

centres, or in base hospitals. A useful constant ratio is 2 psychiatric beds for every 1000 troops in the force.

Among the treatments that may be used in psychiatric hospitals mention must be made of continuous narcosis for acute battle cases and the procedure known as narco-analysis for the removal of hysterical amnesias, conversion symptoms, and for rapid abreaction. We must guard ourselves constantly against a too mechanical application of all these physical methods of treatment. Abreaction may be essential to thorough treatment, and a vigorous psychotherapeutic approach to the problem of the soldier's restoration to full health should be a constant accompaniment of all therapy. The use of ECT in the very common states of depression which were an almost usual symptom of many psychiatric syndromes in soldiers on active service in the late war may also be mentioned. Insulin therapy in modified form proved successful in many conditions in which soldiers have shown well-marked loss of weight, or in certain chronic psychosomatic troubles, such as the old friend "the gastric stomach."

The aim of hospitals is to secure an atmosphere of active treatment—the expectation of cure and return to duty should be adopted by therapist and patient as a matter of course. Too much time should not be spent in hospital; a nervous soldier who spends too long in hospital may become a broken man, unlikely to do useful military work again. The process of rehabilitation should start on the day of admission to hospital.

During the heavy desert fighting of 1942 severe stresses, physical and mental, were experienced by the Middle East Force. It was then suggested to the DMS that 200 beds in a convalescent depot should be allotted to a psychiatric specialist with a view to experiment in the restoration of psychiatric casualties. Results were promising, and from that hot summer until the enemy was thrown out of Africa beds at convalescent depots under specialists in psychiatry were available for psychiatric cases. Physical training, robust occupational work, the constant care of sleep, and group treatment were added to the existing amenities of the depots. Results showed that about 90% of men breaking in battle could be restored to a good standard of stability, though not all were able to return to fighting units; in practice a fairly constant 30% returned satisfactorily to combatant duty, the rest requiring work temporarily or permanently at bases or on lines of communication.

After rehabilitation the medical organisation must include a fresh selection procedure, to place men on return to duty as suitably as possible. It is bad for the reputation of the medical services in general and for psychiatrists in particular to return men to fighting units who are liable to relapse in a short time.

* * *

This extensive organisation, parts of which I have discussed, has been built up during the war years as a result of urgent military needs. Working within it I have become convinced that the neurotic casualty in a military group is in great part due to administrative and medical failure. If soldiers are made out of unselected material, are carelessly placed in the Army machine, are insufficiently trained, insufficiently equipped, and plunged into active service with leaders they may not know, panic reactions, or other neurotic breakdown, will be common. Is it not equally true that in peace many of our neurotic casualties are also the result of a failure in administration—of a failure to organise successfully for living?

We are entering on a new phase in the history of medicine and are anticipating the establishment of a comprehensive State medical service. Are the lessons of two wars going to be forgotten? Are we going to succeed in securing adequate psychiatric services in peace such as were built up in war? The war with all its wreckage will present us with a heavy increase in neurotic disability. We must continue to struggle during the next few critical years for all those possibilities in organisation, prevention, and treatment for our peace-time psychiatric casualties that service in the Army has enabled some of us to construct during war.

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COMPARATIVE EFFECT OF SULPHONAMIDE AND PENICILLIN IN PNEUMONIA

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ALTHOUGH the general success of properly applied sulphonamide chemotherapy in pneumonia is now well established, there is no doubt that there are patients in the older age-groups who show a poor response to chemotherapy, even in adequate dosage; and, further, that complicating factors are often present in such patients which may make therapy hazardous and difficult to control. The pneumococcus, which is the responsible aetiological agent in a high proportion of pneumonias, is susceptible to the action of penicillin (Fleming 1929). It accordingly becomes necessary to find, first, if penicillin is effective in the treatment of human pneumonia; and second, whether it possesses any advantages over the earlier method of treatment. So far as the first problem is concerned, there are already several observations which show that individual cases of pneumonia respond satisfactorily to the antibiotic (Keefer et al. 1943, Dawson and Hobby 1944). The purpose of the present report is to attempt to compare the two methods of treatment.

CHOICE OF CASES AND METHODS OF TREATMENT

This hospital receives notified cases of pneumonia, without previous selection, from all districts of the city of Glasgow. In view of the excellent effect of chemotherapy in the treatment of young adults it was considered that their inclusion in a therapeutic trial was unnecessary and might indeed make the results more difficult to assess. Attention was directed, therefore, to male patients over the age of 35 years. These cases were allocated in the order of their admission alternately to two treatment groups.

