Reduction in rotavirus disease due to the infant immunisation programme in England; evidence from national surveillance

Keywords
Rotavirus; Gastroenteritis; Diarrhoea; Vaccination; Immunisation

In this journal, Glass and colleagues recently reviewed the impact of rotavirus vaccines in a number of high and middle income countries.1 The impact of rotavirus vaccination in these countries has been remarkable, both in terms of reductions in laboratory-confirmed rotavirus infections, and declines in hospitalisations for rotavirus diarrhoea.1 We would like to add to this body of evidence by reporting preliminary findings from England where rotavirus vaccination was recently introduced.

Rotavirus gastroenteritis in England is seasonal, occurring mainly between January and March,2 and is responsible for an estimated 130,000 General Practitioner (GP) visits and 13,000 hospitalisations every year in children younger than 5 years.3 On 01 July 2013, a two-dose, oral rotavirus vaccine, Rotarix®, was introduced into the national infant immunisation programme.4 On-going real-time national surveillance during the subsequent rotavirus season (January 2014 to March 2014) indicated an unprecedented decline in the number of laboratory-confirmed rotavirus infections, which has been attributed to the immunisation programme (Supplementary Figure).4 The Netherlands, however, reported an unexpected 58% decrease in rotavirus detections in children under 5 year olds during July 2000 and June 2014. During 2000/01 to 2012/13, the rotavirus season was consistently predictable, with well-defined peaks between January to March. In 2013/14, laboratory-confirmed rotavirus infections were 67% lower than the ten-season average for the same period in the seasons 2000/01 to 2012/13.4 Prior to routine vaccination, the number of reported rotavirus infections increased from birth and peaked at 12 months of age. In 2013/14, the most substantial reduction was observed among 2–11 month olds, the age-group targeted for immunisation (Fig. 1).

In order to identify any changes in laboratory testing practices, aggregate data for the total number of rotavirus tests performed and test results were collected from eight sentinel NHS microbiology laboratories with the highest number of rotavirus testing in England.6 Between January 2013 and June 2014, there were no changes in diagnostic guidelines at any of the participating sites. A total of 7681 samples were tested for rotavirus and 1214 (16%) tested positive in under 5 year olds. After the introduction of the rotavirus immunisation programme, a large volume of samples continued to be tested for rotavirus (Fig. 2A), with under 1 year olds consistently accounting for a quarter of all samples tested every month. The proportion of rotavirus test-positives, however, declined markedly during the first season after vaccine introduction, which was most marked in under 1 year-olds, but also noticeable in 1–4 year-olds who were not vaccine-eligible (Fig. 2B).

Together, the reduction in laboratory-confirmed reports, lack of evidence of a change in rotavirus testing practice
Figure 1  Weekly rotavirus laboratory reports in children younger than 5 years old by month of age, England 2000–2014. *Data are presented by month of age per epidemiological year, defined as running from July to June of the following year.

Figure 2  Sample-testing data for children younger than five years of age from eight sentinel microbiology laboratories in England between January 2013 and August 2014. (A) Number of rotavirus test-positives and total rotavirus tests per month and (B) percentage of rotavirus positive tests by age-group per month.
and the lower positivity rates specifically in the only age group with high vaccine coverage support a rapid and significant positive impact of the rotavirus immunisation programme on disease burden in England. Our results are similar to reports from the US, and other European countries with national rotavirus immunisation programmes. 1 In Belgium, for example, laboratory-confirmed rotavirus infections declined by 80% in under 1 year olds. 7 The main limitation of our findings is the assumption that the epidemiology would have remained similar if a vaccine had not been introduced, and that other factors would not change. England, like many other European countries, did experience a mild winter during 2013/14 with a higher mean winter temperature than the long-term average. 8 However, England has experienced milder winters in 2007, 1990, 1989 and 1998, 9 and rotavirus cases have never declined to such an extent in almost three decades of national surveillance. 2 Low birth rate as a possible explanation is also unlikely since birth rates in England have risen by 23% since 2001. 9 There was also no evidence of an unusual rotavirus strain causing relatively milder disease during 2013/14 (personal communication, David Allen, PHE Virus Reference Department, September 2014), with G1P[8] remaining the dominant strain along with a mixture of G2P[4], G3P[8], G4P[8], G8P[4], G9P[8] and G12P[8], as reported in previous years. 10

We conclude that immunisation against rotavirus has had a significant impact on burden of rotavirus disease in England within a year of vaccine introduction. Although naturally lower rotavirus activity was observed in the Netherlands during 2013/14, we could not identify any factor other than the infant immunisation programme to explain the decline in rotavirus disease in England. Ongoing national surveillance will continue to monitor the longer-term impact of rotavirus vaccination.

Conflict of interest
None.

Ethics approval
Public Health England has approval under Patient Information Advisory Group (PIAG) Section 60 of the Health and Social Care Act 2001 to process confidential information from patients for the purposes of monitoring the efficacy and safety of vaccination programmes.

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Mayet and colleagues describe a measles outbreak in France in the French military forces, during the major outbreak reported in France from 2008 to 2011, that involved >20,000 notified cases. Unexpectedly, more than 40% of them were young adults, including pregnant women. Because measles is responsible for high morbidity and mortality in newborns, administration of polyvalent immunoglobulins is recommended in neonates born from non-immune pregnant mothers exposed in late pregnancy. However, data regarding the tolerance and efficacy of polyvalent immunoglobulins in this specific group are lacking. We here report on the immediate and long-term tolerance and potential efficacy of polyvalent immunoglobulins administered to 7 neonates in this setting during an outbreak that occurred in our maternity ward in 2011.

Measles during pregnancy is associated with a higher risk of maternal pneumonia and related death, along with fetal loss and prematurity. Maternal measles occurring within 10 days before delivery may also lead to congenital infections, defined by a measles onset in the first 10 days of life. Congenital measles was associated with a fatality rate of 30–50% before the polyvalent immunoglobulins era, and exposes infants to an increased risk of subacute sclerosing panencephalitis with earlier onset (i.e., below 2 years of age). Newborn infants exposed postnatally and born from non-immune mothers are also at higher risk for severe neonatal measles and complications.

Post-exposure prevention is therefore key in non-immune pregnant women and their neonates. Live measles virus vaccination is contraindicated in pregnant women. It is also not recommended in neonates because of their immunological immaturity. Human polyvalent immunoglobulins have proven efficient to prevent or attenuate measles in children older than 6 months. As a part of the French plan for measles elimination, polyvalent immunoglobulins administered intravenously (IVIG) are recommended since 2005 in France after exposure to measles in pregnant women and neonates, although they have not been specifically evaluated in these settings. The French recommendations include IGIV administration to neonates whose mothers developed measles after birth.

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