the most satisfactory results."

He then relates a couple of cases—one where large and repeated doses were borne by the stomach, and another where still larger doses were given by enema, in which the "ipecacuanha stools" were produced with permanent relief. He adds: "But my own experience has led me to believe that a large majority of the cases, as we meet with them in ordinary general practice, cannot be treated as successfully in this way as by the other means. The distressing vomiting that often follows the first administration of ipecac is not compensated for by any degree of permanency in the relief obtained; and unless the temporary relief is followed by other medicines calculated to secure a continuance of the result, in nearly all the cases the effects of the remedy will be temporary in their duration. And my observation has shown that the same remedies which are necessary to secure and perpetuate the beneficial results of the ipecac will in most cases quite as efficiently secure all those results, if administered without the ipecac."

Other adverse testimony might be quoted; but these unfavorable statements are open to the objection

that the remedy has not in these cases been given in the most approved manner, or has not been *persisted in* until its beneficial effects have been fully obtained. Certainly Dr. Davis' method, which from his account seems to have been to impress the system with it for a short time only, is not a fair test of the "ipecacuanha treatment" as described by its advocates.

Dr. Joseph Ewart, the author of the article on Dysentery in Quain's Dictionary, has an interesting article in the London Lancet for August, 1884, in which he bears his testimony in favor of large doses of ipecacuanha in the treatment of simple and sloughing dysentery, given morning and evening only. Dr. Ewart has had experience both in India and England, and an account of his views is worthy to be produced here. Dr. Ewart opens his article by the declaration that "the efficiency of ipecacuanha in the congestive, exudative and ulcerative stages of acute dysentery is now universally acknowledged;" but he states that as to the dose and the frequency with which it is to be repeated, there are still diversities in practice. He opposes the plan of giving five or ten grains three or four times a day, or oftener, and says by this the stomach is constantly teased, and the depression produced is much greater than when from a scruple to a drachm is given once in twelve hours—night and morning. The smaller and more frequently repeated doses induce more protracted nausea and prevent the appropriation of food, while in giving the larger doses

only twice in twenty-four hours the nausea and vomiting from each dose, if either occurs, will last but half an hour, the medicine will be in part absorbed from the stomach, the residue will pass into the bowels, leaving the stomach to receive and digest proper food in the interval, and thus the patient is supported.

He contends that this mode of using this remedy is applicable in a preponderating majority of cases, but there are exceptions in the early management of which a modification has seemed to be advantageous.

Firstly. Where there has been asthenia complicated with extreme irritability of the stomach. These cases are rare. Here the full effect of the drug may be commanded by small enemata containing from a drachm to two drachms of ipecacuanha, with bismuth and soda, night and morning, with or without laudunum according to circumstances. When these enemata cannot be retained so as to ensure the absorption of the active principle of the remedy, he suggests, though he seems not to have tried, the subcutaneous injection of a corresponding amount of emetin.

Secondly. Where the sloughing or gangrene is so extensive that recovery under any method of treatment is hopeless, he would not give the ipecacuanha in any form. Then soothing and supporting measures, opiates, etc., are indicated.

Thirdly. In full-blooded sanguine temperaments and rather free livers, large doses may be used every six hours or so, during the first twenty-four

hours of treatment. Here vomiting and enforced starvation do perhaps more good than harm. After this, the disease not yielding, the twelve hours interval system is advised. This must be continued until the progress of the malady has been arrested, when the subsequent management becomes very easy indeed.

He quotes Dr. Parkes as showing by his dissections in India that the solitary glands of the large intestines are the "seats and centres of ulceration in tropical dysentery," and it is presumed that the most characteristic inflammation is in them everywhere.

Dr. Ewart thinks that "the *first* visible change is congestion, the vessels surrounding and penetrating the capsules being turgid and engorged with blood. The *second* change is augmentation of their contents from the accumulation of albuminous exudation, and enlargement from the size of a millet seed to that of a small shot. The *third* stage is, provided the inflammation advances, rupture of some of the capillaries in the interior of these little vascular glands, extravasation of blood with the area of the dark point on the free aspect increased. The *fourth* stage is now marked by atrophy and molecular disintegration of the free aspect of the capillary wall, and escape of its morbid gelatinised blood-tinged contents into the canal of the intestine. This is the rule, but in very exceptional cases the capsule may burst through the attached portion, lighting up inflammation in the neighboring con-

nective tissue and muscular coat. "In a large number of instances," and this is an important point, "the morbid process may stop short, under proper treatment, at any of the first three mentioned stages, and repair is then effected by resolution. In many cases the morbid action is cut short after completion of the fourth stage without farther extension of the disease. The adjoining follicles of Lieberkuhn do not, in these cases, necessarily participate to any great extent in the diseased process." These alleged facts have been ascertained from examination of cases that have died in the early stages from intercurrent diseases.

