somewhat tedious process, and that, if it be a mere dyscrasial phenomenon, it is liable, even if wholly or partially healed, to recur on every renewal of dyscrasial activity. The way in which many cases of supposed duodenal ulcer become well when carefully managed makes it seem likely that in some instances either no accomplished ulceration, or ulceration of modified extent only, is present. We are all familiar with the difficulties met with in the diagnosis of stomach ulceration, and of the large proportion of cases at first labelled "ulcer" which get completely well under rest, regulated diet, and suitable medicinal treatment. It would require some courage to advocate the opening of the stomach on the provocation only of a set of symptoms that might, but also that might not, be the result of an ulcer somewhere on its mucous surface, and yet nothing less than this is the procedure which the duodenal enthusiast asks us to adopt. In suspected cases the patient should limit for the time being his active work, and must carefully avoid all exercises or active games that throw special stress on the abdominal muscles. In the event of a haemorrhage having occurred, the rest obviously must be complete and in bed. Under such circumstances the food should be bland, easily digested, and given at stated intervals in limited quantity. A semi-starvation diet is recommended by some authorities; but though this may be advisable in acute cases for a few days, it need never be pushed the length that is sometimes found necessary in gastric cases, because ingestive discomfort is comparatively slight and unimportant.

After the first acute phase of the illness is over the diet may be reasonably generous, but it is well to remember that tea, stimulants, uncooked vegetables or fruit, and sugar are best done without, and that starchy food should be taken in moderation. The following plan of dietary will be found to suit many cases: A cupful of hot water to be slowly sipped before breakfast every morning; for breakfast, café-au-lait sweetened with saxon, toasted protein, or caseoid bread with butter, eggs poached, boiled or scrambled, or white fish. During the forenoon a cupful of thin clear meat soup, which it is advantageous to thicken with about half an ounce of gelatine. For luncheon well-cooked fresh veal, mutton, or lamb, cooked green vegetables, preferably in the form of a purée; stewed fruit, sweetened with saxon; some form of starchless bread or biscuit, thickly spread with sour milk or lactic acid cheese; Perrier, Bilin, Gieshübler, or other natural alkaline water. In the afternoon boiled milk, or cocoa infused from the nibs; toasted bread and butter, simple tea-cake. For dinner, fish, plainly cooked and without rich sauce; egg entrée, sweetbread or calf's head, chicken or other form of bird, a small quantity of potato in the form of chips or ribbons, a simple omelette or a savoury. A small quantity of brandy or whisky, if desired, with the meal, and a cup of black coffee after it. Farinaceous puddings, bread, other forms of meat, etc., may be gradually added to the dietary as improvement takes place.

It is of elementary importance to make sure that the buccal cavity is clean, and to this end all decaying stumps should be removed and carious teeth cleaned and stopped. An antiseptic mouth and throat wash should be used freely at least twice a day, both as a gargle and also to brush the teeth with.

As regards medicines, my experience is that most cases are speedily relieved by a combination of bismuth and carbolic acid, to which, if the pain is at all severe, a suitable dose of morphine may be added. The following is a useful formula: Carbonate of bismuth, 40 grains; pure carbolic acid, 2 grains; solution of hydrochlorate of morphine, 15 minims; mucilage of acacia, *quantum sufficit*; compound infusion of gentian to make up 1 oz. To be taken in water from two to three hours after every meal.

To counteract the constipation which usually results from large doses of bismuth, the following or some such pill should be given at bedtime; Calomel, $\frac{1}{2}$ grain; extract of rhubarb, 2 grains; extract of cascara sagrada, 1 grain; capsicine, $\frac{1}{2}$ grain.

When all active symptoms have been subdued, the bismuth mixture may be replaced by such a tonic as this: Finkler's papain, 2 grains; carbolic acid, 2 grains; strychnine, $\frac{3}{32}$ grain; codeia, $\frac{1}{4}$ grain; and extract of rhubarb,

$\frac{1}{2}$ grain. To be put in a capsule and taken after meals three times a day. And the aperient pill may be replaced by a morning dose of Carlsbad salts, when required. When haemorrhage has occurred, it is usually an indication for the administration of iron when the tonic stage is reached.

Treatment by sterile horse serum, together with a dry and mostly meat diet, has been advocated recently, but, though I have not resorted to it in cases of suspected duodenal ulcer, I have given it a fair trial in gastric ulceration, but without any result sufficiently striking to confirm the claims advocated for serum as the most valuable of all methods of management.

The leading indications for surgical interference would seem to be: The occurrence of perforation; repeated melaena or haematemesis, especially if associated with pain and resistance to pressure over the right hypochondrium; cicatricial contraction of the duodenum, causing dilatation of the stomach; resistance of the symptoms to all forms of medical treatment; and recurrent attacks of cholecystitis, accompanied by evidences of pancreatitis.

