8.5.11 Colorado tick fever and other arthropod- bo

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8.5.11 Colorado tick fever and other arthropod-borne reoviruses 819 which are presumably vectors. It was isolated from a child with meningitis who recovered, and from another with fatal encephal- itis. Mokola virus also caused mild disease in a rabies-vaccinated laboratory worker. • Duvenhage virus (species 4) has been identified in three people, all of whom had had skin lesions inflicted by bats and had developed a fatal illness with clinical features identical to rabies encephalitis. European bat lyssaviruses Infected insectivorous bats have been found in Europe since 1954. The European bat lyssavirus (EBLV) group comprises species 5 (also known as EBLV 1) and species 6 (EBLV 2), which have subgroups a and b. EBLV type 1a is found across Northern and Eastern Europe from the Netherlands to Russia; EBLV type 1b in the Netherlands, France, and Spain; EBLV type 2a in the Netherlands and the United Kingdom; EBLV type 2b rarely in Switzerland and Scandinavia. Five unvaccinated people with bat bites died of encephalitis indis- tinguishable from rabies: two infected in Russia, one each in the Ukraine, Scotland, and Finland. Australian bat lyssavirus Australian bat lyssavirus (species 7) has been found in fruit bats (genus Pteropus) (Fig. 8.5.10.16) and insectivorous bats in Eastern Australia since 1996. It caused a fatal rabies-like encephalitis in three people who had handled bats. FURTHER READING Banyard AC, et al. (2011). Bats and lyssaviruses. Adv Virus Res, 79, 239–89. Gautret P, et al. (2014). Rabies in nonhuman primates and potential for transmission to humans: a literature review and examination of selected French national data. PLoS Negl Trop Dis, 8, e2863. Gnanadurai CW, et al. (2015). Novel approaches to the prevention and treatment of rabies. Int J Virol Stud Res, 3, 8–16. Helmick CG, Tauxe RV, Vernon AA (1987). Is there a risk to contacts of patients with rabies? Rev Infect Dis, 9, 511–18. Kaplan C, Turner GS, Warrell DA (eds) (1986). Rabies: the facts, revised edition. Oxford University Press, Oxford. Manning SE, et al. (2008). Human rabies prevention—United States, 2008: recommendations of the Advisory Committee on Immunization Practices. MMWR Recomm Rep, 57(RR-3), 1–28. Nel LH, Markotter W (2007). Lyssaviruses. Crit Rev

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Reovirus, Rotavirus, Orthoreovirus, and three arthropod-borne genera—Coltivirus (Colorado tick fever, Salmon River virus, and Eyach viruses), Orbivirus (Kemerovo group, Changuinola, Orungo, and Lebombo) and Seadornavirus (Banna virus). Colorado tick fever—common in parts of north-western North America; acquired from hard tick (ixodid) bites, most often by hikers and campers, presenting 3–6 days later with sudden fever, rigors, generalized aches, myalgia, headache and backache, rashes (12%), and gastrointestinal symptoms (20%). Diagnosis is con- firmed by detection of viral antigen in erythrocytes or serum, or Fig. 8.5.10.16 Pteropid fruit bats (flying foxes) (Pteropis) roosting, the natural reservoir of Nipah, Hendra, and Menangle paramyxoviruses, and of Australian bat lyssavirus. Copyright David A. Warrell.