If the disease goes on, molecular disintegration of the glands and their exfoliation *en masse*, ulceration more or less extensive, and sloughings in varying degrees as to extent and depth take place.

These pathological statements, which are probably correct as applicable to many but not all cases of the disease, have here been made to call attention to a diagnostic indication for the continuance of abortive treatment.

When in the discharges is found the gelatinoid exudation, called by many "gelatinous mucus" in little forms, heavy, and sinking to the bottom of the vessel in the diluted and washed discharges coming from the inflamed glands, the specific disease is still continuing; and what Dr. Ewart regards as the specific remedy, ipecacuanha, is indicated and should be continued. When these disappear the remedy is no

longer called for. The detection of these little masses requires the use of a microscope; and the examination can be rendered less unpleasant by treating the stools, or a portion of the discharge diluted with water, with carbolic acid or other colorless deodorants.

Invaluable as ipecacuanha is considered by Dr. Ewart, he by no means confines himself to its use alone. Given once in twelve hours he associates it in the intervals with the use of such other medicines as may be indicated—quinine when a malarial influence is suspected, anodyne enemata for relieving tenesmus, fomentations and counter-irritation to the abdomen, nutritious and easily digested food in a liquid form; and it is quite possible that credit may be given to the ipecacuanha which is really due to some of the other means, particularly to the free doses of the quinine; for my experience teaches me that this article in anti-inflammatory, or antipyretic doses, in connection with opiates, exercises a most decided influence over dysenteric as over many other forms of inflammation and congestion.

Dr. Ewart repeats that the existence and persistence of gelatinous exudations in the stools are the unerring indications for perseverance with the ipecacuanha. He, however, excludes very extensive sloughing and gangrenous dysentery, which is usually fatal. This exudation, as already stated, is heavier than the remainder of the stools, and is invariably found at the bottom of the vessel. That from one solitary gland

seldom coalesces with another, and hence the number of these little masses of gelatinoid exudation, more or less tinged with bile, blood, or pus, and surrounded with catarrhal or it may be ropy mucus, from inflamed tubular glands in the vicinity of the disease, affords some idea of the extent of the mischief, superadded to the sloughing going on within. This characteristic material is poured out during the sloughing process. The existence of this material, regardless of sloughing, is the index for the continuance of the ipecacuanha. Thus, he thinks, the extension of the mischief and the sloughing processes are reduced to the narrowest possible limits. When the sloughs are all cast off the resulting ulcers are usually repaired quickly and successfully under absolute rest, liquid nourishment, and appropriate medicines. He thinks continuing the ipecacuanha longer than is necessary is safer than leaving it off too soon.

I have occupied so much space in giving the details of this mode of treatment, and the indications for its continuance, because if these views are sustained by sufficient experience, a marked advance has been made in our knowledge of dysentery and its successful management.

Still, it seems to me there is ground for apprehension that some patients will be too much depressed by the continuance of such free doses of this drug, though given only once in twelve hours; and in our latitude there must be many cases of so mild a char-

acter, tending to a speedy self-limitation, as not to require such heroic treatment. But the testimony seems sufficient to establish the fact that the dysenteries of the tropics, and probably the severer forms of summer dysentery in our climate, in a large majority of cases, will be best treated by ipecacuanha as the leading remedy.

Dr. Ewart seems not to recognize the "diphtheritic" form of Virchow, but it is in that form that others think the ipecacuanha demanded.

Dr. Ewart's paper concludes by answering the question, how does ipecacuanha act? In this question all who propose to use the article must be interested. He says substantially that it acts :

1. Locally and directly as a slight irritant upon the peripheral nerves of the mucous membrane of the stomach, provoking anorexia, nausea, retching or vomiting, (not always), but when repeated, as often happens, this organ becomes more tolerant to its presence. Its retention, which is desirable, is aided by not taking drinks until it has passed out of the stomach. Dr. Ewart advises it to be given in form of pills, (but it might better be put up in gelatine capsules,) the patient to lie with the head but little elevated above the heart, and remaining as quiet as possible.

