

WELCOMING NOTE - LYN GILBERT

Welcome to the first edition of "The Broad St Pump"

Welcome to the first edition of "The Broad St Pump". This will be a regular review of public health microbiology news from ICPMR's Centre for Infectious Diseases and Microbiology (CIDM), Division of Analytical Laboratories (DAL) and CIDM-Public Health - the research group within CIDM, which includes members of laboratory and clinical services and the Sexually Transmissible Infections Research Centre (STIRC). Together these groups provide public health microbiology and communicable diseases reference services, including food and water testing, surveillance and outbreak investigations of foodborne and other enteric

infections; legionellosis, tuberculosis and other respiratory infections; arboviral, blood borne and exotic viral infections; sexually transmissible and vaccine preventable diseases.

Our aim will be to provide feedback to referring laboratories and up-to-date information about important or interesting communicable disease outbreaks and measures taken to identify and control them; epidemiological trends; and new developments in diagnosis and typing of pathogens of public health importance. We welcome comment or questions from our readers.

Lyn Gilbert,
Director, CIDM Laboratory Services &
CIDM Public Health



In 1854, Dr John Snow observed that most cases that occurred in the first few days of an explosive cholera epidemic, in London, occurred in close proximity to Broad St. parish pump, from which 89% of people who died, regularly drew water. He persuaded the vestrymen of the local parish of St James to remove the handle of the pump whereupon "the plague immediately abated". His circumstantial evidence would not have been upheld in a court if the parish had refused his request (or later sued him for loss of revenue). Today he would need a sophisticated laboratory to provide proof of his suspicion.

FEATURE ARTICLE - DOMINIC DWYER

Emerging viral infections in Australia and the region

Introduction

Emerging viruses causing significant clinical disease continue to be described locally and overseas. In recent years Australia has seen the emergence of three newly described bat-transmitted viruses, the geographic extension of previously recognised arboviruses, new outbreaks of enteroviruses and ongoing transmission of newer viruses including human immunodeficiency virus (HIV), hepatitis C virus and human herpes virus 8 (HHV-8). In the Asian region, SARS coronavirus, new strains of avian (H5N1) and human (Fujian H3N2) influenza viruses and Nipah virus, amongst others, have emerged to cause significant morbidity and mortality, with associated economic and political fallout. Approximately 75% of emerging infectious diseases are zoonotic in origin.

There are several examples of new viruses causing previously unrecognised infections in Australia. The equine morbillivirus, or Hendra virus, produced a respiratory infection with high mortality in thoroughbred horses in the Brisbane suburb of Hendra in 1994 and infected three humans with one fatality. The Australian bat lyssavirus was first isolated from the brain of a bat with encephalitis found at Ballina, NSW, in 1996 and has been associated with fatal encephalitis in at least two individuals. The Menangle virus or pig paramyxovirus produced birth defects in piglets and a symptomatic illness in piggery workers at Menangle in June 1997. Nipah virus, a paramyxovirus closely related to the Hendra virus (these are now

called henipaviruses), produced an outbreak of encephalitis in Malaysia and Singapore in 1999.

Enteroviruses

Enteroviruses cause a wide spectrum of clinical disease, mainly in children, including hand, foot and mouth disease (HFMD), respiratory infections, myocarditis and encephalitis. Enterovirus 71 (EV71) causes HFMD with a high incidence of severe central nervous system involvement. Epidemics occurred in 1997 in Sarawak, Malaysia, in 1998 in Japan and Taiwan and in Singapore in 2000. Outbreaks of EV71 have occurred before in Australia but the numbers of people involved in the Malaysian and Taiwan epidemics, the rapid spread of infection (suggesting respiratory rather than enteric transmission) and the geographic proximity to Australia raises concerns about potential outbreaks in this country.

Influenza

One of the most remarkable features of the influenza virus is its ability to undergo antigenic variation, a characteristic that contributes to regular outbreaks of infection.

In Hong Kong during 1997 a new influenza A virus, H5N1, was responsible for a major outbreak of avian infection that spread to humans. Eighteen people were infected, with six resulting deaths, raising concerns over the potential of a new pandemic.

In the last year there have been large outbreaks of avian H5N1 influenza in southeast Asia, with occasional transmission to humans.

Severe acute respiratory syndrome (SARS)

In late 2002 reports of a new severe respiratory disease began to emerge from Guangdong in southern China. Now defined as Severe Acute Respiratory Disease (SARS), explosive outbreaks in Hong Kong, Singapore, Vietnam, Canada and China brought it international attention in early 2003. As the first major new infectious disease of this century, it was unusual in its high morbidity and mortality rates, and took full advantage of the opportunities provided by international travel and by hospital environments. By July 2003, 8,437 cases of SARS had been reported worldwide, leading to 813 deaths.

SARS causes fever, followed by a rapidly progressive respiratory compromise as well as chills, muscle aches, headache, loss of appetite and diarrhoea. These features may be similar to influenza and other causes of atypical pneumonia. The aetiological agent of SARS is a novel coronavirus (SARS-CoV), almost identical to viruses isolated from palm civets and other wild animals from food markets in southern China. Whether these animals are the origin of the SARS-CoV, or were 'bystanders', is still uncertain. Chinese food handlers including caterers and chefs were over represented amongst the first patients with SARS, consistent with SARS being a zoonosis. Having crossed species from animals to people, SARS then spread from person to person.

