During the last few weeks the salivary glands have been affected in a similar manner to the sweat glands of the forehead, and the same aura may herald a sweat or a "mouthful," which latter may also be pink or white.

For the last fortnight she has had attacks of tonic spasm of the muscles of the arms, so that the hands may become rigid in the "accoucheur's position," or she may involuntarily grasp some object, or the hands may be raised and tightly pressed against the back of the head, causing pain in the back and sides, suggesting hysteria. She has suffered from almost continuous headache, frontal and occipital, since the sweating began. She has had no vomiting.

From a scraping of the skin of the forehead staphylococci and streptococci were grown in small numbers only. Histological examination of the sweat shows red and white blood corpuscles in all three types of sweat, but far more in the "pink" sweat than in the others. Bacteriological examination shows staphylococci, a few streptococci, and a Gram-negative bacillus, apparently of the Friedländer group.

The patient was a premature child (eight months); her mother was badly frightened shortly before the birth by being stabbed in the head by a burglar. She has always been addicted to walking and talking in her sleep, but has had no serious illness. A few years ago tenotomy was performed upon both eyes for strabismus. She has not shown any signs of menstruation. There is no tendency to haemophilia in the patient or her family.

Just a week before the sweats commenced she had a very severe shock. Being particularly nervous of air raids, her parents tried to keep her out of their way; one day a gas explosion occurred in the next house while the child was in bed; she was frightened by the noise.

Examination reveals no abnormal signs in the nervous system, heart, lungs, or digestive system. The urine is copious, up to 6 pints daily, is acid, sp. gr. 1020, and contains no albumin or sugar. The reflexes are very brisk and the fundi healthy.

The case would appear to be one of an unusual type of functional disturbance consequent upon the shock of the explosion. It has not hitherto proved amenable to treatment.

INTERMITTENT HAEMATEMESIS FOLLOWING ON AN INJURY TO THE CHEST.

BY

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THE interesting point about the following case is that there were no symptoms of any sort until the patient was injured in 1915. The haemorrhages have all taken place after excessive exertion. Apart from the discomfort and fright caused by the haemorrhages he is in no way handicapped by the condition.

History.

Private K., aged 39, consulted me on March 4th, 1918, on account of haematemesis. In October, 1915, when a cavalryman, he was kicked in the precordial region by a horse. He attended hospital for eight weeks as an out-patient. As far as he knows the ribs were not broken, but he was in strapping for the whole eight weeks. He was said to be suffering from a severe contusion of the chest; there was no vomiting or spitting of blood after the injury, and beyond pain there were no symptoms of any sort; previous to the injury he was quite well, and had been training for service overseas since June, 1915.

Before enlistment he was in extensive business as a book-maker. Both his parents are alive and well; there is no history of heart disease, lung disease, or apoplexy in the family. He has three children alive and well; his wife is healthy, and there have been no miscarriages.

The patient's history is as follows: He has always enjoyed excellent health; there is no specific history. For many years he was a heavy spirit drinker, on occasions drinking as much as one and a half bottles of whisky a day, and he averaged three-quarters of a bottle of whisky daily for ten years. Some three years ago he consulted a medical man, who told him he had a diseased condition of the liver, and advised him to give up spirit drinking; since then he has been for all practical purposes a total abstainer.

Since the injury he has suffered from intermittent precordial pain; about every six months he has had attacks of haematemesis. The attacks come on suddenly without warning, usually during violent exertion. About half a teacupful of blood comes away with a gush; there is no pain at the time

but for a short time after the vomiting he has difficulty in breathing. In the intervals between the attacks he is quite well, but since the accident he has suffered from insomnia.

On February 27th, 1918, while walking up a slope against a very strong wind, he found difficulty in breathing, and blood suddenly rushed into his mouth. Again, on March 3rd, while walking sharply uphill, the same thing happened, only in this case the blood was clotted. He was short of breath for some time after the attack, but was able to walk four miles home and carry on his work next day.

Physical Examination.

Respiratory system: Nothing abnormal found; no evidence of old fracture of ribs.

Circulatory system: Nothing abnormal; no thickening of vessels; no varicose veins.

Nervous system: No objective symptoms.

Abdomen: Much tenderness on palpation over liver; this organ (by percussion) decreased in size; spleen also tender, but not as tender as liver; no history of jaundice; nothing abnormal found otherwise.

Genito-urinary system: No abnormal condition discovered; urine normal.

Haematopoietic system: Nothing abnormal.

Facilities for a more elaborate examination were absent at the time.

Differential Diagnosis.

The haematemesis has, of course, to be differentiated from haemoptysis. In this case there is no history of cough, or of pulmonary or heart disease. Apart from the injury in 1915 there is no reference to any chest trouble. The patient states that the blood is in his mouth before he has any warning, and that on March 3rd the blood was clotted.

The patient can give no information as to the presence of food in the vomit. There is no history of melaena. The absence of pain in the intervals helps to differentiate from gastric, duodenal, and oesophageal ulcers (peptic). The absence of wasting helps to differentiate from malignant disease. The absence of anaemia is a strong point in excluding ulceration of any sort.

