231e Mumps

Steven A. Rubin, Kathryn M. Carbone

DEFINITION

Mumps is an illness characterized by acute-onset unilateral or bilateral tender, self-limited swelling of the parotid or other salivary gland(s) that lasts at least 2 days and has no other apparent cause.

ETIOLOGIC AGENT

Mumps is caused by a paramyxovirus with a negative-strand, nonsegmented RNA genome of 15,384 bases encoding at least 8 proteins: the nucleo- (N), phospho- (P), V, matrix (M), fusion (F), small hydrophobic (SH), hemagglutinin-neuraminidase (HN), and large (L) proteins. The N, P, and L proteins together provide the polymerase activity responsible for genome transcription and replication. The viral genome is surrounded by a host cell–derived lipid bilayer envelope containing the M, F, SH, and HN proteins. The M protein is involved in viral assembly, whereas the HN and F proteins are responsible for cell attachment and entry and are the major targets of virus-neutralizing antibody. The V and SH proteins are accessory proteins, acting as antagonists of the host antiviral response; the former interferes with the interferon response and the latter with the tumor necrosis factor α (TNF-α)–mediated apoptotic signaling pathway. Because of the hypervariability of the SH gene, its nucleotide sequence is used to "genotype" the virus for molecular epidemiologic purposes. Thus far, 12 mumps virus genotypes have been assigned by SH gene sequence and are designated A–N (with the exclusion of E and M, which have been merged with genotypes C and K, respectively).

Nucleotide sequencing of clinical isolates shows that virus genotypes D and G circulate predominantly in the Western Hemisphere; genotypes F, C, and I in the Asia–Pacific region; and genotypes B, H, J, and K in the Southern Hemisphere (Fig. 231e-1). Although numerous mumps virus genotypes have been identified and some vary antigenically from others, only one serotype exists, and there is no evidence to suggest that certain circulating virus strains are more virulent or contagious than others.

EPIDEMIOLOGY

Mumps is endemic worldwide, with epidemics every 3–5 years in unvaccinated populations. These epidemics typically occur in locations where children and young adults congregate, such as schools, military barracks, and other institutions. In countries without national mumps vaccination programs, the estimated annual global incidence is 100–1000 cases per 100,000 population. After the introduction of mumps vaccine in the United States in 1967, the number of reported cases declined dramatically. By 2001, fewer than 300 cases were reported, representing a 99.8% reduction from prevaccine-era levels. Mumps incidence remained at historic lows in the United States until 2006, when 6584 cases were reported—the largest outbreak since 1987. At the time of the 2006 outbreak, the disease was resurging globally, even in populations with high-level vaccination coverage. The number of reported U.S. cases declined precipitously in the 2 years that followed but then spiked in 2009–2010, with focal outbreaks in New York and New Jersey, and again in 2011, with a focal outbreak in California. A recent study by the Centers for Disease Control and Prevention (CDC) showed that two-dose coverage with measles–mumps–rubella (MMR) vaccine in major U.S. cities (94.8%) remains at or very near the level needed to contain these childhood infections; however, focal areas with inadequate vaccination coverage still leave some children at risk. Sporadic, large-scale mumps outbreaks continue to be reported worldwide, sometimes in countries where the disease was once under control.

Although historically a disease of unvaccinated children, with the largest proportion of cases occurring in children 5–9 years of age during the prevaccine era, mumps now frequently occurs in older age groups—primarily college students, most of whom were vaccinated in early childhood. This shift in age distribution and the occurrence of mumps in vaccinated populations are probably the result of several coincident circumstances, including (1) situations promoting the spread of respiratory viruses among young adults (e.g., residence in college dormitories), (2) waning of vaccine immunity with time, (3) lack of endemically circulating wild-type virus to periodically boost vaccine-induced immune responses, and (4) continuing global epidemics (due to either lack of mumps vaccination programs or, where such programs do exist, low rates of mumps vaccination). The notable

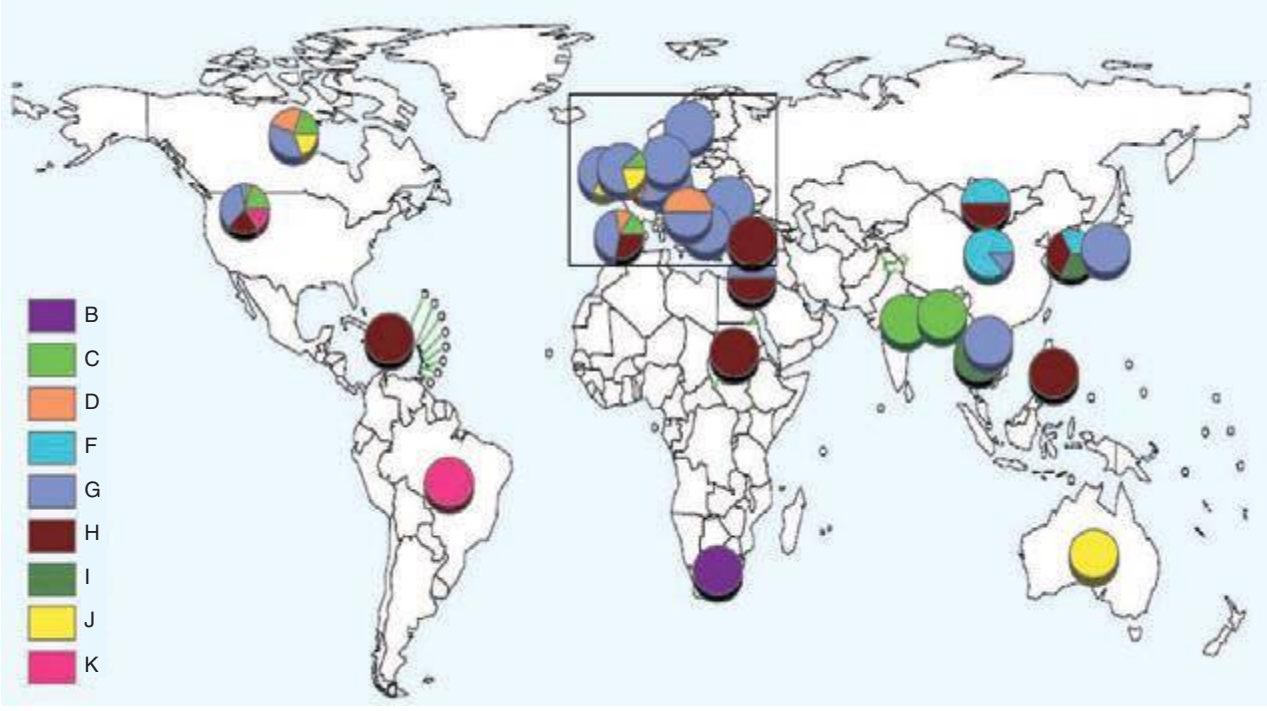

FIGURE 231e-1 Distribution of reported mumps genotypes, 2005–2011 (data as of April 20, 2012). Pie-slice size is proportional to the number of years each genotype was reported. *(Figure courtesy of WHO, with permission; http://www.who.int/immunization_monitoring/diseases/mumps/en/index.html; accessed September 11, 2012.)*