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Tuberculin positive children

Children have been routinely tuberculin tested as a screening procedure during the school BCG vaccination programme in Britain since 1952. The test is generally made with the Heaf multiple puncture apparatus. The fixed head Heaf gun requires disinfection by immersion in alcohol followed by ignition of the spirit before each test to prevent cross infection.[1] A new disposable head apparatus (Bignell 2000) is now available and is the method of choice as it eliminates the risk of cross infection and is simple and accurate in use. The apparatus is approved by the Joint Committee on Vaccination and Immunisation and an explanatory video has been produced by the Department of Health.[2] The proportion of schoolchildren aged 10–13 years found to be tuberculin positive has declined over the years and in 1988 averaged 5% in England. Unexpectedly high proportions of positive reactors are found occasionally in schools, possibly owing to variations in the proportion of Asian immigrants or of children who have been vaccinated at birth. When no reason is evident it is wise to repeat the Heaf test to check the validity of the reading before embarking on a survey to detect a possible source of infection in the school.

The risk that tuberculin positive schoolchildren will develop tuberculosis appears to have diminished over the years. Sutherland and Springett in surveys made in1973, 1978 and 1983 investigated a group of unvaccinated children of white ethnic origin who were tuberculin positive in the schools programme. Estimated annual tuberculosis notification rates in this group decreased steeply during this time.[3] Surveys in Edinburgh during 1960–83 among white schoolchildren showed a considerable fall in tuberculosis notification rates in grade 1 and 2 reactors but no fall in rates among grade 3 and 4 reactors.[4,5] Tuberculous infection still seems likely to be the usual cause of strongly positive tuberculin reactions, but grade 1 and 2 reactions are caused progressively less over the years by tuberculous infection and more by non-tuberculous causes. Department of Health guidelines recommend that unvaccinated children found to have grade 1 reactions in routine school testing should be given BCG vaccination. Grade 2 reactors are not vaccinated and need no investigation. All children who are strongly positive reactors (grade 3 and 4) should be referred for examination to exclude active tuberculosis. There is controversy about the value of chemoprophylaxis or follow up for those found to be free of tuberculous disease in the first examination. Policies vary according to the contact and BCG history and the ethnic origin, which are factors influencing the physician's perception of the risk of development of tuberculosis.

Healthy children of white ethnic origin found to be tuberculin positive on being tested at school have a low risk of subsequently developing tuberculosis. The Medical Research Council surveyed 15 year old children who were unvaccinated and found to be free of tuberculosis at the initial examination in 1950[6]; 6866 had a Mantoux reaction of more than 15 mm to 3 tuberculin units, a reaction equivalent to Heaf grade 3 and 4. These strongly positive tuberculin reactors were intensively followed up for 20 years. Only 140 (2%) developed tuberculosis. Much lower rates of tuberculosis occurred among individuals whose tuberculin reaction was weakly positive. A survey in Edinburgh of white schoolchildren aged 13 years related tuberculosis notifications to the results of Heaf tests in schools during the years 1960–70.[4] All tuberculin positive reactors had chest radiographs within one year of the test, which detected 27 of the 45 notifications in the survey. When the first year was excluded those with grade 3 and 4 Heaf reactions had an annual notification rate of 1·61/1000; the corresponding rate for grade 2 reactors was 0·43. During 1970–83 5380 positive reactors were surveyed.[5] Initial chest radiographs yielded 10 cases, only five more cases being notified during subsequent follow up.[6] The ratio of new cases detected to initial radiographs taken was 1:555 for grade 2 reactors, 1:75 for grade 3, and 1:25 for grade 4. We may reasonable conclude from the results of these studies that for previously unvaccinated children of white ethnic origin who are grade 3 and 4 reactors an initial examination and chest radiograph is valuable. For those having no evidence of clinical tuberculosis the risk of developing the disease subsequently is so small that it justifies neither follow up nor chemoprophylaxis. This would not of course apply to children recently exposed to tuberculosis or if there are factors likely to impair host defences.

The prognosis for children of Asian ethnic origin who are found to be tuberculin positive on being tested at school is problematic because of lack of published studies. The survey of Asian children in Leicestershire reported in this issue of *Thorax* by Cookson and Cookson[7] (p 776) is therefore of special interest. Lists of children with Asian sounding names who had Heaf grade 3 and 4 reactions in schools in 1982–3 were compared with lists of tuberculosis notifications during the years 1983–7. It is important that about 80% of these children had received BCG vaccination early in life as a result of the very comprehensive vaccination programme for Asians in Leicestershire, where there are many immigrants. Among 760 grade 3 and 4 reactors an initial chest radiograph detected tuberculosis in three. Only one developed tuberculosis during the five year follow up. The study may be criticised on the grounds that no distinction was made between children who had and had not received BCG previously, and on the method and short duration of follow up. But the degree of error is unlikely to be so great as to invalidate the authors' conclusion that for this group of Asian children, most of whom had previously received BCG vaccination, chemoprophylaxis would not have been justified. The prognosis for non-vaccinated tuberculin positive Asian schoolchildren is unknown, but for this group giving chemoprophylaxis only to grade 3 and 4 reactors would seem reasonable.

Guidelines for chemoprophylaxis in childhood are given by the British Thoracic Society.[8] The first group comprises contacts of tuberculosis who are tuberculin positive and have no clinical or radiographic evidence of tuberculous disease. Chemoprophylaxis is advised for children who have not had BCG vaccination and whose Heaf test reaction is grade 2–4, and should be considered for previously vaccinated children with strongly positive grade 3 and 4 reactions. Children under the age of five who are close contacts of a sputum smear positive patient should receive chemoprophylaxis irrespective of their tuberculin state; they may be given BCG if applicable after chemoprophylaxis has been completed. The second group comprised immigrant children from countries where tuberculosis is common who are found to be tuberculin positive, but have no evidence of tuberculous disease on being screened after arrival. Chemoprophylaxis is advised for all grade 3 and 4 reactors whether or not previously vaccinated with BCG and for grade 2 reactors who have no evidence of previous vaccination.

Several regimens of chemoprophylaxis are in current use. Isoniazid daily for one year has been shown in controlled trials to be highly effective.[9] Isoniazid for six months is probably as effective,[10] and is recommended by the British Thoracic Society for children, a dose of 10 mg/kg being used.[11] A regimen of isoniazid with rifampicin for only three months has been used but its efficacy has not yet been established by controlled trials. Whatever regimen is used, close supervision is necessary to ensure compliance.

The declining risk of tuberculous infection among the younger native born white population in England and Wales means that eventually the school BCG vaccination programme will be stopped, the optimum time to do so being under discussion.[12] There is uncertainty about the interaction of HIV infection with tuberculosis and the schools programme is therefore being continued at least until 1996 to give time to collect epidemiological data, which will enable the consequences of stopping the programme to be predicted with more certainty than is possible at present.[13] The incidence of tuberculosis in children of parents from the Indian subcontinent is 25 times greater than that of white children if they were born abroad and 15 times greater if they were born in England or Wales.[14] BCG vaccination should therefore be given at birth for those born in Britain for this has been shown to be effective.[15 16] Children born abroad should be tuberculin tested and screened as soon as possible after arrival.

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