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Greasy Pig disease - An emerging disease of swine

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ABSTRACT

Greasy pig disease" is a bacterial skin disease of pigs mainly affecting young piglets, characterized by patches of skin lesions ranging from localized to all over the body. Although this disease's morbidity is variable among the pigs, suckling piglets are more severely affected, which leads to high mortality in the affected litter. Since the infection is mainly caused by *Staphylococcus hyicus,* the beta-lactam group of antibiotics is commonly used to treat the infection. However, rising antibiotic resistance in recent days leads to treatment failure in affected piglets. Of note, in most of cases, sudden mortality is commonly reported in the affected litter. Pork production is the primary livelihood of most of the people in the Northeastern part of India. This disease's occurrence in a larger number of piglets resulted in substantial economic loss to the farmers in terms of mortality in young piglets. It decreased the value of the pork produced. It also indirectly affects the consumer's willingness to consume pork due to unrelished external skin lesions. Hygiene and sanitation of piggeries are important to prevent the outbreak of this disease in piglets. Care and management of suckling piglets will reduce the disease burden and increases the profitability of pig farming.

1. Introduction

Pigs are the most important food-producing animals throughout the world. Among the several food-producing animals, pigs are efficient feed converter next to broiler chicken. Larger litter size, lesser feed cost and easy management in pigs offer more profit with relatively low investment. Further, pig rearing is one of the integral parts of the livestock farming system among most tribal populations in India's North Eastern parts. As per the 20th livestock census, India holds around 9.06 million pig population and positioned 5th rank in the world. Northeastern states are majorly contributing to the total Indian pig population (http://dahd.nic.in). Almost all the rural families in this region keep a minimum of few pigs in their backyard as their source of income (Shakuntala *et al.,* 2020). However, because of the larger population, high stock density, and early weaning, the incidence of several diseases is more prevalent in this region (Baruah *et al.,* 2017). Greasy pig disease, also called the exudative epidermitis, is an important bacterial disease of pigs affecting majorly newborn and weaned piglets resulting in destructive skin lesions ranging from localized to the piglets' entire body (Frana 2012). The name describes the oozing of exudate from the inflamed skin of pigs. The severity of the disease depends on the piglet's age and presence of other secondary bacterial agents. The mortality

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rate is higher in the age group of less than10 weeks (L'Ecuyer and Jericho 1966). During outbreaks, both morbidity and mortality are higher in piglets. The cause of death in exudative epidermitis is mostly due to dehydration. The disease is of major concern in weaned piglets worldwide, including India, especially more prevalent in our country's Northeastern region. This review describes the disease's etiology, its transmission pattern, clinical manifestations, treatment, and prevention control measures.

Etiology

Greasy pig disease is largely caused by bacteria *Staphylococcus hyicus*, although some other staphylococcal species such as *S. aureus, S. chromogenes* and *S. sciuri* may also occasionally induce disease (Foster 2012; van Duijkeren *et al.,* 2007; Andresen *et al.*, 2005; Chen *et al.,* 2007). Normally, *S. hyicus* present in the pig skin as a commensal. However, trauma, and abrasion of skin facilitates the organism to enter into the animal body and produce exfoliative toxins (Devriese 1977a). These exfoliative toxins produced by pathogenic *Staphylococcal* species are responsible for the production of skin lesions. These toxins act on the molecule desmoglein-1, which are present in the epidermis of pig skin (Nishifuji *et al.,* 2008), destroying cutaneous barriers that facilitates bacterial invasion and loss of skin epithelial cells. Toxins are absorbed into the system and produce damage to the kidney and liver. Apart from skin damage, due to fighting injuries, other disease conditions such as swine pox, sarcoptic mange, and pityriasis rosea may also be the contributing factors for the development of greasy pig disease. Besides, hot and humid environmental conditions favor organisms' proliferation by producing a thin moisture layer on the skin of affected piglets. Poor management practices such as badly clipped teeth and tail, metal floors and metal feeding troughs, faulty iron injection and rough side panels in pen also precipitate the disease occurrence (Andresen 2005)

