

## **SURVIVAL TIMES IN THE ENVIRONMENT OF SWINE PATHOGENS**

It is a well known fact that in most cases, a disease is introduced into a swine herd by the addition of new animals that are infected. While some may be visibly sick, others may appear healthy but actually are in the prepatent period or asymptomatic shedders of the etiological agent. As modern disease control methods (such as multiple site production, all-in/all-out, depopulation-repopulation) are employed, there is increased interest in the survival of the agent in the facility once the hogs have been removed. Since the time the facility stands vacant translates into lost production, most operators want to keep the idle time between groups to the minimum that is necessary to break the disease cycle. For this reason, information on several significant disease conditions is listed below.

### **TRANSMISSIBLE GASTROENTERITIS (TGE):**

The TGE virus is inactivated by 6 hours of sunlight. It remains infective for a year when stored at -4 F., but loses all infectivity when kept at 98 F. for 4 days. It is very stable when frozen, but is unstable at room temperature and above. Dogs, cats, and foxes can shed the TGE virus in their feces for a variable period. Starlings mechanically carry it and can shed it in droppings for 32 hours after ingesting it. Flies can excrete it in droppings for 3 days. Pigs routinely shed it for 2 weeks post-infection and some researchers have found it for 35 days. While the TGE virus has been found in lung and intestinal homogenates for 104 days, this does not represent a source of infection for the herd. The virus is inactivated by most common disinfectants including bleach, lye, iodines, and quaternary ammonium compounds.

### **PSEUDORABIES VIRUS**

Survivability has been demonstrated in-on the following substances:

Straw bedding	4 days
Concrete	4 days
Pig urine	14 days
Steel	18 days
Chlorinated water	2 days
Denim cloth	1 day

Swine usually shed the virus for 14-21 days post infection and can shed it intermittently for longer periods. Shedding can occur after reactivation of latent infections.

Rates of pseudorabies virus survival are improved in environments at 55% relative humidity as compared to 85%. Survival was also improved at a temperature of 39 F compared to 72 F. Studies suggest the infectivity of PRV in an aerosol decreases by 50% in less than one hour. Recently Danish investigators have proposed that PRV as an aerosol can be transmitted over distances of 25 miles when the climatic conditions are right for virus survival.

Low temperatures lengthen the survival of PRV as well as other viruses. At 77 F., PRV survived for 7 days in well water, 2 days in lagoon water, 1 day in pit effluent, 3 days in pelleted feed, and 7 days in loam soil. PRV was rapidly deactivated (< 2 days) in the presence of wood, swine feces, green grass, alfalfa and denim cloth.

It is unlikely PRV survives the slaughter and rendering process to be present in meat and bone meal used in livestock feed according to research at Iowa State University.

Effective disinfectants include orthophenolphenate compounds, trisodium phosphate, phenolic compounds, chlorhexidine, and 2% sodium hydroxide. The virus is destroyed at pH > 11.5.

### **ROTAVIRUS**

The virus is acid and alkali resistant in the range of pH 3-9. In fecal material the virus remains viable for 7-9 months at a temperature of 65 F. It can survive at 140 F. for 30 minutes. It resists 1% formalin, 1% lysol, and 1% tincture of iodine. It is inactivated by 70% ethanol, 1% Wescodyne, and 1% hypochlorite. Total elimination of the virus from a premises is unlikely due to its ability to survive outside pigs in mud, its occasional presence in drinking water, and its probable presence in adults including humans, pigs, dogs, and rodents. Cleanliness may be sufficient since elimination is not practical.

#### **ENCEPHALOMYCARDITIS VIRUS (EMC):**

Rats may act as a reservoir with the virus being excreted in the feces. The virus infectivity did not change when subjected to pH range of 3 to 11 for two hours. When the virus was heated to 132 F, the infectivity was reduced after 30 minutes but some infectivity was still present at 6 hours. While no other work could be found describing the survival of the virus under natural environmental conditions, researchers report that it is generally more resistant than pseudorabies virus but less resistant than parvovirus.

#### **PORCINE PARVOVIRUS**

Viral infectivity is little affected by heat, a wide range of pH, and enzymes. It is resistant to many common disinfectants and may remain viable for months in secretions and excretions from acutely infected animals. The virus is shed for approximately 2 weeks after exposure of a susceptible pig.

#### **ACTINOBACILLUS PLEUROPNEUMONIAE**

(Haemophilus)

Survival of the organism in the environment is of short duration. When protected with mucus or other organic material, it can survive for a few days. Transmission by rodents or birds is doubtful.

