VIRAL GASTROENTERITIS

ESSAY

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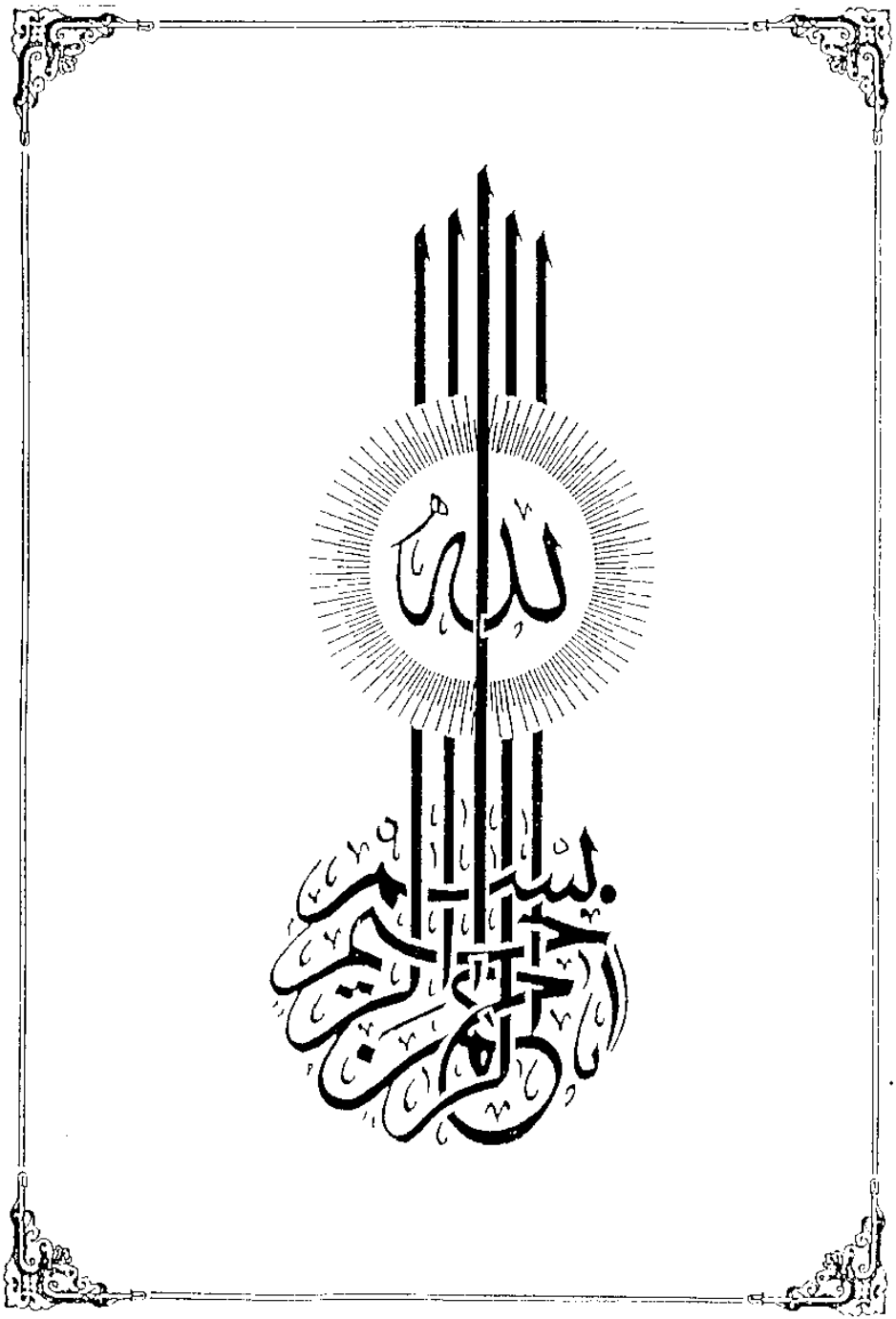

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Introduction

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Infectious gastroenteritis is a frequent recurring illness in young children. It is caused by a viral agent in 70 to 80% of cases (Buzby, 1992).

Acute viral gastroenteritis is a very common illness which occurs in both epidemic and endemic forms and affecting all age groups. The clinical presentation of the illness is variable, but in general it is self limited, has an explosive onset and is manifested by varying combinations of diarrhea, nausea, anorexia, myalgia and malaise. It is responsible for severe, indeed fatal, conditions in the infants or debilitated patients. Due to associated malabsorption, viral gastroenteritis may trigger or enhance the morbidity associated with malnutrition in marginally nourished population (Cukor et al., 1979).

Epidemic viral gastroenteritis is most frequently associated with the 27-nm Norwalk or Norwalk like viruses. The sporadic form of viral gastroenteritis is most frequently associated with the 70-nm rotaviruses (Kapikian et al., 1990).

Epidemic viral gastroenteritis has acquired various names in medical literature including " winter vomiting disease ", " acute infectious non bacterial gastroenteritis", "epidemic diarrhea and vomiting ", "epidemic

collapse" and "epidemic nausea and vomiting" (Blacklow et al., 1972).

Rotaviruses are the single most important aetiologic agents for severe diarrhea of infants and young children in developed and developing countries. They are associated with 35-50% of severe diarrhea in children younger than two years of age, but several other viruses (adenovirus, coronavirus, Norwalkvirus, astrovirus, calicivirus and enterovirus) are known to be capable of causing diarrhea (Hamilton, 1988).

In countries in the northern hemisphere with temperate climates it is suspected that 50% or more of gastroenteritis patients under two years of age who are admitted to hospitals between December and March shed rotavirus. The high incidence of rotavirus infection during the winter season does not conform with findings in countries with tropical and subtropical climates, where the virus is present throughout the year. In such countries, there are sometimes two peaks, one in winter and the other in summer (El Assouli et al ., 1992).

