# Seneca Valley virus VI positive flies *(Musca domestica)*: What questions does this pose for the swine industry?

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## Introduction

Vesicular disease cases associated with Seneca Valley virus (SVV) (Senecavirus A) have recently increased in the swine industry.[1] Vesicular disease is a broad term used to cover several diseases associated with similar clinical signs, such as open or closed blisters located on the snout and/or at the junction where the skin and the hoof wall meet (Coronary band), sudden lameness with redness and swelling at or around the coronary band, and pigs that are suddenly off feed, lethargic and/or have a fever up to 105 degrees Fahrenheit.[2] Foot and mouth disease (FMD) is the major disease of concern. FMD is on the foreign animal disease list and can have a major impact due to being very contagious and having the potential to close foreign trade. Diseases associated with vesicular disease are guilty of being FMD until proven otherwise through diagnostic testing. Idiopathic vesicular disease caused by the Seneca Valley virus is one such disease. Seneca Valley virus belongs to the same virus family as FMD, (*picornaviridae)* and will have similar clinical symptoms to FMD. Major disruptions in pig flow for producers and packers are the result of pigs shipped exhibiting signs of vesicular disease, until a non-FMD diagnosis is confirmed. A recent general veterinarian opinion and observation was that SVV has been seen more often in warmer summer months, versus other viral pathogens. What is the significance of this general observation? Is there something about warmer months associated with an increase in SVV infections? In this discussion, flies were mentioned and a question was posed: can flies carry SVV? Seeking this answer became the basis for this preliminary study testing whether flies can harbor live viable Seneca Valley virus.

**Figure 1:** Captivator Fly Trap

## Materials and methods

Permission was obtained to sample a 4,800 head finisher in Southern Minnesota positive for both SVV and porcine reproductive and respiratory syndrome virus (PRRSV) 24 days post diagnosis (viral swab, oral fluid). Flies were collected in Captivator® jug liquid traps (Starbar®, Central Life Sciences, Figure 1) to reduce any cross-contamination from the environment that may occur during sample collection. Traps were hung six to a room with a negative control that prevented flies from entering the device but allowed room air to circulate in the traps. Flies randomly enter these traps by their own volition. Attractant was solubilized with sterile water. Traps were placed at approximately 8:30 a.m. and removed approximately 12:30 p.m. Flies were netted out of the traps into labeled zip-lock bags and delivered same-day to the Iowa State University Veterinary Diagnostic Lab (ISU VDL). A minimum of 100 flies per trap/bag was targeted. Liquid from the trap was also collected for subsequent PCR testing. Flies were processed as a 10% homogenate solution using phosphate buffered saline. Homogenates were clarified by centrifugation and supernatants were analyzed by real-time reverse transcription polymerase chain reaction (rRT-PCR) per routine protocols at

the ISU VDL for PRRSV and SVV. The remaining supernatants were stored at -80°C. Seneca Valley virus has a propensity to grow in cell culture and virus isolation was conducted in H1299 cells (ATCC CRL-5803) per routine procedures at the ISU VDL.

## Results and discussion

One out of six traps were PCR positive for PRSSV with cycle threshold of 31.6 (Ct 31.6). Two out of six traps were PCR positive for SVV (Ct 30.5 and Ct 30.4). All fly attractant liquid samples were rRT-PCR negative. Virus isolation attempts were conducted on the two PCR positive SVV fly samples. The Ct 30.5 sample was VI positive and confirmed by PCR. The initial passage of cell culture material (P0) had a Ct of 20, and the subsequent passage (P1) had a Ct of 17. These results indicate that the fly sample contained viable SVV (Table 1). A piglet bioassay opportunity for SVV is the next goal. Flies may bypass all current known biosecurity measures and have multiple routes of entry into swine farms. Flies are ubiquitous, can fly up to four miles in search of harborage,[3] live and breed in close proximity to swine, and can be transported by farm vehicles (Figure 2). Insect vectors such as flies have been investigated as a possible source of porcine reproductive and respiratory virus PRRSV.[4] There also is a proven model for transmission of a corona virus by a flying vector.[5] Are flies a potential risk factor in the transmission of SVV? Should current industry biosecurity protocols now include more intensive fly control? More questions arise and further research is needed. This preliminary study showed through positive virus isolation flies can harbor live viable SVV 24 days after diagnosis. At present, there is no standard protocol for fly control in the industry. New technology can help develop strategies to lessen this risk from flies, both in a convenient and economical, e.g. feed-thru, method.

## References


1. National Assembly of State Animal Health Officials (NASAHO) Senecavirus A Working Group Report. October 12, 2017.

2. Securepork.org Wall Chart Swine Vesicular Disease SVD `http://www.securepork.org/Resources/WallChart_SVD_130709.pdf`.

3. Nazni WI, Luke H et al. Determination of the flight range and dispersal of the house fly, Musca domestica (L.) using mark release recapture technique. *Trop. Biomed* 2005 Jun;22(1):53-61.

4. Otake S, Dee SA et al. Transmission of porcine reproductive and respiratory syndrome virus by houseflies, (Musca domestica Linnaeus). *Vet Rec* 2003. 152: 73-76

5. Diseases of Swine. 9th Edition 2006 pg 494-495.


**Table 1:** Diagnostics

| Virus | Date | Sample | Result | Comment |
|---|---|---|---|---|
| PRRS | 8/04/17 | Oral fluid | positive | |
| PRRS | 8/28/17 | Flies | positive (Ct 31.6) | Trap (1 of 6 positive) |
| PRRS | 8/28/17 | Liquid | negative | Liquid attractant in traps |
| SVV | 8/04/17 | Oral swab | positive | |
| SVV | 8/28/17 | Flies | positive (Ct 30.5 & 30.4) | Trap (2 of 6 positive) |
| SVV | 8/28/17 | Liquid | negative | Liquid attractant in traps |
| SVV | 8/28/17 | Flies (Ct 30.5) | positive (Ct 20.0) | Virus isolation passage "0" |
| SVV | 8/28/17 | Flies | positive (Ct 17.0) | Virus isolation passage "1" |

**Figure 2:** Fly on vehicle dashboard