VESICULAR STOMATITIS

ANIMAL GROUP AFFECTED	TRANS-MISSION	CLINICAL SIGNS	FATAL DISEASE ?	TREATMENT	PREVENTION & CONTROL
Horses, mules, donkeys, swine, bovines, South American camelids sheep and goats rarely become infected. experimental: wide host range, including deer, racoons, bobcats, rodents, bats, and monkeys, also infects humans.	Hematopha-gous insects, sand fly and black fly, also direct contact with infected animals, less common transmission through contaminated feeding, watering or milking equipment	Fever, transient vesicles followed by erosions in the mouth and feet (coronary bands), lameness, mastitis often complicates erosions on teats; all indistinguishabl e from FMD	Less than 5%	None (supportive care and treatment of secondary bacterial infections)	*In houses* *in zoos* Serological monitoring system, strict importation restrictions, insect control, vaccination (inactivated antigen)

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Susceptible animal groups
Horses, donkeys, and mules are highly susceptible, but cattle, swine, South American cameilids can all became infected. Sheep and goats are resistant and rarely become infected. Experimental infection has been demonstrated in a wide host range, including deer, racoons, bobcats, rodents, bats, and monkeys.

Causative organism
Vescular stomatitis (VS) is caused by vesicular stomatits virus (VSV), a Vesiculovirus. The virus is a large bullet-shaped (65-185 nm) RNA virus, that belongs to the family of Rhaboviridae. Serotypes New Jersey and Indiana 1 cause classical VS and are the most important in domestic animals. Serotype Indiana ~~1~~ has two subtypes: Indiana 2 (Cocal) and Indiana 3 (Alagoas). Other viruses within the genus Vesiculovirus have been shown to experimentally cause vesicular lesions in domestic animals and to infect humans, these include Piry (isolated from an opossum in Brazil), Chandipura (isolated from humans in India) and Isfahan (isolated from sandflies and humans in Iran).

Zoonotic potential
Humans may be infected by contact and by aerosol, and probably by arthropod vectors.

Distribution
VS occurs only in North and Central America and the northern part of South America. Serotypes New Jersey and Indiana I occur in the United States, Central America and the northern part of South America, whereas subtypes Indiana 2, and 3 occur in South America.

Transmission
Vesicular stomatitis viruses are arboviruses that can be transmitted by sand flies (including *Lutzomyia shannoni*) and black flies (including *Simulium vittatum*) and transovarial transmission has been demonstrated experimentally in both flies, which may explain how the virus survives the winter. In addition the New Jersey serotype has been isolated from a wide variety of other hematophagous insects such as *Culicoides* spp. (biting midges), *Aedes* spp. (mosquitoes) and nonbiting insects such as Chloropidae (eye gnats),

Anthomyiidae, and Musca (house flies). In contrast to sand flies and black flies, the role of these other insects in the transmission of VSV is unknown. Epidemics have occurred irregularly at 10 to 15 year intervals in south-western and western areas of the United States, and VSV New Jersey is endemic to a barrier island off the coast of Georgia in the United States. In subtropical and tropical areas of North, Central, and South America, the disease occurs throughout the year. Interestingly, in colder climates even frost for more than 2 weeks may not stop an outbreak and disease spread can occur throughout the winter. During such periods, virus may be spread by contact with infected animals as well as contaminated water, feeding or milking equipment.

Incubation period

Minimum of 24 hours following experimental inoculation up to 21 days in some cases of natural exposure. Usually 2 to 3 days for humans.

Clinical symptoms

In cattle and pigs the clinical signs are very similar to those of foot-and-mouth disease (FMD) and other vesicular diseases. However, unlike FMD, the incidence of VS in the herd is sporadic, young animals are less severe affected and stabled animals are usually not affected. Up to 70% of affected cattle may develop oral lesion only, whereas only 25% of affected cattle will develop lesions only on their teats. VSV also causes decreased milk and meat production in cattle. In contrast to FMD, animals with lesions occurring simultaneously in the mouth and on the teats as well as foot lesions are rather rare. Also in contrast to FMD, horses are affected by VSV. In horses, vesicles may develop in the mouth and along the coronary band causing difficulties to eat and lameness, respectively. All animals and humans develop fever ranging to 41 C. In humans, VSV may cause a severe influenza-like illness over a 4 to 7 day period, characterised by fever, headache, muscular aches, and occasionally blisters in the mouth similar to herpetic vesicles.

