from 2 to 6 grammes without ill effect. Hamilton Fairley (1940) has successfully injected considerably larger amounts after careful alkalization of the urine.

It is therefore likely that the febrile reactions after transfusion of very old blood are due to products of red cell disruption and degeneration rather than to the mere presence of free haemoglobin in solution.

Though it is not relevant here to discuss the merits of various preservative solutions it is important to use mixtures that are most likely to prevent the early breakdown of the red cells. That haemolysis is impeded by the presence of glucose is now well known. Table IV shows the average haemolysis in five samples of blood, each preserved with and without glucose, over a period of six weeks.

TABLE IV.—*Comparison of Haemolysis with and without Glucose*

Weeks	With Glucose	Without Glucose
3	0.91%	4.99%
4	1.76%	13.24%
5	3.46%	24.75%
6	8.17%	37.4%

Blood preserved in solutions containing no glucose might therefore be expected to lead to a greater incidence of transfusion reactions owing to the additional *in-vitro* and *in-vivo* haemolysis, and this has been found to be so. Thus in the transfusion of fifty bottles of blood preserved without glucose the results of transfusion were as follows:

TABLE V.—*Fifty Bottles of Blood Preserved without Glucose. Average Age of Blood, 11.1 Days*

No. of transfusions	.. 33								
Grade I reactions	.. 18.2%								
" II "	.. 15.1%								
" III "	.. 12.1%								
} 27.2% } = 45.5 per 100 transfusions									
Jaundice	..	..	..	..	..	..	..	1 case = 3%	
Urticaria	..	..	..	..	..	..	..	1 case = 3%	

The total number of bottles of non-glucose blood used is not large, but the reaction rate is considerably higher than in any group of 100 bottles of blood preserved with glucose.

Stored blood can never be better than fresh blood, but its ready availability is an immense advantage, particularly in an emergency, and this outweighs any slightly smaller rise of haemoglobin percentage in the recipient that may occur. The disadvantage of stored blood has been seen to resolve itself chiefly into the question of haemolysis, but with modifications of the preservative solution the life of the red cells can be further prolonged. Fortunately there is now less need to attempt to preserve emergency supplies of blood for long periods of time, since plasma or serum, capable of independent storage for many months, can be given as an emergency measure in place of whole blood in certain cases, when whole stored blood is not immediately available.

Conclusions

There is no significant difference in the nature or number of reactions which tend to occur after the transfusion of fresh blood and blood stored up to three weeks under standard M.R.C. conditions. Such difference as may occur seems to be in favour of stored blood.

When standard stored blood is used a febrile reaction is to be expected in about 20% of transfusions and an obvious rigor in about 5%.

The incidence of jaundice and febrile reactions tends to increase when blood more haemolysed than this is used. These reactions appear to be caused not so much by the free haemoglobin introduced as by the early disruption of effete red cells after transfusion.

Stored blood, as originally prepared, can safely be used for three weeks and in some cases for longer. Modifications of the preservative solution may further increase the useful life of the blood, though the introduction of preserved plasma and serum now renders this less necessary.

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CARRIERS OF TUBERCULOSIS

BY

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The fact that many infectious diseases may be contracted from contact with individuals who are not themselves suffering from any of those diseases at the time of contact is well known. Typhoid fever, scarlet fever, and some other streptococcal infections, cerebrospinal fever, diphtheria, and acute poliomyelitis are examples that come to mind at once, but there may be many other diseases which are spread in this way. The exanthemata and even the common cold, though usually contracted in epidemics from known sources, sometimes appear in a sporadic form which suggests the possibility of contact with a carrier.

Types of Carrier

Clinically there are two types of carrier—the known and the unsuspected. A known carrier has had the disease in question and has never been shown to become bacteriologically negative, although he no longer suffers in any way from the infection; in such a case the organisms appear to be saprophytic only. Carriers of this type are usually kept under observation until eventually the organisms are eradicated by some means or other; in any case they are a known danger and can therefore be controlled to some extent. The unsuspected type of carrier is much more dangerous, for his very existence may not be even suspected until extensive damage has been done. Such persons may have had their infection in an abortive or aberrant form, the true nature of which was not recognized at the time, or, more difficult still, they may never have had the disease in their lives so far as the most careful clinical investigation can discover.

