Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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LEADING ARTICLE

Enteric viruses in hospital-acquired infection

In a recent prevalence study of nosocomial infection in the United Kingdom (Meers *et al.*, 1981), there were surprisingly few reports of virus-associated disease. There is, however, clear evidence that enteric viruses may be transmitted to patients in hospitals and other confined communities. The spread of enteroviruses such as Echo (Nagington *et al.*, 1978) and Coxsackie (Pether, 1982) is known to occur in these environments and in the case of neonates has occasionally resulted in serious illness with significant mortality. Transmission of hepatitis A virus has also been documented as an infection hazard, especially in institutions caring for mentally retarded children (Krugman and Giles, 1970). During the last decade viruses have been recognized as an important major cause of acute diarrhoeal disease. At present rotavirus infection is thought to account for the majority of these cases although there is increasing evidence of episodes associated with other agents, e.g. adenovirus (Flewett *et al.*, 1975), astrovirus (Kurtz, Lee and Pickering, 1977), calicivirus (Cubitt, McSwiggan and Arstall, 1980) and coronavirus (Caul, Paver and Clarke, 1975).

In special care baby units, outbreaks of rotavirus infection may cause symptoms of mild diarrhoea and vomiting (Bishop *et al.*, 1976), but this is not always the case. We have investigated an episode in which infection was accompanied by severe illness which resulted in a number of deaths. Rotavirus may become endemic in such units and under these circumstances infected babies often remain asymptomatic (Chrystie, Totterdell and Banatvala, 1978). Evidence for this situation was provided by a study of the RNA profiles of rotaviruses affecting neonates in a unit in Melbourne (Rodger *et al.*, 1981). In this study, certain strains of virus persisted in the unit for a period of up to four years and differed from strains circulating in the community during this time. Rotavirus infection requiring hospital admission is most common in the six months to three years age group. Nosocomial infections are extremely common in this age range (Holmes, 1979). Recently there have also been a number of reports of infection in adults, involving both patients and staff. These have taken place in an obstetric unit (Hildreth, Thomas and Ridgeway, 1981) and in several wards and residential homes caring for elderly patients (Cubitt and Holzel, 1980; Holzel *et al.*, 1980). In these episodes symptoms ranged from mild diarrhoea to severe gastrointestinal fluid loss requiring intravenous rehydration.

An appreciation of the world-wide distribution of rotavirus infection became possible only recently following the introduction of methods, e.g. immunofluorescence, CIE and ELISA, which are more readily available than electron microscopy as diagnostic techniques. At present, electron microscopy provides

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the only means of diagnosis of infection caused by the non-cultivable gastroenteritis viruses and, therefore, little is known of their true significance in nosocomial infection. During the last year, both astrovirus (Lee and Kurtz, 1981) and adenovirus type 38 (De Jong *et al.*, 1981) have been propagated *in vitro* and further progress along these lines should lead to the development of less sophisticated and expensive means of diagnosis.

Transmission of enteric viruses is generally considered to be via the faecal-oral route and spread of infection may be from patient to patient, or via members of the hospital staff. Upper respiratory tract symptoms are, however, not infrequently reported in association with gastrointestinal disturbance (Steinhoff, 1980; Cubitt and McSwiggan, 1981). These findings suggest that spread of virus may occur via the respiratory route, a possibility which requires further investigation.

Recent studies (Kurtz, Lee and Parsons, 1980; Tan and Schnagl, 1981) investigating the virucidal activity of various disinfectants, have shown the importance of selecting an appropriate compound. These reports indicated that 90 per cent ethanol was the most effective agent against a whole range of enteric viruses. Tan and Schnagl found that commonly used disinfectants, such as 'Hexol', 'Hibiclens' and 'Betadine', were of little value. These findings should be considered in formulating policies both for hand washing and for the disinfection of contaminated equipment. Use of inefficient bedpan washers is a recognized hazard and this possible source of virus transmission was highlighted in the report concerning the outbreak in an obstetric unit (Hildreth *et al.*, 1981).

Management of outbreaks of rotavirus infection requires close collaboration between laboratory and clinical staff. Virological investigations are frequently omitted until bacterial causes have been excluded and we strongly recommend that both types of investigations are performed in parallel. Whenever possible faecal specimens from all patients and staff of an infected unit should be screened for the presence of virus. This may be of particular value as some patients may continue to excrete virus long after the cessation of symptoms. Ideally if all cases are to be diagnosed investigations should also include serological tests.

Our experience of outbreaks in three distinct clinical settings provides information on some aspects of control. Where isolation facilities are provided and correctly used, it is possible to terminate an outbreak rapidly. In practice, isolation cubicles are rarely available and, in units dealing with long-stay patients, control measures are limited to 'stool urine needle' isolation (Bagshawe, Blowers and Lidwell, 1978) and to the limitation of all staff movement from the affected ward. In general wards, where length of hospital stay is short, it may be feasible to close the unit to admissions until no further cases have appeared for 72 h. These measures should limit the extent of the outbreak.