(1) *Sulphathiazole Group* (63 patients).—These received an initial intravenous injection equivalent to 2.0 g. of the drug. During the first twenty-four hours in hospital, they were given six four-hourly doses by mouth, each of 2.0 g. Thereafter, the drug was continued in a dosage of 1.0 g. four-hourly by mouth for six or seven days. The average total dose was 44.4 g. given in 6.7 days.

(2) *Penicillin Group* (63 patients).—The British product was used throughout. Either the sodium or the calcium salt was given, both of which were supplied in tablet form. Most of the patients received the material by continuous intramuscular drip only, a 'Eudrip No. 3' being the means of supply (McAdam, Duguid, and Challinor 1944). Eleven of the patients were given an initial intravenous infusion containing penicillin, either along with, or followed by, administration by continuous intramuscular drip; 5 were given repeated injections every four hours; 4 received penicillin in oil in single daily injections; and 2 others received a combination of one or other of these methods. The average total dose was 0.42 mega units given over a period of 3.2 days. The maximum amount given to one patient was 1.588 mega units.

Routine Clinical Control.—On admission to hospital an X-ray examination was made to confirm the clinical diagnosis. Thereafter, sputum was taken for bacteriological examination and a sample of blood removed. Some of this blood was used for culture; the remainder for carrying out the following tests: admission sulphonamide concentration, serum inhibition against standard staphylococcus (penicillin-treated group), haemoglobin, and total and differential white-cell counts. All of these examinations were repeated after twenty-four hours in hospital and thereafter as seemed desirable. X-ray examination was repeated frequently—at least once per week. The strains of pneumococci isolated from the penicillin-treated cases were tested for sensitivity to penicillin.

RESULTS OF TREATMENT

Equality of the Two Treatment-groups.—It is first of all essential to be satisfied that there were no serious differences between the two groups which might make their comparison invalid. The factors which are known to

TABLE I—DATA TO SHOW THE EQUALITY OF THE TWO TREATMENT-GROUPS

Characteristic	Penicillin group	Sulphathiazole group
<i>Age (yr)</i>		
35-49	29 (3)	29 (2)
50-59	16 (1)	19 (2)
60+	18 (3)	15 (4)
<i>Duration of illness on admission</i>		
Cases admitted before 4th day ..	28 (1)	24 (1)
Mean days ill before admission ..	3.2	3.5
<i>Bacteriology</i>		
Pneumococcus:		
type I	10 (0)	13 (2)
type II	25 (3)	23 (3)
type III	5 (2)	6 (1)
Other organisms, higher type pneum. &c.	23 (2)	21 (2)
Bacteriæmic cases	12 (4)	10 (4)
Cases with no sulphonamide detectable in blood on admission ..	28	26

The deaths in each group are shown in parentheses.

influence the results of treatment may be listed as: (1) age, (2) days of illness before admission, (3) ætiological agent, and (4) presence of bacteriæmia.

Table I shows the distribution of the cases in regard to these factors. A separate table, prepared to show the actual distribution of the cases in respect of the day of illness, showed a very similar "scatter" in the two groups. The mean duration of illness before admission for the penicillin and sulphathiazole groups was 3.2 and

3.5 days respectively. Table I also shows that a similar proportion in both groups was untreated before admission as judged by the absence of sulphonamide in the initial blood sample. It can, therefore, be assumed that the two groups were broadly alike in their distribution and that direct comparison between them is permissible.

Comparison of the Two Groups.—Reference to table I shows that, so far as mortality is concerned, there is little difference between the two methods of treatment (with penicillin the fatality-rate was 11.1% and with sulphathiazole 12.7%). When the clinical details of the patients who died are studied (table II) it is found that nearly all were suffering from a severe infection, often admitted late in the disease. Indeed, 12 of the deaths were in patients admitted after the fourth day, although, of the whole series, only 53 patients were admitted so late. The second point to which attention should be drawn is the high incidence of lung abscesses in those who died with both methods of treatment. In some, the lung tissue was almost diffuent at autopsy and one gained the impression that no method of treatment could have restored the extreme damage.

