48 hours should be insisted upon. In mild cases the symptoms by that time will have subsided, excepting possibly some nausea, anorexia, and weakness. In severe cases more prolonged recumbency is necessary, treatment being symptomatic and carried out according to general principles: oxygen for marked dyspnoea, sulphonamides for pneumonia, and appropriate sedatives for the dry cough and gastric disturbances.

Mild cases recover in a few days; but when pneumonia ensues recovery is necessarily prolonged and disability may last for two months or more. In the few recorded fatalities death has occurred within ten days. Though it is stated that no permanent effects have hitherto been encountered I have noted the following residual symptoms at the expiration of two months: nausea, anorexia, weakness of the legs, slight dyspnoea on exertion, and epigastric tenderness.

An Analysis of 23 Cases

An outbreak of cadmium poisoning occurred recently in a factory to which I am attached. The mishap arose one Sunday morning at 10.30, when a workman, while cleaning out a cadmium-recovery chamber, dropped some red-hot ash from a lighted cigarette on the floor and ignited the cadmium dust deposited there. (The man was smoking, contrary to regulations.) As the metal was in a finely divided state (subsequent examination showed that the size of the particles was between 2 and 10 microns) it began to glow and soon became a red-hot mass emitting yellowish-brown smoke of cadmium oxide. Within a few minutes the wood and canvas filter-frames were blazing furiously. The fumes filled the shop very rapidly and affected in all 23 persons, the chief fireman bearing the brunt of the exposure for 30 minutes, while the rest were in contact with the smoke for not more than 20 minutes.

The *immediate effects* noted by the men were dryness of the throat, constriction of the chest, cough, and weakness of the legs. Two complained of irritation of the eyes, and a few others had headache and giddiness. They all, nevertheless, returned to their respective duties and attempted to resume work. Three, however, were unable to carry on and were allowed to rest.

Delayed effects began to manifest themselves about three hours later, when 10 men complained of nausea and epigastric pain severe enough to warrant attendance at the first-aid post, where they received palliative treatment from the trained nurse in charge. At this stage the dangerous nature of the fumes had not been appreciated, and it was assumed that the smoke had emanated solely from the burning filter-frames. Hence the men received stomach sedatives and were allowed to rest, but no alarm was raised.

I was apprised of the incident at 10.30 p.m. by the control officer, who became concerned at the continued disability among those who were still on duty, and the preliminary report to me included the information that a chemical extinguisher containing carbon tetrachloride had been used for a brief period at the onset of the fire. This led me to suspect delayed phosgene poisoning, and I arranged for the admission into hospital of those who had been seriously affected—eight in all. Subsequent exhaustive investigations, in which Dr. Middleton, the medical inspector of factories, co-operated, proved that the carbon tetrachloride played no part in the intoxication.

A Typical Case.—As the chief fireman was the most serious casualty I shall cite his symptomatology and progress as a "typical" case of poisoning. His early discomfort was slight—a feeling of dryness in the throat—but three hours later he complained of headache, nausea, vomiting, diarrhoea, and prostration, and he received attention at the first-aid post. Eleven hours after exposure he felt well enough to go home, and he refused assistance for this twelve-mile journey. He stated subsequently that his only clear recollection of this trip was the start, when he felt he was "walking on air"; but he was oblivious of the rest of the journey, nor did he remember being met by his wife at the destination. His sickness and diarrhoea continued for the rest of the evening, and I was informed that he had attacks of shivering also. He was admitted to hospital at midnight, July 11. His symptoms then were headache, dyspnoea, slight cough, dry throat, smarting of the eyes, vomiting, and diarrhoea. Examination revealed no cyanosis; breathing was rapid and laboured (rate 40 p.m.), the pulse 92, temperature 101°, and blood pressure 115/70. Both lungs showed generalized fine crepitations. A radiograph on July 13 disclosed shadows at both bases suggestive of patchy consolidation, and a repeat photograph four days later revealed slight clearing at the left base. The sputum showed no pneumococci or other pathogenic organisms, and investigations of the blood and urine were negative. He made steady progress with treatment, which included the administration of sulphamezathine. He was discharged for convalescence on July 26, and resumed work on Sept. 6, being restricted to light duties. He still complains of occasional headache, heaviness of the eyelids, and slight weakness of the legs.

