

may prove to be correct, is somewhat contraindicated by certain facts, namely, by the long period of incubation in the mosquito.

Let us speculate on the life cycle of the parasite of yellow fever so far as reasonable biologic analogy would seem to justify us at present:

Note, first of all, that the incubation of the disease in man is very short when compared with its incubation in the mosquito; hence this fact seems to call for a parasite with very rapid reproduction. Note, further, that the non-sexual reproduction, both of bacteria and of protozoa, is potentially in geometrical progression; hence the assumption, or at least the consideration, of this non-sexual reproduction during the incubation of the disease in man seems justified. Assume, for instance, that each separate organism introduced by the mosquito gives rise to 100, to 1,000, or to 10,000 organisms within a few hours; follow this up in geometrical progression. Would not such a hypothetical case be in harmony with the short incubation in man? Note, however, the important fact that in the hypothesis, up to this point, either bacteria or protozoa could present the required conditions. The fact that the organisms in question disappear early from the blood does not seem to me to be a very strong point either for or against either the bacterial or the protozoan nature of the parasite.

Passing now to the mosquito, note, first of all, the relatively long period of incubation, of about 12 days. This must have some significance.

Let us first assume, for the sake of argument, that yellow fever is caused by a spirillum, namely, from the standpoint of Novy and Knapp, by one of the bacteria. When a mosquito bites a yellow-fever patient in the early stage of the disease she drinks in these bacteria with the blood; according to present conceptions, this blood first passes to the diverticula of the esophagus and later to the stomach: the point is clear that the diverticula have become infected with the yellow fever parasite. The probabilities that all the bacteria would leave the diverticula with the blood and pass to the stomach, leaving the diverticula yellow fever sterile, seem very, very, remote; on the contrary, the probabilities seem very great that some of these bacteria would remain in the diverticula.

The most recent conception of the process of biting on the part of mosquitoes is that after piercing the skin with their mouth parts they eject the contents of the diverticula into the wound. This conception seems to be based on rather good experimental evidence interpreted by a good observer (Schaudinn). If this conception is correct, it would appear reasonable to suppose that if the mosquito bites a non-immune at any time from 2 to 11 days after she has become infected from a yellow fever patient she would vomit some of the yellow fever bacteria from her esophageal diverticula into the person bitten and that this person would contract yellow fever. This conclusion is not, however, in harmony with the 12-day period of incubation in the mosquito and would appear to indicate an error in the assumption that the parasite is a bacterium.

If, however, it is assumed that the parasite of yellow fever undergoes part of its life cycle in the mosquito, the changes in question would naturally begin very shortly after the organisms gained access to the mosquito, and under such supposition they would probably not result in yellow fever even if vomited from the esophageal diverticula into a non-immune, because their life cycle in the mosquito has not been completed.

Novy and Knapp<sup>5</sup> have insisted that we have as yet absolutely no evidence that *Spirillum duttoni* and *Spirillum gallinarum* do undergo any necessary cycle, or even a multiplication in ticks, and at least the first part of this claim seems well founded. Have we not, on the other hand, a certain amount of indirect evidence in the 12-day incubation period that the yellow fever parasite does undergo part of its normal life cycle in the mosquito?

Since we have at present no analogy of such obligatory alternate cycles among the bacteria, and since we have good analogies for such cycles among the protozoa, does not this obligatory period of incubation seem, in our present state of knowledge, and, of course, without prejudice to any unknown cycles in bacteria, to indicate that the parasite in question is of protozoal rather than of protophytic nature?

So far as our present knowledge of unicellular organisms goes, I believe that to-day, as in 1901, the indications are that yellow fever is caused by a protozoön, but I am in doubt as to its exact systematic position, namely, whether it is a sporozoön or a flagellate. If, however, double life cycles can be proved for any of the bacteria, then the present data regarding yellow fever will be equally applicable to the view that the disease is caused by some sort of a bacterium.

What, now, is the meaning of the double life cycle, the alternation of sexual and non-sexual reproduction?

Years ago academic protozoölogy showed that in certain protozoa the non-sexual reproduction is limited in extent and is rapid, while the sexual reproduction may be still more limited in extent and is slower in comparison.

