fied tracheo-bronchial glands in children, says that if the tuberculin reaction is negative to 1 in 100 tuberculin, the lesion is probably obsolete. In our opinion cases with definite calcification of the tracheo-bronchial glands do give a positive tuberculin reaction. The explanation of this is that in almost all such instances tuberculous lesions are still present somewhere in the body. That calcification of those glands is more rare than is generally supposed is borne out by some figures kindly supplied to us by Dr. Atkin, pathologist to the Brompton Hospital. In a series of 200 post-mortem examinations in adults, he found obviously calcified tracheo-bronchial glands in only 14, or 7 per cent., calcified mesenteric glands in 42, or 21 per cent., and no calcification in 144, or 72 per cent. One hundred and twenty-four of the 200 were cases of pulmonary tuberculosis, and the corresponding figures were 11, or 8.9 per cent., 32, or 25.8 per cent., and 81, or 65.3 per cent. In the remaining 76 patients, who had suffered from diseases other than pulmonary tuberculosis, the figures were 3, or 3.9 per cent., 10, or 13.1 per cent., and 63, or 82.9 per cent.

Primary Tuberculous Focus.—Twenty of the 215 positive radiograms showed primary foci to be present. Of these, 7, or 35 per cent., did not react to tuberculin, while 13, or 65 per cent., did react. We think that, as in the case of calcified glands, our criteria were not sufficiently strict, although McPhedran⁵ states that "even in the event of large calcified foci, the tuberculin reaction is often negative to 1 in 100 tuberculin."

Fibrosis.—Fibrosis was present in 30 of the 215 positive radiograms. Fourteen, or 47 per cent. of the cases, did not react to tuberculin, while 16, or 53 per cent., gave a positive reaction. The remainder of the 215 positive radiograms consisted of 11 cases of pleural effusion and 3 cases of pleural thickening. Taking these cases together, we found that 10 out of the 14 cases gave a positive tuberculin reaction.

CONCLUSIONS

1. Abnormal radiograms of the chest in children become more frequent as the age of the child increases.
2. Children who react positively to tuberculin show a higher percentage of intrathoracic lesions as seen radiologically than do those who give a negative reaction.
3. Since 35 per cent. of the non-reactors to tuberculin had positive radiograms, the lesions found in these cases are presumably non-tuberculous.
4. In view of conclusion No. 3, it follows that of the 51 per cent. of the reactors who show a positive radiogram, a considerable number must be discounted in estimating the radiological incidence of intrathoracic tuberculous lesions. In other words, in children infected by the tubercle bacillus, intrathoracic tuberculous lesions radiologically demonstrable are very few.
5. A very large number of infiltrations seen in children are non-tuberculous. The distribution of the infiltration appears to be much the same in all children, whether they are infected with the tubercle bacillus or free of infection, a little over 50 per cent. being in the lower zone, and the remaining 50 per cent. being equally distributed in the upper and middle zones of the lung. We suggest that upper zone infiltrations are more likely to be tuberculous than lower zone infiltrations.
6. In view of the fact that 22 of the 51 children who were considered to have radiological evidence of calcified tracheo-bronchial glands did not react to tuberculin, it would appear that our radiological criteria in this respect were not sufficiently strict. In every case where there is any doubt about the presence of calcified glands, an oblique radiogram should be taken, so as to exclude the possibility of mistaking a blood vessel or other structure viewed "end on" as being a calcified nodule.

7. The same conclusion applies to those cases of primary calcified foci in which the tuberculin reaction was negative.

8. Fibrosis appears to be as common in non-reactors as in reactors.

9. Intrathoracic tuberculosis is comparatively uncommon in children under 15.

It would appear that, in attempting to localize the lesion in children who are shown to be tuberculous by a positive Mantoux reaction, the chest radiogram is not so helpful as might have been supposed. The lesions, if glandular, are invisible unless calcified, and Dr. Atkin's figures suggest that the majority of such lesions may be extrathoracic. Further, our experience in this series of cases shows that non-tuberculous infiltration and fibrosis are more common than tuberculous, from which they cannot be differentiated with certainty. Therefore, while the chest radiogram in children is of great clinical value, it has in this respect these definite limitations, and its interpretation in the "Mantoux-positive" child needs the greatest care.

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THE TRUE PLACE OF SERUM IN PROPHYLAXIS OF MEASLES

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Measles, although endemic in this country, tends to assume epidemic proportions every two or three years. The anticipation, according to statistics, of an epidemic of measles in the autumn and winter of 1931-32 has again brought into prominence the serious complications of this illness and the importance of prophylactic treatment. The gravity of this disease is shown in the report of the medical officer of health and school medical officer on the measles epidemic of 1929-30 (London County Council, 1931). During the past four years in London measles has caused eight times as many deaths as scarlet fever, and one and a half times as many as diphtheria. The average death rate from measles is 6 to 10 per cent., depending on the severity of the epidemic.

It is intended here to deal with the possibilities of immunity in the prophylaxis of measles. Opinion has definitely turned to immunity as the method of control of the epidemic of measles, and the consequent reduction in the death rate. Stocks,¹ among others, expressed this view, and stated that the only hope of preventing these epidemics altogether was through the immunity factor, and that we must hope for either a simple method of inoculation which will produce a more or less permanent immunity, or else a simple method of rendering an attack abortive and harmless.

