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Swine Vesicular Disease

Porcine Enterovirus Infection

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Overview

- Organism
- Economic Impact
- Epidemiology
- Transmission
- Clinical Signs
- Diagnosis and Treatment
- Prevention and Control
- Actions to Take

In today's presentation we will cover information regarding the organism that causes swine vesicular disease and its epidemiology. We will also talk about the economic impact the disease has had in the past and could have in the future. Additionally, we will talk about how it is transmitted, the species it affects, clinical signs and necropsy findings, and diagnosis and treatment of the disease. Finally, we will address prevention and control measures for the disease as well as actions to take if swine vesicular disease is suspected.

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The Organism

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Swine Vesicular Disease

- Family Picornaviridae
  - Genus *Enterovirus*
  - Related to human coxsackievirus B5
- Survives for long periods in environment and in meat products
- Resistance
  - Temperatures up to 157F
  - pH ranging from 2.5 to 12

The swine vesicular disease virus (SVDV) is a single-stranded icosahedral RNA virus. It is a porcine enterovirus in the family Picornaviridae. It is antigenically related to the human coxsackievirus B5 (CVB5) but unrelated to other known porcine enteroviruses. SVDV can survive for long periods in the environment. The virus is resistant to heat up to 157°F (69°C) and pH ranging from 2.5 to 12. They virus can survive up to 2 years in dried, salted, or smoked meat.

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Importance

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History

- First identified in Italy, 1966
- Eradication successful in most countries
- Endemic in southern Italy, possibly parts of Asia
- Recent outbreaks
  - Italy
  - Portugal

SVDV was first identified in Italy in 1966 and was subsequently confirmed in Hong Kong, Japan, and various countries in Western Europe. Since the 1970s, this disease appears to have been eradicated from most countries. In the 1990s, Italy, Spain and Portugal had outbreaks of SVD. Currently, SVD is endemic in Southern Italy, and possibly in parts of Asia.

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Economic Impact

- No severe production losses
- Major economic importance
  - Difficult to distinguish from foot-and-mouth disease (FMD)
  - Control measures and eradication costly
  - Trade restrictions on export of pigs and pork products from infected countries

While SVD does not cause severe production losses, it is of major economic importance because it is difficult to clinically distinguish from foot-and-mouth disease. Control measures and eradication of SVD are costly, and nations which are known to have SVD often face embargoes on the export of pigs and pork products.

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Epidemiology

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Geographic Distribution

- Disease eradicated from most of Europe since the 1970s
- Occasional outbreaks
- Endemic in southern Italy
- Disease has never occurred in North America or Australia

SVD has occurred in Italy, Hong Kong, England, Wales, Japan, Malta, Austria, Belgium, France, the Netherlands, Germany Poland, Switzerland, Greece, and Spain. Since the 1970s, this disease appears to have been eradicated from most countries. In the 1990s, Italy, Spain, and Portugal had outbreaks of swine vesicular disease. SVD is endemic in Southern Italy.

[Photo: This figure shows the OIE SVD disease outbreak map from 2010. Red indicates a current disease event, purple indicates disease limited to one or more zones, dark green indicates disease not reported in this period, and light green indicates disease never reported. From the OIE at http://www.oie.int/wahis/public.php?page=disease_status_map]

Slide 10	**Morbidity/Mortality** • Highly contagious • Low mortality – Up to 10% in piglets • No persistent infection • Protective antibody post-infection • Lower morbidity, lesions less severe compared to FMD	SVDV is considered to be highly contagious, but mortality is low. No persistent infections have been reported, and infected pigs develop protective antibody against SVDV upon recovery. Compared to foot-and-mouth disease, morbidity is lower and the lesions are less severe.
Slide 11	**Transmission**	
Slide 12	**Transmission** • Direct or indirect contact – Infected animals or feces – Contaminated environment • Ingestion – Contaminated meat scraps • Virus excretion – Nose, mouth, feces – Up to 48 hrs. before clinical signs – Shed in feces for >3 months after infection 	SVDV be transmitted via different routes. Pigs are most easily infected through damaged skin or an ulcerated mucous membrane; the incubation period for this route of exposure is 2 to 7 days. Infection by ingestion (of contaminated meat scraps, e.g.) requires a larger amount of the virus; the incubation period is 2 to 3 days. Pigs can secrete the virus from the nose or mouth, and excrete the virus in feces up to 48 hours before clinical signs are seen. Virus can also be shed in the feces for up to three months following infection.
Slide 13	**Animals and Swine Vesicular Disease**	
Slide 14	**Clinical Signs** • Incubation period: 2 to 7 days • Vesicles and erosions – Snout, mammary glands, coronary band, interdigital areas – Very similar to FMD • Fever, lameness • Recovery within 2 to 3 weeks – Little permanent damage	The incubation period for SVD varies by route of transmission. It can be as short as 2 to 5 days if the virus is ingested in contaminated meat or 2-7 days if acquired through contact with infected animals or fecal material. Clinical signs are very similar to foot-and-mouth disease, and include fever, salivation, and lameness. Vesicles and erosions can be seen on the snout, mammary glands, coronary band, and interdigital areas, but vesicles in the oral cavity are relatively rare. The infection may be subclinical, mild, or severe depending on the virulence of the strain. Severe signs are generally seen only in pigs housed on damp concrete with younger animals more severely affected. Neurological signs (including shivering, unsteady gait, and chorea [rhythmic jerking] of the legs) due to encephalitis are rare, and abortion is not typically