Just why this limitation exists, whether the non-sexual reproduction is brought to an end because of the animals' becoming exhausted, from a reproductory standpoint (perhaps an internal cause), or because of unfavorable surroundings (an external cause), or from a combination of both, can not be discussed here, fundamental as the question is. Suffice it to say that the non-sexual reproduction in many unicellular animals is limited in extent. It is fortunate for us that this is so, for were it not, every untreated case of malaria would necessarily be fatal, since the organisms in man increase (potentially) in geometrical progression. Note the important point, however, that in malaria, caused by a parasitic protozoön, this non-sexual reproduction is rapid while it lasts, but that it is limited in extent by some factors not altogether clear at present.

The exact causes of this limitation of non-sexual reproduction among the protozoa calls for extensive academic study, but the results of such study will be of far-reaching practical importance.

## CHRONIC GASTRITIS.\*

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Probably no term employed in the nomenclature of gastric diseases has been more misused than that of chronic gastritis. The disease has been and still is considered by some physicians a very common affection, yet Riegel says: "Chronic catarrh of the stomach is not a frequent disease. If we cease to force all known gastric

\* Read in part at a meeting of the Norfolk District of the Massachusetts Medical Society.

disorders into a few disease categories, and rely only on positive signs of this condition, we shall soon learn that chronic gastritis is not so frequent as older physicians thought and as many modern ones still persist in believing." Stockton<sup>1</sup> says that "the comparative infrequency of chronic gastritis will be endorsed by experience if the cases are carefully studied." In my experience, primary chronic gastritis is encountered once in about every 300-400 adult patients in a general medical clinic, not so often as gastric cancer or gastric ulcer. Of 100 consecutive cases of gastric disorders, taken from my private records in which the stomach contents were examined, 9 presented the objective findings of chronic gastritis. This percentage (9 per cent.) of gastritis cases is greater than I had expected to find, but it should be stated that more than one-half of the number from which these were taken were cases referred by physicians and represent unusually severe types of gastric affections.

With the general practitioner the percentage of such cases is probably somewhat larger than is met in a clinic, for the reason that he does not see so many patients with trivial ills. Yet, however we approach the subject, it will be found that the percentage of cases of primary chronic gastritis is comparatively small.

#### DEFINITION OF CHRONIC GASTRITIS.

Because the above statements will seem surprising, perhaps incredible to some, let us come to an understanding of what is meant by chronic gastritis, and how the condition may be recognized. Briefly, then, chronic gastritis means a chronic inflammation of the gastric mucosa, an organic affection characterized by certain pathologic changes. This condition produces certain alterations in the gastric secretion, usually a diminution of the acidity, with more or less impairment of the ferments pepsin and rennin, and there is usually an excessive secretion of mucus. The degree of alteration of the secretion depends on the extent and severity of the inflammatory process. Now, by certain well-known tests we are enabled to detect the changes occurring in the secretions, and it is on these objective findings that we base our diagnosis. It was the custom in the past to base the diagnosis of this condition on the subjective symptoms of the patients. This older method has frequently resulted in the diagnosis of chronic gastritis in cases which have been proved to be cancer, ulcer, neuroses and other gastric conditions.

Herein lies the explanation for the prevalence of the different opinions regarding the occurrence of this disease. The original purpose of this paper was to consider the occurrence and etiology of gastritis, but since so little has been written on this subject, as compared to other features of digestive diseases, a further discussion of the disease may not be out of place, and the 9 cases referred to will help to present some points I desire to make.

#### DURATION.

In chronic gastritis the duration of the condition is known to be considerable. The average duration in the 9 cases exceeded six years, the shortest being over one year and the longest over twenty years from the beginning of symptoms.

#### SEX AND AGE.

The disease is more common in men than in women. These cases reported occurred in patients between the

ages of 20 and 50 years. Ewald<sup>2</sup> considers that a large number of patients who are said to die of old age, really perish from gastric atrophy, but states that this is not generally recognized, since the symptoms are as yet not well known and because the microscopic changes in the stomach are not marked. Of the few elderly patients in whom I have suspected this condition, I have usually been surprised to find no evidence of it.

#### ETIOLOGY.

So many factors enter into the etiology of the disease that it is often difficult or impossible to attribute the condition to any single cause. The use of alcohol is considered by many as the most common cause, and it seems probable that this agent, by its direct action either on the gastric mucosa, or the liver and other organs, may cause primary or secondary chronic gastritis. The majority of my patients with gastritis have not used alcoholic liquors to excess, and many have not used them at all.