2. It augments the aqueous character of the secretion of the salivary glands, and of the whole alimentary mucous tract. The flow of fluid in the mouth

is from twenty to thirty minutes after it is taken, and it probably produces a similar effect upon the pancreas and the tubular glands of the stomach and intestines.

3. It increases the flow of healthy and unirritating bile, thus depurating the blood and producing a comforting laxative action, relieving the local congestion and portal plethora, and soothing the diseased parts by the subsequent promotion of physiological repose. Hence the speedy moderation and eventual suppression of tormina and tenesmus.

4. It diminishes the force and frequency of the pulse by lowering muscular tension generally.

5. It promotes general diaphoresis.

Dr. Maclean seems to think that its action as an "evacuant" accounts, at least in large part, for its curative effect. That it increases and modifies the secretion of the alimentary canal is evident from the more free and different discharges induced; but Dr. Fagge thinks its curative action is unexplained, and that it must be regarded as a "specific." What is meant by that term, as thus used, is by no means clear.

How these effects should produce so decided a specific action as is alleged over the peculiar dysenteric inflammation may not be so clear, but the curative action of other medicines in other diseases is no less obscure. Dr. Ewart attributes much to its action upon the liver as a cholagogue, and refers to the experiments of Dr. Rutherford and to the statement

of Dr. Lauder Brunton, that the "liver has a power of regulating the flow of blood, not merely through itself, but through the rest of the abdominal viscera, in the stomach and intestines." He thinks ipecacuanha restores the equilibrium of the portal circulation and this, with its effects in augmenting the secretion of bile and intestinal mucus, causing the "ipecacuanha stools," accounts, or helps to account, for its specific curative effect. But the fact of its curative action, if fully sustained, is more important than any speculations as to the manner of its action.

From this account of the manner in which the ipecacuanha should be used for the best effects, it must be presumed that those who have expressed unfavorable opinions of its action have not used it in the best manner—at least not according to Dr. Ewart's plan. However, the question of the extent of its utility, like many other therapeutical questions, is still an open one, but is worthy of the careful consideration of the profession. It is to be hoped that a more general experience with the remedy among us will determine its value more accurately, and the class of cases to which it is best adapted.

My own experience with this remedy has not been sufficient to enable me to judge from observation of its value or adaptability to the common forms of the disease. My chief experience in all grades of cases, both in country and city situations in the Northwest, in the Army of the Potomac during the late war,

and in Western Massachusetts, was before the modern specific ipecacuanha treatment had been brought prominently forward; and it remains for me to state the course of treatment my studies and experience had led me to adopt. In giving this account I can not do better than to quote substantially from my work on the Practice of Medicine:

“When the disease commences in the ordinary manner of decided attacks, with the symptoms which have been sufficiently described, should there be evidence that the stomach is oppressed with undigested food or with bilious secretions, twenty grains of ipecacuanha, in a cup of warm water, may be given at once, and fifteen grains in half an hour if the first does not produce emesis, smaller doses being repeated as may be required to produce a free emetic effect. After the stomach is well washed out (warm water or weak chamomile tea being taken to facilitate vomiting), and the nausea has subsided, five or six grains of blue mass, or four or five grains of calomel, and an eighth of a grain of morphine, should be given, and a similar dose repeated in from three to five hours. Unless free diarrhœal discharges follow from the effect of the ipecac and the mercurial, in four hours after the last powder, a saline cathartic, sulphate of soda, sulphate of magnesia, or Rochelle salts, etc., in a dose of from four to eight drachms, well diluted, and perhaps in warm water with some aromatic added, should be administered. Should this not produce a cathartic

effect in four or five hours, the dose in quantities thought necessary should be repeated. After this operation an opiate should be given, with a moderate quantity of ipecacuanha—say one fourth grain of a salt of morphine, with from one to three or more grains of ipecacuanha—and the dose repeated sufficiently often to obtain a fair, decided anodyne effect of the morphine; and the quantity of ipecacuanha may be increased to the larger doses, if nausea is not produced and the patient is not made uncomfortable by it. In some cases, bismuth in free doses exerts a soothing effect and agrees well with the stomach.