It seems likely that a wider realization of the importance of hospital-acquired viral infection supported by the availability of new diagnostic techniques will improve our understanding and management of this type of nosocomial infection.

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References

Bagshawe, K. D., Blowers, R. & Lidwell, O. M. (1978). Isolating patients in hospital to control infection. *British Medical Journal* **2,** 879–881.

Bishop, R. F., Hewstone, A. S., Davidson, G. P., Townley, R. R. W., Holmes, I. M. & Ruck, B. J. (1976). An epidemic of diarrhoea in human neonates involving a reovirus-like agent and Enteropathogenic serotypes of *Escherichia coli*. *Journal of Clinical Pathology* **29,** 46–49.

Caul, E. O., Paver, W. K. & Clarke, S. R. V. (1975). Coronavirus-like particles in faeces from patients with gastroenteritis. *Lancet* **i,** 1192.

Chrystie, I. L., Totterdell, B. M. & Banatvala, J. E. (1978). Asymptomatic enteric rotavirus infection in the newborn. *Lancet* **i,** 1176–1178.

Cubitt, W. D. & Holzel, H. (1980). An outbreak of rotavirus infection in a longstay ward of a geriatric hospital. *Journal of Clinical Pathology* **33,** 306–308.

Cubitt, W. D. & McSwiggan, D. A. (1981). Calicivirus gastroenteritis in north west London. *Lancet* **2,** 975–977.

Cubitt, W. D., McSwiggan, D. A. & Arstall, S. (1980). An outbreak of calicivirus infection in a mother and baby unit. *Journal of Clinical Pathology* **33,** 1095–1098.

De Jong, J. C., Wigand, R., Kidd, A. M., Wavel, G. & Kupsenberg, J. G. (1981). Candidate Adenovirus 38, associated with human infantile gastroenteritis and related to non-cultivable enteric adenovirus. *5th International Congress of Virology, Strasbourg* P16/10, p. 194.

Flewett, T. H., Bryden, A. S., Davies, H. & Morris, C. A. (1975). Epidemic viral enteritis in a longstay children's ward. *Lancet* **1,** 4–5.

Hildreth, C., Thomas, M. & Ridgway, G. L. (1981). Rotavirus infection in an obstetric unit. *British Medical Journal* **282,** 231.

Holmes, I. H. (1979). Viral gastroenteritis. In *Progress in Medical Virology*, Vol. 25 (Melnick, J. L., Ed.), pp. 1–36. Basel: Karger.

Holzel, H., Cubitt, W. D., McSwiggan, D. A., Sanderson, P. J. & Church, J. (1980). An outbreak of rotavirus infection among adults in a cardiology ward. *Journal of Infection* **2,** 33–37.

Krugman, S. & Giles, J. P. (1970). Viral hepatitis: new light on an old disease. *Journal of the American Medical Association* **212,** 1019.

Kurtz, J. B., Lee, T. W. & Parsons, A. J. (1980). The action of alcohols on rotavirus, astrovirus and enterovirus. *Journal of Hospital Infection* **1,** 321–326.

Kurtz, J. B., Lee, T. W. & Pickering, P. J. (1977). Astrovirus associated gastroenteritis in a children's ward. *Journal of Clinical Pathology* **30,** 948–952.

Lee, T. W. & Kurtz, J. B. (1981). Serial propagation of astrovirus in tissue culture with the aid of trypsin. *Journal of General Virology* **57,** 421–424.

Meers, P. D., Ayliffe, G. A. J., Emmerson, A. M., Leigh, D. A., Mayon-White, R. T., Mackintosh, C. A. & Stronge, J. L. (1981). Report on the National Survey of Infection in Hospitals 1980. *Journal of Hospital Infection* **2** (Supplement).

Nagington, J., Wreghitt, T. G., Gandy, G., Robertson, N. R. C. & Berry, P. J. (1978). Fatal Echovirus 11 infections in an outbreak in a special care baby unit. *Lancet* **2,** 725–728.

Pether, J. V. S. (1982). Coxsackie B2 outbreak in a special care baby unit. *Communicable Disease Report* 82/C4.

Rodger, J. M., Bishop, R. F., Birch, C., McClean, B. & Holmes, I. H. (1981). Molecular epidemiology of human rotaviruses in Melbourne, Australia from 1973–1979, as determined by electrophoresis of genome ribonucleic acid. *Journal of Clinical Microbiology* **13,** 272–278.

Steinhoff, M. C. (1980). Rotavirus: the first five years. *Journal of Paediatrics* **96,** 611–622.

Tan, J. A. & Schnagl, R. D. (1981). Inactivation of a rotavirus by disinfectants. *Medical Journal of Australia* **1,** 19–23.