ISSN: 2583-8288
Technical Article
Published on: 28.02.2025

SMEDI in Swine for Reproductive Losses

Diksha Upreti[1], Renu Sharma[2], Abhisek Mishra[3], Bharti Rana[4], Pushpa[5]

[1]M.V.Sc. Scholar, Division of Animal Reproduction, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, India.
[2]PhD. Scholar, Division of Animal Reproduction, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, India.
[3]M.V.Sc. Scholar, Division of Medicine, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, India.
[4]M.V.Sc. Scholar, Division of Pathology, College of Veterinary and Animal Sciences, G.B.P.U.A.T, Pantnagar, India
[5]M.V.Sc. Scholar, Division of LPM, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, India.
DOI:10.5281/Vettoday.14983829

Abstract

SMEDI (Stillbirth, Mummification, Embryonic Death, and Infertility) in pigs is a reproductive syndrome that causes significant economic losses in pig farming, primarily due to decreased litter sizes, high stillbirth rates, and the birth of weak or non-viable piglets. The most common cause of SMEDI is Porcine Parvovirus (PPV), but other viral infections such as Porcine Reproductive and Respiratory Syndrome (PRRS), Leptospira spp., Swine Influenza Virus (SIV), and Pseudorabies Virus (PRV) also contribute to this condition. SMEDI is characterized by embryonic death, mummification, stillbirth, and infertility, often depending on the timing of infection during gestation. Diagnosing SMEDI involves post-mortem examinations, serology, PCR testing, and ultrasound, which help identify the causative pathogens. Prevention and control of SMEDI rely heavily on vaccination, strict biosecurity measures, good herd management, and sanitation practices. Despite limited treatment options for viral infections, managing secondary bacterial infections with antibiotics and antiviral therapies, alongside fertility management, can help reduce the incidence of SMEDI in breeding herds. Effective herd management practices are essential for minimizing reproductive failure and ensuring sustainable productivity in pig farming.

Keywords: *Infertility, Reproductive Syndrome, Pig Farming, Economic Losses.*

Introduction

SMEDI, which stands for Stillbirth, Mummification, Embryonic Death, and Infertility, is a reproductive syndrome in pigs that leads to significant reproductive losses in breeding herds. SMEDI syndrome in pigs, primarily caused by porcine parvovirus, represents a significant challenge to swine health and productivity. The disease's complexity is heightened by the presence of coinfections with other infectious organisms.This syndrome affects the reproductive performance of sows, causing economic losses due to decreased litter sizes, high rates of stillborn piglets, and the birth of weak or non-viable piglets. SMEDI is primarily associated with viral infections, although bacterial and other factors can also contribute.

Causes of SMEDI

The most common causes of SMEDI are Porcine Parvovirus (PPV), Porcine Reproductive and Respiratory Syndrome (PRRS), and other infectious agents, including Leptospira spp., Swine Influenza, and Pseudorabies Virus (PRV). Let's explore these causes in detail:

1. **Porcine Parvovirus (PPV**
   Porcine Parvovirus is the leading cause of SMEDI in pigs. When a sow is infected with PPV early in pregnancy (usually before 35 days of gestation), the virus affects the developing fetuses. Infected embryos typically die, resulting in embryonic death, stillbirth, and mummification of piglets. The outcome depends on the timing of the infection: early infections lead to embryonic death, while later infections result in stillbirths and mummified piglets.
2. **Porcine Reproductive and Respiratory Syndrome (PRRS)**
   PRRS, caused by a virus of the Arteriviridae family, is another major contributor to SMEDI in pigs. This virus can cause reproductive failure, including stillbirths, abortion, and the birth of weak piglets. While it typically affects late-term pregnancies, it can also cause respiratory problems in piglets. PRRS can lead to significant losses in reproductive efficiency and piglet health.
3. **Leptospirosis**
   Caused by the Leptospira bacteria, Leptospirosis can result in reproductive failures such as stillbirths, abortion, and infertility. The infection is typically transmitted through contaminated water or urine from infected animals. It can lead to severe reproductive consequences, especially in sows.
4. **Swine Influenza Virus (SIV)**
   Although Swine Influenza primarily causes respiratory disease, it can also lead to abortions and reproductive failure, contributing to SMEDI in pigs. Infection with SIV may cause fever, weakness, and miscarriages in pregnant sows, leading to stillborn piglets.
5. **Pseudorabies Virus (PRV)**
   Pseudorabies, caused by the Herpesvirus, is another infectious agent that can cause SMEDI. It results in abortions, stillbirths, and mummification of piglets when sows are infected during pregnancy.
   Pseudorabies can also affect piglets after birth, causing neurological symptoms and death. (Eddicks et al., 2023)

Symptoms of SMEDI

SMEDI leads to a variety of symptoms in pigs, including:

