it will be possible to publish them later, when the morphological variation exhibited by these organisms will be more fully shown than is possible in the text figure.

Earlier Observations.

There are a few vague references in the literature to spirochaetes, or spirilla, as they were often called, in human faeces. Thus, H. Kowalski (1893, 1894) recorded the presence of spirilla in cholera motions examined by him. Apparently no illustrations or dimensions of the organisms were published, and at first they were not named. The number of curves, "about one, two, or three, seldom four, five, or many," is noted. Kowalski's first observations, made on eleven cases, are recorded in an incomplete form in the report of a meeting of a medical society in Vienna in December, 1893. During the discussion thereon Paltauf stated that Escherich in 1884 had seen spirochaetes in normal human faeces. Escherich himself in 1894 referred to his previous work in 1884-86, and stated that he had found spirilla in diarrhoeic stools of babies and adults and in cats. He compared them with dental spirochaetes, but found them to be shorter. Abel (1894) and Aufrecht (1894) also recorded the finding of spirochaetes in the faeces of a few cholera patients, the latter worker comparing them with blood spirochaetes. Rechtsamer (1894) mentioned the finding of spirilla in the dejecta of cholera patients in Caucasia.

Lustig and de Giaksa, writing in 1894, refer to their earlier work in 1886 on the stools of four cholera cases in Trieste, in which the occurrence of spirilla was noted. In their earlier paper (1886) these authors give drawings of a few spirilla, but neither state the dimensions of the organisms nor name them. On examining their illustrations I find that the spirilla measure up to 13μ . As a result of a discussion of the work of Lustig and de Giaksa, Kowalski (1894) named his organisms *Spirillum hachaiiae* or *S. hachaiicum*. However, as no dimensions and no detailed differential characters were given, either by Kowalski or the other earlier workers—most of whom called the organisms spirilla or spirochaetes indifferently, though the parasites are not stated to have had flagella, characteristic of spirilla—it is very doubtful whether Kowalski's names are valid.

"Spirillar" or spirochaetal dysentery has been briefly recorded by Le Dantec (1903). The patient, who came under observation in the neighbourhood of Bordeaux, had been known to the author for some time, and had been at Tonkin eighteen months before, when in the French Colonial Medical Service. It was stated that the patient developed dysentery in Bordeaux. Spirochaetes were found to be abundant in the mucus of the stools. Some of the organisms showed three curves, and were 6μ to 14μ long. Coiled-up and bowed forms were also seen. Some spirochaetes were observed to enter and emerge from intestinal cells.

Werner (1909) found spirochaetes in his own stools while apparently in good health, though he had suffered from diarrhoea when in German South-West Africa in 1905. A few other cases are also mentioned by him, among them the occurrence of spirochaetes in a case of sprue. Werner separated two species of spirochaetes, which he considered to be distinct. He named these *Spirochaeta eurygyrata*, "a wide wound form," varying in length from 4.6μ to 7.3μ ; and *S. stenogyrata*, "a narrow wound form," varying in length from 3.5μ to 6.1μ . Only six indistinct microphotographs illustrate the paper, and they hardly justify Werner's statements.

Werner differentiated partly on the character of the "windings." As I (1915) have previously pointed out, the number of windings or curves is not of specific value, but is chiefly an indication of the rate of movement. Further, the processes of growth and division will easily explain the so-called differences in morphology and size between Werner's species. Morphological and biological variations appear to have been overlooked in the desire for the creation of new species.

In 1914 J. G. and D. Thomson recorded the presence of spirochaetes in the stools of healthy individuals, of patients suffering from rheumatoid arthritis, of a case of profound anaemia, and of a case of amoebic dysentery. They also found what they considered to be *Treponemata* in human stools. Macfie (1915) found spirochaetes in the stools of a monkey suffering from amoebic dysentery in West Africa, and in those of diarrhoeic patients in Accra.

Nomenclature.

From the foregoing remarks it will be seen that the nomenclature of the spirochaetes found in human stools is in a very confused state, owing to lack of precision and detail in the incomplete descriptions published. As already indicated, the species *S. hachaiiae* is insufficiently defined, and its name appears to be invalid.