Table III lists the main complications. Again, there is little difference between the two groups. It will be seen that delayed resolution (which was defined as the presence of clinically apparent, and radiologically confirmed, consolidation after the 35th day of illness) was equally noted in both groups. This finding seems to us of great interest.

Composite temperature charts were prepared for the uncomplicated cases in both groups. (For this purpose cases of delayed resolution were not excluded.) So far as the immediate reaction was concerned there was no

TABLE II—ANALYSIS OF DEATHS: PENICILLIN GROUP

Case	Age (yr)	Day of illness on admission	Site of consolidation	Pn type	Blood-culture	Meningitis	Empyema	Sterile effusion	Days in hosp. at death	Other complications	Cause of death	Autopsy findings
1	37	7	L ₁ +L ₂	II	+	-	-	-	1	Hepatic enlargement	Lobar pneumonia	Multiple abscesses left lung
27	50	4	R ₃	II	+	+	-	-	1	—	Pneumococcal meningitis	No autopsy
33	60	7	R ₁ +R ₂ +R ₃	III	+	-	-	-	2	—	Lobar pneumonia	Abscesses R ₁ ; multiple abscesses R ₂ ; red hepatisation R ₃
54	61	7	Diffuse broncho-pneu.	III	-	-	-	-	7	Myocarditis	Broncho-pneumonia	No autopsy
57	67	7	R ₁ +R ₃	II	+	-	-	-	1	Auricular fibrillation	Lobar pneumonia	Early abscesses R ₃
118	36	3	R ₂	Not typed	-	-	-	+	24	Chronic nephritis, dilatation of heart	Cardiac failure	Vegetation on aortic cusp
110	38	7	L ₂ +R ₃	Not typed	-	-	+B	-	104	Extensive thrombophlebitis both legs with abscess formation	Lung abscess, empyema, toxæmia	Abscess L ₂ ; empyema left and right pleural cavity

SULPHATHIAZOLE GROUP

7	73	3	Left basal	IV	-	+	-	-	9	Thrombosis of saphenous vein	Pneumococcal meningitis; pulmonary embolism	Pulmonary embolism; no consolidation; pus over brain
15	64	8	R ₁ +R ₂ +R ₃ +L ₂	III	+	-	-	-	1	—	Lobar pneumonia	Abscesses R ₁ ; consolidation R ₂ , R ₃ , and L ₂
20	44	5	L ₁ +L ₂	II	+	-	+	+	62	Chronic tuberculosis	Pulmonary tuberculosis with empyema	Pericarditis; left lung, cavitation opening into pleura; right, pleural effusion
24	76	14	L, mid zone	II	-	-	-	+	8	Myocarditis, delirium	Bronchopneu., cardiac failure	Widespread bronchopneumonia
30	45	5	L ₁	II	+	-	-	-	6	Polycystic kidney	Lobar pneumonia	Rt polycystic kidney; abscesses L ₁
28	59	7	L ₂	I	-	-	+	-	6	Dilated heart	Lobar pneu.; cardiac failure	L ₂ gray hepatisation; commencing empyema; dilated heart
72	52	7	R ₃	I	+	-	-	-	3	Heart dilated	Lobar pneumonia	Abscess R ₃
93	62	8	L ₂ +R ₃	<i>Strep. faecalis</i>	-	-	-	-	16	Carcinoma R ₃ ; Sonne dysentery	Pneumonia; carcinoma of lung	Carcinoma R ₃ ; consolidation R ₃ , L ₂ , and R ₂ ; <i>Strep. faecalis</i> cultured

Note: L₁ = Left upper lobe, &c.

B = Bilateral.

Pn = Pneumococcus.

difference between them. After the initial fall, the chart for the penicillin cases showed a slight rise of about 0.5° F. This could be explained by a pyrexial reaction noted in about half the cases which was not related to the disease but seemed to be due to the penicillin or its impurities.