“This treatment might be continued for one or two days at least, and the after-treatment should be governed by the conditions presented. If the eyes are yellow and the tongue much coated, a few grains of a mercurial might then again be given; and if only mucous and bloody discharges have occurred, and the patient's strength has not been greatly impaired, this should be followed by another saline laxative; and this, again, by the opiates. Should the tenesmus be great, the opiates might be given by enema, in a moderate quantity of some bland fluid (thin, well-made starch answers a good purpose). When laudanum is the form of opiate it is commonly given in starch, but morphine or some aqueous preparation of opium is well given in water. Opium or morphine suppositories, with cocoa butter, are often better borne than enemas. In children, where neither

enemas nor suppositories will be retained, morphine dissolved in glycerine, or mixed with a little fresh butter, may be applied by the finger of the nurse to the verge of the anus, or just within the sphincter, with a decidedly soothing effect. The quantity must be properly regulated, as absorption takes place, and a general as well as local effect is produced.

Morphine, hypodermically, may be used here as in other cases, when thought advisable. Its general soothing effects are more marked, when used in this manner, than in any other. Should the pain be great in the abdomen, fomentations, or inunctions of extract of belladonna might be applied.

The laxatives might be repeated or not, according to the amount of fever, the strength of the patient, and the amount and character of the discharges. Should there be much fever, and should the case present no adynamic characteristics, saline laxatives in small doses may be repeated once in four or five hours, thus adopting the saline treatment.

In any of the cases where laxatives or cathartics have been mentioned, castor oil may be used in place of the salines, and would be preferable where there was much debility, or where the salines produced an irritating or depressing effect. Mucilaginous drinks, or emulsions of almond oil, might be given in place of the small doses of salines, in cases of a more adynamic character.

If the disease persists for ten days or more, there

will be reason to apprehend the advent of the suppurative stage, with denudation and ulcerations of the mucous membrane. The salines, as a rule, must now be discontinued, and oils and emulsions, if laxatives are required, should take their place.

In this stage of the disease, and *sometimes earlier*, I have found *much benefit* from the use of the *turpentine emulsion*, to which reference has been made, and for which a formula has already been given. I cannot too strongly express my opinion of the utility of this preparation in many cases at this stage of the disease. A similar condition is now present to that which exists in the ulcerative stage of Peyer's glands in typhoid fever, and in the advanced condition in other forms of muco-enteritis and chronic diarrhœa.

The formula is here repeated:

℞ Oil of turpentine, 3 iijss.
Tinct. of opium, ʒ iij—jv.
Gum arabic (pulv.),
White sugar, āā ʒ ss.
Camphor water, ʒ iij.

M.—For emulsion. Dose ʒ j, once in four or six hours.

Local alteratives and astringents may now be useful, the more unequivocally as the case approaches the chronic state. Injections of solutions of *nitrate of silver* will often now be of the greatest service. Trousseau used from ten to twelve grains to eight ounces of water. These injections may be repeated once a day, or once in two days, more or less fre-

quently according to the indications and the manner in which they are borne. The strength in some cases may be greater and in others less than the formula of Trousseau. When much pain or smarting is produced by their use, an enema of an aqueous solution of morphine may with much benefit be used soon after.

Modern experience in the use of various remedies in different diseases has released the profession from the rules of the dose-books as to the quantity and times of administering the different agents. Much larger and much smaller doses than are ordinarily advised are found most useful in particular cases.

Other local alteratives or astringents, such as the preparations of tannin, or vegetable infusions containing tannic or gallic acid as the basis; sulph. of zinc; weak solutions of carbolic acid; the astringent preparations of iron; acetate of lead three to five grains to the ounce; chloride of zinc one-half to two grains to the ounce, etc., are articles from which selections may be made to act as astringent and alterative enemas.

In dysenteric ulceration of the rectum of long standing marked advantage has been reported from the use of strong nitric acid applied with a rod through a speculum. Great care, of course, must be taken with so powerful a caustic not to have its action penetrate too deeply. Only a very small quantity must be used, and its effects carefully watched. It may be applied once in a few days. Touching the ulcers with

a stick of nitrate of silver would be safer, if not quite as effectual.

