32 | MUMPS VIRUS

32.1 | Disease agent

- Mumps virus (Mumps orthorubulavirus)

32.2 | Disease agent characteristics

- Family: *Paramyxoviridae*; Subfamily: *Rubulovirinae*; Genus: *Orthorubulavirus*.
- Virion morphology and size: Enveloped, helical nucleocapsid, pleomorphic, roughly spherical particles, 100–600 nm in size.
- Nucleic acid: Linear, negative-sense, single-stranded, RNA genome, ~15.3 kb in length
- Physicochemical properties: Virions are sensitive to treatment with lipid solvents, nonionic detergents, formaldehyde, oxidizing agents, and heat; no significant change in infectivity is seen after 8 days in a pH range from 4.65 to 8.5.

32.3 | Disease name

- Mumps
- Epidemic parotitis

32.4 | Priority level

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical
- Public perception and/or regulatory concern regarding blood safety: Very low
- Public concern regarding disease agent: Very low but moderate in areas affected by epidemics

32.5 | Background

- Epidemics occurred until widespread vaccination was adopted. This resulted in >99% decline in mumps infection. However, focal and multistate outbreaks have occurred in recent years with a total of 3474 US cases reported in 2019.
- Unfounded concerns about vaccine safety in the United Kingdom, as a result of scientific misconduct, caused declining vaccination rates resulting in >70,000 cases of mumps during a 2-year period in the mid-2000s.
- An unexplained epidemic occurred in the United States, focused in the upper Midwest during 2006 with >5000 reported cases. Early epidemiologic data from Iowa suggested that 90% of cases for whom vaccination status was available had received at least one dose of mumps vaccine and that 71% had received two doses. Waning vaccine-induced immunity may be a factor in these cases.
- While multiple mumps virus lineages are present in the United States, one lineage has been predominant since at least 2006, suggesting unrecognized epidemiological connections between seemingly unrelated outbreaks.
- Whether the evolution of variant mumps virus strains is influencing mumps incidence in highly immunized populations is not clear.
- Mumps vaccine has been introduced in nationwide programs in 122 WHO Member States by the end of 2019 (mostly in combined measles-mumps-rubella (MMR) vaccine).

32.6 | Common human exposure routes

- Transmitted by respiratory droplets or by direct contact with infected respiratory secretions (e.g., kissing or shared utensils) or by contact with items in the environment contaminated with infected secretions.

32.7 | Likelihood of secondary transmission

- High in susceptible populations

32.8 | At-risk populations

- Unimmunized or incompletely immunized populations in developed countries in winter and spring months.
- Children between the ages of 5 and 14 years in poorly immunized populations.

32.9 | Vector and reservoir involved

- Humans are the reservoir.

32.10 | Blood phase

- Viremia has been demonstrated in small numbers of symptomatic patients during the first 2 days of illness.
- The occurrence of orchitis, CNS invasion, and other extra-respiratory manifestations before or in the absence of recognized classic parotitis suggests the possibility of viremic spread from the respiratory tract in infected patients.

32.11 | Survival/persistence in blood products

- Unknown

32.12 | Transmission by blood transfusion

- No cases reported. However, a theoretical concern arises because of the possibility of viremia during unrecognized infections.

32.13 | Cases/frequency in the population

- Rare in vaccinated populations until the 2006 outbreak in the United States
- Very common in areas of the world with less effective immunization programs

32.14 | Incubation period

- 16–18 days (range: 2–4 weeks)

32.15 | Likelihood of clinical disease

- Up to 30% of infections are asymptomatic.
- 30%–50% may present with nonspecific symptoms of upper respiratory infection and be difficult to recognize in the absence of parotitis.
- Around two-thirds of symptomatic patients have classical enlargement of the parotids, with or without involvement of other salivary glands.

