

Report of the Australian Rotavirus Surveillance Program 2002–03

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Abstract

The National Rotavirus Reference Centre, together with collaborating laboratories Australia-wide, has conducted rotavirus surveillance since June 1999. This report describes the serotypes of rotavirus strains responsible for the hospitalisation of children with acute gastroenteritis during the period 1 July 2002 to 30 June 2003. We examined 573 faecal samples using monoclonal antibody immunoassays, reverse transcription-polymerase chain reaction, and polyacrylamide gel analysis. For the second consecutive year, serotype G9 strains were the most prevalent type nationally (74.7%) and were found in all seven contributing centres. Serotype G1 strains were the second most prevalent type (11.3%), identified in four of the centres. These findings have implications for vaccine development strategies which have targeted protection of disease due to serotypes G1–G4. *Commun Dis Intell* 2003;27:492–495.

Keywords: communicable disease, rotavirus, surveillance

Introduction

Rotaviruses are the single most important cause of severe gastroenteritis in young children worldwide. While there are few deaths in developed countries, there is considerable morbidity, with 10,000 Australian children hospitalised each year.¹ There is wide acceptance of the need for a vaccine to prevent rotavirus disease in children under five years of age throughout the world.

The previous rotavirus surveillance report from the National Rotavirus Surveillance Program, covering the period July 2001 to June 2002, highlighted the emergence of serotype G9 as the dominant serotype nationally.² For the first time since national surveillance began in 1993, serotype G1 was not the dominant type in Australia.

The National Rotavirus Reference Centre in Melbourne, together with collaborating laboratories in Western Australia and the Northern Territory, has undertaken the surveillance and characterisation of rotavirus strains causing annual epidemics of severe diarrhoea in young children. In this report we describe the results of the Australian Rotavirus Surveillance Program for the period 1 July 2002 to 30 June 2003.

Methods

Collaborating laboratories undertook rotavirus detection by enzyme immunoassay (EIA) or latex agglutination. Rotavirus positive specimens were collected, stored frozen and forwarded to Melbourne, together with relevant age and sex details. Specimens were then tested using an in-house monoclonal antibody (MAB) based serotyping EIA. The EIA employed a panel of MABs specific for the major glycoprotein VP7 of the outer capsid of the five major group A human rotavirus serotypes (G1, G2, G3, G4 and G9). Strains unable to be assigned a serotype were genotyped by reverse transcription/polymerase chain reaction (RT/PCR) using serotype specific oligonucleotide primers.³ Polyacrylamide gel electrophoresis was used to classify rotavirus strains genetically into electropherotypes, and to confirm the sharing of the same electropherotype between collaborating centres.

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Results

Number of isolates

A total of 573 specimens were received from Melbourne and the collaborating centres in Western Australia and the Northern Territory. Specimens containing insufficient specimen for testing or specimens that were not confirmed to be positive for rotavirus were omitted. A total of 487 rotavirus positive specimens over a 12 month period from 1 July 2002 to 30 June 2003 were analysed.

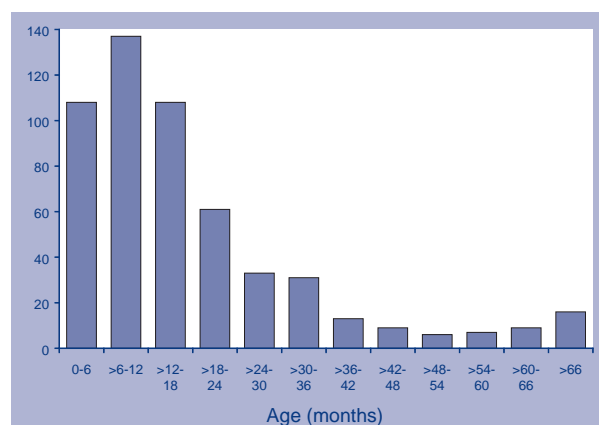
Age distribution

The age distribution of the children with acute gastroenteritis was typical of rotavirus infection (Figure 1). In the reporting period, 33 per cent of cases were from infants 12 months of age or less, 39 per cent were from patients 13–24 months of age, and 15 per cent were from patients 25–36 months of age. Overall, 87 per cent of samples were from children three years or less, and 94 per cent were from children five years or less. The male to female ratio was 1.1:1.

Serotype distribution

Rotavirus serotypes identified in Australia from 1 July 2002 to 30 June 2003 are shown in the Table. Serotype G9 was the most common, representing 74.7 per cent of all specimens and 50 per cent or more of serotypes identified in all seven centres. G1 was the second most common serotype, and represented 11.3 per cent of specimens overall, but was identified in only four centres (Melbourne, Perth, Darwin-Western Pathology and Western Australia's PathCentre) (Table). Serotypes G2, G3 and G4 each represented less than two per cent of all specimens. Serotype G3 was identified in three centres, Melbourne, Perth and WA PathCentre, while G2 and G4 were identified only in Perth (Table).

