It may be suggested that at the start of the attack he had a gall-stone colic so severe that it caused him to fall and in his fall strike some object which ruptured his spleen. I do not think this at all likely, for he showed no external signs of injury either at first or later, and he would scarcely drop so helplessly as to make his fall comparatively heavy; he was absolutely confident that he fell on level ground without any stones or other objects likely to have caused the rupture. There was no jaundice, and when the abdomen was opened there was no evidence of stone in the ducts.

For my part, I do not think either of these two reasons could be the cause of the rupture, and I must look upon it as a case of "spontaneous rupture of a normal spleen." I regret I was unable to have a blood count made.

THE RELATION OF PFEIFFER'S BACILLUS TO INFLUENZA.

BY

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The following report is based upon a number of cases examined during the 1918 epidemic. Attempts to obtain cultures from the circulating blood were made in three cases, and from the heart's blood *post mortem* in two. Of the former, two were sterile and one yielded streptococci; of the latter, one was sterile and one gave streptococci. In no case was Pfeiffer's bacillus discovered, and of three swabs taken from the nasopharynx none showed this organism. Cultures were made from the sputum in seventy-three cases, the specimens in all cases being purulent or muco-purulent in character. The *Bacillus influenzae* was recovered seventeen times (24 per cent.).

The earliest cultures were made on agar smeared with fresh human blood, but the results with this medium were not equal to those with the media afterwards used, and the percentage of positive results was smaller. The later media were Levinthal's and Flemming's. Both were prepared freshly for each plate (within twelve hours).

Levinthal's was prepared by melting some nutrient agar, cooling to 75° C., and adding 5 per cent. citrated human blood. The whole was then just brought to the boil, cooled 10° to 15° C., and raised a second time to ebullition; it was finally passed through a sterile gauze and cotton-wool filter and poured immediately in plates.

Flemming's was prepared as follows: Stock flasks containing 160 c.cm. nutrient agar were prepared and kept ready for use. Human blood was obtained and added to five times its quantity of tap water and an equal quantity of NHCl . The mixture was well stirred and preserved in a sterile stoppered bottle in the ice chest for three to seven days. This was found necessary to ensure sterility. Tubes put up with blood newly treated were contaminated with *B. subtilis* in from 25 to 50 per cent. Immediately before use 14 c.cm. of the acidulated blood were taken and 2 c.cm. of normal NaOH added, mixed thoroughly and the reaction adjusted to just blue to litmus. The whole amount was then added to 160 c.cm. of melted agar and plated.*

Both these media proved highly satisfactory but rapidly lost the power of giving good growths. The primary culture and first and second subcultures must be made on the freshly prepared medium. Subsequently the organism becomes acclimatized and will grow on older media.

Pfeiffer's bacillus grows on them as minute, round, colourless colonies, which generally require thirty-six hours' incubation before they can be picked off for subculture. Here, as on other media, they show a marked tendency to congregate round colonies of staphylococci. An organism was accepted as a true *B. influenzae* if it was a minute Gram-negative cocco-bacillus with slightly tapering ends, non-motile, growing best on blood media, and staining only slowly with ordinary aniline dyes.

For further investigation three strains were chosen, numbered 14, 16, and 43, after very numerous replatings to ensure absolute purity.

*I have been unable to discover any references in bacteriological literature to either of these media. In both cases the details of the preparation were communicated to me personally by a fellow worker. I believe that the second has not yet been published, but a very similar method has been devised by Hundershagen, *Deut. med. Woch.* 1918, 44, 1181, quoted by the *Medical Supplement* to the Daily Review of the Foreign Press, vol. i, No. 12, December, 1918, p. 456.

Pathogenicity.—None of the strains produced any symptoms when injected intraperitoneally into rats or intravenously into rabbits.

Immunity.—A suspension of strain 14 was put up against the serum of a rabbit by Dreyer's technique. No agglutination occurred. The same rabbit received on the following day, December 5th, 1918:

At 10.55 a.m. an intravenous injection of one agar slope of strain 14 suspended in physiological saline to which had been added 0.5 per cent. phenol, the whole having been heated to 60° C. for thirty minutes.

At 11.55 a.m. a second slope culture of the same strain similarly prepared was injected intravenously, and again at 12.55 p.m. a third slope. The animal remained perfectly well.

On December 12th, 1918, two slopes of strain 14 were given into the ear vein. This time the organisms were living. Again no ill effects ensued.