#### **PASTEURELLA MULTOCIDA**

The organism does not survive for more than a few weeks outside the host. It is killed by exposure to sunlight for 10 minutes or by heating to 140 F for 30 minutes.

#### **MYCOPLASMA HYOPNEUMONIAE**

This organism can be recovered from infected lung tissue stored at room temperature for 1 week. As a rather substantial inoculum is required, most transmission is to penmates by direct contact or droplet infection. There is some evidence of aerosol spread between herds a mile apart given suitable climatic conditions. When stored in culture media, the organism survived 42 days at 41 F, but was inactivated in less than three days at 98.6 F.

#### **TREPONEMA HYODYSENTERIAE**

The organism survives in feces for 7 days at 77 F. and for 2 months in feces diluted with water (pits and lagoons) at 41 F. It remains viable in soil at 39 F. for 18 days. To prevent infection of susceptible swine, contact with lagoons should be avoided for 90 days in warm weather, longer in cold weather. Contaminated soil should be avoided for at least 30 days in warm weather. Infected mice have shed the organism in their feces for more than 180 days while dogs have shed it for 13 days after oral administration. Birds and flies have also been shown to carry it for 8 and 4 hours respectively. It has remained viable for more than 10 years when stored at -176 F.

#### **SALMONELLA CHOLERAESUIS**

The organism can survive freezing and drying very well. It can persist for months or years in suitable

organic matter. It is easily inactivated by heating and exposure to sunlight. Common phenolic, chlorine, and iodine based disinfectants are effective in inactivating it. In another trial, Salmonella choleraesuis suspension dried on a steel surface survived for 2 days when kept at 50 F and 50% relative humidity while Salmonella typhimurium under the same conditions survived for more than 14 days. Salmonella choleraesuis is very rarely isolated from pig feed. Less than 1% of the S. choleraesuis isolations are made from sources other than swine and these are usually from rodents. Carrier pigs are common and shedding of organisms in the feces is precipitated by stress.

### **ERYSIPELOTHRIX RHUSIOPATHIAE**

This organism is somewhat resistant to drying and can remain viable for several months in animal tissues under a variety of condition. It can survive several months in cured and smoked hams. It has been recovered from swine feces and fish slime for up to 6 months when the temperature has been kept below 53 F. Although formerly thought to persist in the soil for years, it is now believed that it survives only about a month in the soil. It is readily killed by common disinfectants and by heating to 140 F for 15 minutes. The organism has been found in at least 50 species of wild mammals and 30 species of wild birds as well as fish, turkeys and sheep.

### **LEPTOSPIRA SPECIES**

Some carrier swine may shed viable leptospira organisms in their urine for as long as two years. In undiluted urine the organisms remain viable for several hours while in diluted urine or liquid manure L. pomona has remained viable for 2 months. In general, the presence of other bacteria and increasing temperatures shorten the survival of leptospira. When infected urine is deposited in poorly drained soil, the organisms may survive for extended periods of time. Wildlife provides the primary source of infection with serovars of grippityphosa, icterohemorrhagiae, and autumnalis.

### **STREPTOCOCCUS SUIS**

At 32 F, Strep suis Type 2 can survive for 104 days in feces and for 54 days in dust. At 48 F, it survived for 10 days in feces and 25 days in dust. At room temperature, S. suis could not survive in dust for 24 hours. It is easily inactivated by commonly used disinfectants.

### **ASCARIS SUUM**

(Roundworm)

Eggs are highly resistant in the environment, surviving more than 4 years even through long freezes. Some references quote the viability at 7-15 years in soil.

### **TRICHURIS SUIS**

(Whipworm)

The eggs are highly resistant in the environment and remain viable for at least 6 years in the conditions found in pasture or dirt hog lots.

### **ISOSPORA SUIS**

(Coccidia)

Common disinfectants used at normal concentrations are insufficient to kill the oocysts. Ammonia at 50% strength or household bleach at 50% strength will inactivate the infective oocysts, as will live steam. The oocysts can survive freezing for 26 days.

### **SARCOPTES SCABIEI**

(Mange mite)

Survival of the mite and eggs away from the host is for a short time only. Experiments showed that the

mites did not survive for 96 hours at temperatures less than 77 F. At 77-86 F., the mites survived no longer than 24 hours off the host.

### **HAEMATOPINUS SUI**

(Louse)

The hog louse can not live more than 2-3 days away from the host. The normal life cycle is entirely on the host.