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Case Report

Management of exudative epidermitis (greasy pig disease) in 4 week old piglets

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An outbreak of dermatological disease in piglets from backyard piggery in Makurdi Benue State, Nigeria was investigated and detected to be "Greasy pig disease" which was also confirmed by bacteriological identification of the etiology as *Staphylococcus hyicus.* The disease is characterized by exudative inflammation of the epidermis in pigs. The natural infection and characteristic lesions were observed in the piglets which include; abscess that varied from small nodular type to deep intramuscular containing pus, ulcerative-crusted skin lesion on the cheek region, emaciation and general weakness. From the 16 piglets in the farm, 10 piglets were found to present signs typical to the disease, and the bacterium was identified from 7 piglets out of the 10 clinical cases. The causative agent *S. hyicus*was was identified by bacterial culture. Based on antibiotic disc sensitivity test, the organism was sensitive to rifampin, levafloxacin, ciprofloxacin and norfloxacin and was resistant to amoxycillin, erythromycin, chloramphenicol and ampicillin.

Key words: Management, exudative, epidermitis, piglets and *Staphylococcus hyicus*.

INTRODUCTION

Exudative epidermitis (EE), also known as "greasy pig disease", is a skin infection mainly affecting neonatal and newly weaned piglets, characterized by lesions ranging from localized lesions of a few mm in diameter to a generalized condition covering the entire body. The condition has been recognized for over 150 years and reported worldwide. It occurs sporadically and can be of economic significance as a cause of mortality and a cause of poor growth rate (Wegener and Skov-Jensen, 2006). *Staphylococcus hyicus* is generally considered the causal agent, and in particular, virulent strains of *S. hyicus* that produce exfoliative toxins (Andresen et al., 2005; Wegener and Schwarz, 1993). Both virulent and avirulent strains of *S. hyicus* can be isolated from the skin of healthy or diseased pigs (Park and Kang, 1986). There may be other factors associated with virulence as well as toxin production but these factors are not yet well defined. Other staphylococci including, *Staphylococcus aureus* (van Duijkeren et al., 2008), *Chromogenes* (Andresen et al., 2005), and *Staphylococcus sciuri* (Chen et al., 2007) can produce exfoliative toxins and have been isolated, although rarely, from cases of EE.

It is generally agreed that along with the presence of the causative bacteria there is a requirement for skin wounds which allow the bacteria to invade the epidermis. In addition, there are environmental and host factors that are important in determining whether disease occurs or not (Wegener and Skov-Jensen, 2006). Exudative epidermitis is found worldwide and is a common disease problem in young pigs. The highest prevalence and most severe clinical signs of the disease are generally reported in suckling pigs within the first week of life (Wegener and

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Skov-Jensen, 2006).

The most important virulent factor in the pathogenesis appears to be the production of exfoliative toxins. Recently, Nishifuji et al. (2008) explained the mechanism of action of staphylococcal exfoliative toxins which act as “molecular scissors”. Virulent strains of the bacteria produce exfoliative toxins that cause the loss of keratinocyte cell-cell adhesion in the superficial epidermis (Nishifuji et al., 2008).

S. hyicusis is a commensal of the skin of pigs, and due to abrasion or cuts of the skin, the organism enters and causes epidermititis where the greasy exudates is noticed, hence the name “Greasy pig disease” (Park and Kang, 1986). In acute cases, the death occurs within 3 to 5 days. The organism was isolated from clinical case from a backyard farm in Makurdi, Benue State, Nigeria.

MATERIALS AND METHODS

Swabs were collected from wound or pus from the 10 clinically affected animals. The swabs were cultured for isolation and identification of the bacteria. The swabs were collected from different sites of lesion and mostly cheek region where the abscess and exudates were common. The surface of abscess was first disinfected with the rectified spirit and was incised open for collection of pus swab to avoid unnecessary contamination. The swabs were streaked on 5% sheep blood agar in order to detect the type of haemolysis produced by the organism and also to study the colony characteristics, and the swab was also streaked in Mac konkey’s Agar. The culture was kept overnight (24 to 48 h) at 37°C and the colony reading was done the next day.

