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## Changing patterns of invasive *Haemophilus influenzae* disease in England and Wales after introduction of the Hib vaccination programme

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Since 1990 we have been monitoring strains of *Haemophilus influenzae* referred to the Public Health Laboratory Service Haemophilus Reference Laboratories from all cases of invasive *H influenzae* disease from five English regions and Wales. Methods of reporting and participating laboratories have remained constant over this period, which allowed us to compare the incidence of infection before and after the introduction of vaccination against *H influenzae* type b in October 1992.

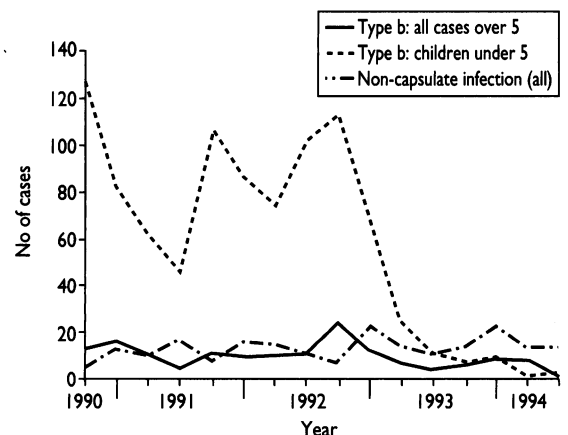
### Patients, methods, and results

The case definition was a systemic infection in which culture of normally sterile body fluid revealed *H influenzae*, or the organism was detected by antigen to *H influenzae* type b. Organisms were identified and typed at the reference laboratories using both type specific antisera and a polymerase chain reaction method.<sup>1</sup> Brief clinical details were also collected. The results for the first two years of the survey showed that most *H influenzae* infections were due to type b, presented as meningitis, and occurred in children under 5,<sup>2</sup> suggesting that mass vaccination of infants should achieve a rapid change in the pattern of invasive *H influenzae* infections.

Since October 1992 there has been a rapid reduction in the number of reported cases of *H influenzae* type b

disease, particularly in children aged under 5 (see figure). Annual attack rates for *H influenzae* type b disease in children under 5 (calculated using denominator populations) have fallen from 30.9 cases per 100 000 population in 1991-2 (369 cases recorded) to 2.0 per 100 000 in 1993-4 (24 cases), a reduction in risk of invasive disease from 1 case in 3200 to 1 per 50 000 children. Comparison of the rates of invasive *H influenzae* type b disease in children under 5 using log-linear regression showed a highly significant reduction ( $P < 0.001$  in 1993-4 compared with previous years).

Non-capsulate *H influenzae* isolates have shown an increase in annual attack rate (for all ages) from 0.25 cases per 100 000 population in 1990-1 (45 cases recorded) to 0.37 in 1993-4 (67 cases). The total number of recorded cases of non-type b infections (non-capsulate and other serotypes: 75 cases) exceeded the number of cases of *H influenzae* type b (50 cases) in 1993-4. These increases demonstrate a sustained trend, approaching significance for non-capsulate infections during 1993-4 ( $P = 0.066$ ), which has been most noticeable in people aged over 65 years.



Invasive *H influenzae* type b and non-capsulate infections by quarter

## Comment

These findings show the expected rapid reduction in the numbers of invasive *H influenzae* type b infections after the introduction of vaccination. The rate of decline has closely followed the increase in vaccine coverage and has been greatest in children aged under 5. This survey suggests that the United Kingdom vaccination schedule has been as effective at reducing numbers of cases as those schedules adopted in the USA<sup>3,4</sup> and northern European countries.<sup>5</sup> The increase in non-type b strains may reflect improved case ascertainment, perhaps because of increased awareness of haemophilus disease after the vaccination campaign. Nevertheless, there is a need to continue to monitor all invasive infections to determine whether these trends will be maintained in both the vaccinated and unvaccinated populations.