820 section 8 Infectious diseases by serodiagnosis. Management is symptomatic. Illness usually resolves in 10–14 days, but convalescence may be prolonged. Prevention is by avoiding, repelling, or rapidly removing ticks; no vaccines are available. Coltiviruses Colorado tick fever The virus responsible for Colorado tick fever or ‘mountain fever’ is an 80-nm double-shelled particle covered with capsomeres. The icosahedral core contains 12 segments of double-stranded negative-sense RNA. The virus can infect human erythro- cytes and this may also occur with the other coltiviruses and orbiviruses. Colorado tick fever is a zoonosis involving hard (ixodid) ticks (principally Dermacentor andersoni, but also D. occidentalis, D. parumapertus, D. albipictus, and others) and wild mammals, including porcupines, deer, coyotes, squirrels, chipmunks, deer mice, and other rodents. Ticks pass Colorado tick fever virus transstadially and transovarially. Epidemiology Colorado tick fever is acquired from tick bites in western and north-western parts of the United States of America (including California) and Canada (British Columbia and Alberta). Very rarely, it has been caused by an infected blood transfusion. In the United States of America over 10 years up to 2012, 75 cases were reported mostly in Wyoming and other western states. Although underreporting is suspected, the incidence seems to have been declining. Hikers and campers are at special risk in rodent- and tick-infested terrain. The prevalence of antibody to Colorado tick fever among shepherds was 32%. The highest incidence is from May to July when ticks are most active. Infection usually confers lasting immunity. Clinical features In adults, the infection is nearly always mild, but in children it is occasionally severe but rarely fatal. Three to six days after the tick bite (extreme range 1–19 days) there is a sudden fever for about 3 days, with rigors, generalized aches, myalgia, headache, and back- ache. In one-half of the patients there is a biphasic fever. Rashes then appear in up to 12% of patients, usually a transient peripheral maculopapular rash or petechiae on flexor surfaces of arms but can be widespread and it may be hyperaesthetic. Gastrointestinal symp- toms occur in 20% of patients. Laboratory findings include leuko- penia with relative lymphocytosis, occasional thrombocytopenia, and mild lymphocyte pleocytosis. The illness usually resolves in about 10–14 days, but conva- lescence may be prolonged. Severe

manifestations include en- cephalitis, meningitis, or drowsiness, sometimes associated with gastrointestinal symptoms, spontaneous bleeding, thrombocyto- penia, and disseminated intravascular coagulation. Fatalities are rarely reported in children and one immunosuppressed adult. Late, possibly immunological effects include myocarditis, pericarditis, pleurisy, arthritis, and epididymitis. Colorado tick fever infection may precipitate abortion or transplacental infec- tion, but the teratogenic effects reported in mice have not been observed in humans. Diagnosis Viral antigen may be detected in erythrocytes by immunofluor- escence 1–120 days after the start of symptoms. Erythrocyte pre- cursors are infected in the marrow, but their survival is apparently not affected. Virus can be isolated from the blood and, if there is cen- tral nervous system involvement, the cerebrospinal fluid. Colorado tick fever virus produces a cytopathic effect on several cell lines, but intracerebral injection of ground blood clot or preferably washed erythrocytes into suckling mice is more sensitive for diagnostic iso- lation. Antigen can be detected in serum during acute infections, especially the first 2 weeks after onset, by polymerase chain reaction (RT-PCR), but enzyme-linked immunosorbent assay techniques have been less sensitive. Neutralizing antibody and specific IgM en- zyme immunoassays become positive after 14–21 days and the IgM disappears after 45 days. Differential diagnosis Many other tick-borne acute febrile illnesses, some with rashes and nervous system involvement, can be acquired in the area en- demic for Colorado tick fever. These include Rocky Mountain spotted fever, tularaemia, Lyme disease, and relapsing fever. Tick paralysis caused by D. andersoni and other ixodid ticks presents as a poliomyelitis-like, ascending, flaccid paralysis that is unlikely to be mistaken for the meningitic or encephalitic syndromes of Colorado tick fever. Treatment The symptomatic treatment of fever and pain should exclude sali- cylates in case of thrombocytopenia. Tribavirin (ribavirin) inhibits the replication of Colorado tick fever virus experimentally, but its use in humans has not been reported. Immunity is long-lasting. Convalescent patients should not donate blood for 6 months after their illness. Salmon River virus This virus is closely related to Colorado tick fever virus. It was iso- lated from a patient with similar symptoms in Idaho. Eyach This European coltivirus has been found in ticks in Germany and France and is likely to be an adapted variant Colorado tick fever virus introduced from America. There is serological evidence of human infection in Czechoslovakia causing meningoencephalitis or neuropathies. Orbiviruses Although the respective antibodies to the tick-borne Great Island virus and insect-borne Corripata orbiviruses have been found in humans, there is no evidence of the diseases’ pathogenicity.

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