and completely normal by the tenth day. This was the shortest fever of all 16 inoculated cases and also the shortest fever of the entire series of 130 cases. The eyes were slightly suffused, the spleen* was just palpable, the liver was not palpable on the sixth day, and both were unchanged on the tenth day. All other systems were found to be normal.

On the seventh day the blood pressure was 90/65 mm. and on the tenth day 95/70 mm. Hg. The deep reflexes were unaltered throughout. The white cell count on the seventh day was 7,000 (polymorphs, 52%; lymphocytes, 40%; monocytes, 8%). It was difficult to persuade the patient to remain in bed, since he maintained throughout that he felt perfectly fit; he ate and slept well. The Weil-Felix reaction was as follows:

7th day	...	OX K, 1:40	...	OX 19, 1:80	...	OX 2, nil
10th	"	" 1:80	...	" 1:80	...	" nil
14th	"	" 1:160	...	" 1:40	...	" nil

The blood pressure rose on the 14th day to 105/75 mm. Hg. All fever, signs, and symptoms had cleared by the 12th day of illness, and the patient, at his own urgent request, was not sent to convalescence, as was the normal procedure, but was returned to his unit on the 14th day, with recommendation for 10 days' "excused duty."

Comment

Group I.—The outstanding modifications of the usual course of the disease appeared to be: (1) A considerable lengthening of the fever (average 21.5 days, as against an average for the complete series of 17.38 days and for Group II of 14.5 days). (2) A delay in the development of toxicity in some cases and its relative diminution in others. This latter was a remarkable feature in view of the long fevers (32 days in Case 1, 34 days in Case 2, and 26 days in Case 4) and the relatively high temperature reached daily—103°–104° F. (39.4°–40° C.). It was odd to see all but Case 2 able to sit up in bed to read and to enjoy meals, and to find that, with the same exception, headache, retro-orbital pain, and respiratory signs, when present, were minimal. Of the 16 patients, No. 2 alone showed loss of weight, and he and No. 7 both had a circulatory collapse, the former on the 21st and the latter on the 12th day. The fever was prolonged in Case 12 by a coincident amoebic hepatitis.

Group II.—These cases seemed to be less affected in their general course than those of other groups. It did seem, however, that the course of the illness was probably shortened. The average length of fever in this group was 14.5 days, as against 17.38 days for the entire series of 130 cases and 21.5 days in Group I. All five cases were moderately toxic; four of them showed eschars.

Group III.—These two cases shared the common feature that neither patient was really ill; both sat up in bed to read and eat, and neither had any complications.

Group IV.—The two cases of this group were so mild that had there not been eschars and lymphadenitis to confirm the diagnosis it would have been in doubt, especially so since the final agglutinations were lost by fire and Case 15 reached only a titre of OX K 1:80 and Case 16 1:160. Neither of these patients really felt ill at all, the fever subsiding in 10 and 9 days respectively, the former being sent to convalescence on the 16th and the latter to his unit on the 14th day.

Summary

The effect is reported of scrub typhus prophylactic vaccine on 16 men who were at that time in the process of incubating the disease.

Of these only one (Case 2) became seriously ill; four others became slightly toxic at some stage of the disease. This compares most favourably with the mortality rate of 7% for the entire series of 130 uninoculated cases and the fact that of these quite 50% were severely toxic.

Inoculation of 1 ml. of scrub typhus prophylactic vaccine seemed to have the effect of lengthening the fever very considerably while materially reducing and delaying the onset of toxicity.

Inoculation of two doses of 1 ml. produced yet milder cases, and inoculation of three 1-ml. doses gave the mildest of all cases seen.

The presence of an eschar in the high proportion of 14 out of 16 cases was most helpful in diagnosis.

The general clinical features are set out in tabular form.

I wish to thank Brig. Harris and Brig. Macnamara, Twelfth Army, for their encouragement and for permission to publish findings; also Lieut.-Col. C. E. Moorhead and Lieut.-Col. P. O'Shea, R.A.M.C., my commanding officers.

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PROGNOSIS OF PRIMARY PLEURISY WITH EFFUSION

BY

BRIAN C. THOMPSON, M.D.

late Tuberculosis Officer, Middlesex County Council

Pleurisy with effusion, when its cause is otherwise in doubt, is now usually believed to be of tuberculous aetiology. It is sometimes followed by frank tuberculosis in the lungs or other organs, but the incidence of such secondary disease has never been statistically established. Published figures range from 5% (Helms, 1934) to 66% (Borelius, 1933), and a recent review by Robson (1944) shows that this wide divergence is due to three factors: (1) A clear definition is not always made between whether parenchymal tuberculosis was or was not already in evidence at the time of the initial pleurisy; indeed, many studies do not include satisfactory x-ray diagnosis. (2) Though examination of a group of patients after a period of years may show a certain proportion to have developed phthisis, it cannot establish the date of onset of such disease. This method, on which most investigators have relied, must also miss a proportion of the lesions which arise and resolve spontaneously during the intervening period. (3) Patients lost sight of must be statistically evaluated; they vitiate the results in proportion to their number, and this has generally been high.

The present study is based on 233 patients, the sum-total of all cases referred to the Ealing Chest Clinic in the years 1937–44 on account of primary pleurisy with effusion. Of these, 43 were judged to have x-ray evidence of parenchymal pulmonary tuberculosis at the outset and are therefore excluded. The remaining 190 were kept under constant observation at this clinic, with regular x-ray examination, for maximum periods up to the end of 1945, with the following exceptions: one patient was lost sight of after two and a half years; eight ceased to attend after one year and five after two years owing to removal from the district, etc., but were known to be alive, well, and at work at the end of the maximum observation period. Of these 190 patients 40 have so far developed secondary tuberculosis, and six have died.