Finally, it seems necessary to list any advantages or disadvantages of the two treatments. So far as sulphathiazole was concerned,

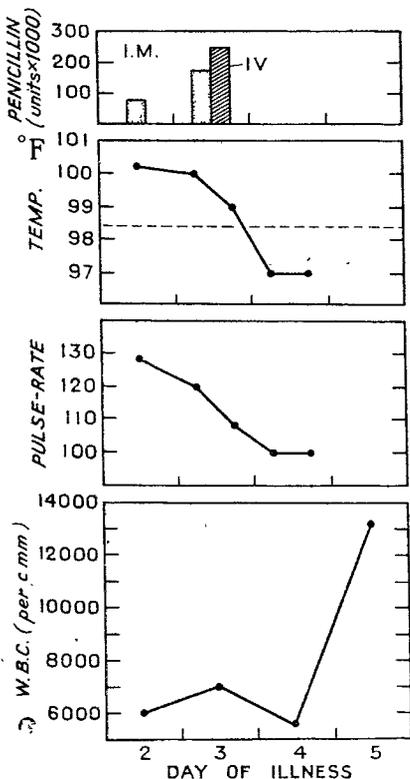


Fig. 1—Case 19.

Penicillin dosage (IM, intramuscular, IV, intravenous) temperature, pulse-rate, and white-cell counts.

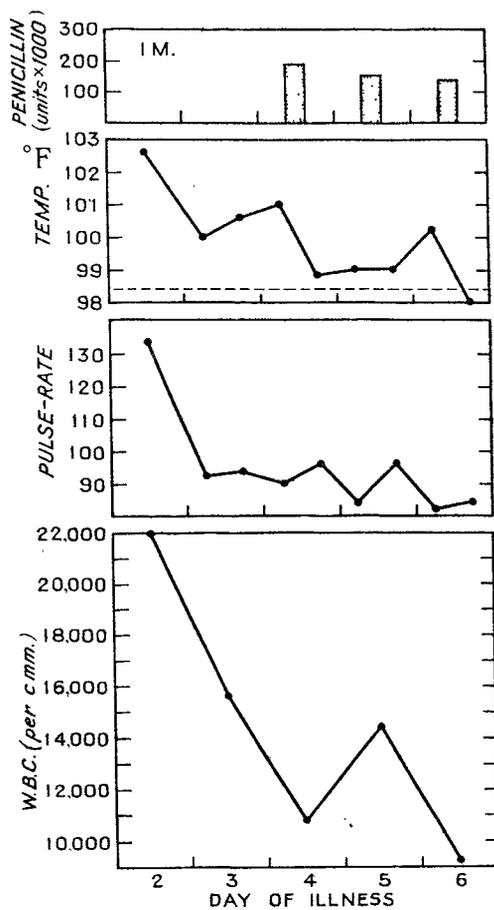


Fig. 2—Case 66.

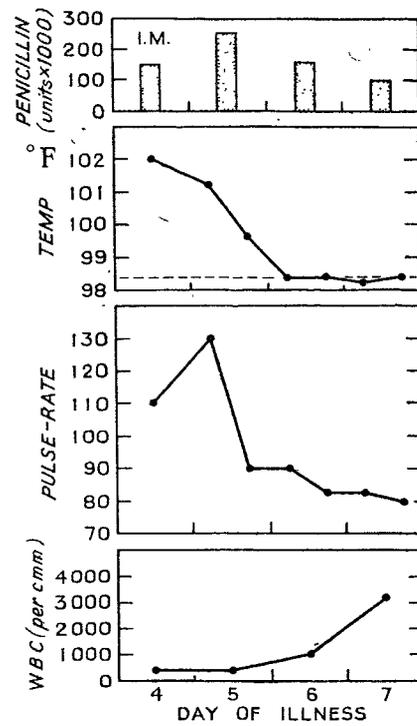


Fig. 3—Case 82.

deteriorated. Empyema was diagnosed and pus (type I pneumococcus) removed. Treatment was changed to penicillin (1.029 mega units in 7 days) both parenterally and intrapleurally, which was followed by prompt improvement. Intrapleural drainage had eventually to be performed, and he was dismissed well after 52 days in hospital.

Case 82.—Man, aged 66 years (fig. 3); 4th day of illness; consolidation L₂; sputum, pneumococcus type I; blood-culture positive (pneumococcus type I). On admission he was found to have an

administration was, of course, easy. Toxic effects from the drugs were noted in only 5 cases—drug sensitisation (2 cases), severe nausea and vomiting (3 cases). (It is perhaps worth emphasising, in view of the high dosage during the first twenty-four hours, that no case showed any renal disturbance.) In the case of penicillin, administration was undoubtedly difficult. Although the eudrip apparatus worked satisfactorily it required constant supervision, especially during the first twenty-four hours. Many of the ill patients resented the needle and tried to remove it. In one or two cases, the patient actually pulled down the whole apparatus. Apart from some redness of the thigh at the site of injection and the pyrexial effect, already referred to, toxic effects were not encountered. So far as nursing management and general clinical control was concerned the advantage undoubtedly lay with the sulphonamide-treated group.