In view of the great amount of work which has been done on the carrier problem it is surprising to note that little attention has apparently been paid to the possibility of the existence of carriers of tuberculosis. Of course it is well known that sufferers from chronic pulmonary tuberculosis may eject tubercle bacilli in the sputum for years, but a point often overlooked is that those who have

ceased to suffer from the complaint—i.e., patients whose disease has been classed as and is in fact “arrested”—may do the same thing, either continuously or at intervals. Such patients may be perfectly fit in the physical sense, and every possible test which can be applied to detect the presence of tuberculous toxæmia or of progressive change in the lungs may be negative. There may be no fever even on great exertion, the weight may be steady and satisfactory, there may be no sputum except when a cold or a mild bronchial infection causes slight expectoration, the sedimentation rate may be normal, and the radiographs may show very little damage or, at any rate, no appreciable change over a period of years. It is likely that many individuals who are quite unaware that there is anything at all wrong with their lungs may be coughing up tubercle bacilli from time to time; it is even possible that this also occurs in the case of some in whom no amount of investigation would reveal any trace of disease. The existence of cases in this latter group would be very difficult to prove, for it would mean the wholesale examination of the sputum, almost on a national scale. The fact that, even to-day, phthisis is being recognized as such for the first time in persons who have had cough and sputum for many months, or even for years, suggests that neither the public nor the medical profession are yet educated to the proper standard in the application of this simple test.

The subject of pulmonary tuberculosis is of particular and pressing interest at the present time, both because of the care which has to be taken in order to exclude cases with early disease from the Forces and because of the risk of spread of the infection which is likely to result from contact in air-raid shelters. Much has been written about mass radiography; this is certainly desirable, and the results already have been of considerable value. But it must be remembered that radiographs demonstrate shadows only, and that the information gained solely refers to anatomical change in the tissues. Infectiousness is an entirely different problem, but it is one which is even more important, for it concerns that part of the population which is still not infected, and not a particular individual. The only test of the infectivity of any person is the examination of the sputum. It is not suggested that mass sputum examinations should replace mass radiography, but it seems necessary to point out that these examinations are of immeasurably greater value if both are considered together, and that a complete observation should therefore always be made when looking for tubercle.

Danger of Apparently Healed Cases

The object of the present paper is to point out that apparently completely healed cases of tuberculosis may still constitute a danger to the public health, and to suggest that the disease may even be spread by contact with people who themselves appear to be perfectly normal. While the second part of this thesis is likely to be difficult to prove, four cases are reported in which the disease showed not the least sign of activity and yet the patients were certainly infectious from time to time.

Case 1.—A widow aged 65 came to the out-patient department of the Royal Chest Hospital in 1929 complaining that she had suffered from cough, a little sputum, and increasing shortness of breath for the past three winters. On examination she appeared to be a typical chronic bronchitic. The past history was most instructive. She had had eleven children, of whom no fewer than six had died in infancy from acute forms of tuberculosis. In addition two grandchildren had died from the same complaint. The sputum was negative for tubercle bacilli, but the radiograph showed several small calcified deposits in both upper lobes. On careful questioning she would not admit to any previous period of illness in her life. It seemed perfectly clear that this woman had

suffered from tuberculosis in a subclinical form, and that she had been a menace to her family for a considerable period of time.

Case 2.—A retired business man aged 80 was seen in consultation in 1938. His complaint was that he had become rather wheezy during the last three years and found it difficult to manage a complete round of golf, although he was still capable of playing nine holes without undue fatigue. In his case a diagnosis of active tuberculosis had been made in 1888, and tubercle bacilli had been found in the sputum at intervals since that time, although he had led a normally active life. Tubercle bacilli were still present in 1938. On examination there was evidence of fibrosis in both upper lobes, and this was confirmed by radiograph; there was, however, not the least evidence of active disease, and one had the impression that the condition had been stationary for a long time, although it was not possible to prove this as the previous films were not available for comparison. There was, however, evidence that the patient had been coughing up bacilli for half a century, and his clinical state appeared to indicate that the disease had not been progressive for many years. This case illustrates the type of carrier who has made a clinical recovery from the disease but has never become bacteriologically free.