- Stillbirth: Dead piglets born after full-term pregnancy, often caused by infection or fetal death.
- Mummification: Piglets that die in the uterus but are retained and dried out, resulting in small, shriveled piglets.
- Embryonic Death: Early-stage deaths of embryos, usually before the 35th day of pregnancy, leading to early resorption or mummification.
- Infertility: Failure of the sow to conceive or carry the pregnancy to term due to the effects of infections or immune responses. (He et al., 2021)

Diagnosis of SMEDI

Diagnosing SMEDI requires a combination of clinical observation, laboratory testing, and herd history. Common diagnostic approaches include:

1. Post-mortem Examination
   - Examination of stillborn or mummified piglets is essential for identifying the cause of death. This helps differentiate between viral or bacterial infections.
2. Serology and PCR Tests
   - Blood tests to detect antibodies for Porcine Parvovirus (PPV), PRRS, Leptospira spp., and other infectious agents can confirm the presence of the causative pathogen. PCR (Polymerase Chain Reaction) testing is also useful for detecting viral DNA or RNA in tissues.
3. Ultrasound and Hormonal Tests
   - Ultrasound can be used to detect the presence of live embryos or fetuses, while hormonal tests may provide insight into underlying reproductive problems, such as anestrus or hormonal imbalance. (Zakaryan, n.d.)

Prevention and Control of SMEDI

Controlling SMEDI involves several strategies aimed at preventing infection and improving herd management:

1. **Vaccination**
   - Vaccines are available for some of the primary agents of SMEDI, such as Porcine Parvovirus (PPV) and PRRS. Regular vaccination of breeding herds can reduce the risk of infection and improve reproductive performance.
2. **Biosecurity Measures**
   - Strict biosecurity protocols are essential to prevent the introduction and spread of infectious agents. This includes quarantining new animals, disinfecting equipment, and controlling rodent and insect populations that may transmit diseases.
3. **Herd Management**
   - Regular monitoring of the health of sows and boars, along with managing stress and environmental conditions, can reduce the risk of reproductive failure. Implementing controlled breeding programs and avoiding overexposure to pathogens during critical reproductive periods can help.
4. **Good Sanitation**
   - Ensuring that barns, feed, and water are free from contaminants is crucial for reducing the risk of infections like Leptospirosis and Swine Influenza. Cleaning and disinfecting farrowing units, pens, and equipment regularly helps to maintain a healthy environment. (Christianson, 1992)

Treatment and Management

Once SMEDI is detected, treatment options are somewhat limited, especially for viral infections. However, management strategies include:

- Antibiotics may be prescribed to treat secondary bacterial infections, especially if Leptospirosis or other bacterial pathogens are involved.
- Antiviral drugs are available for some viral infections, such as PRRS, though they are not always effective in eliminating the virus entirely.
- Fertility management through improved breeding practices and genetic selection may help reduce the incidence of SMEDI in the long term. (Vereecke et al., 2022)

Conclusion

SMEDI (Stillbirth, Mummification, Embryonic Death, and Infertility) represents a major reproductive challenge in pigs, primarily caused by viral infections such as Porcine Parvovirus and PRRS. This syndrome leads to significant economic losses due to decreased productivity and high rates of reproductive failure. Effective prevention through vaccination, strict biosecurity, and good herd management practices is crucial for minimizing the impact of SMEDI. Although treatment options are limited, addressing secondary infections and improving fertility management can help reduce its prevalence and support sustainable pig farming practices.

References

Christianson, W. T. (1992). Stillbirths, Mummies, Abortions, and Early Embryonic Death. *Veterinary Clinics of North America: Food Animal Practice*, *8*(3), 623–639. https://doi.org/10.1016/s0749-0720(15)30708-8

Eddicks, M., Gründl, J., Seifert, A., Eddicks, L., Reese, S., Tabeling, R., Swam, H., Strutzberg-Minder, K., Ritzmann, M., & Fux, R. (2023). Examination on the Occurrence of Coinfections in Diagnostic Transmittals in Cases of Stillbirth, Mummification, Embryonic Death, and Infertility (SMEDI) Syndrome in Germany. *Microorganisms*, *11*(7), 1675. https://doi.org/10.3390/microorganisms11071675

He, Y., Chen, W., Fan, J., Fan, S., Ding, H., Chen, J., & Yi, L. (2021). Recombinase-Aided Amplification Coupled with Lateral Flow Dipstick for Efficient and Accurate Detection of Porcine

Parvovirus. *Life*, *11*(8), 762. https://doi.org/10.3390/life11080762

Vereecke, N., Kvisgaard, L. K., Baele, G., Boone, C., Kunze, M., Larsen, L. E., Theuns, S., & Nauwynck, H. (2022). Molecular epidemiology of Porcine Parvovirus Type 1 (PPV1) and the reactivity of vaccine-induced antisera against historical and current PPV1 strains. *Virus Evolution*, *8*(1). https://doi.org/10.1093/ve/veac053

Zakaryan, H. (n.d.). *Porcine Viruses Edited by From Pathogenesis to Strategies for Control Caister Academic Press*. https://www.caister.com/openaccess/pdf/9781910190913-06.pdf