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Measles — Old Nemesis Reappears

ON the 9th of June, a child from China being adopted by a family in the metropolitan area arrived at Kansas City International Airport. The following day, this child developed a rash illness and was hospitalized. Subsequently the child was shown by laboratory confirmation to have measles. An adult case of measles was later linked to this child. It was most likely that this child was infectious from the 6th to the 14th of June; a period that included travel on two different airlines. Unfortunately, because passenger lists are not maintained by airlines after flight completion, it was impossible to notify the other passengers of their possible exposure to measles.

In this post-measles vaccine era in the United States, importations of this virus are not uncommon. Earlier this year, for example, the Centers for Disease Control and Prevention (CDC) reported on other cases of measles among adoptees from China (MMWR 53:323, 2004). During 2001-2003, a total of 216 cases of measles were reported to CDC of which 96 (44%) were imported (MMWR 53:713, 2004). Of the 120 cases acquired in the US, 59 (49%) were linked to an imported case, 18 (15%) were not linked to an imported case but were infected with a

virus strain of non-US origin, and 43 (36%) had unknown sources. Two individuals died as a result of their infection for a case-fatality rate of 0.9%.

Measles was first described in the 7th century and was the 1st clinically characterized rash illness of children. Prior to the deployment of measles vaccines in 1963, infection in the US population was nearly universal. Approximately 450,000 cases were reported annually and more than 400 persons died each year from measles. In 1963, two different measles vaccines were licensed — a killed virus product (eventually withdrawn in 1967) and an attenuated live-virus vaccine. The live virus vaccine underwent changes in 1965 and 1968. In 1971, the measles vaccine was combined with vaccines for mumps and rubella, resulting in the MMR (measles-mumps-rubella) vaccine product. Because 2-5% of the vaccinees failed to respond to a single dose of measles vaccine, in 1989 the US adopted the current 2-dose vaccination schedule for this virus.

Measles vaccines proved highly effective at reducing the number of cases and deaths from measles. In 1963, the year the vaccines were introduced, there were 385,156 cases of measles reported nationally. By 1969, only

Numbered Rash Illnesses of Children

#	Name	Agent
1	Measles	Measles (rubeola) virus
2	Scarlet fever	Streptococcus
3	Rubella	Rubella virus
4	Duke's disease	No agent; non-existent disease
5	Erythema infectiosum	Parvovirus B19

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25,826 cases were reported. Despite flare-ups in 1971 and 1977 (75,290 and 57,345 cases, respectively), the number of measles cases reported in the US continued to decline so much so that the 1,000+ cases reported in 1990 and again in 1991 were considered significant increases.

Although data is not available for every year, extant records for Kansas City show that an average of 1,000+ cases of measles occurred every year in the City between 1920 and 1963. Following the introduction of measles vaccination, the annual case counts began declining. During the 1970s, only 1,521 cases were recorded with 97% of those cases occurring in two outbreaks (1,403 in 1971 and 79 in 1977 — the two years when the disease flared up nationally). Between 1980 and 2003, there were 18 documented cases of measles in 8 different years among Kansas City residents, the last in 1996.

There is a growing concern in the US and some other countries over declining immunity levels against various vaccine-preventable diseases. These declines reflect the attitudes, beliefs, and behaviors of parents regarding vaccine safety concerns and as a result many children are not immunized or are under immunized (Pediatrics 114:e16, July 2004). Vaccination rates are falling across the country. In 2001, CDC estimated that only 62.8 of children 19-35 months of age were fully vaccinated. In June 2004, a telephone survey commissioned by the Kansas City Health Commission found that 3.2% of over 1,200 Kansas City residents interviewed thought it was not a good idea to vaccinate children. Sixty percent of these individuals felt vaccines were not safe, 16% said they were not needed, and the balance expressed other reasons.

Polio Eradication — Snag in the Road

THE successful smallpox campaign of the late 1900s demonstrated that global eradication of a disease is possible, given the necessary technical base, political commitment and economic resources for immunization and continued surveillance. Currently, there are 3 infectious viral disease candidates for global eradication — polio, measles, and rubella. Each of which closely satisfies necessary preconditions for eradication as outlined by the 1997 Dahlem Conference of Disease Eradication (Institute of Medicine. *Considerations for Viral Disease Eradication*. 2002. Natl Acad Press, Washington DC):

1. no animal reservoir for the virus is known or suspected;
2. sensitive and specific tools are available for diagnosis and surveillance;

3. transmission from one individual to another can be interrupted;
4. non-lethal infection or vaccination confers life-long immunity;
5. the burden of disease is important to international public health; and
6. political commitment to eradication efforts exists.

