TABLE III.—Hexavaccine (T.A.B.C.P.M.), Two Inoculations.

Rabbits Inoculated.	Blood tested against	Limits of Agglutination. Weeks after First Inoculation.					
		1	2	3	4	5	6
No. B-3	<i>B. typhosus</i> ...	1/320	1/1280	—	1/320	—	1/40
	<i>B. paratyphosus A</i> ...	1/40	1/160	—	1/40	—	1/20
	<i>B. paratyphosus B</i> ...	1/80	1/640	—	1/160	—	1/40
	<i>V. cholerae</i> ...	1/320	1/640	—	1/160	—	1/40
	<i>B. pestis</i> ...	1/20	1/80	—	1/20	—	1/20
	<i>M. melitensis</i> ...	1/160	1/320	—	1/160	—	1/40
No. A-21	<i>B. typhosus</i> ...	1/80	1/1280	1/1280	1/320	1/80	1/80
	<i>B. paratyphosus A</i> ...	0	1/320	1/160	1/80	1/20	1/20
	<i>B. paratyphosus B</i> ...	1/20	1/1280	1/640	1/160	1/80	1/80
	<i>V. cholerae</i> ...	1/20	1/640	1/320	1/320	1/80	1/80
	<i>B. pestis</i> ...	0	1/20	1/40	1/20	1/20	1/20
	<i>M. melitensis</i> ...	1/20	1/80	1/160	1/160	1/80	1/80

Porcelli, carrying out experiments in the South of Europe with a hexavaccine prepared by one of us, found that bacteriolysins were produced in very satisfactory amount for all the germs. He observed also that the inoculated rabbits showed complete protection to the subcutaneous injection of virulent *B. pestis*.

Inoculation of the Hexavaccine in Man.

Six persons were inoculated in the tropics in 1913, and recently twenty persons in the Adriatic-Balkan zone. The reaction, as is the case with all vaccines containing plague, is severe; somewhat less severe, however, than after inoculating with Haffkine's plague monovaccine. The blood of two of the inoculated individuals was examined regularly during five weeks for agglutinins; they developed for typhoid in large amount; for paratyphoid A and paratyphoid B in a fairly satisfactory quantity; for cholera and Malta fever in small amount; and only a trace for plague. On the whole the production of agglutinins was similar to that observed in control individuals with monovaccines; but further researches on a much larger number of inoculated individuals will be necessary before coming to a definite general conclusion.

CONCLUSIONS.

1. The inoculation of the combined vaccines mentioned in this paper is harmless. The reaction is not severe with the exception of those containing *B. pestis*, but even simple plague monovaccines, whatever their method of preparation, give a severe reaction.
2. The mixed vaccines should be prepared by using emulsions in carbolized normal saline solution (carbolic acid 0.5 per cent., salt solution 0.85 per cent.) without heating. These emulsions give much less local reaction than broth cultures killed by heat. The presence of 0.5 per cent. carbolic acid is sufficient to kill the micro-organisms.
3. It is essential to use in the preparation of the vaccines selected strains of the various micro-organisms which have been found by experience to be rich in antigen. This is especially the case as regards *B. paratyphosus A* and *M. melitensis*, some strains of which are very poor in antigen, and when injected give rise to only a small production of antibodies.
4. Combined vaccines are of practical advantage, especially in the case of troops, rendering possible a contemporaneous immunization for several different maladies; this saves a great deal of time, and the men do not suffer the discomfort of a large number of inoculations. To protect the troops against typhoid, paratyphoid A, paratyphoid B, and cholera with the old method of ordinary monovaccines in succession, eight inoculations at least were necessary, spread over a period of two months; with the tetravaccine T.A.B.C. two inoculations only are sufficient, spread over a period of a week.
5. The triple vaccine, typhoid + paratyphoid A + paratyphoid B (T.A.B.), prepared and used by one of us since 1905, has been adopted in practically all the armies. We consider that the tetravaccine (T.A.B.C.) is also past the experimental stage, and should be adopted in the routine inoculation of troops going east. The pentavaccines (T.A.B.C.P. and T.A.B.C.M.) have given encouraging results, and can, in our opinion, be used without any risk. The hexavaccine (T.A.B.C.P.M.) is still in the experimental stage, and we propose to continue our experiments

on it, as we consider that this vaccine, if it be found efficient, would constitute the ideal vaccine for use in the tropics.

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RUPTURE OF LEFT BRONCHUS FROM TRACHEA.