Transmission

Direct contact between piglets is the most common method of transmission. Improper clipping of teeth at birth results in skin damage surrounding the mother's teats and mouth part of other piglets, facilitate bacterial invasion and establishes infection (Nishifuji *et al.*, 2005). Also, lesions produced by rough concrete floors on knees, trauma due to fighting between piglets after weaning, skin damage due to mange infestation, rupture of vesicles/pustules, abrasions in the ear and skin due to constant rubbing against pen floor and walls predisposes the transmission of infection between piglets in the farm (Frana 2012). The disease is highly contagious and spreads rapidly among the piglets in the same litter. Although adult pigs develop resistance against the infection when age progresses, they can act as sources of infection to susceptible population (Vaillancourt *et al.*, 2018). It has recently been shown that immediately before farrowing, the organism multiplies profusely in the vagina of a pregnant sow, and piglets are infected during farrowing or soon after the birth (Vaillancourt *et al.,* 2018).

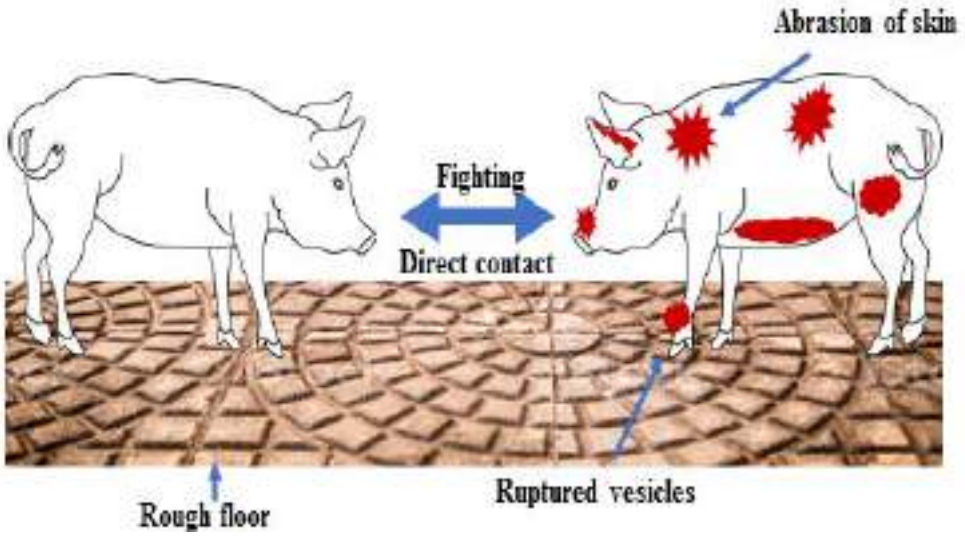

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Fig.1. Transmission and Clinical signs of Greasy pig disease

Clinical signs

Greasy pig disease produces a wide range of clinical presentation in affected pigs ranging from mild localized skin lesions to severe generalized skin lesions with oozing of blood-stained exudate throughout the body (Zimmerman *et al.*, 2019). The clinical signs start with restlessness, depression, and small, dark reddening of the skin around the body surfaces in one or two piglets of the affected litter. The appearance of brown to black color scabs around the tip of the ears, shoulder, and neck in young piglets up to 7 weeks old indicates the disease's progress in the litter (Nishifuji *et al.*, 2008). The per acute or acute form of illness most commonly occurs in suckling and weaned piglets, resulting in severe fluid imbalance and death due to dehydration. On the contrary, in adults, the disease's chronic form is more prevalent (Sato *et al.,* 1991). Affected pigs refuse to eat and show elevated body temperature during the early phase of the disease. In the mild condition, localized patches of erythema and exudative discharge oozing from the affected part, mostly soft skin areas such as the abdominal part and chest, can be mistakenly taken as contact allergy due to floor disinfectants. If treatment and proper management are not given, it may develop into a generalized form affecting the pig's entire body.

Complication of greasy pig disease results in formation of dry gangrene in extremities such as the tip of the tail and ear in young piglets. In adults, discrete patches of superficial skin lesions present over the body are harmless; however, it may spread the infection rapidly to young ones present in the same litter. Sows are rarely affected by the fatal form of *S. hyicus* infection. The skin from the affected parts become wrinkled, and oozing of fluid makes the area greasy. As the infection progresses, the area may turn into black color necrosed area, and piglets may die. As a result of fighting, the ulcers may be visible on the face, around the nostrils, and leg area (Zimmerman *et al.,* 2019).