Of the 3 diseases, poliomyelitis is likely the next candidate for global eradication. In the Americas, polio was eradicated in the early 1990s, and there were only 783 cases reported worldwide in 2003. At the end of 2003, there were only 6 countries that harbored endemic polio — Afghanistan, Pakistan, India, Egypt, Niger, and Nigeria. As of the 18th of August, these 6 countries reported 569

cases of polio with 80% occurring in Nigeria. The current goal is certification of global eradication by 2005.

The situation in Nigeria is particularly frustrating. In mid-2003, vaccination efforts were suspended in the northern state of Kano when certain Muslim clerics claimed that the vaccine was an attempt by non-Muslims to sterilize children. It was not until the summer of 2004, that Nigerian health authorities attempted to restart vaccination efforts with a vaccine prepared in a Muslim country. The country's President made a media event out of his child being given this vaccine, but still influential clerics oppose the program.

Of global concern is that the situation in Nigeria will allow polio virus to reestablish itself in other African countries. This year alone, more than 80 cases of imported polio have been recorded from previously polio-free countries in Africa. Genetic sequencing has linked the viruses from cases to strains currently circulating in northern Nigeria

Historic Tidbit

Children's Mercy Hospital staff reported that 70-80% of children in Kansas City were immune to polio virus, while only 56% were immune to pertussis.

Source: Missouri Med 79:81, 1982.

(Weekly Epi Record 79:253, 2004). On the 23rd of August, it was announced that 12 countries in sub-Saharan Africa were now reporting cases.

The African situation reaffirms that the main challenges confronting global eradication of polio are maintaining high levels of immunization in the population at large and targeting high-risk areas with "mopping up" operations in order to interrupt the last chains of transmission. Thus, eradication efforts need to be stepped up drastically as most of the world is vulnerable to re-infection through cross-border importations.

Plague — A Persistent Threat

WHILE the Black Death, or plague, is viewed as a historical curiosity by many, this disease remains of concern in the world today as a naturally occurring cause of illness and death, and as a potential bioterrorist weapon. According to the World Health Organization, in 2002-2003, 4,043 human cases of plague were reported worldwide (WER 79:301, 2004). A total of 359 deaths from plague resulted from these infections, for a case-fatality rate of 8.9%. Over the prior 10 years (1992-2001), the worldwide case-fatality rate averaged 7.1%.

Between 1989 and 2003, there were 38,310 human plague cases and 2,845 deaths recorded in 25 countries. Throughout this period, 8 countries reported plague cases almost annually, including the

US. During this 15 year period, the US recorded 91 cases and 9 deaths. Plague is an endemic disease in the southwestern and western states, or essentially all states west of the 101st meridian.

The most recent US case had onset of illness on the 16th of August 2004 (Associated Press, 8/26/04). This case involved a 54 y old woman who had been hiking and camping in Larimer County Co. Although she initially presented as bubonic plague, the case evolved into secondary pneumonic plague. In the week prior to this case, 2 cats in Larimer County were diagnosed with plague, although it is not believed that cats were involved in this woman's infection. Plague in cats is common in plague endemic states and transmis-

sion of *Yersinia pestis* to humans has been documented on more than one occasion.

The potential use of plague as bioterrorist weapon is of concern. There are instances where it was used as a weapon in military actions, the most recent by the Japanese during World War II against populated areas of China. And, the former Soviet Union manufactured large quantities of plague suitable

for use (an endemic area) traveled to New York City where they subsequently incubated out their infection and became ill with bubonic plague.

The phenomenon of acquiring plague in one area and becoming ill in another area where plague is not endemic is referred to as peripatetic plague. Although rare, peripatetic plague is more likely to result in fatal outcomes because of delays in seek-

for placing into weapons; this material still exists.

When cases of human plague occur far away from known endemic areas consideration must be given to potential bioterrorism. Yet, it must be ascertained if the cases were naturally acquired. This was the situation in 2002, when the only known human plague cases in the US turned up in New York City, far away from any endemic area (MMWR 52:725, 2004). A couple from New Mex-

ico (an endemic area) traveled to New York City where they subsequently incubated out their infection and became ill with bubonic plague.

Cases of plague resulting from bioterrorist activity are more likely to present with primary pneumonic or primary septicemic plague rather than the bubonic form of the disease. This is because the agent in all likelihood would be released as an aerosol.



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