#### WEIGHT.

It is the popular opinion that patients with gastritis are usually emaciated or show considerable loss of weight. Strumpell<sup>3</sup> speaks of it, and Ewald says: "Emaciation soon occurs, and losses of from 30 to 60 pounds may often occur in a few weeks." On the other hand, Einhorn<sup>4</sup> states that "although there are exceptions to this rule, the general appearance is good, the patient looks well nourished and usually possesses a good panniculus adiposus."

Of the 9 cases cited (with an average duration exceeding six years) three patients had lost less than 5 pounds, and but one more than 10 pounds; my general experience coincides with Einhorn's.

#### OTHER SYMPTOMS.

*Appetite.*—This is generally considered as diminished, although most writers mention exceptions to the rule. I find that only one patient complained of poor appetite, four considered their appetites good, and four that their appetites varied from excessive to voracious. With good appetites and fairly good vicarious digestion by the intestines there is but little reason for much loss of weight.

*Pain.*—In only 2 of the 9 cases was pain complained of. In 1 of these cases it occurred from one to two hours after eating and was relieved by eating again. This case has been referred to in another article,<sup>5</sup> and is one of several of this kind which I have observed. Boas<sup>6</sup> refers to this peculiar type of pain in chronic gastritis, and remarks that "it has exactly the same character as the pain in hyperchlorhydria," with which statement I quite agree. Pain as a rule, however, is the exception.

*Bowels.*—Constipation occurred in 4 cases, while in 5 the bowels were regular. Constipation is considered the rule. Distress or discomfort (not pain) after meals occurred in 5 cases. This I find is a fairly common symptom. Excessive flatulence occurred in 3 cases, and was usually an annoying and obstinate symptom to overcome. Eructation of gas, with or without regurgitation, also occurred in 3 cases, as did also nausea and vomiting, which was soon relieved by treatment.

Thus it is seen that no one symptom, nor any particular group of symptoms is characteristic of gastritis;

2. Ewald: *Diseases of the Stomach*, Amer. Edition.

3. *Textbook of Medicine*.

4. Einhorn: *Diseases of the Stomach*.

5. Chase: *Boston Med. and Surg. Jour.*, Sept. 14, 1905.

6. *Therap. d. Gegenwart*, Berlin, xlv, No. 1.

1. *Diseases of the Stomach*, 1903: Nothnagel's *Ency. of Practical Medicine*.

moreover, any symptom, or almost any group of symptoms, here mentioned may result from a neurosis, or an organic disease other than gastritis. It should be borne in mind that purely nervous symptoms may occur in cases of gastritis.

#### DIAGNOSIS.

The diagnosis must be based on the objective findings obtained from examination of the gastric contents; yet it is rarely safe to make a positive diagnosis from a single examination. I shall not enter into the details of diagnosis; they may be found in any recent work on diseases of the stomach.

In these 9 cases, free HCl was absent on repeated examinations, and combined HCl was, as a rule, diminished, with a corresponding reduction in total acidity. Mucus was present in excessive amounts in 7 of the 9 cases. Except in 3 cases of slight stasis, the amount of contents one hour after an Ewald test breakfast was always diminished, and in the majority of patients no contents could be obtained at the expiration of this period. "Acid gastritis" and secondary gastritis are not considered here.

*Differential Diagnosis.*—Nervous achlorhydria, some cases of cancer of the stomach and achylia gastrica are the conditions with which gastritis is most often confused when considering the gastric contents. Cases of transient achlorhydria are easily distinguished by observation, as the secretion soon returns in full strength, whereas the return of the secretion in chronic gastritis is always gradual and rarely or never appears in normal amount. Cancer is soon distinguished after observation by the continued loss of weight and the certain downward progress of the patient. The chemical findings of achylia gastrica can not be distinguished from those of atrophic gastritis, from which condition the achylia may and usually does result, although we occasionally see a case, one of which I have briefly reported,<sup>7</sup> in which it is difficult to conceive of a pre-existing gastritis, since there are no symptoms.

#### COMPLICATIONS.

A slight degree of stasis or motor insufficiency was observed in 3 of these 9 cases; it was soon overcome by treatment. I believe that marked degrees of stasis or atony rarely occur in uncomplicated cases of gastritis.

Hypermotility or pyloric insufficiency occurred in six of the patients, as indicated by the absence of gastric contents one hour after an Ewald test breakfast. In so far as I know, it has never been positively determined whether this premature expulsion of contents results from hypermotility, or from an insufficient pylorus. A factor to be considered in this condition is the fact that the diminished secretion naturally causes a diminution in the amount of contents. Whatever the condition may result from I have found it a difficult or impossible one to overcome, although in some cases in which the secretion has been restored, more gastric contents have been obtainable at later periods after the test meal than at the beginning of treatment. Some observers look on this condition merely as a compensatory one, whereby the chyme is hurried into the intestines where the greater part of digestion occurs. If viewed in this light it is not a condition to be overcome.