This survey was coordinated by the haemophilus working group of the Public Health Laboratory Service. We acknow-

ledge the help of all contributing microbiologists, the regional coordinating microbiologists, and the staff at the haemophilus reference units in Oxford and Bangor. Dr Paddy Farrington gave statistical advice and Dr Mayon-White read the manuscript.

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Conflict of interest: None.

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## Congenital rubella in south India: diagnosis using saliva from infants with cataract

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**Table 1—Characteristics of 25 cases of serologically proved cataract due to congenitally acquired rubella. Values are numbers (percentages)**

Characteristic	
Maternal history of fever and rash	12 (48)
Cardiac disease	13 (52)
Deafness	7 (28)
Severe developmental delay	7 (28)
Ocular features in 50 eyes (25 patients):	
Microphthalmos	38 (76)
Corneal clouding	10 (20)
Glaucoma	2 (4)

Congenital rubella is a preventable disease which has been largely controlled by immunisation in the developed world.<sup>1</sup> Serological surveys in India indicate that up to 45% of women of childbearing age are susceptible to rubella and potentially at risk of infection during pregnancy.<sup>2</sup> We tested affected infants to see whether detection of rubella specific IgM from saliva is as reliable as from serum for diagnosing rubella infection and whether rubella is an important cause of congenital cataract in south India.

### Patients, methods, and results

We studied 95 consecutive infants with congenital cataract presenting to the paediatric department of the Aravind Eye Hospital in 1993-4. Thirty six age matched children attending the same clinic over the same period with a diagnosis of watering eyes acted as controls. Serum samples were taken from 61 children with cataract and saliva samples from all 131 children. Saliva samples rich in crevicular fluid were collected using the Orasure device (Epitope Inc, Beaverton) according to the manufacturer's instructions. Serum and saliva samples were tested for rubella specific IgM by antibody capture.<sup>3,4</sup> Specimens were considered positive if the test to negative control ratio exceeded 3:1.

The mean (range) age of the 95 cases was 6.2 months (1-11) and of the 36 controls 7.3 months (1-11). Rubella specific IgM was detected in saliva and serum in 17 paired samples and was absent in 44 paired samples (sensitivity 100%, 95% confidence interval 80.5% to 100%; specificity 100%, 95% confidence interval 92% to 100%). Saliva testing gave no false positive and no false negative results compared with serum.

Twenty five of the 95 infants with cataract (26.3%) had congenital rubella infection confirmed by detection of rubella specific IgM in saliva. None of the controls had raised rubella specific IgM ( $\chi^2=11.71$ ,  $P<0.005$ ). Congenital rubella was suspected clinically in 19 of the 25 cases of congenital cataract in which

rubella specific IgM was detected (sensitivity 76%, specificity 100%). The other six children had clinical features compatible with congenital rubella syndrome but rubella had not been diagnosed before laboratory confirmation. The general and ocular characteristics of the 25 children with rubella cataract are shown in table 1.

Sequential saliva samples taken from seven infants with congenital rubella showed that in all cases raised concentrations of rubella specific IgM persisted up to 6 months of age and in five they persisted up to 14 months.

## Comment

This study showed excellent agreement between test results in saliva and serum in the 61 paired samples, suggesting that saliva is as reliable as serum in allowing the detection of rubella specific IgM in infants. Although the infants tested had few teeth and therefore produced little crevicular fluid, adequate saliva samples were collected from all cases. The storage and transport of samples was not ideal, but this study indicates the potential of the Orasure device for undertaking studies remote from testing centres.

The study also suggests that congenital rubella is a significant cause of congenital cataract in south India. Nevertheless, this group of children admitted to hospital may not be representative of all children with congenital cataract in the community and therefore more extensive studies will be needed to establish the true scale of the problem.

Improved surveillance is required for congenital rubella in developing countries. The identification of rubella specific IgM in saliva offers a simple, non-invasive test that can be used in infants to enhance surveillance based on clinical case finding.

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