

vomiting the dose was reduced after twenty-four hours to two tablets six-hourly. This course was continued till March 3—for thirteen days in all—by which time the change in her local and general condition was so dramatic that the drug was stopped. Estimations of blood sulphapyridine made every three days gave an average figure of free sulphapyridine 2.0 mg. per 100 c.cm., total 3.3 mg. per 100 c.cm., with minimum findings of 1.7 mg. and 2.4 mg. respectively. No methaemoglobin was detected. The discharge decreased rapidly from the first day of giving sulphapyridine. Drainage tubes were removed on February 27 and the wounds were healed by March 16. The patient left hospital on April 7, but was readmitted on May 14 for repair of a ventral hernia at the site of her original laparotomy and for appendectomy. The appendix showed fibrosis, but no microscopical evidence of actinomycosis; as the pelvic viscera appeared to be normal, however, it seems likely that the appendix was the original site of the infection.

On July 12 the patient rejoined her unit with the A.T.S. Owing to the many scars in her abdominal wall she was not considered fit for motor driving, but is being employed in office duties. She has been advised to take 10 minims of Lugol's iodine thrice daily till the end of the year.

The salient features of the case are indicated in the accompanying chart. The drop in the pulse rate and leucocyte count is well shown, but the cessation of discharge, the gain in weight, and the rapid improvement in general condition do not lend themselves to graphic portrayal.

Conclusions

This case is not reported as a cure of actinomycosis by sulphapyridine. Before such a claim could be made it would be necessary to establish, by laboratory experiments with pure cultures, that the drug has in fact a lethal or inhibitory effect on the *Streptothrix actinomyces*. It is probable, as is the case with many anaerobic infections, notably those of gas gangrene, that in this patient the association of an aerobic haemolytic streptococcus with the causative organism had produced a more serious condition than a pure infection alone would have done, and that the sulphapyridine, by eliminating the streptococcus, allowed her to effect her own cure of the actinomycotic infection. Whatever be the therapeutic explanation, this girl, treated by standard methods, was losing ground and, if the estimate of the clinical course and the forecast of statistics can be accepted, would eventually have died; owing to sulphapyridine she is cured, or at any rate is well enough to be serving with the Forces.

I should like to express my thanks to Drs. R. Cruickshank and M. Hynes of the Group Laboratory of the North-Western Hospital for their constant help in the investigation and advice in the treatment of this case.

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The July issue of *Occupational Psychology*, published by the National Institute of Industrial Psychology (Aldwych House, W.C.2), contains an article by Mr. Eric Farmer, of the Industrial Health Research Board, on accident proneness and accident liability. After indicating the main factors determining accident incidence and the results of investigating accident proneness, Mr. Farmer deals with the prevention of accidents during wartime. "The necessity of increased production and the dilution of labour brought about by war conditions will greatly increase accident rate, unless special precautions are taken. . . . If the length of the working spell is unduly increased, hourly output is reduced and the accident, sickness, and absentee rate increased." He emphasizes the importance of training ordinary workers for unfamiliar tasks and the even greater need for adequate training for young and inexperienced workers.

EFFECT OF EXPLOSION-BLAST ON THE LUNGS REPORT OF A CASE

BY

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The following case is reported because it illustrates the importance of blast injuries on the lungs.

Case Report

The patient, a man aged 30, was injured when a bomb of medium calibre fell into an enclosed space and exploded about forty-five feet away from him. He was admitted to hospital with a large lacerated wound on the outer side of the right thigh. The muscles were torn and the femur was exposed but not fractured. The wound bled freely, so that shortly after admission he had to be taken to the operating theatre. A general anaesthetic (ether by the open method) was given, and the wound was excised and the haemorrhage controlled. Soon after his return to the ward he was seen to be very much shocked, and a pint of plasma was transfused in three-quarters of an hour. He did not recover from the shock, but died twelve hours after sustaining his injury. Blood was not seen in the mouth at any time, and, in fact, symptoms suggesting a pulmonary lesion had not been noted.