#### PROGNOSIS.

Riegel says: "Mild degrees of gastritis may be cured and frequently are cured. If severe degrees of atony

have developed the prognosis is less favorable." According to Ewald, "the prognosis of this disease should not be considered too slightly, especially as in prolonged cases of atrophy, an incurable and fatal lesion may be developed. Even in apparently cured cases the organ is left in such a sensitive condition that the slightest irritation or deviation from a specified diet may cause a fresh attack."

I believe that practically all patients with gastritis may be relieved of their subjective symptoms. Even in cases of achylia with gastric atrophy such results are often obtained, and these patients are seen to follow their occupations, to eat almost any kind of food with little or no discomfort, and to maintain their standard weight. In a large percentage of the simple and mucous forms of gastritis, the subjective symptoms are not only overcome, but the free HCl (which may have been absent for months or years judging from the duration of the symptoms) may be restored, at least in part. Such results may certainly be considered as cures.

It would seem that relapses are liable to occur in this disease, yet I have encountered only an occasional case, and in each, gross indiscretion in diet or the excessive use of liquor seemed the probable cause. During treatment most patients learn a valuable lesson in dietetics and profit thereby. For this reason I feel that they may be less liable to a recurrence than many individuals, who daily abuse their stomachs, are to the disease. The nine patients cited were treated from one month to several months. In every case the subjective symptoms were relieved or entirely overcome within a few weeks.

In 6 of the 9 cases free HCl was restored in amounts from .2-.5 of one part per 1,000 or .02-.05 of 1 per cent. The return of the HCl was always a gradual process, at first merely a trace appeared and later amounts sufficient to titrate. The earliest return of HCl in any case was after eleven days' treatment, while the longest time required for its appearance was seven months of irregular treatment. The average time of total treatment was about three months.

The results of treatment in those cases in which HCl was not restored seemed quite as satisfactory as in those in which it returned, in so far as relief from symptoms was concerned. At the time of discharge all these patients were partaking of a plain, wholesome diet. During the period of from twelve to nineteen months since their discharge, six of these patients have reported no recurrence of symptoms, and in 5 of the cases in which the HCl was restored it is still present. Three cases have not been followed.

It may be argued that these cases were unusually mild ones (the average duration was six years), yet I consider them fairly representative of the class of gastritis cases usually encountered. The question may arise, how long after the disappearance of subjective symptoms is one justified in treating a case in an attempt to restore the secretion? It may be said generally that the stronger or the richer the secretion the greater the possibility of restoring it to normal.

The strength of a secretion is best ascertained by the result of the quantitative test of its rennin or rennin zymogen. Boas<sup>8</sup> and Bourvere<sup>9</sup> have determined that normally rennin zymogen, after the addition of calcium chlorid, will coagulate milk with a dilution of 1 part secretion to from 150 to 160 parts water. Hence, the

8. Deutsch. Med. Wochschr., No. 17, 1892.  
9. Gaz. Méd. de Paris, No. 22, 1893.

7. Philadelphia Med. Jour., June 14, 1902.

greater the dilution of a secretion, and a positive result from this test, the stronger it is. The above-mentioned writers have further decided that "a secretion which will not coagulate milk, after a 1-25 dilution, indicates a condition of advanced atrophy, in which there is but little probability that the gastric secretion can be restored." Usually the free HCl returns, if at all, within a few weeks.

One of the objects of treatment is to restore the secretion as nearly as possible to its normal strength, consequently so long as examinations from time to time show an increase in the amount of HCl, treatment should be continued. I have found, however, that after the free HCl has reached the strength of about 0.5 of 1 part per 1,000, or .05 of 1 per cent., continued treatment fails to effect a further increase. I have never seen or heard this point discussed, therefore I do not know if mine has been a common experience with others.

#### TREATMENT.

The object of treatment is to overcome the inflammation and if possible to restore the secretion and the impaired motor power of the stomach. Since any single cause of the inflammation is rarely discoverable, we must remove all conditions which may be considered as contributing factors. Hence, good hygiene is advised, which means regular habits as to eating, exercise and action of the bowels, repair of carious teeth, etc.