On December 15th, 1918, a few c.cm. of blood were drawn off and the serum put up against all three strains of the bacillus, with the following results (in Dreyer's nomenclature):

Strain.	Dilution of Serum.			
	125.	250.	625.	1,250.
14	T	T -		
16	T	T	S ++	S +
43	T	T -	S +	S

On December 20th, 1918, the rabbit was bled to the amount of 20 c.cm., the serum removed and used as a control for further experiments. It consistently gave a clear agglutination of all three strains in a dilution of 1 in 1,250.

Having demonstrated the antigenic properties of these strains, the serums of patients suffering from influenza were put up against them with unvarying negative results.

Bronchopneumonia Present.		Bronchopneumonia Absent.	
Week of Disease.	No. of Serums Examined.	Week of Disease.	No. of Serums Examined.
1 (1-7 days) ...	3	1 (1-7 days) ...	12
2 (8-14 days) ...	8	2 (8-14 days) ...	11
3 (15-21 days) ...	4	3 (15-21 days) ...	10
4 (22-28 days) ...	5	4 (22-28 days) ...	1
5 (29-35 days) ...	3	5 (29-35 days) ...	2
Total	23	Total	36

From this table it is seen that no agglutination of either of three typical strains of Pfeiffer's bacillus was obtained with serums removed from 59 cases of influenza, whether those cases were or were not complicated by bronchopneumonia, and whether they were in the first, second, third, fourth, or fifth week of the disease.

When it was found that agglutination tests failed to reveal the presence of antibodies in the blood of influenza patients, attempts were made to discover them by means of complement fixation tests; but here a difficulty arose in the preparation of the antigen. At first a suspension of the bacilli in 0.85 per cent. saline was employed. The growth on several agar slopes was washed off in saline and washed several times. Unfortunately great difficulty was experienced in obtaining the use of a centrifuge, so that the washing was not as thorough as could be wished. Possibly more perfect washing would have altered the result. As it was, every suspension that it was possible to obtain was so strongly anticomplementary of itself that no complement fixation tests in the presence of a possible antibody could be carried out.

In order to overcome this, further cultures were washed off the medium with normal NaOH , a little of the latter being used for much growth of the bacilli. The suspension was kept on ice for a few days, and then neutralized exactly with normal HCl . Finally it was diluted with distilled water to give a NaCl content of 0.9 per cent., and further diluted with saline to give the requisite strength of antigen. This was determined empirically for each strain. Eight serums were put up against all three antigens, and in no case was the complement fixed.

One patient had bronchopneumonia, and two bronchitis, probably bronchopneumonia; and the day of the disease was 8, 25, 14, 14, 25, 6, 15, and 17 respectively. At the time of this experiment no control with a known agglutinating serum was possible.

CONCLUSIONS.

From the above observations it appears that influenza is not produced by Pfeiffer's bacillus, but by some other virus at present unknown, since—

1. The *B. influenzae* is found in only a proportion of the cases. Other workers have, however, recovered it in more than 90 per cent., but streptococci can be found in quite as many.

2. In certain epidemics of influenza it has been found extremely rarely, while in others it has been entirely absent.¹

3. It is found in cases other than influenza.

4. No specific immunity has been demonstrated to follow infection with this organism. Here again, however, others have arrived at a different result, and have found agglutinins to the bacillus in certain cases of influenza, but their presence has been found by no means constant, and they appear more frequently in the first week of the disease than in the later stages.

The observation that the bacillus is pathogenic to animals after intracerebral injections is no proof of an etiological relation with influenza, since in the human disease infection can never be effected by that path; while equally invalid in this respect is the fact that it has been recovered from pleural, arthritic, and meningeal exudates. It is well established that certain organisms—for example, *B. coli communis*—though normally harmless saprophytes, may in certain circumstances become pathogenic; and it is probable, or even certain, that the *B. influenzae* Pfeiffer is one of these. What are the factors producing such a change have not yet been determined.

REFERENCE.

¹ Dopter et Sacquepée, *Bactériologie*, 1914, p. 527.

PREGNANCY COMPLICATED BY VOLVULUS OF THE PELVIC COLON,

BY

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The publication in the BRITISH MEDICAL JOURNAL of December 13th last of Dr. M. Donaldson's interesting case of pregnancy complicated by volvulus, prompts us to place on record another case of the same kind presenting several remarkable features.

In February, 1918, one of us (E. C. B.) was called to see a lady five months pregnant who had symptoms of acute intestinal obstruction. She was very ill, in great pain, and the abdomen was exceedingly distended.

First Operation.