Enteric adenoviruses are considered the second most important viral agents of infantile diarrhea and are associated with 5% to 10% of diarrheal illness requiring hospitalization in infants and young children. Caliciviruses and astroviruses have not been implicated as important causes of gastroenteritis requiring hospitalization (Kapikian, 1993).

As well as these viruses,certain serotypes of coronaviruses can be detected in the faeces of patients with gastroenteritis (Duerden, et al., 1987).

Enteroviruses have been variably associated with acute diarrhea specially in summer months (Wyatt and Kapikian, 1981).

Viruses Associated with Acute Gastroenteritis in Humans (Kapikian, 1993).

Virus	Size, nm	Epidemiology	Important as a Cause of Hospitalization
Rotavirus			
Group A	70	Single most important cause (viral or bacterial) of endemic severe diarrheal illness in infants and young children worldwide (in cooler months in temperate climates).	Yes
Group B	70	Outbreaks of diarrheal illness in adults and children in China.	No
Group C	70	Sporadic cases and occasional outbreaks of diarrheal illness in children.	No
Enteric adenovirus	70-80	Second most important viral agent of endemic diarheal illness of infants and young children worldwide.	Yes
Norwalk virus and Norwalk-like viruses	27-32	Important cause of outbreaks of vomiting and diarrheal illness in older children and adults in families, communities, and institutions; frequently associated with ingestion of food.	No
Coronaviruses	80-160	Sporadic cases and small outbreaks of diarrheal illness in children and the elderly.	No
Enteroviruses	25-30	Sporadic cases in children.	No
Caliciviruses	28-40	Sporadic cases and occasional outbreaks of diarrheal illness in infants, young children, and the elderly.	No
Astroviruses	28	Sporadic cases and occasional outbreaks of diarrheal illness in infants, young children, and the elderly.	No

Rotavirus

Rotavirus

Rotavirus causes more than 500,000 deaths in young children in developing countries annually (Butler, 1984).

The importance of rotavirus as a major enteropathogen in infancy and childhood has been assessed throughout the world by several investigators and these viruses have been shown to play an important role as etiological agents of infantile acute diarrhea in both temperate and tropical countries. In developing countries where many children suffer from malnutrition, severe dehydration as a consequence of rotavirus diarrhea results (Linhares et al., 1988).

However rotavirus may not always be associated with disease, neonates, in particular, have been found to excrete the virus asymptomatically (Rodriguez et al., 1983). Such asymptomatic infections in neonates have been shown to confer protection against clinically severe rotavirus disease (Bishop et al., 1983).

Morphology:

Rotavirus is a wheel-like structure with large hub-like 36 nm core of nucleic acid from which short cylinderical capsomeres radiate like spokes of wheel and hence the name rotavirus (Flewett et al., 1974).

Stannard and Schoub (1977) proposed that the virus is seen in three forms; complete, incomplete and stain penetrated particles.

1- Complete (smooth):

These have a smooth outer layer with icosahedral symmetry, 60-75 nm in diameter. This outer capsid has a honey comb appearance on the outer surface.

2- Incomplete (rough):

These are single shelled particles, 50-60 nm in diameter. The inner capsid is an icosahedral structure with 9 capsomeres perface, and thus a total of 180 structural capsomeres per particle with a lattice like arrangement. It is not outlined by a rigid array of capsomeres and this must allow some elasticity in the shape of the particle, so that at times it becomes almost spherical.

3- Stain penetrated particles:

The particles appear empty and have rounded appearance.

Antigenic Structure:

Up to 1980, all Rotavirus strains isolated from human and many animal species, shared a common group antigen detected by immunofluorescence. Since 1980, viruses having the characteristic

morphology of rotaviruses but not sharing the common group antigen had been described. Pedley (1983) called them "atypical rotaviruses" or "Pararotaviruses".

The rotavirus common antigens are located on the inner capsid. These can be detected by immunofluorescence, complement fixation and ELISA. Two major antigenic subgroups of rotaviruses have been identified. Type specific antigens differ among rotaviruses, and are demonstrable by neutralization tests. At least 4 serotypes have been identified among human rotaviruses, and at least 3 more serotypes exist among animal isolates (Dimitrov, et al., 1985).

Classification:

Rotaviruses have been classified serologically into seven distinct groups (A to G) on the basis of group specific antigen detected by immunofluorescence, ELISA, or immunoelectron microscopy. Group A rotaviruses, the most common group, are found in almost all species and are divided into at least 12 distinct serotypes (Browning et al., 1991).

Viruses in the genus Rotavirus have been classified into groups, subgroups (I, II, I + II and non I non II) and serotypes (1 to 14). The two proteins in the virion outer shell, VP4 and VP7, have been shown to elicit a neutralizing antibody response. Although the possibility of

classifying virus serotypes on the basis of epitopes present on VP4 (P specific) is being actively investigated, currently virus serotypes are defined on the basis of epitopes present on glycoprotein VP7 (G specific) (Beards et al., 1992).

Human rotaviruses were isolated from asymptomatic neonates at various hospitals and clinics in the city of Bangalore, India, and were found to be subgroup I. Three of these strains were adapted to tissue culture and found by serotype analysis and neutralization assays to be of serotype 10, a serotype commonly found in cattle but infrequently found in humans and not previously identified in neonates (Dunn et al., 1993).

Resistance:

The carbohydrate moiety in rotavirus particle affords it some protection against degradation with proteolytic enzymes. Acid treatment causes loss of infectivity of rotaviruses. However they are stable at pH4 (Welch and Twiechaus, 1973).

Also, the virus retains its morphology when heated at $50^{o}C$ for 1 hour (Brooks et al., 1991).