Apart from this straightforward comparison, however, we would draw attention to 3 patients in the whole series whom we think need special mention.

Case 19.—Man, aged 53 years (fig. 1); 3rd day of illness; consolidation R₁. No sputum available; blood-culture negative. Had a history of previous coronary thrombosis and on admission auricular fibrillation was manifest. Initial white-cell count 6000 per c.mm. (17% myelocytes). Hæmoglobin (Hb) 15.4 g. per 100 c.cm.; red cells 4,730,000 per c.mm. Plasma proteins 6.0 g. per 100 c.cm. This man was gravely ill and was given penicillin intramuscularly and intravenously. Recovery was straightforward and he was dismissed well after 30 days in hospital.

Case 66.—Man, aged 58 years (fig. 2); 2nd day of illness; consolidation L₁, L₂; types VIII and I pneumococcus; blood-culture negative. On admission, was gravely ill with auricular fibrillation. White cells 22,000 per c.mm. (15% myelocytes). Hæmoglobin 12.7 g. per 100 c.cm. Plasma proteins 6.98 g. per 100 c.cm. Received 17 g. sulphathiazole during the first 36 hours in hospital, but the condition

untreated pernicious anæmia. White cells 400 per c.mm. (10% myelocytes). Hæmoglobin was 6.9 g. per 100 c.cm. falling to 5.95 g. by 7th day of illness. (He was later shown to have a histamine-fast achlorhydria.) Plasma proteins 5.68 g. per 100 c.cm. Penicillin was administered by intramuscular drip: 0.675 mega units in 4 days. Dismissed with incomplete resolution of the lung after 46 days in hospital.

TABLE III—COMPLICATIONS NOTED IN THE TWO TREATMENT-GROUPS

	Em-pyema	Menin-gitis	Sterile effusion	Delayed resolution	Other	Total
Penicillin group	1	1	7	19 (30.1%)	5	33
Sulphathiazole group	3	1	4	23 (36.5%)	0	31

The figures in parentheses are percentages of the total cases in each treatment-group.

We regarded these 3 as the most serious cases in the series, and we believe that the treatment with penicillin was instrumental in saving their lives.

DISCUSSION

We fully appreciate that the comparison of two relatively small groups of cases cannot take into account all the possible complicating factors which may affect the course of pneumonia. The data which have been presented, however, show that, in the average case, there is little to choose between the two methods of treatment, so far as the end-result is concerned. But even in this series of cases 3 patients can be singled out as having been so gravely ill that, in our opinion, death might have been expected. Their recovery after treatment with penicillin suggests that there is a small proportion of pneumonic patients over 40 years for whom penicillin (possibly

because of its low toxicity) will represent a definite improvement over sulphonamides.

Some tentative guides for the efficient use of penicillin may be formulated. In the first place, in such severe cases, an adequate dose of a sulphonamide should be given during the first twenty-four hours. (We believe that our results with sulphathiazole, given as we gave it, are satisfactory for unselected patients in this age-group, and that pneumonia in the person over 40 years should be regarded as a medical emergency.) In the second place, a preliminary blood-culture (before administering sulphonamides) becomes of increasing importance; for a positive result, especially if the infection is heavy, should suggest the need for starting penicillin. Thirdly, a routine white-cell count, when treatment is begun, will be of value in picking up the leucopenic patient (not uncommon in this age-group) who may respond unsatisfactorily to sulphonamides. Lastly, but not least important, the clinical assessment of the patient should be taken into account. We are satisfied that a poor cardiovascular system remains the most important prognostic factor in pneumonia, and should constitute an indication for combined therapy. Extensive pulmonary involvement, severe cyanosis, and dyspnoea are other indications which may call for the support of chemotherapy by penicillin. The fact that we now have two effective methods of attack makes it more than ever important that the closest co-operation should be established between the laboratory and the clinician if the best results are to be obtained in the management of pneumonia.

In one respect our results were surprising. Since penicillin was not, like sulphonamides, a foreign chemical substance toxic to body-cells, we had expected that resolution would proceed more quickly in the patients given penicillin. Our results show that the complication is equally liable to occur in both groups. It is, therefore, unlikely that delay or failure of resolution is a consequence of the therapeutic agent itself, but must be related to some failure on the part of the patient. That this failure is not due to the lack of specific immune substances is suggested by the fact that delayed resolution remains as frequent when chemotherapy is combined with serotherapy (Anderson 1943).