A post-mortem examination was performed seven hours after death. The most striking changes were found in the lungs. They were as a whole not unduly congested. Many small fresh haemorrhages were visible on the pleural surfaces everywhere. The cut surfaces of the lung were most striking, since innumerable bright red points of haemorrhage were to be seen wherever a cut was made in either lung. The condition was unlike any I had ever met, and may perhaps best be described as a miliary condition of unmistakable fresh haemorrhages. No observation was made that the haemorrhages were more numerous in one part of the lungs than another; indeed, they seemed to be everywhere. The trachea and bronchi showed a number of submucous points of haemorrhage, and there was some blood on the surface of the mucous membranes. No tear was found in any part of the lungs, and no injury was discovered in the brain, kidneys, spleen, or any other viscus. Microscopical examination showed generalized arterial dilatation and intense focal capillary dilatation, with exudation of fluid into many alveoli. In a few places there were red blood cells in the alveoli and in the small bronchioles.

Discussion

The importance of these injuries needs no emphasizing. In the case described no clinical impression had been formed of the lung lesions present, yet consideration of these lesions suggests the necessity of being able to diagnose them if treatment is to be effective. It may, for example, be essential to postpone operation at all costs, apart from controlling very severe haemorrhage. Certainly if operation is necessary the form of anaesthesia chosen will be most important. Inhaled anaesthetics may be too irritating, and local anaesthesia would be preferable. If local anaesthesia were not feasible it might be combined with light gas-and-oxygen anaesthesia, or a basal anaesthetic might be preferred.

At present the diagnosis of damage to the lungs by explosion-blast can be made if blood-stained fluid appears in the nose or mouth without apparent cause, but further investigation of the whole problem is desirable. Experimental work now in progress has shown that in animals these injuries are due to the first impact of the pressure wave on the chest wall, and suggests that for every individual killed by blast many others may have pulmonary injuries. In addition to this experimental work

the three following lines of investigation are clearly indicated.

First, clinical observation of patients injured in an air raid should be instructive. It should be noted whether blood-stained fluid appears in the mouth, whether physical signs develop in the chest, whether the respiratory rate is increased, and whether the degree of shock appears consistent with the external injuries. These observations on a large number of patients, if carefully recorded, may make it possible to deduce in an individual patient that the condition described here is present or probably present. If, for example, as the result of careful observation of a number of patients it is proved that these pulmonary lesions are present in those whose degree of shock is out of proportion to the severity of the injury, then the indication will be to avoid operative intervention and open anaesthetics, and to concentrate on the treatment of shock by morphine, oxygen (preferably using the B.L.B. mask), and possibly transfusion of plasma. Still further observation will be required as to the effect of each of these points of treatment.

Secondly, reports of post-mortem examinations done as a routine on people killed in air raids, whether they had been admitted to hospital or not, would help greatly in assessing the frequency of the condition described.

Thirdly, radiological examination of the chests of patients who have been near a bomb explosion may show a miliary shadowing. No such shadowing was seen in either of two similar cases investigated recently. One was a patient who collapsed, became cyanosed, and had a weak pulse when she got up a week after her accident. These acute symptoms were probably due to a pulmonary embolus rather than to any lesion such as the one described here. The indication is to radiograph these patients as soon after the accident as possible.

The object of this communication is to stimulate interest in the subject and to indicate lines along which investigations might fruitfully be conducted.

Dr. S. Zuckerman of the Department of Human Anatomy, University Museum, Oxford, to whom the Ministry of Health has suggested that all observations on this subject should be forwarded, has kindly examined with me the lungs described here, and I am indebted to him for his description of the microscopical pathology. I should like to thank Mr. A. J. Blaxland, under whose care the patient was admitted, for permission to publish this case, and Dr. G. P. C. Claridge for much pathological assistance.