Post mortem findings

Vesicles and erosions are indistinguishable from those of FMD, swine vesicular disease (SVD), and vesicular exanthema of swine. Primary viral replication takes place in the stratum spinosum of the affected epidermis. Following hydropic degeneration and edema, keratinocytes in affected areas become spherical (ballooning degeneration) and float into the vesicular fluid. The stratum basale remains intact. In contrast to FMD, no lesions observed are found in the rumen or heart and there are no lesions in the brain as reported with SVD.

Diagnosis

Differential diagnosis for VS must include foot and mouth disease. Other vesicular diseases such as SVD and vesicular exanthema of swine also should be ruled out, along with chemical and thermal burns. The range of affected species may help in the diagnosis of vesicular diseases. If only swine are affected other differentials include swine pox, pseudorabies, and classical swine fever. In ruminants oral lesions may suggest other reasonable differentials including infectious bovine rhinotracheitis, bovine viral diarrhoea, malignant catarrhal fever, bluetongue, and contagious ecthyma. In horses and ruminants, mechanical stomatitis caused by rough forage also may resemble vesicular stomatitis. Vesicular fluid samples and tissue biopsies of lesions are tested by complement fixation (CF) or an antigen capture ELISA test. Virus isolation should be performed to confirm the diagnosis. Serodiagnostic tests available for distinguishing VSV-NJ and VSV-IN are virus neutralization tests, indirect enzyme-linked immunosorbent assay (I-ELISA), and competitive ELISA (C-ELISA). These tests can detect early and long-lasting antibody responses, but because of the nature of these assays, they are not able to differentiate a primary from a secondary VSV infection. Rt-PCR and nested PCR are available for both major serotypes.

Material required for laboratory analysis

The following should be collected from each of two or three animals:

1. Vesicular fluid (as much as possible).
2. Epithelium covering a vesicle.
3. Flaps of epithelial tissue still attached. Don't collect old necrotic or fibrinous material that is difficult to remove, because it is often highly contaminated with bacteria.
4. Serum (10 ml of serum).
5. Full set of tissues in formalin.

Collect material from vesicles in suitable sterile virus transport medium. The virus may persist for a week or so in one or more of the following tissues: oral cavity, tongue, teats, coronary band, tonsil, and lymph nodes and these tissues should be collected fresh and also be fixed in formalin.

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Treatment

There is no effective treatment for VSV infected animals – supportive care and treatment of secondary bacterial infections may be helpful. There is essentially no mortality, however production losses may be significant, and infected animals may shed virus for days or weeks, posing a potential threat for other animals. A clinical appearance similar to FMD causes significant diagnostic problems and is the main reason for strict eradication of the disease. Animals that have recovered from infection may be re-infected with the same or different serotype at a later date.

Prevention and control in zoos

Rapid confirmation of the diagnosis is important. Following a diagnosis, quarantine of confirmed cases and exposed animals, insect control, and environmental decontamination and biosecurity practices are important. Commercial scale, inactivated, bivalent VSV vaccines have been used to fully protect cattle against disease.

Suggested disinfectant for housing facilities

VSV is inactivated by cresol, sodium hydroxide (2%), formalin (1%), sodium carbonate (4% anhydrous or 10% crystalline, with 0.1% detergent), ionic and non-ionic detergents, strong iodophors (1%) in phosphoric acid, lipid solvents such as chloroform, examples of effective disinfectants: potassium peroxymonosulfate (Antec Virkon S at a dilution rate of 1:100); hypochlorites (bleach, Chlorox (The Chlorox Company) at a dilution rate of 1:32 (only in the absence of organic material, disinfectant properties of sodium hypochlorite are inactivated by organic material and diminished by alkaline materials (lime) and moisture, contact with skin is irritating), phenols and related compounds, e.g. cresols, 1 Stroke Environ® (Calgon Vestal), Tek-Trol (Bio-Tek Industries, Inc.) at 1-2% concentrations, not inactivated by organic debris, disinfectant properties are enhanced by warm temperatures, and diminished by cold temperatures and moisture, contact with skin is corrosive and the use of goggles and rubber gloves is recommended

Notification

Yes

Guarantees required under EU Legislation

Guarantees required by EAZA Zoos

Measures required under the Animal Disease Surveillance Plan

Measures required for introducing animals from non-approved sources

Measures to be taken in case of disease outbreak or positive laboratory findings

Conditions for restoring disease-free status after an outbreak

Contacts for further information

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