There is no haemophilia or abnormal blood condition; there is no affection of throat or nose which might account for the haemorrhage. The history of excessive spirit drinking spread over many years (confirmed by condition of liver and spleen found on examination) points to the condition being secondary to the hepatic (or splenic) condition.

Treatment.

The patient has been advised to abstain from spirit drinking and lead a normal, active, healthy life, but to avoid all undue exertions, such as rushing upstairs and walking quickly up hills. He has been advised to take his meals slowly and not bolt his food, and to abstain from drinking very warm fluids. No drug treatment has been given.

I think the probable cause of the recurrent haemorrhages is a varicose condition of the veins at the lower end of the oesophagus. The absence of any arterio-sclerosis excludes a small aneurysm. The veins may have been injured by the trauma to the chest, and so an extra strain has been thrown on veins already weakened by cirrhosis of the liver and spleen.

I beg to acknowledge the kindness of Surgeon-General Julian, D.D.M.S. Western Command, for permission to publish this case.

THE PHAGOCYtic RESPONSE TO THE INTRODUCTION OF BACTERIA INTO CLEAN WOUNDS.

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In the course of an extensive experience of the bacterial flora of war wounds I have been struck by the small numbers of *B. coli* which are present as the wound tends to clean. Even wounds of the buttock which are repeatedly contaminated with faeces contain after a few days comparatively few *B. coli* although they are swarming with enterococci.

At first I imagined that the explanation of the selective effect of the wound on faecal flora might be that the wound fluids offered an unsuitable medium for the growth of *B. coli*. No doubt this is an important factor, but the following few experiments show that the immunity is an active one, and that the phagocyte plays an effective part in its production.

Experiment I.—Fate of Living Culture of *B. coli* Introduced into a Clean Wound.

The patient (R.) had a wound (6 cm. by 5 cm.) of right forearm just below the elbow-joint. On November 23rd, 1917, the wound was granulating, and a swab taken on that date gave a growth

of enterococci but no *B. coli*. On November 22nd a culture of *B. coli* had been made from patient's faeces, and on November 25th 1 c.cm. of a very thick emulsion of the growth was introduced into a small depression of the wound, and films were made at intervals so as to study the effects.

After five minutes a few leucocytes and many *B. coli* were seen. After sixty minutes numerous leucocytes were present, and many of the bacilli were intracellular. After two hours the fluid in the wound had become thicker, stringy, and contained plenty of leucocytes. It was, in fact, becoming purulent. After six hours the majority of the bacilli were intracellular. After twenty-four hours no bacilli could be seen on direct examination of films, but in culture numerous discrete colonies were obtained. After forty-eight hours the wound, which was now quite clean again, showed leucocytes and connective tissue cells in film, but no micro-organisms were visible. On culture *B. coli* was absent, but enterococci were still present.

Experiment II.—Effects of Brilliant Green on Phagocytosis of *B. coli* in a Clean Wound.

On November 27th, 1917, in the same wound as used in Experiment I, 0.5 c.cm. of a thick suspension of *B. coli* was added, and immediately followed by an equal volume of 1 in 1,000 brilliant green solution.

Films made after five minutes showed leucocytes and numerous *B. coli*; after fifteen minutes more leucocytes and some phagocytosis; after two hours there were still leucocytes and some phagocytes, and after six hours a fair number of pus cells; no bacilli visible. On culture a few *B. coli* colonies developed as well as the persistent enterococci. On November 28th cultures yielded no *B. coli*.

Experiment III.

There was a little saucer-shaped wound (3 cm. in diameter) in the front of the chest, just over the right pectoral muscle. The bottom of the wound involved the muscle fibres. On November 26th, 1917, this wound appeared very clean and no bacteria could be seen on films made from it. The addition of distilled water to the little wound cavity led to the emigration of leucocytes into the cavity, and a loopful planted out yielded four colonies of a long-chained streptococcus; 0.5 c.cm. of a thick suspension of *B. coli*, derived from a culture from the patient's intestine, was added to the wound on November 27th and immediately followed by 0.5 c.cm. of 1 in 1,000 brilliant green solution.

Films made after five minutes showed many *B. coli* and no leucocytes; after fifteen minutes many *B. coli* and a few leucocytes; after two hours some phagocytosis of the *B. coli*. At this stage the edges of the wound were stained green and its cavity contained a clear watery fluid. At the end of six hours the wound cavity was full of yellowish pus; no bacilli could be seen on films made at this stage. Cultures made from the pus yielded a considerable number of discrete colonies of *B. coli* on an agar slope. At the end of twenty-four hours a few *B. coli* were seen in films and cultures were still positive. At the end of forty-eight hours the films showed very few leucocytes, and some of these contained bacilli; the cells present were mainly of the mononuclear connective tissue type. On culture a loopful of wound secretion yielded 100 discrete colonies of *B. coli* on an agar slope.