seen. Recovery will usually occur within 2 to 3 weeks with little permanent damage.

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	Foot & Mouth Disease	Vesicular Stomatitis	Swine Vesicular Disease	Vesicular Exanthema of Swine
Clinical Signs by Species	All vesicular diseases produce a fever with vesicles that progress to erosions in the mouth, nares, muzzle, teats, and feet			
Cattle	Oral & hoof lesions, salivation, drooling, lameness, abortions, death in young animals, "pantera"; ***Disease Indicators***	Vesicles in oral cavity, mammary glands, coronary bands, interdigital space	Not affected	Not affected
Pigs	Severe hoof lesions, hoof sloughing, snout vesicles, less severe oral lesions: ***Amplifying Hosts***	Same as cattle	Severe signs in animals housed on concrete; lameness, salivation, neurological signs, younger more severe	Deeper lesions with granulation tissue formation on the feet
Sheep & Goats	Mild signs if any; ***Maintenance Hosts***	Rarely show signs	Not affected	Not affected
Horses, Donkeys, Mules	Not affected	Most severe with oral and coronary band vesicles, drooling, rub mouths on objects, lameness	Not affected	Not affected

Clinically, all vesicular diseases produce a fever with vesicles that progress to erosions in the mouth, nares, muzzle, teats and feet. Vesicular diseases are clinically indistinguishable from one-another, especially in swine as this chart shows, and a laboratory diagnosis is required. Any disease with vesicles and fever should be immediately reported to a State or Federal veterinarian.

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Vesicles on the mouth and hooves are common clinical findings in pigs infected with SVD, and are clinically indistinguishable from lesions of foot-and-mouth disease. The vesicles may be ruptured or unruptured; shown above are ruptured vesicles found on the feet. These photographs show typical lesions on pigs infected with SVD: the vesicles may be ruptured or unruptured, and may be present on the tongue or teats as shown above.

[Photo source: www.aphis.usda.gov]

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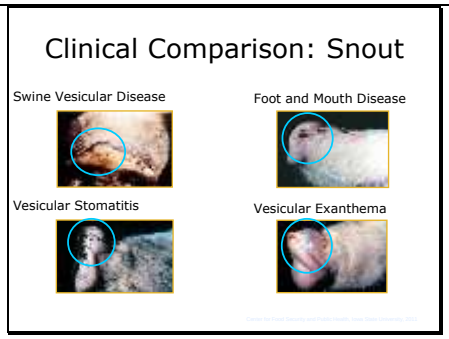

These photographs show vesicular lesions on the snouts of swine infected with four different viral vesicular diseases. They are clinically indistinguishable.

[Photo source: www.aphis.usda.gov]

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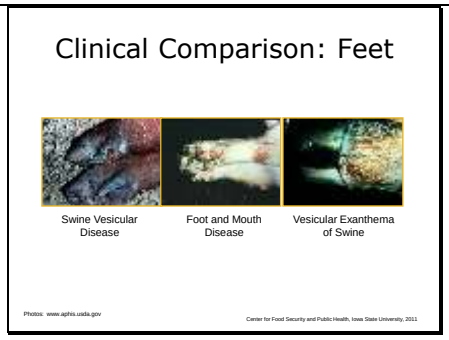

These photographs show lesions on the feet of pigs infected with swine vesicular disease, foot-and-mouth, and vesicular exanthema. These diseases are clinically indistinguishable.