The following table is a summary of the main symptoms displayed by the victims:

Symptoms	No. Affected
Irritation of eyes	2
Headache and vertigo	4
Throat irritation	6
Precordial constriction	21
Dyspnoea	21
Cough	9
Gastric pain, nausea, vomiting	16
Ague or fume fever	14
Pneumonia	1
Prostration	16

A survey of the incapacity caused by the accident shows that of the 23 men involved 7 lost no time, 4 were absent for one day, 3 for six days, and 1 for nine days. Of the more seriously affected, one was away for four weeks, another for seven weeks, and the fireman, who had pneumonia, was disabled for two months. One employee made a start but was unable to continue because of indefinite abdominal pains and anorexia; he is now away undergoing further investigations. These have shown that his abdominal symptoms had no organic basis and that there was no sign of cadmium poisoning.

Conclusions and Summary

Twenty-three cases of cadmium poisoning have been described.

The inflammability of finely divided cadmium has been emphasized and the dangers of cadmium fumes have been noted.

Nausea, epigastric pain, precordial constriction, dyspnoea, and prostration are fairly constant symptoms; and ague occurred in 14 cases.

The delayed action of cadmium intoxication is well illustrated.

No fatality occurred in this series.

Where the possibility of such fumes arises the worker must be protected adequately, by either an efficient exhaust system or a suitable respirator.

In the event of a fire in a department where cadmium is used the firemen must wear suitable respirators.

The rule "No smoking" should be strictly enforced where cadmium powder is present.

I wish to thank the factory management for permission to publish this report, also to express my appreciation of the co-operation of Dr. Middleton and Dr. Van der Walt.

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DRY BLOOD TEST FOR TYPHUS FEVER PRELIMINARY REPORT

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In 1942 Steuer utilized a slide agglutination method for the rapid diagnosis of typhus fever. He claimed that 200 slides could be examined in 90 minutes, and that each individual slide could be read in from 5 to 10 minutes. We found his technique unnecessarily cumbersome, and it was therefore modified by us to make it more workable for general use. The essential difference between the two techniques was that, while Steuer used *exactly* measured quantities of blood and antigen suspension, we used *approximate* quantities. The technique we employ is:

Method

Place on a clean glass slide two drops of blood, obtained by pricking the finger or the ear lobe without squeezing, separated from each other by a grease-pencil line. Dry in air and mark the drops 1 and 2. Place a drop of concentrated suspension of OX 2 and OX 19 on blood drops 1 and 2 respectively. Leave for a minute, and then complete the mixing of the blood and the suspension by gently rocking the slide. (Mixing with a platinum loop or other

foreign object tends to produce strings of fibrin, which cause confusion in reading the results.) Set aside for five minutes, taking care to avoid drying up of the slide and soiling by dust. Rock the slide occasionally.

Results are read in from 5 to 10 minutes by the naked eye, and if necessary are confirmed by a hand-lens. The use of the low-power objective, as recommended by Steuer, is rarely necessary.

Results

The tests were carried out on Egyptian labourers. Slides were taken in various camps under military control, were brought to the laboratory the same day, and were examined within the next 24 hours. In all, 640 persons were examined; 11 of these gave "slide-positive" results against OX 19, and 2 were positive to OX 2 in addition. These 13 were then followed up by a complete Weil-Felix reaction, using Dreyer's technique. The results are summarized in Table I.

TABLE I

Positive to OX 19	..	..	..	..	..	..	7*
Negative "	..	..	..	..	..	..	6

* Of these 7 positives, 2 also showed agglutination in 1/50 against OX 2; and these two were the same persons who were slide-positive for OX 19 and OX 2.

The seven "slide- and Dreyer-positive" cases were further studied by carrying out a series of Weil-Felix tests at 4-day to 7-day intervals. The results obtained are shown in Table II.

TABLE II

Serial No.		1st Test	2nd Test	3rd Test	4th Test	Remarks
3	OX 2 OX 19	0 250	50 250	— —	— —	Had typhus a month before first test
4	OX 2 CX 19	50 50	50 125	50 500	— —	Not traceable afterwards
12	OX 2 OX 19	50 500	— —	— —	— —	Had typhus 3 weeks previously in hospital
19	OX 2 OX 19	0 500	— —	— —	— —	Not traceable: history not available
20	OX 2 OX 19	0 1,280	0 2,560	— —	— —	Hospital case: diagnosed typhus
21	OX 2 OX 19	0 250	0 1,800	— —	— —	Typhus with rash
22	OX 2 OX 19	0 250	0 250	0 1,250	0 1,250	Typhus with rash

Nos. 4 and 19, despite the history being unobtainable, should be considered typhus cases in view of the high titre. The others were definite typhus cases. It will thus be seen that all the clinical and Weil-Felix-positive typhus cases showed "slide agglutination" as well.