The process of resolution is imperfectly understood, but its satisfactory accomplishment seems to depend on two factors—the dissolving of the pulmonary exudate by enzymic or phagocytic activity, and its subsequent removal from the lungs either directly through the air-passages as sputum or by absorption along lymph- or blood-vessels. The action of both of the therapeutic agents is antibacterial; their therapeutic effect is dependent on their ability to attack any circulating infection as well as to penetrate into the consolidated lung. It has long been known that the penetration of the consolidated lung through the blood-stream is hampered by the ischaemia which develops fairly early (Kline and Winternitz 1915) and the poor results obtained with serum after the fourth day were often ascribed to this cause. Quite apart, therefore, from the possibility that there may be chemical interference with the formation of the dissolving enzyme by the therapeutic substance; the further possibility exists that the infective agent in the pulmonic consolidation may be damped down at a stage when ischaemia is still a definite factor. This latter occurrence might make it as difficult for the exudate to be removed along partially impeded vessels as it was for the therapeutic agent to gain entrance. It is our experience that delay or failure of resolution is most likely to occur (1) in those over 40 years of age, (2) in those with definite cardiovascular disease, and (3) in those whose consolidation is most dense as judged by radiography. This last point particularly supports the view that ischaemia may play a part.

The present results suggest that slow resolution (which is so common with these modern therapeutic measures) is the price we must pay for stopping an infective process too quickly. Improvement in the speed of resolution must therefore depend not on refinements in the methods of administering the antibacterial agents but on some ancillary method of treatment aimed at dissolving the pulmonary exudate more rapidly or making its absorption more easy.

SUMMARY

A series of 126 patients over the age of 35 years suffering from pneumonia was divided by random selection into two groups, one of which was given sulphathiazole, the other penicillin. All patients received the same symptomatic treatment and general clinical control.

The distribution of factors known to influence the course of the disease was the same in the two groups.

Each method achieved fairly similar results. In 3 patients, however, it was thought that penicillin had produced an unexpected recovery.

There is no reason for abandoning properly controlled sulphonamide treatment for the average case; and it is suggested that penicillin should be used for selected patients, usually in combination with a sulphonamide. Indications for the use of penicillin are tentatively suggested.

The cause of delayed resolution is discussed.

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MASS RADIOGRAPHY*

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THE purpose of mass radiography was thus defined by the Minister of Health in the House on June 30, 1942: "We have tended to concentrate on treatment rather than early diagnosis, but the developments in miniature radiography during the last few months seem to give us a new and useful weapon for detection—and it was hoped that toward the end of the year we should be able to detect and treat tuberculosis in the early stages, when we can by a period of suitable treatment restore a man to health and self-sufficiency with the shortest possible interruption of his normal life."

The impression was given to the public that radiography would be applied to the whole population; that in consequence *all cases* of tuberculosis would be recognised early, and prompt treatment would lead to cure—at least diminution if not eradication of the disease. The fact that about 50% of the patients die within 12 months of notification appears on superficial examination to support this.

Since that time the aims have been considerably modified; for, whereas to radiograph the entire population periodically some 4000 units with all their medical and technical personnel and accommodation would be necessary, only 25 units have been provided, and the likelihood of any considerable increase on this is very questionable.

GROUP EXAMINATIONS

With the few units available all we can do is to confine our attention to certain groups of people, and already some groups of the armed forces, civil service, factory workers, schools, &c., have been examined with them. Such group examinations will permit us to detect all those cases which have lesions sufficiently advanced to give us contrast density within the normal tissues. These will include those patients in whom the disease has not been diagnosed, because its signs and symptoms have been regarded by the patient and/or the doctor as merely those due to colds, influenza, bronchitis, or pneumonia, even though, or perhaps because, the bouts of ill health have been followed by shorter or longer periods of quiescence during which the affection appeared to have been overcome. Apart from pulmonary tuberculosis radiography will reveal other lesions of the lungs and deformities of the outlines of the heart and large vessels.

But with all these discoveries mass radiography has important limitations. It is unlikely that it will reveal more than a few cases of the acute progressive disease, for the relatively sudden onset and the prominence of

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