*Diet.*—In this condition starches are better digested in the stomach than under normal conditions, while proteids are but poorly cared for here, being digested almost entirely in the intestines. Bearing this point in mind and remembering that all mechanical, chemical and thermal irritants are to be avoided, we have the key to dietetics in this disease.

The articles of food to be allowed I check from a printed diet list, usually advising three meals a day, with one or two lunches if desired. Of the more restricted diet in the beginning of treatment, patients will rarely eat too much, while if the scales show a maintenance or increase of weight, I feel that they are eating enough, regardless of the number of calories which the food represents. Cooked fats I have found are not usually well borne. No alcoholic liquors are allowed; my reasons for prohibiting them are given elsewhere.<sup>10</sup>

*Mechanical Means.*—To free the stomach of mucus and to stimulate secretion and peristalsis, douching of the stomach internally with a warm alkaline and saline solution, is, I believe, the most valuable means we possess. For this purpose I employ my stomach apparatus,<sup>11</sup> using the Rosenheim tube. The solution is injected with the amount of force desired, but it is always greater than that obtained by ordinary lavage. By the douche I believe that adherent mucus is more thoroughly removed than by simple lavage, while the stimulating action of the small forceful streams must be far greater than that produced by pouring water into a tube which has but one or two large eyes. In fact, I feel that douching of the stomach in gastritis and other conditions will become a more popular means of treatment when its technic and results are better known.

Riegel agrees that "the internal douche may frequently be employed with profit in chronic gastritis. It may be useful under certain conditions to force the fluid into the stomach under pressure." Douching or lavage should

be done at least twice a week and always with the fasting stomach. The agents which I usually employ are sodium chlorid and sodium bicarbonate 30 grains of each to a pint of water at 100 F. "Washing out" the stomach with copious draughts of medicated water seems but a poor substitute for douching.

*Drugs.*—For the purpose of dissolving mucus and increasing the secretion I use from 10 to 15 grains each of sodium chlorid and sodium bicarbonate in a glass of warm water, to be taken about fifteen minutes before meals. Some of the saline mineral waters may serve the same purpose in a measure, so also may some of the more elegant preparations containing the various salts. The phosphate or sulphate of sodium may be used, especially if there is constipation; nux vomica, condurango and other bitter tonics may be of service, but of late I have rarely used them.

I have elsewhere expressed my views regarding the use of hydrochloric acid<sup>12</sup> and pepsin.<sup>13</sup> I believe that the large doses of from 15 to 20 minims of HCl fail to accomplish the desired object; moreover, I feel that they may do harm. Small doses of from 5 to 10 minims may in some ways prove beneficial, but I consider that there is no evidence to show that they stimulate the secretion of HCl.

Vacations and out-of-door exercise or occupation are important and at times seemingly necessary factors in the cure of gastritis.

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## A GRAPHIC METHOD IN PRACTICAL DIETETICS.

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Professor Mendel, in an address on dietetics before an audience of Boston physicians, asked the very pertinent question: "Why do physicians take so much care in measuring their dosages of drugs, which are administered only occasionally, and so little care in measuring their food prescriptions, which are to be followed daily?" In prescribing drugs, a physician would be regarded as criminally negligent if he simply told his patients to take "a little" strychnia, but to be sure "not to take too much;" or to take a "big dose" of calomel. Yet in prescribing diet, physicians often give just such advice.

Doubtless in the scheme of Nature man was not expected to measure his food. He was provided with healthy, normal instincts instead. But, as often happens in diseased conditions, the food instinct has sometimes become perverted and can not be trusted. The consumptive requires, or at any rate is believed by most physicians to require, more food than his appetite calls for, and the victim of kidney diseases less. To re-establish the instinctive guides to food selection should doubtless be the ultimate aim of the physician; but, to that end, a quantitative determination of the food actually used, and a quantitative regulation thereof, may be advantageously employed. As yet, however, neither the quantity of food nor the proportions of its constituents have been often prescribed with precision.

12. Clinical and Laboratory Study of the Therapeutic Value of HCl in Diseases of the Stomach. Boston Med. and Surg. Jour., Sept. 14, 1905.

13. Therapeutic Value of Some Digestive Preparations. Boston Med. and Surg. Jour., May 18, 1905.

10. Philadelphia Med. Jour., June 6, 1903.

11. An Improved Stomach Tube, THE JOUR. A. M. A., July 28, 1906.