The abdomen was opened in the middle line and an enormous volvulus of the pelvic colon was found, so large that when untwisted the loop of intestine was long enough to reach from the wound to the floor of the room and back again. The bowel was not only greatly distended, but greatly hypertrophied as well. There was an anatomical abnormality whereby the descending colon was continued sessile over the brim of the pelvis and down its side wall to within an inch of the point where the rectum began. The pelvic mesocolon, therefore, had only this length of base from which it spread fanwise to its attachment to the enormous loop of movable pelvic colon, so that the whole loop was, so to speak, pedunculated, and it was at the point of the peduncle that the twist had occurred. At the junction of the colon and the rectum the bowel wall was much thickened and its lumen narrowed, so that a degree of chronic intestinal obstruction must have existed for some time before the acute attack took place, and there was, in fact, a history of symptoms for two years pointing in this direction.

Having untwisted the volvulus, the bowel was incised and emptied of a great quantity of gas and faeculent fluid; but even in its collapsed state it was so large that it was impossible

to return it into the abdomen, and it was necessary to "colostomize" it at the upper end of the wound, the segment left outside the abdomen being thrice the size of a man's fist. The pregnancy was not interfered with, as the patient's state did not permit of a prolongation of the operation.

Second Operation.

There was a good deal of suppuration round the colostomy, and it was several weeks before the exposed portion of the bowel shrank to a reasonable size.

The next problem was to deal with the pregnancy, for the position of the anchored bowel would not permit of the uterus attaining a size much over six months. Consequently, five weeks after the first operation vaginal Caesarean section was performed and a dead six and a half months child was extracted, the fetal head having been perforated first. The patient again made a good recovery except for a slight attack of femoral thrombosis three weeks after the operation.

Third Operation.

Finally, in June, the colostomy being healthy and the uterus involuted, the abdomen was reopened, the anchored bowel freed, the whole loop of still hypertrophied pelvic colon excised, and what was practically the end of the descending colon was joined to the rectum.

Once again the patient did well, and at the present time is in very good health.

Memoranda: MEDICAL, SURGICAL, OBSTETRICAL.

DEATH DUE TO SWALLOWING A DENTAL PLATE.

A WOMAN, aged 40 years, was admitted into Chelsea Infirmary on October 9th, at 4.15 p.m., with the following history:

She had been healthy until three weeks before admission. On September 18th, in the afternoon, whilst eating a potato, she swallowed a dental plate. She drank a cup of tea to wash it down, and then tried to vomit, but could not do so. She felt pain and heaviness in the pit of the stomach, and pain in the back of the chest. She then took about 8 oz. of castor oil in two doses, but could not say whether she passed the plate. She was quite comfortable, took her food fairly well until October 8th, at 5.30 p.m., when she fell down a few stairs; she was picked up by her daughter in a fainting condition, and recovered after taking a drink of water. About half an hour later she complained of feeling faint, and vomited blood (about 10 oz.). She slept quite well that night, but at 6 a.m. on October 9th she again complained of faintness, with a sensation of choking, and then vomited about a pint of blood. She was seen by a doctor at her house, who ordered her removal to the infirmary, where she was admitted at 4.15 p.m. on the same day.

FIG. 1.—Dental plate showing attachment which pierced oesophagus into aorta (two-thirds actual size). Gold attachment of plate.

On admission the patient looked very pale, anaemic, was rather restless, respirations were rapid, her pulse being almost imperceptible at the wrist. She was given 1 c.cm. of pituitary extract (intramuscularly) and one pint of saline per rectum. She returned most of the saline mixed with blood. She then stated she felt faint, and had an attack of haematemesis, vomiting about 10 oz. of blood. Abdominal examination showed nothing except dilated stomach, with tenderness in the pyloric region. A haemic murmur could be heard all over the heart region, and the lungs showed evidence of emphysema and chronic bronchitis.

The patient rapidly became worse, and died at 5.15 p.m., complaining of choking sensation and the desire, but inability, to vomit.

A post-mortem examination was performed by order of the coroner on October 11th, and the following was found:

The body was well nourished. There was no evidence of violence except a slight discoloration of the skin over the left tibia. The mouth was normal; on opening the oesophagus a dental plate was found lodged 5 in. from the back of the pharynx, at the level of the arch of the aorta where the trachea divides. An attachment of the plate had pierced the left antero-lateral surface of the oesophagus and made its way into the aorta, just below the origin of the left common carotid artery. There was a bean-shaped ulcer (1 in. by ½ in.) on each side of the oesophagus where the margins of the plate had rubbed against the mucous membrane. There was also dilatation of the oesophagus. There was a large clot, easily detachable from the posterior wall of the aorta. The heart was fatty