TUBERCLE BACILLI IN THE FAECES IN TUBERCULOSIS.

BY

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It has been commonly supposed and taught that the discovery of the tubercle bacillus in the stools is diagnostic of tuberculous enteritis. Until recently it had hardly been conceived that the tubercle bacillus might be found in the faeces of persons suffering from other forms of tuberculosis. The observations which follow show how frequently they occur in the faeces of patients affected with pulmonary tuberculosis. Their occurrence in the stools would indeed seem to be much more constant than in the expectoration.

It may be recalled that last year Rosenberger¹ described the presence of tubercle bacilli in the blood in different forms of tuberculosis. More recently Willson and Rosenberger² announced that they had found tubercle bacilli in the stools of 100 tuberculous patients, including early cases, and in 21.5 per cent. of 1,033 clinically normal persons. According to these observers, the bacilli obtain access to the blood stream and are carried from the affected focus to the intestinal wall, through which they are excreted, and so are finally discharged in the stools. Klose³ has likewise found that in almost every case where tubercle bacilli were found in the expectoration they were also found in the faeces.

The significance of the constant discharge of tubercle bacilli from the alimentary tract is immense, both from the point of view of clinical medicine and of public health. On this account it seemed to us desirable to make further observations on the subject, and these are now recorded.

Uhlenhuth and Xylander⁴ have recommended the use of "antiformin," a mixture of alkali hypochlorite and alkali hydrate, for the purpose of distinguishing acid-fast from other bacteria in sputum. Acid-fast bacteria can resist this disinfectant when diluted to 20 per cent. for two to five hours, while other bacteria and organic matter generally are speedily dissolved. Uhlenhuth mixed sputum with antiformin in sterile Petri dishes. We used instead conical precipitating glasses. A small piece of faeces, about a cubic $\frac{1}{2}$ in. in size, is placed in a conical glass, and to this some 20 c.cm. of antiformin, which has been diluted with water to 15 per cent., is added. The faecal matter is well broken up and mixed with the fluid, and thereafter as much again of the dilute antiformin solution is added. This is further mixed, and allowed to stand for about an hour. A white curdy precipitate appears on mixing, and in the course of an hour settles into a white layer which varies in breadth. Beneath the white layer some unchanged faecal matter remains, and above the white layer the fluid is of a clear yellow or brownish colour. A residue, including tubercle bacilli, which have been set free by the destruction of the other

constituents of the faeces, appears to be gathered into the white layer by a process of sedimentation. During the precipitation and sedimentation of the organic matter the bacteria are carried down, perhaps in some degree agglutinated. This concentration of the organisms makes up for the disadvantage caused by the initial dilution of the material.

For microscopic examination a drop is then taken from the white curdy layer by means of a pipette and placed at the end of a slide, along with a drop of albuminous water from a mixture containing 1 part of egg albumin to 10 of distilled water and 1 per cent. of formalin, and 90 per cent. of distilled water is added. A film is made in the usual way by drawing out the fluid with a second slide along the surface of the first. The albumin, which is recommended by Seeman,⁵ helps to produce a better film and prevents the film from being washed off.

As to the strength of antiformin to be used, we have found that 15 to 20 per cent. is most suitable. The use of a stronger solution, say 50 per cent., is apt to lead to separation of the film. The time during which the action of the antiformin may be continued does not require very strict limitation; although Seeman says that the bacilli cannot stand its action for twelve hours, we have not been able to determine any deterioration of staining properties of the bacilli after twenty-four hours' action when use is made of the 15 to 20 per cent. dilution. The action of the antiformin seems to be chiefly exerted during the first hour, so that there seems no reason to continue the process for more than that time. Indeed, if the white layer has formed well within half an hour, the film may be prepared then. Even when the curdy layer does not become quite white, but remains of brownish tint and small in amount, our experience is that little is to be gained by waiting longer than an hour. The excess of brownish coloration is commonly dependent on an excess of faecal matter, or, perhaps, on the presence of iron taken as medicine. The prepared slides are fixed by heat and stained in the usual way by carbol-fuchsin and methylene blue, being decolorized with both acid and alcohol. As the tubercle bacilli are commonly sparse, it is advisable to prepare two or three films from each specimen.

Microscopically the film is found to consist entirely of a blue-stained residue. Here and there tubercle bacilli are conspicuous by their reddish colour. In most instances they require much searching, as their total number is small. Only in two of the considerable series of specimens examined by us could they be said to be abundantly present.

Some doubt might be suggested as to the identity of the bacilli. Willson and Rosenberger were able to distinguish the bacilli in the stools examined by them by means of prolonged exposure to Pappenheim's stain. Other acid-fast bacteria, with the exception of the bacillus of Johne's disease, lost their carbol-fuchsin stain in twenty minutes. Tubercle bacilli retained it for one hundred and sixteen days.