[Photo source: www.aphis.usda.gov]

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Post-Mortem Lesions

- Vesicles are the only post mortem lesions


The only post-mortem lesions of SVD are the vesicles that can be seen in live pigs. These lesions are similar to those of other vesicular diseases, including foot-and-mouth disease. Shown above are vesicles that are common on the snout and hooves of animals infected with SVDV.

[Photo source: www.aphis.usda.gov]

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Differential Diagnosis

- Foot-and-mouth disease
- Vesicular stomatitis
- Vesicular exanthema of swine
- Chemical or thermal burns

The differentials for swine vesicular diseases include foot-and-mouth disease, vesicular stomatitis, vesicular exanthema of swine, and chemical or thermal burns.

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Sampling

- Before collecting or sending any samples, the proper authorities should be contacted
- Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease

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Contact authorities if you are suspicious of a vesicular disease. Samples must be properly obtained, securely packaged, and sent to authorized laboratories for diagnosis. Call before sampling as a USDA trained Foreign Animal Disease Diagnostician (FADD) will need to collect and ship the samples.

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Diagnosis

- Laboratory testing essential to rule out other vesicular diseases
- Available tests
  - ELISA
  - Direct complement fixation
  - Virus isolation
  - RT-PCR
  - Serology: virus neutralization**, ELISA

Swine vesicular disease or other vesicular diseases should be suspected when vesicles or erosions are found on the mouth and/or feet of pigs. Other vesicular diseases must be ruled out with laboratory tests. SVDV can be identified using enzyme-linked immunosorbent assay (ELISA), the direct complement fixation test, virus isolation in pig-derived cell cultures, and RT-PCR. Virus neutralization is the definitive test. Serological ELISAs are used for surveillance.

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Swine Vesicular Disease in Humans

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Human Infection

- Laboratory workers
- No case reports in farmers or veterinarians working with pigs
- Incubation period: 1 to 2 weeks
- Usually mild influenza-like symptoms
- Diagnosis: seroconversion
- Treatment: supportive care

A small number of human SVD cases have been documented in laboratory workers. There are no reports of seroconversion or disease in farmers or veterinarians that have worked with SVD-infected pigs. The incubation period in humans varies from 1 to 2 weeks to up to 5 weeks. Aerosolization of the virus is thought to be the major route of transmission but entry into cuts or abrasions is also suspected. Clinical signs include mild influenza-like symptoms (fever, malaise) with generalized abdominal and muscle pain and weakness. Vesicular lesions are not seen. Diagnosis is by seroconversion, and treatment includes supportive care.

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Prevention and Control

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Recommended Actions

- IMMEDIATELY notify authorities
- Federal
  - Area Veterinarian in Charge (AVIC)
    http://www.aphis.usda.gov/animal_health/area_offices/
- State
  - State veterinarian
    http://www.usaha.org/StateAnimalHealthOfficials.pdf
- Quarantine

Center for Food Security and Public Health, Iowa State University, 2011

If you suspect a case of swine vesicular disease, state or federal authorities should be notified immediately. Animals suspected with SVD should be isolated, and the farm should be quarantined until definitive diagnosis is determined.

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Control

- Slaughter
  - Infected pigs
  - Pigs in contact with SVD pigs
  - Disposal
- Disinfection
  - 1% sodium hydroxide + detergent
  - Oxidizing agents
  - Iodophors + detergent

Pigs infected with SVDV and those in contact with them should be slaughtered and disposed of. The premises should be thoroughly cleaned and disinfected. In the presence of organic matter, sodium hydroxide (1% combined with detergent) can be used. Oxidizing agents and iodophors used with detergents work well for personal disinfection in the absence of gross organic matter.

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Vaccination

- No effective vaccine
- We all need to do our part
  - Keep our pigs healthy
  - Free of disease

Although there are inactivated vaccines against SVDV, none are commercially available, and vaccination of pigs has never been undertaken in the field. We all need to do our part in keeping our pigs healthy and free of foreign animals diseases such as SVDV.

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Additional Resources

- World Organization for Animal Health (OIE)
  - www.oie.int
- U.S. Department of Agriculture (USDA)
  - www.aphis.usda.gov
- Center for Food Security and Public Health
  - www.cfsph.iastate.edu
- USAHA Foreign Animal Diseases ("The Gray Book")
  - www.usaha.org/pubs/fad.pdf

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Acknowledgments

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