Case 3.—A nursing sister aged 35 complained of a slight cough. In 1929 her sputum was slightly stained on three occasions. No records are available of the condition at that time, but a right artificial pneumothorax was induced and was kept up for two years, when it had to be abandoned owing to obliterative pleurisy. Since that time she had been nursing in a sanatorium and had apparently been in good health. In January, 1940, there was again slight staining of the sputum following a cold, and re-examination showed the presence of a few tubercle bacilli. There were no abnormal signs in the chest, and the radiograph showed only a little thickening of the pleura overlying the right lower lobe, consistent with the old obliterative pleurisy. So far as could be determined the lung fields themselves were normal and a tomogram did not reveal anything further. Between January and July the sputum was found to contain tubercle bacilli on three occasions, although it was negative on several others. In April, 1940, she was admitted to the Royal National Sanatorium, Bournemouth, where the sputum was found to be positive on two occasions. She was not complaining of any symptom except a slight cough with a minimal amount of sputum; her general condition was excellent; there were no abnormal physical signs, the radiograph showed nothing beyond slight pleural thickening over the right lower zone, and the sedimentation rate was 4 mm. in one hour. After keeping the patient under observation for some weeks it seemed impossible to conclude that she was suffering from active tuberculosis as the term is generally understood, and the view was taken that she was in fact a carrier of the disease.

Case 4.—A single woman aged 25 came to the out-patient department of the Royal Chest Hospital in 1932 “for an overhaul.” Her brother had died from pulmonary tuberculosis two months previously. The patient appeared to be in perfect health, and physical examination was entirely negative. A radiograph of the chest showed nothing abnormal, but the sputum was reported to contain tubercle bacilli on two occasions, although many other tests proved negative. This patient was kept under observation for two years, during which time her condition remained unchanged and she appeared to be in perfect health. The sputum tests were carefully carried out and there does not seem to be any reason to consider that they were not genuine.

Discussion

These four cases are recorded in order to stimulate further investigation into the infectivity of tuberculosis among members of what appears to be the normal population. Naturally the cases described have been chiefly those in which there had been some story of contact with the disease to account for tubercle bacilli being looked for. In none of them, at the time of examination, could it be said that the patient was suffering from active tuberculosis, yet three were infectious and the fourth had clearly

infected others in the past. The diagnosis of pulmonary tuberculosis rests upon a correlation of symptoms, signs, radiological appearances, and pathological tests. No single one of these can be regarded as sufficient in itself for an assured diagnosis. It appears certain that, without confirmation from these other sources, the presence of tubercle bacilli in the sputum cannot be regarded as proving the contention that there is active disease. In other words, the expectoration of tubercle bacilli may be consistent with clinical health for a long period of time, and persons so expectorating may well act as carriers of the disease. Although not illustrated in this series of cases, it is quite likely that some of the patients who harbour the bacilli in their respiratory tract in this way are liable to relapse and to sustain further spread of the infection in their lungs.

The fact that these cases are infectious is a matter of great importance from the public health point of view. Sometimes they are sent to a sanatorium; but sanatorium treatment is not likely to sterilize the respiratory tract, and actually we do not know of any measures that will render such a patient free from bacilli. Steps can be taken to make them as safe as possible by ensuring that they observe the same precautions as do other patients discharged from sanatorium with a positive sputum, the chief difference being that they can lead a normal life without restrictions.

Summary

This paper is not intended as a record of fresh observations, but rather as a presentation of known facts from a somewhat different angle. The object is to stimulate still further the search for the human sources of tuberculous infection, for it is only by their recognition and eventual elimination that the disease will be finally overcome. While it is well known that actively tuberculous patients are a present source of danger, it would help to emphasize the importance of the problem if those who, while clinically in perfect health, still cough up tubercle bacilli, either continuously or at intervals, were regarded as carriers of the disease from the point of view of the public health. Complete reliance on a negative radiograph may be misleading in some cases, and a more diligent search for tubercle bacilli in sputum would certainly yield valuable results.