32.16 | Primary disease symptoms

- Parotitis accompanied by fever, sore throat, and systemic symptoms of malaise and fever
- Less common manifestations, with or without parotitis, include benign orchitis, aseptic meningitis or encephalitis (1 in 400 to 1 in 6000), oophoritis, transient deafness (4.4%), and others.

32.17 | Severity of clinical disease

- Mumps is usually benign and self-limited.
- Long-term sequelae are rare and generally occur in those infected after adolescence.

32.18 | Mortality

- Very low; death occurs in 1.4% of those with encephalitis

32.19 | Chronic carriage

- None recognized

32.20 | Treatment available/efficacious

- No specific therapy; supportive care only

32.21 | Agent-specific screening question(s)

- No specific question is in use.
- Not indicated because transfusion transmission has not been demonstrated.
- No sensitive or specific question is feasible.
  - Among patients in the 2006 US outbreak, recognized contact with a suspected or confirmed case of mumps was unusual, so case contact questioning is not likely to be a sensitive intervention.
  - Also in the 2006 outbreak, approximately 90% of cases had received at least one dose of vaccine, and over half had received two doses, so a history of immunization would not eliminate donors who might be incubating mumps in an outbreak setting.

32.22 | Laboratory test(s) available

- No FDA-licensed blood donor screening test exists.
- Virus isolation on embryonated eggs and in cell culture from clinical diagnostic specimens (e.g., saliva, CSF, urine).
- NAT for clinical diagnostic specimens.
- Serology by a number of methods for IgG and IgM. However, IgM assays demonstrated substantial nonspecificity during the 2006 US outbreak.

32.23 | Currently recommended donor deferral

- The following interim measures were recommended by AABB during the 2006 epidemic. They are of little relevance at this time but should be retained for reference in the event of further outbreak activity.

- Deferral of potential donors with mumps until 14 days after resolution of symptoms.
- Deferral of donors with recognized contact to a mumps case for 4 weeks after the last contact.
- Retrieval and quarantine of products from donors providing postdonation information about contact with a case of mumps or the development of mumps with intervals consistent with the incubation period and what is understood about mumps viremia.
- Donors providing postdonation information that they developed mumps were to be deferred for 14 days after resolution of all symptoms. Products collected in the 28 days before or the 14 days after resolution of symptoms were to be recalled, quarantined, and destroyed, unless used for research.
- Donors providing postdonation information that they were contacts of a mumps case were deferred for 28 days after the last recognized contact. Any products collected from the first date of such contact until 28 days after the last recognized contact were to be recalled, quarantined, and destroyed, unless used for research.
- Consideration to refrain from the production of frozen products from donors in areas with mumps activity was recommended.

32.24 | Impact on blood availability

- Agent-specific screening question(s): Not applicable
- Asking for recall and quarantine of frozen transfusable products in areas affected by an epidemic, resulted in short-term shortages of fresh frozen plasma and cryoprecipitate in some affected blood centers.
- Laboratory test(s) available: Not applicable

32.25 | Impact on blood safety

- Agent-specific screening question(s): Not applicable
- Interim measures in areas affected by an epidemic: Unknown because of lack of proven transfusion transmission
- Laboratory test(s) available: Not applicable

32.26 | Leukoreduction efficacy

- Unknown

32.27 | Pathogen reduction efficacy for plasma derivatives

- Multiple pathogen reduction steps used in the fractionation process have been shown to be robust in removal of enveloped viruses.

32.28 | Other prevention measures

- Live, attenuated vaccines are available and routinely used in the United States and Canada as the combination measles-mumps-rubella (MMR) or MMRV (MMR with varicella) vaccine administered as a dose at 12–15 months of age and a second dose at 4–6 years.
- Adult vaccination is recommended if not vaccinated during childhood.
- Vaccine efficacy is approximately 80% following the first dose and 90% following the second.
- An outbreak of mumps in the upper Midwest in the United States in 2006 included a large number of persons who had completed the two-dose series; whether this is a result of primary or secondary vaccine failure because of waning immunity is unknown.

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