The WHO played a vital role in the containment of SARS by issuing global alerts and emergency travel recommendations, and

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STAFF PROFILE



Jo-Anne MacRae

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Jo has been working at ICPMR for twenty years as a Scientific Officer. She first started in Immunology on secondment from Sydney Hospital then moved to Virology and Microbiology.

For the past twelve years Jo has been responsible for the Electron Microscopy section of Clinical Virology. During this time she became interested in Molecular Biology and has developed two molecular based assays; norovirus PCR, routinely used for the investigation of viral gastroenteritis, and polyomavirus PCR, routinely used to monitor renal transplant patients.

In the future Jo is planning to develop quantitative PCR assays.

Norovirus

Norovirus is a major cause of food and waterborne outbreaks of non-bacterial gastroenteritis. Person to person transmission ensures rapid spread of the disease and fomites also play a role. The illness has a short incubation period of around 12- 48 hours and is characterized by projectile vomiting and watery diarrhoea. Abdominal cramps, nausea and fever may also occur. The symptoms usually resolve within 12 to 60 hours. Large numbers of viral particles are excreted in stools and vomitus and excretion in stools can continue for a period greater than 2 weeks. The infectious dose is as low as < 10² particles. There have been reports of outbreaks involving hundreds of people in military facilities, hospitals, cruise ships, restaurants and following consumption of contaminated food and beverages. The virus survives 10ppm chlorine, freezing and heating to 60°C.

Since June 2000 a reverse transcriptase polymerase chain reaction (RT-PCR) has been used at ICPMR for the detection of norovirus in stools and vomitus. During this time we have investigated 519 outbreaks of gastroenteritis. A total of 229 of the 519 outbreaks investigated

(44%) were positive for norovirus.

By category, norovirus positive results were confirmed for outbreaks investigated as follows: aged care & retirement villages 93/163 (57%); hospitals 109/269 (41%); Public Health Unit referred 11/32 (34%); community outbreaks 7/28 (25%); childcare, playgroups and schools 4/12 (33%); military facilities 3/5 (60%); university and training facilities 1/5 (20%) and vocational settings 1/5 (20 %). Around 5% of individual cases not associated with an outbreak have previously been shown to be positive for norovirus.

Outbreaks not due to norovirus were further investigated using electron microscopy. We were able to find a viral cause in around 5% of outbreaks investigated by electron microscopy and 17% of sporadic cases.

Future outbreaks will be investigated using a combination of ELISA, RT-PCR and electron microscopy. The ELISA kits, although not as sensitive as RT-PCR, will enhance the laboratory's ability to test large numbers of stool specimens with a shorter turn around time.

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FEATURE ARTICLE

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quickly set up collaborative networks in laboratory diagnosis and research, clinical management and epidemiological investigation. One month after issuing a global alert the causative agent was isolated by laboratories working within the WHO Global Laboratory Network. The early recognition of the aetiological agent made it possible to rapidly develop molecular and serological diagnostic assays, the details of which were made available on the internet.

Arboviruses

Australia has more than 75 arboviruses but only a handful produce human disease, the most important being the Ross River (RRv), Barmah Forest (BFv), Japanese encephalitis (JE), Murray Valley encephalitis (MVE) and Dengue viruses. BFv is an alphavirus, similar to RRv and unique to Australia, that produces an epidemic polyarthrits with rash. Its distribution is predominantly down the east coast of Australia. More recently it has extended into new areas in Western Australia and the Northern Territory. RRv is endemic in rural Australia and in recent years there has been spread of RRv to the edges of urban areas including the major capital cities.

The JE virus is a flavivirus found throughout southeast Asia, India and China that is responsible for a severe encephalitis, mostly in children, as well as asymptomatic infection. It was first reported in Australia in 1995 with three

clinical cases and seroconversion in pigs and humans described on Badu Island as well as on other surrounding islands in the Torres Strait. In 1998 an Australian fisherman acquired clinical JE infection on the west coast of Cape York Peninsula. Australia has both the mosquito vectors (Culex. annulirostris and Cx. gelidus) and the vertebrate hosts (feral and domestic pigs and wild birds) to allow JE to become established and continuing surveillance and mosquito control is necessary to prevent this from occurring. JE vaccination is currently recommended for all residents of the 'outer' islands of the Torres Straits and is given simultaneously with the measles-mumps-rubella vaccine at 12 months of age.

Discussion

The control of emerging viral infections is dependent on many factors. Clinicians must be alert to the presentation of new syndromes or clusters of disease (not just in the context of travel or unusual exposure) to provide early warning of the circulation of new viruses. This must be supported by international human and veterinary laboratories able to diagnose and characterise new agents, as demonstrated by the multidisciplinary approach to the investigations of the Hendra, Menangle, Nipah and SARS coronavirus infections. The formation of the Public Health Laboratory Network (PHLN) in 1957, under the auspices of the Communicable Diseases Network of Australia (CDNA), was an attempt to improve such collaboration within Australia.

Environmental and social factors impact upon disease emergence. Changing weather patterns or global warming (arboviruses), increasing urbanisation (RRv), animal husbandry (H5N1 influenza, Menangle virus, SARS-CoV), international travel (dengue, influenza, SARS), social behaviour (hepatitis C virus, HIV and HHV-8), and advances in medical practice (latent animal viruses from xenotransplantation) are examples of known factors that influence viral epidemiology.

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