The organism was then stained with differential stain (Gram’s method) modified by Preston and Morrell (1962) to study the reaction (that is, positive or negative.) Motility was tested by hanging drop method which is one of the characters for identification in the first stage. Catalase test was conducted with 3% H_2O_2 (hydrogen peroxide) for the production of catalase enzyme. Oxidase test was conducted for cytochrome oxidase activity of the organisms. The method described by (Kovacs, 1956; Cowan and Steel, 1974) that is, with tetra methyl compound. The commercially available “DD 018 (oxidase) bacteriological differentiation disc” was also used. Oxidation and fermentative reaction test was conducted in order to find out whether the attack on the carbohydrate is by oxidation or fermentation by the method described by Koontz and Faber (1963).

The above tests were conducted for first stage identification of the *Staphylococcus*. Further in second stage, other bio-chemical tests were conducted for the identification of species. Slide coagulase test was conducted on slide by adding culture on the rabbit plasma for detection of bound coagulase enzyme produced by the bacteria described by Cadness-Graves et al. (1943). A loopful of *Staphylococcus* culture emulsified in a drop of distil distilled water is taken on a slide, and a loopful of rabbit plasma is added and mixed well with bacterial suspension for detecting the clumping within 1 to 2 min.The test is also considered as a basic tests for classification of pathogenic and non-pathogenic *Staphylococcus*. The test is still a reliable test and widely used for recognition of potentially pathogenic *Staphylococcus*. Voges-Proskaur (VP) test was carried out basically for acetylmethyl-carbinol production. Acetylmethylcarbinol may be broken down and used as carbon source by *Staphylococcus* (Bailey and Scott, 1962).

Acid production from the following sugars was detected with lactose, maltose, mannitol, salicin, sucrose, trehalose. Sensitivity tests were conducted for following antibiotics, rifampin, amoxycillin, levofloxacin, erythromycin, ciprofloxacin, chloramphenicol, norfloxacin, ampicillin, gentamycin and streptomycin. The test was carried out with Mastering-S (Mast diagnostic) for gram positive bacteria.

RESULTS

The organism *S. hyicus* was isolated and identified as described in material methods. Initially, indetification was based on morphology and culture and later stage identified the organism, with bio-chemical properties.

Morphology and staining reactions

The organism was a gram positive cocci, in single cells, in pairs and short chains and clusters of aerobic and facultative anaerobic.

Cultural and bio-chemical properties

The colonies on sheep blood agar are creamy white and circular and some of the colonies were alphahaemolytic, some were non-haemolytic. No growth was detected in Mac konkey agar. The organism was non-motile, catalase positive, and oxidase negative. It evinced fer-mentative attack on carbohydrate (O-F test). Coagulase was positive. Coagulase is not usually produced, although Underdahl et al. (1965) reported that some strains they examined were coagulase positive. Earlier, Teranishi et al. (1987) had concluded that the disease was caused by a coagulase-negative micrococcus which he named *Micrococcus hyicus,* later the organism was renamed as *S. hyicus*. Later, *S. hyicus*is was detected as coagulase-positive by 5 different methods (Anon., 2009).

Many enzymes like coagulase are toxic to tissues (Ma et al., 2002). Rabbit plasma contains fibrinogen that is being converted into fibrin by *Staphylococcal* coagulase enzyme. VP was negative but *Staphylococcus* needs longer incubation of up to 10 days, and gave greater number of positive results (Cowan and Steel, 1974). Acid production from following sugars were detected; lactose, sucrose and trehalose (Table 1).

In all the tests, the organism was highly sensitive to rifampin, levafloxacin, ciprofloxacin and norfloxacin and were resistant to amoxycillin, erythromycin, chloram-phenicol and ampicillin (Table 2). Bergey’s manual classified it as a bio-type 2 of *Staphylococcus epidermidis* (*albus*). *S. hyicus* differs antigenically from *S. epider-midis*. Although some antigens are shared, antiserum to *S. hyicus* that has been absorbed with *S. epidermidis* can be used to distinguish *S. hyicus* from non-pathogenic skin *Staphyloccoci*. *S. hyicus* was divided into two sub-species viz *S. hyicus* subsp s*hyicus* (non-pigmented) and subsps. *Chromogens* (pigmented) by Aarestrup and Jensen (2002). The natural hosts for *S. hyicus* are cows and swine.