It is probable that the earlier authors, and, indeed, all those mentioned in this paper, were dealing with the same spirochaete, which exhibited morphological variation due to the processes of growth and division. The first name proposed by Werner—namely, *S. eurygyrata*—will then be valid. It is therefore necessary to amend the definition of the organism as follows: *Spirochaeta eurygyrata* has tapering ends, measures up to 15μ long, and is about 0.25μ broad. It contains a diffuse nucleus consisting of chromatinic granules. The number of coils or waves is variable, depending on the rate of movement and thickness of the organism.

Conclusions.

Spirochaeta eurygyrata, Werner emend. Fantham, may occur in the stools of dysenteric and apparently healthy persons. The organism, which has pointed ends, measures from 3μ to 15μ in length by about 0.25μ in breadth.

The so-called spirilla, mentioned by some of the earlier workers as occurring occasionally in cholera motions, are included under the name *Spirochaeta eurygyrata*.

The number of coils in a spirochaete is not a specific character but is variable, and is primarily an index of its rate of motion, being also partly dependent on the thickness of the organism.

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PERFORATING AND PENETRATING WOUNDS OF THE CHEST WITH SEVERE HAEMORRHAGE:

A SUGGESTION FOR TREATMENT.

BY

A. DON, F.R.C.S., MAJOR R.A.M.C.(T.).

I HAVE been impressed with the impotency of treatment for severe haemorrhage in these cases, and have recently had an opportunity of trying a method which I have not seen advocated elsewhere, and I offer it for consideration and trial by surgeons near the front. The severer cases

almost all die of haemorrhage within the first few hours, and so far there has been little success in attempts to check this mortality. The movements of respiration with its suction force, combined with the elasticity of the lung itself, tend rather to a continuance of haemorrhage than to natural arrest. Plugging the wounds in the chest wall, unless fortunately the bleeding vessel is an intercostal, and is by chance compressed against a rib, seems to do more harm than good, to hasten rather than retard the end. The method is extensively used, but if it is to arrest the bleeding from the lung itself, which is oftenest the cause of death, it must allow complete rest to the lung by collapse, and before this can take place the pleural cavity has to be full of blood. Slow collapse of the lung would not be nearly so effective in arresting severe haemorrhage as sudden collapse, and a pleural cavity filled with blood spells a bloodless and often moribund patient.

If one considers the mechanism and physics of respiration one finds that with each inspiration there is a lifting of the chest wall and depression of the diaphragm, which tends to produce a vacuum in the pleural space by a sucker-like effect. A wound of either pleura will have this suction applied to it, and every child knows how little effort is required to suck blood from a pinprick in the finger. The suction power of the mouth is feeble compared with that of the chest in the pleural space owing to the intervening column of air in the lungs, and the elastic lungs themselves.

The suction in the pleural cavity is exerted strongly from the commencement of the act of inspiration to that of expiration, and more feebly, though of the same kind, during the whole expiration. A bleeding point thus has a suction pump applied to its open rent, and a clot is prevented from forming, for even at the end of expiration the lung occupies a much greater space than it would occupy if the chest wall had an opening in it and the lung were completely collapsed. The same process of suction takes place also throughout the lung tissue, and there is added the elasticity of the lung itself, which pulls apart and keeps open any rent. Unless a very large vessel be torn there is not apt to be so much bleeding into the trachea as into the pleural cavity, though it may equally be continuous for days, for there is not so great suction force to the trachea side, and it is not so uniformly exerted during the whole respiratory act. The suction is positive during inspiration, the air pressure being negative and almost equal during expiration. But there is the cough to consider.

To overcome both the suction and the elastic forces and to allow the lung a complete rest till haemorrhage has been arrested, I thought of making a temporary opening into the pleural cavity, allowing the lung to contract quickly, and, if necessary, washing out the blood clot. In most of the cases of chest wounds, especially from shells, the haemothorax has later (reports from base hospitals) become septic and death from empyema has supervened. This infection of the blood clot is almost certain to happen, for it may be, and usually is, infected by the missile, or it may be, and sometimes is, infected from a septic pneumonia arising in the injured lung. There is then the difficulty of diagnosing this empyema. Fluid and dullness are already present from the haemothorax, and the rise of temperature may not be sudden, and may be due to the septic pneumonia. One could, of course, put in a needle daily, but the risk of infection from repeated punctures is as great as from the single stab of operation. Besides—and this is not unimportant—one hesitates to disturb and pain a serious chest case daily. It is against the rest treatment at present in vogue, as well as against one's feelings of sympathetic nursing.