BY

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WHILE there is no limit to the variety of possible injuries which the body may suffer, and while the record of them may tend to be equally limitless, occasionally a case is met with whose vagaries are so peculiar as to merit notice. I have had many opportunities of examining the bodies of persons who have died as the result of violence, but I cannot recall any injury quite like that of the following case:

Gunner J. S., aged 34, was admitted to the casualty clearing station, Salonica, with the story that he had on the previous day fallen from an empty general service limber, whose wheel had passed over his chest.

On admission he was suffering great respiratory distress, with orthopnoea. The complexion was livid, face swollen, eyes apparently bulging and lower eyelids very full. There was a great collar-like emphysematous swelling from the edges of the lower jaw to the clavicles, extending backwards across the posterior triangles. The left side of the chest was flattened, owing to fracture of several ribs. There was limited emphysema of the left side of the chest in the axillary line. The sternum was broken at the junction of the manubrium and gladiolus. There was no bruising or other evidence of injury on the skin of the chest wall. The temperature was 103.4°, pulse 110, respirations 44. No mitigation of the patient's distress and agony resulted from treatment. It was thought that his condition was due to acute pulmonary congestion with pneumo-haemothorax; he was so ill, however, that clinical examination was very imperfect. The temperature varied from 99.6° to 102°; the pulse very quickly reached from 128 to 140, and was often uncountable; the respiratory rate ranged from 40 to 52. His condition became rapidly worse, and he died seventy-two hours after injury. *Post-mortem* examination revealed the following:

1. Fracture of third to seventh left ribs at the anterior axillary line, the fifth penetrating the parietal pleura.
2. Fracture (incomplete) of the sternum at the junction of manubrium and gladiolus.
3. The left lung was collapsed to about one-fourth its ordinary size; the lower lobe was intensely haemorrhagic, with a blood cavity within it 2 in. in diameter; on section the lung appeared to be one mass of blood clot; the visceral pleura was covered by very thick shreddy exudation; there was no gross visible laceration of lung; the left pleural cavity was half full of blood.
4. Acute generalized pericarditis, exudation exceedingly loose, of buttered bread appearance; in the pericardial cavity were 1½ drachms of thin pus; heart otherwise normal.
5. Separation of the left bronchus from trachea, the tear being through the anterior portion to the extent of two-thirds of the circumference; acute inflammatory reddening of the mucous membrane of both bronchi; inflammatory infiltration of cellular tissue of middle mediastinum; the cartilaginous rings of trachea and bronchi normally flexible and tough.

The most striking primary features of the *post-mortem* examination were the profound degree of collapse of the left lung, its acute haemorrhagic state, evidence of the severity of the crushing blow, and the acuteness of the pericardial inflammation. This last was difficult to account for, and it was not till closer search was made that the rupture of the left bronchus from the trachea was found. There was no discoverable tear in the posterior pericardium,

though it was distinctly thinned. The source of infection of the pericardium seems, therefore, to have been through the great gap in the respiratory tract. From this gap also came the air which forced its way up the cellular tissue of the mediastinum within the deep cervical fascia so as to form the emphysematous collar described. The possibility of the tear at the junction of bronchus and trachea being an accident of the *post-mortem* examination may be definitely excluded. The valves at the junction of the internal jugulars and the great veins of the neck were examined and found to be intact.

If one tries to pull the bronchi apart from the trachea with the parts *in situ* within the chest cavity it will be found to be impossible. Even after removal from the body if the trachea be taken in one hand and the lung torn away from it with all one's power it will be found that the broncho-tracheal junction will not yield. The force exercised by the wheel of the limber crossing the chest without evidence of injury to skin must have been extraordinary. The wheel was thought by the man to have passed over the thorax obliquely from left to right, following a line from the left nipple to the middle of the right clavicle. This fact, and the situation of the rib fractures might indicate that the lung was crushed backwards and upwards, and the bronchus bent acutely in the same direction over the vertebral column, its comparative rigidity causing it to yield while the other constituents of the root of the lung proved sufficiently resilient. Possibly there was associated with this force a bursting action in an antero-posterior direction, the rupture being in the same line.

NOTE ON THE TREATMENT OF VINCENT'S ANGINA.

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In view of the widespread incidence amongst our troops on this front of affections of the throat and gums due to the fusiform bacillus and spirochaete of Vincent's angina, it may be of value to indicate a method of treatment that has met with unvarying success since its adoption in the area served by this laboratory during the last eighteen months.

The treatment consists in the local application of the following lotion. By its use the familiar gingivitis is usually cured in about six days, while the throat condition clears up altogether in from twenty-four to forty-eight hours.