Table 1. Acid production from sugars.

S/No.	Tests	Results
1	Gram's Reaction	Cocci
2	Motility	Non-motile
3	Anaerobic	Growth
4	Catalase	Positive
5	Oxidase	Negative
6	O-F (Oxidative /Fermentative)	Fermentative
7	Coagulase	Positive
Acid Production from Sugars		
8	Lactose	Positive
9	Maltose	Negative
10	Mannitole	Negative
11	Salicin	Negative
12	Sucrose	Positive
13	Trehalose	Positive
14	VP (Voges-Proskauer) test	Negative

Table 2. Sensitivity of organism.

S/No.	Atibiotic	Sensitivity
1	Rifampin	+++
2	Levofloxacin	+++
3	Ciprofloxacin	+++
4	Norfloxacin	+++
5	Gentamycin	+
6	Streptomycin	+
7	Amoxycillin	Resistant
8	Erythromycin	Resistant
9	Chloramphenicol	Resistant
10	Ampicillin	Resistant

The *S. hyicus* was isolated from 7 of the clinical cases. Out of 10 samples cultured, bacterial organism *S. hyicus* was isolated. The organism was isolated with the basic techniques and the facility available in the laboratory. The clinical lesions noted were initially a nodular growth (inflammatory) type and later covered with greasy exudates and then followed with thick crust. Often, abscess was noted (Figures 1 and 2). The sites included mostly cheek, neck and head. However, the investigation also reveals that the majority of the abscess cases can be due to *S. hyicus* and also the dermatitis as of the investigation was conclusive of greasy pig disease.

Figure 1. Infected piglet showing encrusted areas on the cheek region.

Figure 2. Infected piglet showing encrusted, scab and abscessed areas on the cheek region.

Treatment plan and advice to client

Based on the sensitivity test result obtained, the pigs were placed on:

1. Enrofloxacin 7.5 mg/kg (i.m) × 3/7.
2. Multivitamin injection 1 ml/10 kg body weight (i.m) × 5/7.
3. The affected piglets should be isolated.
4. The wallow site should be changed.
5. A veterinarian should be contacted whenever any problem is observed within the herd rather than instituting treatment by self.
6. Soft bedding should be provided (for example, chaffed straw).
7. Records of all events on the farm should be properly kept.

Table 3. Haematological results.

Parameter	PCV (%)	Total WBC ($\times 10^9$/L)	MONO ($\times 10^9$/L)	BASO ($\times 10^9$/L)	Lymph ($\times 10^9$/L)	EOSIN ($\times 10^9$/L)	NEUTR ($\times 10^9$/L)
Normal	26-35	11-22	0-1	0-0.5	3.8-16.5	0-1.5	0.7-6.0
Sample	24	3.0	0	0	1.59	0	1.41

Table 4. Variation in rectal temperature (°C) and respiratory rates (Cpm) and heart rate (Bpm).

Parameter	Normal	Piglet 1	Piglet 2	Piglet 3
Temperature (°C)	38.7-39.8	38.9	37.7	37.6
Respiration rate (Cpm)	32-58	59	60	57
Heart rate (Bpm)	70-120	115	110	120

Table 5. Follow-up result post therapy record of rectal temperature (^{0}C) and respiratory rates(Cpm) and heart rate(Bpm) .

Temperature	Piglet 1	Piglet 2	Piglet 3
17/8/12	37.6	38.5	38.3
18/8/12	37.7	38.1	38.1
20/8/12	38.0	38.3	38.5
Respiratory rate (Cpm)			
17/8/12	60	58	60
18/8/12	59	61	59
20/8/12	58	56	55
Heart rate (Bpm)			
17/8/12	110	117	110
18/8/12	105	120	120
20/8/12	120	110	100

8. Some of the boars should be sold off and more sows bought.

Changes in the hematological parameters of the apparently normal piglets and clinically ill ones were examined (Table 3) and variation of rectal temperature (°C), respiratory rates (Cpm) and heart rate (Bpm) in some of the piglets were taken and compared (Table 4). Follow-up result post therapy record of rectal temperature (°C) and respiratory rates (Cpm) and heart rate (Bpm) as shown by (Table 5) and a remarkable change in signs and recovery was observed post therapy (Figure 3).

