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EDITORIALS

Rotavirus vaccine: a welcome addition to the immunisation schedule in the UK

Change in policy promises substantial benefits

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In November 2012, the Department of Health announced that rotavirus vaccine will be introduced into the United Kingdom's childhood immunisation programme (www.dh.gov.uk/health/2012/11/rotavirus). The live, attenuated, two dose, oral monovalent vaccine (Rotarix, GlaxoSmithKline Biologicals) will be given with other routine vaccines to children by the age of 4 months. Clinical trials in Europe and the Americas with both currently licensed rotavirus vaccines (Rotarix and a pentavalent vaccine Rotateq developed by Merck) led to a recommendation by the World Health Organization in 2006 to vaccinate children in these regions. Subsequent trials in Africa and Asia led to an extension of the recommendation to include all children worldwide.[1] The Department of Health's joint committee on vaccination and immunisation recognised as early as 2008 that rotavirus vaccination would reduce the burden of rotavirus disease in the UK population. However, at that time, the cost effectiveness analysis indicated that at market prices universal vaccination of UK infants significantly exceeded the accepted threshold for intervention,[2] and that universal rotavirus vaccination would become cost effective only if vaccine prices were reduced. Economic aspects remain a barrier to vaccine introduction in western Europe, with only Austria, Belgium, Finland, and Luxemburg having rolled out universal programmes. Currently, more than 40 countries include a rotavirus vaccine in routine childhood immunisation programmes. On the basis of their experience, what can the UK expect?

Rotavirus, the most common cause of severe gastroenteritis in infants and young children, causes an estimated 453 000 deaths each year in children under 5 years, with more than 90% of deaths occurring in developing countries.[1] In industrialised countries, rotavirus is the main pathogen responsible for hospital admissions for diarrhoea. In the UK, rotavirus is estimated to result in 750 000 episodes of diarrhoea and 80 000 general practice consultations each year,[3] together with 45% and 20% of hospital admissions and emergency department attendances for gastroenteritis, respectively, in children under 5 years.[4]

Clinical trials in middle and high income countries showed high (>85%) vaccine efficacy against severe rotavirus gastroenteritis, with much lower efficacy reported from some low income countries.[5] The direct benefits of introducing rotavirus vaccination in high and middle income countries have been similar to those seen in clinical trials, with significant reductions in hospital admissions for diarrhoea caused by rotavirus infection.[6] In the United States, where routine rotavirus vaccination was introduced in 2006, norovirus has replaced rotavirus as the leading cause of hospital admissions and emergency department visits for gastroenteritis in young children.[7] Importantly, post-introduction surveillance has shown reductions in mortality in middle income countries in Latin America. Such reductions could not be detected in clinical trials because of insufficient sample sizes.[8]

Routine rotavirus vaccination has altered the epidemiology of rotavirus infection in some settings. In countries with strong rotavirus seasonality, vaccination has led to a delay in peak activity.[9] Mathematical models, which are supported by observational data,[9 10] predict that in some settings biennial rather than annual epidemics may occur after introduction of the vaccine. It is still unclear whether rotavirus vaccination drives the emergence of vaccine escape strains. The emergence of G2P[4] strains in Brazil, Belgium, and some territories in Australia, and of G9P[4] strains in Mexico after introduction of the G1P[8] Rotarix vaccine, led to concerns over the ability of this vaccine to protect against fully heterotypic strains.[6] However, case-control studies conducted after introduction of the vaccine have reported comparable vaccine effectiveness in relation to hospital admission for diarrhoea caused by such strains.[11] Post-vaccination strain changes may therefore represent natural fluctuation of circulating rotavirus genotypes, as supported by the observation of similar strain distributions in countries in the same region with and without rotavirus vaccination programmes.[6] However, mathematical models predict that subtle differences in vaccine effectiveness against particular rotavirus strains may lead to strain selection that could take years to become apparent.[12]

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An unanticipated but beneficial consequence of rotavirus vaccination is the reduction of rotavirus disease in unvaccinated people (herd protection), probably because of reduced virus transmission. Such indirect benefits include reduced disease in non-vaccinated older children and adults in whom the burden of rotavirus disease may have been under-recognised.[13] Decreased immune boosting owing to reduced virus transmission may shift the burden of rotavirus disease into older age groups, although there are no published data to support this.

In relation to vaccine safety, large pre-licensure studies showed no association with intussusception for either of the rotavirus vaccines, at least at the risk level found in the US with RotaShield.[5] However, a low rate of intussusception was recently reported after routine use of Rotarix in Mexico and Rotarix and Rotateq in Australia.[1 6] An increased risk of intussusception has not been detected so far in the US, where data suggest that the benefit from the reduced number of cases of rotavirus gastroenteritis would far outweigh an increased risk of intussusception at the level seen in Mexico or Australia.[14] Nevertheless, these findings underscore the importance of continued safety monitoring by countries introducing a rotavirus vaccine.

The introduction of rotavirus vaccination in the UK is expected to result in substantial health benefits to vaccinated children and to the wider population. There is also expected to be a reduction in the burden of nosocomial rotavirus infection.[15] The impact will be most pronounced in the winter months, when many seasonal infections are at their peak and pressures on the NHS are greatest. Finally, the UK will be able to assess the direct and indirect cost benefits associated with the introduction of universal rotavirus vaccination because of its system of publicly financed healthcare. Such an assessment will provide the largest dataset in western Europe and is likely to inform decision making in other European countries.

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