It is clear from Table I that the relative incidence of secondary tuberculosis was approximately the same in each age group and that case-fatality rates were also evenly distributed. Of the 40 patients 18 were male and 22 female. It was possible to date within a few weeks the onset of the earliest radiological evidence of a pulmonary

TABLE I.—*Distribution by Age and Sex*

Age Groups (Years)	Cases of Pleural Effusion			No. Developing Tuberculosis	Deaths
	Male	Female	Total		
0-4	1	1	2	—	—
5-9	7	5	12	1	—
10-14	6	7	13	4	1
15-19	44	21	65	15	2
20-24	23	25	48	10	1
25-29	12	10	22	7	1
30-34	5	3	8	—	—
35-39	5	2	7	2	—
40-44	1	3	4	—	—
45+	3	6	9	1	1
Total ..	107	83	190	40	6

lesion, with two exceptions in which there was a lapse from observation of four years between recovery from the initial pleurisy and the detection by skiagram of parenchymal disease; these two cases are shown in Table II as developing in the fifth year.

TABLE II.—*Annual Morbidity*

Year	Total Patients	No. Developing Tuberculosis in Each Year of Observation							
		1st	2nd	3rd	4th	5th	6th	7th	8th
1937	8	—	—	1	—	—	—	—	—
1938	16	2	1	—	2	—	—	—	—
1939	15	—	2	—	—	—	—	—	—
1940	22	2	4	1	1	2	—	—	—
1941	28	1	2	—	—	—	—	—	—
1942	34	5	1	—	—	—	—	—	—
1943	28	7	1	—	—	—	—	—	—
1944	39	5	—	—	—	—	—	—	—
Total ..	190	22	11	2	3	2	—	—	—
No. exposed to risk in each successive year	190	134	102	72	45	—	—	—	—
Probability of developing tuberculosis in each year	0.12	0.08	0.02	0.04	0.01	—	—	—	—
This probability applied to a basic 1,000 patients:									
No. affected during each year	120	70	16	32	8	—	—	—	—
No. remaining unaffected on each anniversary	880	810	794	762	754	—	—	—	—

The number exposed to risk each year is calculated by the life-table method described by Bradford Hill (1939), its several stages here being compressed for economy of space. The total 190 patients were observed for one year. The 39 originally seen in 1944 could of course not be followed beyond the end of 1945, when the survey was closed, so these must be subtracted, together with the 17 of the remainder who had already developed tuberculosis during the first year, leaving 134 at risk during the second year. A similar calculation is required in each succeeding year not forgetting the further subtraction of the one patient lost sight of in the third year of observation.

The "probability" of developing tuberculosis in any given year for those entering it so far unaffected is simply the number of cases divided by the number at risk. The two fifth-year cases, whose date of onset is unknown, must be divided by the total 190, giving a probability figure of 0.01.

The next step is to apply these probability ratios to an arbitrary total of 1,000 patients, subtracting each year the number that would become affected, leaving the remainder at risk for the following year. The progressive depletion thus taking place leaves us at the end of five years with 754 of our original 1,000 patients still unaffected: in other words, 246 have developed pulmonary or extrapulmonary tuberculosis—approximately 25%.

A similar calculation from the observed fatalities in the original series gives a death rate of 3.5% over the five-year period. This, however, is of limited value, as the

insidious and progressive character of many of the pulmonary lesions encountered leads one to expect a considerable mortality in later years.

Conclusions

Observation of 190 patients with primary pleurisy with effusion shows that one-quarter of all such patients developed systemic tuberculosis within five years. Nearly half the cases arose within one year of the initial pleurisy. No case has been found to occur after five years.

Of the tuberculous lesions that developed 15% were extrapulmonary. The remainder first became evident in the lung, though in either case spread to other systems tended to occur, as in any similar lesion acquired in other ways.

The death rate for the five-year period was 3.5%.

The age of the patient did not seem to influence either the incidence or the character of any subsequent tuberculosis.

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A CASE OF BILATERAL SIMULTANEOUS SPONTANEOUS PNEUMOTHORAX

BY

GEORGE M. KOMROWER, M.B., M.R.C.P.

Late Officer in Charge, Medical Division, British General Hospital

Bilateral simultaneous spontaneous pneumothorax is relatively uncommon (Glickman and Schlomovitz in 1936 reported only 82 cases in the literature) and is often fatal. The following case is presented because of the rapid uninterrupted recovery and the methods employed to reduce the dangerous positive pleural pressures.

Case Report

A soldier was admitted to hospital on Nov. 28, 1944, with the following history: He awoke that day with a slight pain in the right chest, not associated with cough or dyspnoea, but these symptoms became well established when he began his daily duties, and in the afternoon he reported to the out-patient department, where a spontaneous pneumothorax was discovered. Inquiry into his family and previous medical history revealed nothing of significance.

On examination he was seen to be a well-built healthy individual with little cyanosis and no dyspnoea when at rest. His trachea was displaced to the left, and his apex beat was located 1 in. (2.5 cm.) external to the mid-clavicular line. There was diminished movement of the right chest, the percussion note was more resonant on the right side, and breath sounds were diminished in the right lung. X-ray examination confirmed the diagnosis of a complete right pneumothorax and he was ordered complete bed rest. On Nov. 30, when using a bed-pan, he experienced a sudden pain in the left chest and rapidly became extremely cyanosed and dyspnoeic. Examination revealed the presence of a bilateral pneumothorax, and efforts were immediately made to relieve the man's respiratory embarrassment. His intrapleural pressures were: right, + 3 → + 8; left, + 3 → + 6; after the removal of 1,200 ml. of air from each pleural cavity they became: right, - 3 → + 4; left, - 3 → + 4. His general condition improved for a short time but his cyanosis and extreme dyspnoea soon