The risk, then, of causing by operation an infection which would not otherwise occur is infinitesimal, and on all grounds my suggestion, wisely used in selected severe cases, seems a sound one, and I have convinced most of my colleagues with whom I have discussed the subject of its feasibility and utility. Very severe haemorrhage could be treated in advanced stations of field ambulances, less severe ones more comfortably in the small hospitals of the field ambulance and others, a diminishing number, in the casualty clearing stations.

In the only case in which I have done the operation great relief was experienced in breathing; there was a marked diminution of pain, and, though haemorrhage

could not be said to have been severe, it was still going on, and stopped quickly after the operation.

The operation may be done under a general or a local anaesthetic, and in any of the usual sites for empyema, preferably the mid-axillary line. Percussion localizes the haemothorax, and a stab is made with a scalpel through the intercostal space, close to the lower rib. The scalpel goes right into the pleural space. Even if the point of the knife wounds the lung, which is unlikely in most cases and impossible where there is much effusion, the consequence is negligible. The outer covering of one of the army tracheotomy tubes is slipped easily, owing to its central groove, one half along each side of the blade of the knife, and is pushed right home. The knife is then withdrawn and the centre piece of the tracheotomy tube put in. If air has not entered during the previous manipulations it will do so now, with a hissing noise, and the blood will be coughed out. The haemothorax may be aspirated through a soft catheter placed inside the tracheotomy tube, as was done in my case, but this would not be necessary in cases treated earlier, when clotting would not have taken place. The tube is now turned so that the inside end points up, and is fixed by straps and plaster or a suture to the chest wall. A pad of sterile gauze and wool completes the dressing. Mr. Lawrie, R.A.M.C., suggested that a trocar and cannula, such as is supplied in the pannier of the field ambulances and casualty clearing stations, would be sufficient to give relief and allow the patient to be transferred before more haemorrhage would take place. This is worth considering for advanced dressing station treatment. The cannula would, of course, not be left in.

When a tracheotomy tube is put in the whole operation does not occupy a minute, and the tube is removed after twenty-four or forty-eight hours, according to the amount of blood escaping. The wound closes immediately aseptically. Our patient went to the base on the third day quite fit.

The advantages of this treatment are—

1. The lung collapses quickly, and any wound in it immediately closes.
2. The lung gets complete rest for a time and will be better able to combat infection later, as it will contain very little blood effused into its tissues.
3. The suction force of respiration is immediately removed from the rents of the interthoracic vessels, and clotting and natural arrest is allowed to take place.
4. Plugging may be done for haemorrhage from the chest wall with a certainty of arresting it and of doing no harm, and there will be less movement—a comparative rest—on the collapsed side.

A SUCTION OR VACUUM BOUGIE FOR THE TREATMENT OF CHRONIC GONORRHOEA.

BY

CAPTAIN A. CABELL, R.A.M.C.(T.).

In chronic gonorrhoeal urethritis there are two conditions chiefly responsible for the failure, in many cases, of the usual methods of treatment. The one, is the gonococci are wholly or partially sealed up in the lacunae and glands, owing to the infiltration and thickening which has taken place round the walls. The other is, the great alteration in the vascularity of the mucosa by the infiltration resulting from the invasion of the gonococcus in the subepithelial tissue.

At this stage of the disease irrigations, injections, and other local applications are practically of no value, as they are unable to penetrate the glandular elements to wash out the lurking gonococci. Mechanical dilatation will not open the ducts or glands with infiltrated and thickened walls. The application of heat to the urethral mucosa by bougies fails to achieve its two objects, which are to kill the gonococci by the direct action of heat, and to induce an artificial hyperaemia, because the mucosa will not tolerate without injury the necessary temperature.

With the idea of inducing an effective hyperaemia in the subepithelial tissue, and promoting absorption, and also of emptying the lacunae and glands, I have designed a suction or vacuum bougie. I have used it in many