Figure 1. Age distribution of children with rotaviral infection, Australia, 1 June 2002 to 30 June 2003



During the reporting period, 3.4 per cent of the rotavirus samples analysed contained multiple serotypes. The presence of mixed infections provides the opportunity for rotavirus to undergo reassortment, potentially resulting in new strains. In 7.2 per cent of the samples a serotype was unable to be identified. These could represent samples with low virus numbers which are below the detectable limits of our assays. Alternatively, these could represent unusual serotypes not identified using standard methods. Future studies will include further characterisation of the genes encoding the outer capsid proteins of these strains.

Table. Rotavirus G serotypes in Australia, 1 July 2002 to 30 June 2003

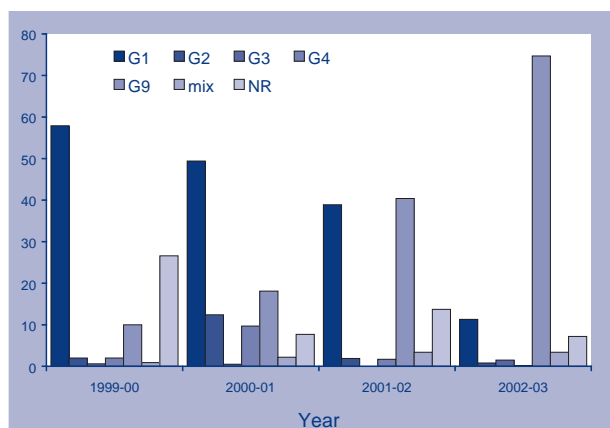
Centre	Total number	Serotype percentage						
		G1	G2	G3	G4	G9	Mixed serotypes	No result*
Melbourne	109	16.5	0.0	1.83	0.0	65.1	5.5	11.0
Perth	147	16.3	2.7	2.0	0.7	71.4	4.8	2.0
WA PathCentre	104	11.5	0.0	1.9	0.0	78.9	1.0	6.7
Darwin	39	0.0	0.0	0.0	0.0	87.2	10.3	2.5
Darwin-Western Pathology	6	16.7	0.0	0.0	0.0	50.0	0.0	33.3
Alice Springs	70	0.0	0.0	0.0	0.0	87.1	4.3	8.6
Gove	12	0.0	0.0	0.0	0.0	66.7	0.0	33.3
Total	487	11.3	0.8	1.5	0.2	74.7	3.4	7.2

* No result—unable to be serotyped with monoclonal antibodies or genotyped by RT/PCR.

Discussion

National rotavirus surveillance from 1 July 2002 to 30 June 2003 showed that serotype G9 continued to be the nationally dominant serotype comprising 74.7 per cent of all strains. Serotype G9 has steadily increased since it was first identified during Australia-wide surveillance in 1997.⁵ G9 became the second most prevalent serotype nationally during the 1999–00 and 2000–01 surveys, representing 10 per cent and 18.1 per cent respectively, of specimens collected in those years (Figure 2).^{6,7} G9 became the dominant strain nationally in 2001–02, comprising 40 per cent of the strains, but represented less than 14 per cent of strains in Melbourne and Perth.² The dominance of serotype G9 nationally in 2002–03 may be due to a large outbreak of acute gastroenteritis caused by rotavirus G9 in Central Australia during 2001.⁴

Figure 2. Rotavirus serotypes identified in Australia, June 1999 to June 2003



The four major rotavirus serotypes (G1, G2, G3 and G4) represented over 90 per cent of strains in epidemiological studies conducted throughout the world since the early 1980s.⁸ Serotype G9 is an emerging serotype, and since 1996 has been recognised as a frequent cause of acute diarrhoea in children. It is now recognised as the fifth most common serotype worldwide. Its apparent re-emergence is illustrated by serotyping studies from Japan. Serotype G9 strains were first identified in Japan in 1985–1986, but were absent for nine years until identified in two specimens in 1994–1995.⁹ The re-emergence of G9 in Japan has continued with an increased prevalence in 1996–2000.¹⁰ The high prevalence of G9 in Australia is remarkable when compared with prevalence of this serotype in other countries reported to date. Serotype G9 has been identified on all continents and in more than 17 countries, with prevalence rates of 1–8 per cent.^{11,12,13} Few countries have reported prevalence rates comparable to Australia. Epidemiological studies

from Bangladesh and Nigeria found 38 per cent and 53 per cent of rotavirus strains were type G9 during 1998 and 1997, respectively.^{14,15}

The decline in the prevalence of serotype G1 in Australia has been dramatic. G1 was the dominant serotype from 1993 to 1996¹⁶ and in two surveys conducted Australia-wide during 1999–00 and 2000–01, represented 58 per cent and 49.5 per cent of specimens.^{6,7} However, during the next two years (2001–02 and 2002–03), G1 declined to 38.9 per cent and 11.3 per cent respectively.² The decline in the prevalence of G1 strains around Australia can be attributed to the increase in the prevalence of G9 strains in Central Australia.

The increase in prevalence of serotype G9 has not been associated with changes in the age distribution of children infected with rotavirus. The majority of children (87%) infected with rotavirus were under three years of age.

These results together with those of previous years highlight the continuing change in the prevalence and emergence of new rotaviral serotypes. Multi-centre surveillance of rotavirus is important to continue to monitor strains and essential to inform the development of new rotavirus vaccines.

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