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Important Viral Diseases of Pigs and General Precautions for their Control and Prevention

Ritu Panghal

Department of Veterinary Microbiology, LUVAS, Hisar-125001

**Corresponding author: ritupanghal0@gmail.com*

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INTRODUCTION

India's economic development and its rural livelihood are largely dependent on the livestock and animal husbandry sectors. A major portion of the country's gross domestic product is contributed by these two sectors, as India possesses one of the largest livestock wealth in the world. Pigs holds a significant position among the livestock species as it is being reared by socio-economically weaker sections of the society and has a great potential to contribute economically to the farmers at a faster rate. According to the 20th livestock census held in 2019, the total pig population is around 970 million globally and 9 million in India. Pigs are an important source of meat (pork) and have great potential to ensure nutritional and economic security for the weaker sections of the society. Pork constitutes about 5% of total meat production of our country.

Despite its importance, the growth of pig industry is showing a declining trend. One of the most important reasons for such a trend is the occurrence of various infectious diseases in the pig population. In comparison to previous livestock census, a decrease (about 12%) in pig population has been observed. Among the different diseases, a number of viral diseases are there that results in significant economic losses due to morbidity and mortality of the affected pigs. Multiple factors, such as back-yard farming, pig/pork movements, consumer behaviours, small-scale slaughterhouses, and wet markets, are known to contribute to disease transmission within and among countries, thus resulting in major viral disease outbreak in pig industry.

The severity of clinical signs depends on the age of the pig, the route of infection, the virulence of the infecting virus and the immunological status of the animal. Here some important viral diseases affecting the pigs have been mentioned briefly along with their symptoms and transmission routes. This information could increase the understanding

of pig owners towards different diseases and help in early identification of affected pigs so that necessary steps and precautions could be taken to control and prevent the disease.

1. African swine fever

African swine fever (ASF) is a highly contagious haemorrhagic disease of domestic pigs, warthogs and wild pigs. All the age groups of pigs are equally susceptible. The infection is transmitted to healthy pigs either by direct contact between sick and healthy animals or by feeding on garbage containing infected meat or through biological vectors – soft ticks of the genus *Ornithodoros* or by fomites including, premises, vehicles, implements, clothes. Two distinct patterns of transmission occur: a sylvatic cycle in warthogs and ticks and epizootic & enzootic cycles in domestic swine. Blood, tissues, secretions and excretions of sick and dead animals act as the important sources of the ASF virus.

The incubation period of ASF is usually 4–19 days and it occurs in four different forms in pigs. In peracute form, the pigs shows few symptoms and die suddenly. The acute form is characterised by fever (40.5–42°C) and reddening of the skin - tips of ears, tail, distal extremities, ventral aspects of chest and abdomen. The affected animals develop anorexia, listlessness, cyanosis and incoordination within 24–48 h before death. The pigs also shows vomition, diarrhoea that can contain blood sometimes, eye discharge and increased respiratory rate. The pregnant sows may abort. Usually mortality rate is 100 % and death occurs within 6-13 days. In subacute form, less intense signs develop including slight fever, depression, and reduced appetite. The mortality rate is comparatively lower and affected pigs die within 15-45 days. The chronic form caused by moderately or low virulent virus shows low mortality and survivors may become carriers for life. In this form, the affected pigs shows weight loss, necrosis and ulcers of the skin, respiratory symptoms, arthritis and swelling over the joints.

2. Aujeszky's disease (pseudorabies)

Aujeszky's disease is a highly contagious, economically significant disease of pigs that causes central nervous system signs in young animals, respiratory illness in older pigs, and reproductive losses in sows. Very young piglets have higher mortality rates than older animals, who usually recover and can carry the virus latently and resume shedding it in the future. The infection is usually transmitted by respiratory or oral route, with a possibility of venereal transmission also.