Fig.2. Classical form of Greasy pig disease

(Source: Dr. Mark White, The National Animal Disease Information Service, https://www.nadis.org.uk/disease-a-z/pigs/greasy-pig-disease/)

2. Diagnosis

Diagnosis can be made primarily based on the characteristic skin lesions. Affected pigs show dehydration, emaciation, and changes in the skin. It is essential to isolate the bacteria and conduct antimicrobial susceptibility testing to treat with specific antibiotics in outbreak situations. Samples for cultural characterization have to be taken from the affected region's moist area after removing the skin's overlying scabs. Samples must be collected aseptically with all precautions and processed immediately in the laboratory. Baird Parker Agar (BPA) and Mannitol Salt Agar (MSA) are commonly used growth media to isolate *Staphylococcal* spp. (Baruah *et al.,* 2017).

Further, protein profiling of crude extracts of S. hyicus toxin can be done using SDS-PAGE. Histopathological examination of the affected part of skin showing neutrophils, degeneration and increased length of interpapillary pegs in stratum germinativum (Baruah *et al.,* 2017). Toxinotyping can be done by using polymerase chain reaction. Postmortem investigations may show congestion and white precipitation in kidney and hepatomegaly.

3. Treatment

Greasy pig disease responds well to antibiotic treatment provided the antibiotics effective against the particular strain and early administration of proper doses of antibiotics. Systemic β-lactam antibiotics can be used to treat the infection effectively (Davies 2016). Application of antiseptic solutions or soap on entire body surfaces can kill the bacteria locally (Vaillancourt *et al.,* 2018). Following systemic antibiotics, in-feed, or in-water medication for 3-5 days is recommended for complete elimination of organism (McEwen and Fedorka-Cray 2002). In recent days, *S. hyicus* and *S. aureus* show a higher level of resistance to β-lactam antibiotics, including penicillins and cephalosporins, making it difficult to treat infections (van Duijkeren *et al.,* 2007; Park *et al.*, 2013; Wegener and Schwarz 1993). To overcome antimicrobial resistance, various herbal preparations and essential oils were tested against *S. hyicus* and *S. aureus* isolates. Studies have proven that essential oils from thyme, cinnamon, and winter savory effectively treat greasy pig disease (Vaillancourt *et al.*, 2018). Thus, it may significantly reduce the antimicrobial resistance and help to develop an herbal treatment approach to cure the disease in affected piglets (Baruah *et al.,* 2017). Electrolytes have to be given as supportive therapy to avoid severe dehydration in young piglets. Autogenous bacterins have been tried with some success rate to reduce the disease burden in chronically infected pig farms. Concomitant infections such as sarcoptic mange should also be treated alongside greasy pig disease to prevent aggravation of existing conditions (Park *et al.*, 2013).

4. Prevention and control

The main precipitating factor for developing the disease is skin damage due to many reasons such as fighting, rubbing on rough floors and pen walls, etc. Thus, all the possible measures must be taken into account to avoid skin damage (Zimmerman *et al.*, 2019). Fighting between the piglets can be minimized by maintaining the same age group of piglets, avoiding mixing in the pen area, ensuring a sufficient quantity of accessible water, feed, and resting space. Teeth clipping may reduce the occurrence of skin damage to a certain extent. Hygienic practices such as routine washing of pigs with a soft soap or antiseptic solutions, cleaning of walls and floors with disinfectants, periodical removal of dung and urine in the pens will reduce the colonization of microorganism in pig skin as well as in the floors (Deka and Thorpe 2008). Routine health checkup of piglets can be done to see the presence of any skin erosions or damage and correction of primary cause (Nishifuji *et al.*, 2008). Rough concrete floors can be brushed over after disinfection with hydrated lime. Colostrum feeding of piglets protects against infection. As udder skin is the most important reservoir of infection, iodine-based antiseptic solutions may be sprayed over the udder or teat may be dipped daily, for three days before and after farrowing. As control of external environmental temperature and humidity has an influence on the multiplication of bacteria in the pens, high humidity (above 70%) and wetting of pens should be avoided. Disinfection of pens between the batches should be done with ideal disinfectants. Farm managers and workers should be educated about hygienic practices in the pen such as safe handling of piglets while transferring to weaning pens, and routine monitoring of piglets for any wounds or trauma.

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