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# *Vesicular Stomatitis Backgrounder*

(August 23, 2006)

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## Causative agent

Vesicular stomatitis (VS) is caused by a rhabdovirus; the rabies virus is also a member of this viral family. Rhabdoviruses are 180 nanometers (nm) by 80 nm, enveloped, and cylindrical in shape. The vesicular stomatitis virus (VSV) belongs to the genus vesiculovirus. The virus contains negative sense, single-stranded RNA. The two most important serotypes of VSV are Indiana and New Jersey.

## Natural distribution

VSV has only been identified in the Western hemisphere. The virus is endemic in horses, mules, donkeys, cattle, South American camelids, and swine in regions of Mexico and Central and South America. Sheep and goats are rarely affected. Deer, bobcats, goats, raccoons, and monkeys have also been found to be susceptible hosts of VSV. White-tailed deer and small mammals act as reservoirs of the virus in tropical climates. Although VS cases can develop throughout the year, they are more common during the rainy season in tropical areas.

The VS Alagoas virus (Indiana-3), the Argentina coccal virus (Indiana-2), and Piry are three exotic strains of VSV that exist in South America. Only one strain of VS-New Jersey has been recognized.

Outbreaks of VS occurred in the United States in 2004, 2005 and 2006. In the past, outbreaks had occurred about every 10 years. Most cases developed in the summer and early fall months. The first frost attenuated the outbreaks, but new cases still developed in December. Cases were confirmed in the West, Midwest, and Southwest regions, and resulted in marked economic and regulatory consequences.

## Transmission

The epidemiology of VS is still poorly understood. VSV is spread via direct contact, fomites (including contaminated inanimate objects and people moving between infected and uninfected animals), and arthropod vectors, such as black flies and sand flies. In both fly species, the virus can be transmitted to subsequent generations through the ova (egg). The saliva, vesicular fluid, and vesicular lining of affected animals are infective. Aerosol transmission may also play a role in the spread of VS outbreaks.

The incubation period for VS in animals ranges from 2 to 8 days. The incubation period in humans is 24 to 48 hours. Because of the potential for rapid spread of the virus, and the severe economic losses and agricultural trade restrictions associated with outbreaks, the World Organization for Animal Health (OIE) has classified VS as a notifiable animal disease.

## Clinical Signs

Hypersalivation and depression are often the first clinical signs observed. Affected animals develop vesicular lesions of the tongue, lips, nostrils, oral mucosa, and at the corners of the mouth and gums. Horses may also develop crusting scabs on the muzzle, lips, or ventral abdomen. In affected ruminants, vesicular lesions may also be observed on the hard palate, udder, and teats. A fever may develop immediately before or coincident to the appearance of vesicles.

Mastitis and reduced milk production may occur in ruminants. Oral lesions are the most common clinical sign of VS in horses, whereas foot and snout lesions are more commonly observed in swine. Affected animals may be reluctant to eat or drink, resulting in weight loss and dehydration. Most animals affected by VSV develop lesions on only one region of the body.

The disease clinically resembles [foot-and-mouth disease](#) (FMD), but follows a milder course. Ruptured vesicular lesions begin healing within four days. Affected animals usually recover within 2 to 3 weeks unless secondary bacterial infection develops.

VSV causes nonspecific, influenza-like symptoms in humans. Symptoms include fever, muscle aches, headache, and malaise. Humans usually recover in 4 to 7 days.

### Diagnosis

VS is tentatively diagnosed by observation of clinical signs, but distinguishing VS from FMD is not possible on the basis of clinical picture. One factor that can be used as a preliminary discriminator of VS from FMD is the failure of FMD to affect equids; therefore, if cases are observed in horses, VS is the more likely cause of the vesicular disease outbreak. In swine, VS is clinically indistinguishable from FMD, swine vesicular disease, and vesicular exanthema of swine.

Serum or material obtained by swabbing vesicles, saliva, or affected mucous membranes may be submitted for diagnostic testing. Competitive enzyme-linked immunosorbent assay (CELISA), virus neutralization (VN), or complement fixation (CF) tests can be performed. VSV can be detected by isolation in tissue culture or by using reverse transcriptase polymerase chain reaction (RT-PCR). Samples should be aseptically collected and frozen for submission. Paired acute and convalescent serum samples can be submitted for serologic examination; a minimum of 2 ml of serum is required, and should be shipped on ice. Prior to shipping samples, the proper authorities should be contacted.

### Treatment

**Vesicular stomatitis is a reportable disease** in the United States. State or federal animal health officials should be immediately notified when vesicular disease is observed. There is no vaccine available.

Treatment is generally not necessary, but antimicrobials may be required if secondary bacterial infection develops. Mild, antiseptic mouthwashes may alleviate discomfort in some animals.

### Morbidity and Mortality

Morbidity of VS varies with species. Morbidity in most affected herds is 5 to 10%, but can range up to 90%. Morbidity in dairy herds approaches 80%. The case fatality rate (the number of affected animals that die from the disease) of VS in all species is low.

### Prevention and Control

Affected animals should be strictly quarantined. Animal movement from affected premises should be restricted for a minimum of 21 days after the last observed lesion has healed. Insect control is also beneficial in controlling spread of disease. Animals kept in stalls appear to be less likely to contract the disease from infected animals, probably because direct contact with infected animals is prevented. Proper sanitation and hygiene on affected premises are important in reducing transmission. Because humans are susceptible to VS, proper hygiene is essential when handling affected animals. VSV is inactivated by heat (a temperature of 58 C sustained for 30 minutes). Formalin (1%), sodium carbonate (2%), sodium hydroxide (4%), iodophor (2%), and chlorine dioxide solutions are also effective for disinfection.