A culture made after seventy-two hours yielded twenty discrete colonies. On November 30th, a swab was taken from the wound (this yielded about twenty colonies of *B. coli*), and then the wound was moistened with an emulsion killed by heating to 70° C. There was a free exudation of leucocytes, and films showed, at the end of one hour, phagocytosis and bacteriolysis of the cocci; at the end of seven hours no cocci could be seen in the cells or outside them; they had been completely destroyed.

A culture made on agar at this stage yielded no growth. In Experiment III the wound was covered over with a watchglass, and the pus in it remained in its saucer-shaped cavity, and was not lost by adhering to dressings. There was no question, therefore, of the mechanical removal of the bacilli and cocci. The wound was left covered with the watchglass until December 2nd, and when examined then (that is, forty-eight hours after the vaccine was put in) yielded only two colonies of *B. coli* when an ose was planted out.

Experiment IV.

A gunshot wound of shoulder which was healing offered a suitable little pocket for holding emulsion of bacteria. A swab taken on December 5th, 1917, yielded twenty colonies of streptococci on an agar slope; 0.33 c.cm. of a very thick emulsion of dead staphylococci was introduced into the wound on December 7th. A film made immediately afterwards showed no pus cells but enormous numbers of well-stained cocci. At the end of one hour the great majority of the staphylococci were inside the leucocytes, many of the latter being crammed with them. The staphylococci stained badly, and were evidently being digested. After six hours the majority of the cocci had disappeared, but an occasional leucocyte could be found filled with them. At the end of twenty-four hours little pus was present and no trace of staphylococci except a few intracellular cocci. A culture on agar at this stage yielded seven colonies of streptococci.

Experiment V.

From a wound of the right wrist a foreign body had been removed on December 7th and a clean gutter-shaped wound was left. On December 10th a film showed very few cells and no bacteria. On December 11th a thick emulsion of *B. welchii*

was introduced; this was really a vaccine, as the culture contained no spores and had been heated to 70° C. After one hour there was a fair degree of emigration of leucocytes and pronounced phagocytosis; after six hours there was no trace of bacilli.

In a patient with I.C.T. of the right leg the introduction of a thick emulsion of dead staphylococci led to a zone of redness round the ulcer.

CONCLUSIONS.

1. Experiments *in vivo* demonstrate the rapidity with which leucocytes migrate out and destroy micro-organisms introduced into a healing wound.

2. Experiment II indicates that brilliant green momentarily arrests this protective action, but later on, when the dye has been absorbed by the skin, etc., the process goes on. Whether the rapid bactericidal effect of chemical substances on free bacteria compensates for their inhibitory action on the leucocytes is open to doubt.

3. Circular wounds a few centimetres in diameter can in a few hours destroy thousands of millions of *B. coli*.

4. Vaccines introduced into a wound lead to a prompt leucocytic reaction, and this fact might be of service in the treatment of sluggish sores and ulcers.

5. These few *in vivo* experiments would convince the most sceptical of the truth of Metchnikoff's theory of phagocytosis, and confirm what has been long ago demonstrated *in vitro* by Leishman and Wright.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

PERFORATING WOUND OF THE HEART: DEATH ON THE FIFTH DAY.

PERFORATING wounds of the heart are sufficiently rare in civil life to justify a record of the following case.

A boy 16 years of age was stabbed with a large pocket knife on April 1st by another boy aged 12, after leaving a cinema performance. Helped by a friend, the injured boy walked about six yards, then collapsed and fell down.

He was conveyed to the local hospital, where I saw him a few minutes after admission. He was very pale, collapsed, and pulseless. There was a vertical incised wound in the third intercostal space immediately to the left of the sternum; there was fairly free venous hæmorrhage. Cardiac dullness was completely absent, and the heart sounds were muffled. Pulmonary resonance and the breath sounds were normal, as was the temperature. The wound was cleaned and lightly plugged with cyanide gauze. Half a pint of warm water was given by the rectum.

The next day the patient was comfortable with a temperature of 98° F. The pulse was 112 and irregular; the respirations 17. Cardiac dullness, though less than normal, could be made out. No pericardial friction was heard. On April 3rd the temperature was 101.8° F.; he was flushed, and complained of some pain in the region of the wound. There was no pericardial friction; the heart sounds were still muffled. Pulmonary resonance and breath sounds were normal. On April 4th the temperature came down to 99.4° F. There was less pain, and the patient was altogether more comfortable. Cardiac dullness slightly more than normal; no friction.

On April 5th the temperature rose to 101.8° F.; breathing was short and shallow, and a small patch of pleurisy could be made out at the base of the left lung. Pulmonary resonance was normal, the pulse 110, and the respirations 20.

On April 6th the patient died quite suddenly after drinking a little warm milk.

Post-mortem Examination.—A quarter of an inch to the left of the sternum in the third intercostal space was a clean vertical incised wound half an inch long dividing the cartilage of the fourth rib. There was a vertical wound of the pericardium corresponding to the skin wound. The pericardium was distended with blood-stained serum, and contained one large clot. Pericarditis was marked. An incised wound of the anterior wall of the right ventricle penetrated to the cavity, and a small abrasion and some ecchymosis was found on the septum between the two ventricles. Otherwise the heart was quite healthy. There was a small patch of pleurisy at the base of the left lung,