Four cases are reported in which not the least sign of active tuberculosis was shown, but in which the patients were infectious from time to time.

The cases are discussed from the point of view of their danger to the public health.

As already announced, the Central Midwives Board for England and Wales has re-elected its chairman, Sir Comyns Berkeley. At the April meeting a letter was received from the Midwives' Institute stating that Miss A. A. I. Pollard felt unable to continue as a member of the Board after twenty years' service and that Miss C. K. Knott had been appointed in her place. The remaining members of the Board have been re-appointed. A resolution was passed by the Board expressing great regret at Miss Pollard's retirement and stating that she had devoted herself ungrudgingly to the service of the C.M.B. and of midwives for the past twenty years: in her the midwives of the country have had a representative who justly earned their affection and gratitude. "In championing the cause of midwives and of maternity and child welfare Miss Pollard has been aided by her wide and intimate knowledge of the midwifery profession and has been guided by her high regard for the dignity and responsibilities of that profession. Her enthusiasm for improvement has been tempered with wisdom and a shrewd appreciation of what was capable of early achievement. In all her dealings with her colleagues on the Board and with members of the profession she has displayed kindness, sympathy, and a noble honesty of mind and purpose. It is a source of gratification to the Board that Miss Pollard has already seen success crown many of the movements she supported."

PELVIC ABSCESES: DIAGNOSIS AND TREATMENT

BY

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There are few operations more satisfying to patient and surgeon alike than that of draining a pelvic abscess through the rectum. Collections of pus in the pouch of Douglas in the female and in the recto-vesical pouch in the male occur after any septic abdominal operation, but especially after a perforated appendix; less often they follow a perforated peptic ulcer, salpingitis, or suppurative diverticulitis. In a general surgical practice I meet about four cases a year; three will be caused by suppurative appendicitis with peritonitis, whilst the fourth will follow something less common. A recent instance developed after a partial gastrectomy for a huge gastric ulcer which was resected from the pancreas. An undetected pelvic abscess is one reason for a septic peritonitis not responding to sulphapyridine.

Diagnosis

The diagnosis of a pelvic abscess is straightforward. It is based mainly on the physical signs, for the symptoms as such seldom direct attention to the rectum. The story is approximately as follows:

After an abdominal operation the chart shows a raised pulse and temperature for about a week, then after two or three days of normal readings there is a return of the elevated pulse and of pyrexia to around 100° F. with a tendency to swing. The respirations throughout are unaffected, which negatives the possibility of a sub-phrenic abscess or respiratory sepsis. In a few days frequency of the bowels is noticed—perhaps four to six times a day. This is regarded as satisfactory at first, for it has often been preceded by constipation. Less often the bowels remain inactive. The stools consist mainly of mucus and a little fluid faeces. The patient is toxic, with colour pale or slightly grey, and the initial progress is obviously slowed down. The hand will be found coolish, the nails white instead of pink, and the pulse is small. The tongue is moist, smooth or shiny, and bright red, and the papillae have been shed; there is an exfoliative glossitis. It is interesting to watch this tongue condition recover when the pus has been drained: the whole of it may be affected, or occasionally only the tip or sides.

The abdomen is inclined to be tight, and to be full in the lower half, and the respiratory excursion is absent or even reversed—i.e., it is indrawn on inspiration instead of moving outwards. There is seldom abdominal tenderness or rigidity. In a thin patient visible peristalsis may be observed, raising the possibility of subacute intestinal obstruction; rarely a patient vomits, further strengthening this suspicion, but if there is the possibility of "pus somewhere" it must be sought out before considering intestinal obstruction, apart from an inflammatory paralysis of the bowel.

The diagnosis is clinched by inserting a finger into the rectum. According to the stage of development of the pelvic abscess when the examination is made, one of three states will be found. They are:

1. *The Early and Suspect Stage.*—The rectum will be found empty, dilated, and warm, and the mucous membrane is smoother than usual. The rectal wall at the tip of the finger is hard and unyielding, with induration. There is no fluctuation, and the impression formed is that the rectum is "set in felt."