SCOPE OF SERUM PROPHYLAXIS

Both animal serum and that of convalescent measles cases have been used. The animal serum is obtained by injecting goats with a green-producing diplococcus isolated from measles patients and claimed to be the causal organism of the disease. The consistently good results of human serum have overshadowed those of the animal serum. Of the animal serums Tunncliffe's² has been shown to give the best results with a protection of 43 per cent. of cases treated, whereas with human convalescent serum

Gunn³ obtained a protection in 95.7 per cent., and Nabarro and Signy⁴ in 98.1 per cent., of cases treated.

The claims put forward for the use of the serum from convalescent measles patients are that, given in the correct dosage, one can by this means ensure:⁴

1. Complete protection against measles if the injection is given before the sixth day of incubation. This passive immunity lasts only two to four weeks.

2. Partial protection if the serum is injected between the sixth and ninth days of incubation. The patient suffers a mild attack of measles, which induces a permanent active immunity.

The injection of serum after the ninth day of incubation has no effect whatever on the course of the disease.

GENERAL CONSIDERATIONS

Instances of natural immunity to measles are too uncommon for practical purposes, and, with the exception of the transient immunity which exists in the first three months of life,⁵ one has to work on the assumption that every child at some time in its existence will experience an attack. Therefore one must endeavour to control the attack so that it occurs under the best conditions from the prognostic point of view.

TABLE I.—Cases of Measles Admitted into the Fever Hospitals

Ages	1912			1930		
	Total Admissions	Deaths	Case Mortality per cent.	Total Admissions	Deaths	Case Mortality per cent.
Under 1	404	82	20.3	488	78	15.9
1 to 2	1,042	196	18.8	1,453	201	13.8
2 to 3	779	62	8.0	1,110	70	6.3
3 to 4	697	43	6.2	1,041	34	3.2
4 to 5	566	22	3.9	886	19	2.1
5 to 10	714	8	1.1	1,245	17	1.3
Over 10	112	1	0.8	229	3	1.3
Totals ...	4,314	414	9.6	6,452	422	6.5

Of the total death rate of measles, 93 per cent. occurs at the age period of 1 to 5 years; the mortality is highest among the very young children, and decreases rapidly up to 5 years. Table I, giving the figures for the last epidemic and for the one in 1912 (taken at random), shows this very well.

Theoretically, therefore, the attack should be postponed until the fifth year. To achieve this would necessitate injections of serum on every occasion of exposure to infection. The hopelessness of attempting such a measure during an epidemic, when contact is of daily occurrence, with a serum which protects only from two to four weeks, is apparent, even without taking into account the other great difficulties associated with the supply of the serum. The question would assume an entirely different aspect should a serum be produced which would protect for a period of years. Stocks,⁶ from a purely theoretical consideration of the possibilities of immunity in the control of measles epidemics, concluded that the isolation and immunization of all home contacts with convalescent or parent's serum was the most practical method of attacking the problem, but the total volume of an epidemic could not be reduced by more than about 13 per cent. by this means, and only about one-third of the injections would have any useful effect.

Where a modification of the attack is the object of the injections, however, the position is very different. Here, at least, should the contact develop the disease, the risk of complications is reduced to a minimum, and, what is of the greatest importance, the child has thereby acquired

a permanent immunity to further attack. It would therefore be a general principle that the place of serum in the prophylaxis of measles is to ensure a modified form of the disease. The only exception is the case of a patient already so ill that even a mild attack of measles might have serious consequences; this child must be protected at all costs. This general rule applies also to ward infections. The latter, which present an important problem from the administrative point of view of the individual hospital, are of small significance in the general problem of measles.

PRACTICAL ASPECTS

In practice the medical man is usually first called in to see the case on the appearance of the rash. Should the case be seen in the prodromal stage, a diagnosis of measles would only be made on the appearance of Koplik's spots. Seeing that serum has no effect when injected after the ninth day of incubation, all cases of measles seen in general practice are therefore too late for serum treatment. From this point of view the serum treatment of hospital cases of measles is more hopeless still. The usual hospital case is one that has been treated privately for several days, and then sent into hospital because the disease is not taking its usual course and complications are setting in. Of all cases of measles which are treated in fever hospitals, roughly one-quarter are already complicating, as will be seen from the following figures, which are taken from the London County Council report of measles cases admitted to fever hospitals during the last two epidemics.

TABLE II

	1927-28	1929-30
Total measles cases admitted	8,723	6,452
Admitted with complications	1,528	1,847
Admitted with broncho-pneumonia as the complication	1,340	1,250
Developed broncho-pneumonia first day after admission	107	18

A further illustration of the late type of case dealt with by the fever hospitals is seen from the following series of 150 consecutive cases which were kept under observation during an investigation.⁷ The cases were admitted at the stages given.

TABLE III

Stage	No. of Cases
Prodromal	3
First-day rash	46
Second-day rash	63
Third-day rash	20
Fourth-day and later	18

It will be seen, therefore, that, leaving out the problem of the contacts who are never brought for treatment, and whose serum prophylaxis has already been discussed, all measles cases are first seen and diagnosed when it is too late to apply serum treatment.

CONCLUSIONS

1. The place of convalescent serum in the prophylaxis of measles is to ensure a modified attack, and only in exceptional cases to produce complete protection.

2. The use of serum to-day is of little practical value in the control of measles epidemics and in influencing the resulting mortality.

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