Hydrogen peroxide ...	...	...	...	...	...	3v
Vinum ipecac.	...	...	...	...	...	3iij
Glycerin ...	...	...	...	...	...	3v
Aq.	...	...	...	...	ad	3viij

Vincent's angina of the throat is not only met with as a separate infection, but is very frequently associated with diphtheria. An analysis of the cases that have reached this laboratory shows that in nearly 60 per cent. of diphtheritic throats both fusiform bacilli and spirochaetes are present, while fusiform bacilli but no spirochaetes are present in a further 15 per cent.

The *rationale* of the formula was based upon the following considerations: First, that hydrogen peroxide is especially useful in loosening and cleaning up purulent exudates, and, moreover, would militate against the growth and multiplication of the anaërobic fusiform bacillus; secondly, that ipecacuanha wine might prove to have a more or less specific action upon the spirochaete; and, thirdly, that glycerin, by virtue of its hygroscopic and penetrative properties, would effectually convey the preceding ingredients into otherwise inaccessible recesses.

Whatever may be the theoretical value of these surmises, the practical issue is beyond doubt, and the consistent results obtained would appear to merit the general use of this lotion in Vincent's anginal infections.

I wish to thank Captain Mallet, L.D.S., Captain Place, L.D.S., and the many medical officers at casualty clearing stations and field ambulances who have kindly reported their results.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

PERFORATING WOUND OF THE CHEST.

The following instance of a large foreign body passing through the chest without causing death seems worthy of record. A Greek national soldier, aged 22, was admitted to a dressing station on December 6th, 1916, with gunshot wound of the left leg, and a wound in the back $\frac{1}{2}$ in. wide, near the centre of the right scapula. There was a hard lump in the epigastric region, and haemoptysis was present. On December 7th this swelling was frozen with ethyl chloride and incised. A piece of brass tubing from a shrapnel shell was extracted. It was 10.5 cm. in length, 1 cm. in diameter, and its wall was 1 mm. thick. It weighed 25 grams; one end was smoothly cut, the other jagged and bent. On December 12th the patient was moved four miles on a travois to the head quarters of the field ambulance. Haemoptysis continued till December 13th. On December 16th he was taken four miles on a travois to a casualty clearing station, which he left, almost recovered, on December 27th.

H. S. HOLLIS,
Captain R.A.M.C.(T.F.).

CASE OF TEMPORARY BLINDNESS.

SERGEANT D., aged 49 years, was admitted complaining of being unable to see; he was so blind that he had to be led to the ward.

Hearing the call of the motherland he came voluntarily from Johannesburg to rejoin his old regiment, being a time-expired N.C.O. after having served in the army for ten years. He had always been a healthy man, and never suffered from any disease which would account for his present state.

When admitted he was so blind that he was unable to see anything, not even a man standing by his bed, and mistook the window for the door. Temperature 101.2°, pulse 79, respirations 18. Nothing was to be made out on examination of chest and abdomen, and there was nothing abnormal with respect to urine; the arteries were soft, and the blood pressure normal for his age. He complained of some headache of a diffuse nature but slept fairly well. On making a careful examination of the eyes, it was found that vision was reduced to the recognition merely of hand movements. The media were clear and the fundi healthy; no thickening of the retinal arteries could be seen, nor was there any contraction in their size.

The temperature fell gradually, and at the expiration of eight days became normal. *Pari passu* with the reduction of temperature his vision began to improve, and fourteen days after admission he could see well enough to read a newspaper. As he was not feeling strong he was sent to a convalescent home, where he stayed a fortnight, and was then discharged as fit for duty.

The usual causes of blindness unconnected with visible eye changes are hysteria, uraemia, and acute retrobulbar neuritis. The case bears some resemblance to the latter, but the pupils were undilated and normal in reaction, and there was no pain on movement of the eyes, nor pain on pressure applied over the globes.

On the whole, we are disposed to think that the cause of the temporary blindness was some toxic condition of the blood which caused either anaesthesia of the rods and cones of the retina, or of the neurons of the visual centres in the cortex.

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ACCORDING to M. Jules Viala of the Paris Pasteur Institute the number of persons who underwent the antirabic treatment there in 1916 was 1,391. Of these 6 died of hydrophobia, giving a general death rate of 0.43 per cent. In two of the cases, however, the disease developed in the course of the treatment, and one patient died in less than fifteen days after its termination. Deduction of these leaves the following figures: Number treated, 1,388; died of hydrophobia, 3; mortality 0.21 per cent.