In all these caustic applications, if much pain is continued, an enema of a solution of morphine should follow their use.

In the meantime the general treatment must be adapted to the condition which the case has assumed. Tonics and astringents internally may be required; and throughout, the diet and the hygienic arrangements will require careful attention. The diet and the internal remedies now will not differ materially from those advised in muco-enteritis. Dr. Bartholow says: "When destruction of the mucous membrane is beginning, the most effective remedies are corrosive sublimate, sulphate of copper, sulphate and oxide of zinc, acetate of lead, bismuth, arsenic, etc. Of this formidable list, sulphate of copper and arsenic are most effective. They ought to be combined with opium." (Practice p. 89). He advises Fowler's solution in doses of one drop with from five to twenty drops of deodorized tincture of opium every three hours. The sulphate of copper is advised in doses of one-twentieth of a grain, with one-eighth or one-twelfth of a grain of morphine every three hours. It must require very accurate discriminating powers to determine how much of the good effects of these prescriptions is due to the arsenic or copper, and how much to the opiate. The proof of the real efficacy of these alterative articles in such doses needs confirmation.

The fluid extract of coto bark has lately come into use in the subacute stages of dysentery, and is highly spoken of by some whose opinions are worthy of respect. It is astringent in its properties, but comparatively unirritating, and is given in doses of ten or fifteen drops or more with a teaspoonful of paregoric, repeated three, four or more times a day according to circumstances. The fluid extract of hamamelis is another mild astringent which in obstinate cases may be tried. The dose of this astringent is from half a drachm to a drachm three or four times a day.

When a malarial influence is present, and the symptoms present any periodicity indicative of that influence, *quinine* must be given in full antimalarial doses, but not long continued in such quantities. The very striking effects which I have so repeatedly seen from it, not only in controlling the fever and periodicity, but the inflammation of the intestines and the dysenteric symptoms as well, have led me to prescribe it in connection with opium, in cases where there was no reason to suspect the presence of a malarious influence; and the beneficial effects in many cases of this kind have been almost as striking as where a malarial influence was evident. Dr. Woodward, in the Army Report before referred to, mentions the strikingly beneficial effects of quinine in antipyretic doses. The frequent reference to the use of full doses of quinine in various conditions of inflammation and fever may to some, not practically familiar with such use, seem

routine, and extravagant; but if it be an antipyretic and antiphlogistic agent of great value, as I believe it is, it is applicable to a large number of diseases where fever and inflammation are present, and therefore requires to be frequently mentioned.

The profession must ultimately become familiar with the fact, that most inflammations, as well as the febrile state, are materially influenced, and often abruptly terminated, by "antipyretic" doses of quinine. The effect of salicin, salicylic acid, or salicylate of soda may be similar, but I have not had experience with them in dysentery. Free antipyretic doses must be given, if anti-inflammatory effects are realized. In the most severe and malignant cases of dysentery, the same general principles apply as in the most ordinary forms of the disease, the treatment of which I have endeavored to describe. All depressing agents, however, must be avoided, and full antipyretic doses of quinine should be early given and tonic doses may afterward be continued.

In the sloughing stage of the severe cases, supporting measures, tonics and stimulants may be tried, and injections of permanganate of potash may be given; but of course, in such cases all efforts commonly fail.

Confirmed cases of *chronic dysentery* are exceedingly obstinate and often fatal. The treatment must be conducted on the same principles as in those cases where the disease is approaching and merging into

that state. Tonics and astringents internally—the liquor ferri-ter-nitratis, sulph. of iron or copper with opium, the *turpentine emulsion*, and other balsamic preparations, as in chronic muco-enteritis, should be tried. The local application of nitrate of silver in stick, after cleansing the rectum, if the ulcerated surfaces can be reached, or by injections when higher up, affords the greatest prospect of relief. Other local and internal remedies may be tried, such as nitric acid locally, strychnine and nitric acid, stimulants, etc., internally, as in similar or identical forms of muco-enteritis. A change of climate may succeed where other means fail.