The incubation period of the disease is about 30 h. Young piglets under two weeks of age are most susceptible to the disease, shows a high mortality rate and have shorter course of disease (typically 4 to 8 days). The initial symptom of the pseudorabies is mild fever that subsequently rises to 42 °C in the following 48 h. During the fever, pigs may vomit and experience constipation. Pigs are listless, depressed, recumbent and exhibits excessive salivation. They shows severe neurological disorder including muscle spasm, periodic convulsions, lack of coordination and nystagmus. Pigs reach moribund state by the 6th day and die within 12 h. The pigs that are older than two months of age, usually

shows mild to severe respiratory signs- sneezing, coughing and nasal discharge that may progress to pneumonia due to secondary bacterial infections. Although the mortality rate for mature pigs is low (often less than 2%), the animals' post-recovery weight loss and growth rates are poor. The pregnant sows may abort or give birth to a mummified, macerated, stillborn or weak swine.

3. Classical swine fever

Classical swine fever (CSF) is a highly contagious disease of pigs that is transmitted through ingestion, contact with the conjunctiva or mucous membranes, skin abrasions, genital transmission or artificial insemination. The infection can spread by direct contact between animals or indirect contact through premises, vehicles, clothes, instruments, needles and insects. Farm visitors, veterinarians and pig traders also contribute to the disease transmission. The virus is secreted in the blood, urine, faeces, semen, oronasal and lachrymal discharges.

The disease have an incubation period of 2-14 days in general and 3-7 days in acute cases. The acute form of the disease occurs due to the more virulent strains of CSF virus (CSFV) and is characterized by fever, conjunctivitis, haemorrhagic lesions on skin, enlargement of lymph nodes and cyanosis of skin especially of extremities (ears, limbs, tail, snout). The affected pigs huddle together and exhibits anorexia, lethargy, difficulty in breathing, vomiting, ataxia, paresis, convulsions and constipation followed by diarrhoea. Mortality rate is 100 % and death occurs in 5-25 days after disease onset.

The less virulent strain of CSFV causes chronic form of the disease in which pig shows dullness, pyrexia, diarrhoea, ruffled appearance and retarded growth. The pig may exhibit disease relapse and death within three months after recovery. The CSFV also affects pregnant sows and results in foetal death, abortion or still births. In mild form of the disease, the affected pigs shows transient fever and inappetence, from which they generally recover and show lifelong immunity.

4. Foot-and-mouth-disease

Foot-and-mouth disease (FMD) is a highly contagious, transboundary disease of cloven-hoofed animals including pigs with an incubation period of 2-14 days. The pigs are designated as amplifier host of FMD as they are able to secrete large amount of FMD virus (FMDV) via their breathe. The FMDV is present in all the secretions and excretions of the infected animals – breathe, saliva, feces, urine, milk, semen, meat and meat by-products. The infection is transmitted to healthy pigs by direct contact with infected animals or contaminated inanimate objects, consumption of untreated meat products, contaminated milk ingestion and inhalation of infectious aerosols. The disease is difficult to clinically differentiate from other vesicular diseases, such as swine vesicular disease, vesicular stomatitis and vesicular exanthema.

The affected pigs show excessive salivation, inappetence, depression, fever and lameness. There is formation of vesicles or blisters on feet, snout, tongue, mouth and teats of recently farrowed sows. The vesicles burst within 24 h and start to heal later but leaves

erosion marks or is converted to ulcers especially on coronets of feet. The pigs when housed on concrete flooring, the foot lesions are particularly severe and the claw horn can even get detached. Pregnant sows may abort. Low mortality rate is observed in adult pigs, but piglets shows increased mortality due to myocarditis.

5. Porcine reproductive and respiratory syndrome

Porcine reproductive and respiratory syndrome (PRRS) is mainly characterised by reproductive failure in sows and respiratory problems in piglets and growing pigs. The virus is generally transmitted directly via contact with infected pigs or with faeces, urine, saliva and semen. It can also spread by insects or aerosol routes. Pigs are the only species naturally infected with PRRS virus.