The Royal Victoria Hospital Tuberculosis Trust, which has existed for twenty-five years for the care and prevention of tuberculosis throughout Scotland, has issued its annual report. Much useful work has been done at the sanatorium colony at Liberton, where patients from all parts of Scotland have been received, and also in the direction of postgraduate courses in Edinburgh for members of the medical profession, the teaching of tuberculosis at the colony to medical students, and lectures to district nurses and nurses in training. Special mention is made of the substantial progress in the eradication of tuberculosis from attested herds of cattle since the introduction of the scheme in 1935. Since that year the number of attested herds in Scotland has increased from forty-four to 2,641. The Trust's own herd, at Gracemount Farm, Edinburgh, was one of the first of the tubercle-free herds, and the aim of the committee is to produce milk which not only complies with the legal standard but is as free from bacteria as is humanly possible. Mention is also made of research work carried out under the auspices of the Trust by the assistant medical officers of the sanatorium colony. This has included investigations on the seasonal variation in tuberculosis, the action of blood serum on the growth of tubercle bacilli, and the phagocytic activity of the polymorphonuclear leucocytes.

PROBABLE EFFECT OF THERAPEUTIC INJECTION OF SERUM ON AGGLU- TINATION TESTS FOR LEPTO- SPIRAL INFECTION

BY

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It is sometimes asked whether the agglutination test for leptospiral infection is worth while if a patient has already received a therapeutic injection of anti-leptospiral serum. The answer to this depends on knowing how quickly the injected antibodies decrease in the blood stream, and the matter could best be settled by injecting anti-leptospiral serum into healthy human volunteers and performing agglutination tests on serum taken from them at intervals after the injection. It has not been possible to do this; but the rate of disappearance of agglutinins was watched in four rabbits, when it was found that the antibodies decreased to a very low titre within forty-eight hours in three and within 120 hours in the other. The rabbits were young adults of approximately equal weight, and were kept under the same conditions. Dr. W. W. Kay kindly calculated the volume of the plasma of one of the animals by the injection of Congo red and the determination of the dilution of it in the plasma by the Pulfrich photometer. The volume was found to be 67 c.cm., and this was assumed for the other three animals. On this basis an intravenous injection of 0.67 c.cm. of anti-leptospiral serum (B. W. and Co.) was made into each animal after a preliminary specimen of blood had been withdrawn. Small amounts of blood (1 to 2 c.cm.) were taken from an ear vein at periods of from five minutes to five days afterwards. The agglutination tests were performed by the well-known technique of Schüffner and formalized leptospira used. It was found that before the animals were injected their serum did not agglutinate the leptospira significantly.

By injecting 0.67 c.cm. of the therapeutic serum into 67 c.cm. of plasma of each rabbit a hundredfold dilution was made; and therefore, since the titre of the therapeutic serum was 1 in 30,000, it would not be expected that the rabbits' serum, taken after the injection, would agglutinate the leptospira in a dilution of more than 1 in 300. Actually this power of agglutination was not reached at all in one rabbit, and was found weakly in two after the first five minutes only and in one at seven hours, twenty-four hours, and forty-eight hours.

Table showing Results of Agglutination Tests on Rabbits

		1/10	1/30	1/100	1/300	1/1,000
R. 201	Before ..	±	-	-	-	-
	5 mins. .	±	+	+	-	-
	7 hrs. . .	+	+	+	-	-
	24 " . .	+	+	+	-	-
R. 202	48 " . .	+	±	±	-	-
	120 " . .	±	-	-	-	-
	Before ..	+	+	+	+	-
	5 mins. .	+	+	+	+	-
R. 262	7 hrs. . .	+	+	+	+	-
	24 " . .	+	+	+	+	-
	48 " . .	+	+	+	+	-
	120 " . .	+	+	+	+	-
R. 263	Before ..	+	+	+	+	-
	5 mins. .	+	+	+	+	-
	6½ hrs. .	+	+	+	+	-
	24 " . .	+	+	+	+	-
R. 263	48 " . .	+	+	+	+	-
	Before ..	+	+	+	+	-