Our slides were decolorized with alcohol as well as acid. Bacilli were not present in the faeces from the normal cases examined. The bacilli in both sputum and faeces possessed the same characters. One case with short, thick bacilli in the sputum had short, thick bacilli in the faeces.

We attempted to make cultures from the faeces, but a large number of resistant spores occur in faeces, and we were unable to destroy them without also destroying the tubercle. While it is possible to obtain pure cultures of the tubercle bacillus from sputum, faeces present greater difficulties, and so far our attempts have proved unsuccessful.

The results obtained by us may be summarized as follows. Altogether 109 different specimens were examined. Of these, 99 were from patients suffering from pulmonary tuberculosis, in different stages of the disease, in the Royal Victoria Hospital for Consumption. None of the patients had intestinal tuberculosis. The others were from patients in the Royal Infirmary, one from a case of tuberculous peritonitis, and the others from patients without a suspicion of tuberculous infection.

Of the 109 persons, only 34 had sputum in which tubercle bacilli had been discovered; 42 had sputum in which no bacilli were found, and 24 had no sputum whatever.

Of the 100 tuberculous cases examined 79 were found to yield tubercle bacilli, and only 21 were negative. Of the 9 specimens from presumably normal subjects none yielded tubercle bacilli.

Of the tuberculous patients, all those with bacilli in their expectoration, with one exception, presented tubercle bacilli in the faeces. Of the 42 cases in which bacillary examination of the sputum was negative, 29 gave tubercle bacilli in the faeces. Of the 24 cases without sputum 17 showed bacilli in the stools.

These results are striking, and are suggestive in regard to clinical diagnosis, and to the larger aspect of preventive medicine. Thus it may be stated with absolute certainty that the occurrence of tubercle bacilli in the faeces is independent of the presence of an intestinal lesion. Indeed, their presence has little reference to abdominal tuberculosis. They were actually absent from the only case of tuberculous peritonitis which was examined.

The remarkable frequency of their occurrence in relation to pulmonary tuberculosis, not only in cases where tubercle bacilli were determinable in the sputum, but also in cases where either bacilli were absent or there was no sputum whatever, would seem to afford an important addition to our means of diagnosis in doubtful cases of pulmonary tuberculosis.

From the public health point of view, the almost unfailing presence of tubercle bacilli in the faeces—the presumption is that in some of the negative cases in the present series more minute examination would have discovered them—raises questions as to the need for disinfection of stools, more especially in the case of bed-ridden individuals, such as has hitherto not been thought necessary. Further, if, in the Royal Victoria Hospital where swallowing of sputum is carefully guarded against, tubercle bacilli are found to occur so constantly in the stools of the patients, whether expectorating bacilli or not, it may be assumed that in the great proportion of untreated cases, where swallowing is often the rule, the number of tubercle bacilli discharged in the faeces will be vastly greater.

It may be added that the technique necessary for the clinical detection of the bacilli is not difficult or lengthy, and that the process of faecal examination, which is apt to be repellent to some observers, has most of its unpleasantness removed by the method which has been described.

REFERENCES.

- ¹ Rosenberger, *Amer. Journ. of Med. Sci.*, February, 1909. ² Willson and Rosenberger, *Journ. of Amer. Med. Assoc.*, 52, 1909, No. 6. ³ Klose, *Muench. med. Woch.*, January 14th, 1910. ⁴ Uhlenhuth and Xylander, *Berl. klin. Woch.*, 1908, No. 29. ⁵ Seeman, *ibid.*, 1909, No. 14.

THE EXPERIMENTAL EVIDENCE FOR THE THEORY OF THE NEUROGENIC CO-ORDINATION OF THE HEART IMPULSE.*

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IN an abstract of the work of Cohn and Trendelenburg in the *Centralblatt f. Physiol.*, 1910, No. 5, p. 183, doubt is cast upon the observations, made many times in the Hallerianum Berne, which speak for the neurogenic nature of the conduction of the heart impulse. The authors have obviously not had time to study the work on this subject, and yet pronounce the opinion that the fundamental experiments of Pauk were carried out "with entirely insufficient methods." In August, 1907, Pauk communicated and demonstrated his experiments to the Seventh International Physiological Congress in Heidelberg.¹ Not one of the experts present doubted the result.

The myogenic theory does not explain how it is that the ventricles can fibrillate while the auricles pulsate, and vice versa; or why a thrust in the right spot into the intraventricular septum brings the heart into fibrillation; or why, what is easier, paraffin injected into the peripheral twigs of the coronary arteries produces a like

* See Appendix D, pp. 224-227, in Sir Lauder Brunton's *Treatise on the Circulation* (John Murray), 1908.