Pigs of all ages are susceptible to the infection and is initially characterized by loss of appetite, fever, and lethargy. Younger pigs have rough hair coats, reduced growth rates, laboured breathing, red discoloration of the skin, cyanosis of the ears, and increased mortality (20-50%). Sows infected in early to mid-gestation have little adverse consequence, whereas sows in late gestation (usually in last third of gestation) frequently experience reproductive failure as a result of the infection. There is abortion and premature farrowing in sows resulting in birth of weak small pigs, stillborn pigs, and partially or completely mummified fetuses. Some neurological signs like ataxia and circling are shown by infected sows. Piglets that survive pregnancy and are born alive after *in utero* infection are often weak and die quickly, typically with respiratory distress. Piglets that acquire the PRRS infection after weaning, are concurrently infected with other disease agents.

6. Swine influenza

Swine influenza is an acute upper respiratory disease characterised by fever, lethargy, loss of appetite, weight loss, coughing, sneezing, nasal discharge, and laboured breathing. Due to secondary effects of fever, decreased semen production in boars and abortions in sows may also occur. The morbidity rate of the infection is 100% but case fatality rate is generally less than 1-4 % and most of the animals recover within 3-7 days. However, some complications can occur in affected pigs due to secondary bacterial or viral infections that increases the mortality rate and recovery time.

The swine influenza viruses are readily transmitted between animals through pig to pig contact via the nasopharyngeal route. The affected pigs start shedding the influenza virus by 7-10 days generally, but the shedding can start as early as within 24 h of infection. Other species including birds, human and horses may serve as the source of influenza viruses and is capable of infecting the pigs.

7. Swine vesicular disease

Swine vesicular disease (SVD) is an acute, contagious viral disease of pigs characterized by fever and vesicles in the mouth and on the snout, feet, and teats, which later develops into ulcers. Pigs are the only natural host for the disease.

The incubation period for SVD is between 2 and 7 days and is illustrated by appearance of vesicles, lameness, fever and anorexia. Vesicles mainly develop on the coronary band resulting in loss of the hoof and rarely on the snout, lips, tongue and teats. The affected pigs faces difficulty in moving especially on the hard surfaces and usually they limp, stand with arched back or do not move at all. Pigs kept on abrasive floors and unsanitary conditions demonstrate more grave symptoms as compared to the pigs kept on grass or housed on deep straw. Young pigs are more severely affected by SVD and recovery occurs usually within 2–3 weeks.

8. Vesicular exanthema

Vesicular exanthema (VE) caused by, Vesicular exanthema of swine virus (VESV) is transmitted by feeding uncooked garbage and fish scraps to pigs. It can also spread via direct contact with diseased pigs, vesicular fluid, secretions from mouth or nose and vesicle coverings.

The disease is characterised by formation of vesicles on the snout, oral mucosa, soles of the feet, coronary bands, between the toes and sometimes on teats. VESV is also associated with reproductive failure in swine and mild encephalitis.

9. Vesicular stomatitis

The exact mechanism of vesicular stomatitis virus (VSV) transmission is not understood, but occurrence of infection by transcutaneous or transmucosal route or by arthropod transmission is a possibility. The VSV is secreted in saliva, vesicle exudate or epithelium of infected pigs and arthropod vectors.

The incubation period of the disease is 2-8 days and symptoms are similar to those of FMD. The vesicular stomatitis usually occurs in adult animals and is characterised by excessive salivation, development of blanched raised or broken vesicles of various sizes in the mouth, snout & foot leading to lameness. Generally the mortality is rare and recovery occurs in few days

Figure 1. Important viral diseases of pigs with their causative agent and host range

