Rotavirus serotypes causing acute diarrhoea in hospitalized children in Yogyakarta, Indonesia during 1978–1979

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Summary. Rotavirus strains in stool specimens from 111 children aged 3–24 months admitted to hospital in Yogyakarta, Indonesia for treatment of acute diarrhoea were serotyped using VP7 serotype specific monoclonal antibodies in a double sandwich enzyme immunoassay. A serotype could be assigned to 59 of 111 specimens (53%). Inability to assign a serotype to 47% of specimens was probably due to loss of the outer capsid during transport of specimens from Indonesia to Australia. All four major human rotavirus serotypes were detected during the 15 month survey from June 1978 to August 1979, including one serotype 1, 5 serotype 2, 31 serotype 3, and 21 serotype 4 strains. One additional strain reacted with serotype 3 and 4 Mabs. Serotype 3 strains showed intratypic variation.

The relative frequency of serotypes 2, 3, and 4 varied during the 15 months and appeared to be influenced by climatic changes associated with dry and wet seasons. Vaccine strategies must take account of comparatively rapid changes of predominant serotypes in a community and are only likely to be successful if comprehensive immunity can be established simultaneously against the four major human serotypes.

Introduction

Rotavirus infection is the single most important cause of severe acute diarrhoea requiring admission to hospital of young children throughout the world. Development of an effective vaccine has become a priority of the World Health Organization in an attempt to reduce mortality in young children in developing countries [3]. Field trials of candidate rotavirus vaccines in developing countries have yielded variable results to date. Candidate vaccines derived from animal rotavirus strains have shown high efficacy, when tested in a field setting where
strains causing severe infection have been predominantly of the same serotype as that of the candidate vaccine [9]. The same vaccines have been ineffective when the predominant field strains have differed in serotype from the candidate strains [4].

In order to develop effective vaccine strategies it is necessary to compile information about the geographical and temporal distribution of rotavirus serotypes commonly isolated from infants with diarrhoea. Limited surveys of rotavirus serotypes (using assays incorporating absorbed hyperimmune sera) have shown a worldwide distribution of serotypes 1, 2, 3, and 4 [18]. These assays detect two outer capsid proteins (VP4, VP7), and recent evidence indicates that the serotype assignments correspond mainly with epitopes on the outer capsid glycoprotein VP7 [13]. The development of serotyping assays incorporating monoclonal antibodies reacting with epitopes on VP7 of human rotaviruses [8, 16] now permits serotyping of larger numbers of strains of human rotaviruses derived from field surveys.

We previously published results of a 13 month survey of the importance of rotavirus infection in aetiology of acute diarrhoea in children aged 0-24 months admitted to one hospital in Yogyakarta, Indonesia during 1978-1979 with acute diarrhoea [15]. The same specimens were subsequently analysed by electrophoresis of genome RNA and shown to comprise nine different electropherotypes [1]. This study now reports the relative frequency of human rotavirus serotypes in specimens collected during that survey.

Materials and methods

Specimens

Stool specimens from 111 children (62 males) aged 3-24 months known to be positive for rotavirus were studied. The children had been admitted to paediatric wards of Gadjah Mada Hospital, Yogyakarta, Indonesia for treatment of acute diarrhoea between June 1978 and August 1979. Specimens were obtained within 24 hours of admission to hospital from 35 children of medium-high socioeconomic level and 76 children of low socioeconomic level (defined as from rural and urban families with an income less than US$15.00 per month and unable to pay for hospital treatment). Specimens were initially stored at -20°C in Yogyakarta and transported by air in batches to Melbourne, Australia every 3-4 months. Electron microscopy had detected rotavirus particles as sole enteric pathogen in 107 children [15]. LT positive enterotoxigenic Escherichia coli had been identified in addition to rotaviruses in four children. Electrophoresis of genome RNA extracted from faecal specimens had allowed an electropherotype to be identified from 53 of the 111 specimens [1]. Rotavirus positive specimens used for serotyping had been stored at -70°C for 8-9 years as ultracentrifuged pellets prepared for electron microscopy.

Monoclonal antibodies

The derivation and classification of the neutralizing monoclonal antibodies used in the assay have been described previously [6, 7]. The serotype specificities have been confirmed using serum neutralization assays or solid-phase immune electronmicroscopy [11]. Six monoclonal antibodies that recognize VP7 of Group A rotaviruses were used. Mabs RV 4:1, RV 4:2, RV 4:3 recognize epitopes on VP7 of serotype 1 and permit classification into