The results of the six slide-positive and Dreyer-negative cases (see Table I) are detailed in Table III.

TABLE III

Serial No.:	1	2	7	13*	15	17
OX 2 ..	0	0	0	0 0	0	25
OX 19 ..	0	0	0	0 0	50	50

* Done twice, at five days' interval.

Except in two cases, there was no agglutination by Dreyer's method, and in neither of these was the titre high enough for diagnosis. These observations suggest that negative cases may occasionally give positive results, but this is not of much import. The fact that every clinical typhus case which was proved positive by the Weil-Felix reaction was spotted by the slide method is justification enough for urging the use of this simple technique as a preliminary to putting up a long series of tests by Dreyer's or Felix's method.

It was decided to try out a number of slide-negative cases by Dreyer's method, to see whether the zone phenomenon or some other factor would produce positive results in slide-negative cases. Thirty-three such sera were tested; the highest dilution put up was 1 in 250 and the lowest 1 in 25. Of these, 25 were completely negative; the remaining 8 gave agglutinations as shown in Table IV.

TABLE IV

Serial No.:	25	27	29	33	35	45	50	52
OX 2 ..	0	25	0	50	25	25	0	25
OX 19 ..	25	0	25	0	25	0	25	0

None of these titres has any diagnostic value.

It is reasonable to conclude from these results that a slide-negative blood will not give a positive Dreyer reaction—certainly not of any diagnostic value. The low titres given in Table IV have no significance beyond perhaps the possibility that the individuals had developed some immunity as a result of subclinical infection, or had suffered from the disease some time previously.

Comment

Having established that all positive cases can be detected by the slide method (of course to be confirmed by a complete agglutination test), and that the slide-negative cases will not give a positive result by Dreyer's method, it is a reasonable assumption that a complete Weil-Felix test need not be done unless the slide test is positive. If this procedure is followed the obvious advantages will be: (a) economy in material and time; (b) avoidance of unnecessary bleeding of the patient; and (c) easier dispatch of slides, as compared with that of blood or serum, to a laboratory situated at a distance from the hospital. Probably the test could be done on thick smears of blood, similar to those used for the detection of malaria parasites, and taken at the same time.

Summary

A dry blood test for typhus has been tried out among Egyptian civilians.

It has been shown that all typhus cases give a slide-positive result, though a slide-positive result does not necessarily mean a positive case.

Control tests show that a negative slide will not give a positive Weil-Felix reaction.

The need for trying out this method on a more extensive scale is urged, and the advantages to be derived therefrom are discussed.

We thank Mr. A. C. Lahiri for his help in recording our results and with the typescript.

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Medical Memoranda

Vaginal Ulceration and Vitamin C Deficiency

During the past six months several patients attending the gynaecological clinic at the Radcliffe Infirmary with acute ulceration of the vagina were given doses of 300 to 500 mg. of ascorbic acid daily while investigations were proceeding to determine the aetiology of the ulceration. Healing occurred rapidly without further treatment. With this in mind it was decided in future to investigate the level of the blood ascorbic acid before starting treatment. The following cases are therefore of interest.

CASE I.

A single woman aged 34, in apparently good health, complained of pain and discomfort on micturition and a continuous blood-stained vaginal discharge for one month. There were two small areas of ulceration on the inner surfaces of the labia minora and an additional area on the vault of the vagina. They had the punched-out appearance of syphilitic ulcers and the acute tenderness of tuberculous ones. There was no surrounding induration, smears and cultures failed to reveal either treponema or gonococci, and the Wassermann reaction was negative. Biopsies showed no evidence of epithelioma and nothing suggestive of gonococcal, tuberculous, or syphilitic infection. The urine was sterile and there was no glycosuria. Haemoglobin amounted to 98%, the red count was 4,900,000, and the leucocyte count 10,000. The blood ascorbic acid level was 0.04 mg./100 ml. The normal wartime level as found in a control series of apparently healthy persons was 0.4 mg./100 ml. (J. R. P. O'Brien—personal communication).

In view of these results the patient was questioned on her diet, and it was found to be unusually lacking in green vegetables and fruit. The main meal of the day was taken in the canteen of a munition factory. Ascorbic acid mg. 150 t.d.s. was prescribed for three days, and mg. 100 t.d.s. for a further month. The ulceration had completely disappeared five days after starting treatment. There