S.no.	Name of the disease	Caused by		Host
		Virus name	Virus family	
1.	African swine fever	African swine fever virus	<i>Asfarviridae</i>	Domestic pigs, wild pigs, ticks of the genus <i>Ornithodoros</i>
2.	Aujeszky's disease	Suid herpesvirus	<i>Herpesviridae</i>	Variety of mammals- pigs, dogs, cats, cattle, sheep, rabbits, foxes, minks etc.
3.	Classical swine fever	Classical swine fever virus	<i>Flaviviridae</i>	Pigs
4.	Foot-and-mouth disease	Foot-and-mouth disease virus	<i>Picornaviridae</i>	Cloven-hoofed animals including cattle, buffalo, sheep, goat, pigs and wild ruminants
5.	Porcine reproductive and respiratory syndrome	Porcine reproductive and respiratory syndrome virus	<i>Arteriviridae</i>	Domestic and wild pigs
6.	Swine influenza	Influenza A viruses	<i>Orthomyxoviridae</i>	Pigs, humans, horses, birds
7.	Swine vesicular disease	Swine vesicular disease virus	<i>Picornaviridae</i>	Domestic and wild pigs
8.	Vesicular exanthema	Vesicular exanthema of swine virus	<i>Caliciviridae.</i>	cattle, horses, primates, reptiles, and fish.
9.	Vesicular stomatitis	Vesicular stomatitis virus	<i>Rhabdoviridae</i>	Horses, donkey, mules, cattle, pig

General precautions to be taken to prevent the spread and occurrence of different viral diseases in pigs

The important viral diseases infecting pigs along with their causative agents and host range have been mentioned in Fig. 1 and their symptoms, sources and mode of virus transmission have been discussed briefly in the above section. Against viral diseases, no specific treatments are available and they are known to spread very easily among the animals. Hence, here some possible measures are mentioned that could be followed by the pig owners in order to prevent and control these diseases.

- Good herd management practices should be followed to maintain the proper growth and health of the pigs
- Regular and careful observations should be made to observe any signs of ill health, unusual behaviour or potentially sick pigs.
- New stock of the pigs should be purchased from a reputable and certified sources.
- The new stock should never be introduced into the pig herd directly. Instead, there should be a separate area on farms where new pigs are separated from rest of the herd for a minimum of 30 days.
- The pigs should also be quarantined when they return from any fairs, shows or exhibition or when sick.
- Along with quarantine, the pigs should be dewormed, tested for specific diseases or vaccinated if required prior to their addition or return to the farms
- Good quality and fresh feed should be provided to the pigs that is well balanced nutritionally according to the age and physiological conditions of the pigs.

- Owners should provide a clean environment to the animals. Good sanitation and proper ventilation of buildings will help prevent the disease. Cleaning and disinfection protocols should be established and periodically performed on every farm facility, vehicle, and piece of equipment
- Movements of pigs or pig products coming from infected areas should be prohibited to prevent the disease spread.
- Unnecessary visits on the farm should be discouraged. But if visitors enter the farm, visits should be registered and visitors should follow strict biosecurity measures regarding footwear and clothing. Same biosecurity procedures should be followed by farm staff and veterinarian.
- Foot baths should be used at the main gate of farm and at the entrance of every unit where animals are kept.
- Regular trainings should be conducted by the government or professionals for pig owners and farm workers regarding different diseases, their management, general managemental practices, feeding practices and information related to pig breeding etc.
- Proper physical barriers (fencing, walls, gates) should be there on farms and animals should be kept in a way that ensures that no direct or indirect contact occurs with wild boar, feral pigs, or domestic pigs coming from other premises. The location of the farm should be generally away from forest or other farms and swill feeding should be avoided.
- The carcasses, discarded parts from slaughtered pigs and food waste should be disposed properly.
- The faeces, bedding materials, leftover feed or other excretions or secretions of diseased animals should be completely removed and properly disposed of, followed by thorough cleaning and disinfection.
- All-in/ all-out system complemented with cleaning and disinfection of farm facilities for the new batches of animals should be followed.
- It is very important to establish a work routine that takes into account the role in disease transmission of the different age groups within the farm. Either there should be separate personnel working in fattening units, pregnant units or piglet unit. If separate personnel is not possible than the usual recommendation is to establish a workflow following the pig flow, from younger to older.
- Proper deworming and vaccination schedule should be followed.
- If any sign or symptom related to disease is observed, a veterinarian should be consulted immediately.