The complications of dysentery, such as pyæmia, abscess of the liver, etc., will call for the treatment which those affections demand in other cases, taking into account the dysenteric condition. Not only the more severe complicating accidents, but special symptoms occurring at any stage of dysentery will require attention and such treatment as their relief demands. The catheter must be used when the urine is retained, but with care, as the urethra and bladder are often exceedingly irritable, and more or less severely inflamed. Fomentations, the warm bath, etc., may afford relief, but the use of the catheter where there is much distention of the bladder must not be delayed. The mistake should be avoided of selecting too small an instrument where no firm organic stricture of the urethra exists. A good sized instrument is more

easily introduced and far less dangerous than a small one.

Too much attention cannot well be given to the diet, but it will not differ from that applicable in other cases of muco-enteritis, in summer diarrhœa, and to the statements under that head the reader is referred.

The sequelæ, such as impairment of the function and contraction of the intestine, etc., must be treated by sustaining measures and hygienic regulations.

An inflammation followed by ulceration of the lower intestines with dysenteric symptoms sometimes follows the free use of mercury—a condition of these parts being induced similar to that in mercurial stomatitis. The chlorate of potash at first, and the iodide of potassium afterward, as in other cases of mercurialization, will be required.

It will be inferred from the discussion which has preceded, that astringents are disapproved of in the acute forms of dysentery. They can be useful only in very exceptional cases, and are generally decidedly hurtful. The temptation which some seem to have to resort to them must be resisted, and even opiates must be used with discretion. An acute inflammation will be aggravated by an irritating astringent, and while the inflammation is present and active, the secretion and discharges unload the vessels and procure relief. Opium is given, not to suppress directly the secretion, but to allay irritation and check the inflammatory processes. Its action in checking the secre-

tion, except as it does so by allaying inflammation, is not generally desirable. If it operated directly and only as an astringent, its effect in acute dysentery would, as a rule, be harmful. Its claims to be used in acute cases rest entirely on other properties.

Dysentery is a disease of such wide prevalence, and often of such great severity, occurring under such a variety of conditions, and presenting such different types and peculiarities, that I have felt bound to mention a variety of views which are entertained, and to describe a variety of methods which are in favor with those whose opinions are entitled to respect. I do not feel myself bound to any special method, and would encourage a choice of courses to be pursued according to the experience and judgment of each practitioner in the various localities and seasons, and in the various forms in which he meets the disease.

A great variety of special prescriptions for dysentery may be found in different systematic works, and in the medical journals; and many of them will be applicable to different forms and stages of the disease.

In using enemas to be retained the best time is immediately after an evacuation. If some few minutes are allowed to pass before the injection is used, expulsive efforts are likely to take place at once; but if given immediately, and the patient resumes the recumbent posture, and especially if the nates be pressed together and the discharge thus resisted, an anodyne

and soothing impression will be made before the discharge occurs. Attention to minute details in using various remedies, adapting them to the peculiar conditions, will influence results more than might be supposed.

“Antiseptic Intestinal Medication” has found such advocates and been attended with such favorable results in the treatment of diarrhœa as to suggest its applicability to that of dysentery. There seems much the same reason for supposing that microbes and ptomaines are concerned in the causation of dysentery as of summer diarrhœas. Indeed, the doctrine of the existence of an infection—of a specific poison—in the former is older and, perhaps, more plausible than in the latter. Experience, however, has not so clearly shown the advantages of the antiseptic treatment in the one as in the other. It must be borne in mind, that the successful antiseptic treatment of summer diarrhœa is very recent, and our knowledge of it depends upon the testimony of comparatively few persons.

I can but urge upon those who may have an opportunity in numbers of cases to give a trial to the antiseptic method in dysentery, and compare its effects with other modes of treatment. The plan I suggest is similar to that advised in summer diarrhœa—decided and, if necessary, repeated evacuations of the bowels by castor oil, aided by large enemata, simple or antiseptic, and the continued use of salicylate of

soda. For an adult some fifteen grains, more or less, may be given once in four or six hours, or perhaps smaller doses more frequently repeated would be better. If the stomach or the brain be too much disturbed, smaller doses must be given, but judging from its effects in other diseases it is presumed that these would be borne by most persons in dysentery.

The remedies more particularly to be studied in their relations to dysentery are: Ipecacuanha, opium and its preparations, saline cathartics, castor oil, mercury, oily emulsions, the turpentine emulsion, quinine, astringents, nitrate of silver, and now various internal antiseptics, and especially salicylate of soda.

With these remedies skillfully applied, it is not unreasonable to hope for the future more than has been generally accomplished in the past.

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