DISCUSSION

The isolation and identification of *S. hyicus* was conspicous for the disease “greasy pig disease”. The *S. hyicus* produces various toxins like epidermilytic toxins and pyrogenic exotoxins, protein A and enterotoxin. The disease is of systemic involvement and can be fatal. The death in the disease is due to dehydration, protein and electrolyte loss, and cachexia. *Staphylococci* are one of the major groups of bacteria inhabiting skin (Schwartz, 2002). During the days before farrowing, the organisms multiply in the sow’s vagina and infect the piglets during the process of birth or soon after. The suckling piglets are usually infected by their dams, but cross infection occurs after mixing at weaning. Other contributing factors include: (1) Sharp teeth cut on the skin around the mouth during competing for teat and fighting at weaning, (2) abrasion on knees from suckling and from poor concrete surfaces or metals, (3) faulty injection (without proper sterilization), (4) mange giving skin damage. Field evidences suggested that the environmental stress of various kinds including agalactia and intercurrent infection also predisposes the disease.

The *S. hyicus* is highly contagious and spreads rapidly from one group to the other. A vesicular type of virus may be a predisposing factor. Trading of animals has been shown to be an important factor in spread of disease which usually takes about 2 weeks after the infected animal has been brought into clean premises. The first signs of the disease are listless and reddening of the skin in one or more piglets in the litter. Affected pigs become depressed and refuse to eat. Body temperature may be elevated early in disease but thereafter is normal. The skin thickens, reddish brown spots appear from which the serum exudates, and pain is evident in acutely affected pigs. Often, there is suppurative inflammation of the external ear and catarrhal inflammation of the eyes. The feet are nearly all affected with erosion of coronary bands heel, hoof may be shed in rare cases. The disease was detected mostly on cheek region (Figures 1 and 2).

The disease produces variety of symptoms from where the entire body becomes covered with a moist, greasy exudates to a more chronic condition where the onset is slower and the skin is more wrinkled. The principal lesion

Figure 3. Recovery in piglets post therapy.

is an inflammatory exudative reaction in the corium and upper layers of the dermis. As the disease progress over the body surfaces, the skin becomes thickened and layers of the epidermis peel off. Milder form of disease may present as a dandruff scaling or as a reddish-brown spots on the ears and other body areas. Pigs begin to recover about 14 days after the elisions appear and are fully recovered in 30 to 40 days. Some pigs are often affected with ulcerative glossitis and stomatitis.

In sows, the lesion are seen commonly behind the face and eyes. Severely, affected piglets die often due to dehydration and septicaemia/toxaemia. It has been suggested that the biotin requirements of affected swine is greatly increased by factors produced by *S. hyicus* which causes biotin deficiency and contributes to the lesion *S. hyicus* and occurs frequently on the skin of healthy cattle (Devriese, 1984) and was also isolated from the animal products and slaughter house effluents (Devriese and Hajek, 1980). *S. hyicus* subsps. *Hyicus* has also been isolated from intramammary infection of bovines (Brown, 1983). The organism *S. hyicus* was also isolated from the goat's milk (Poutrel, 1984). The organism *S. hyicus* has also been found in naturally occurring lesions of dermatitis of the lower limb of horses and similar lesions over the neck and back of donkeys also has been recorded. Experimentally, the organism can cause lesions in horses similar to those of exudative epidermititis. *S. hyicus* also can occur in poultry (Devriese, 1984) and may be responsible for mild infections (Devriese, 1980). *S. hyicus* subs. *Chromogenes* has been isolated from the dermatic lesion of cats (Devriese, 1984). The organism has also been implicated in "seborrhic dermatitis" of pigmy goat. Human beings also may become infected with this organism.

REFERENCES

Aarestrup FM, Jensen LB (2002). Trends in antimicrobial susceptibility in relation to antimicrobial usage and presence of resistance genes in *Staphylococcus hyicus*isolated from exudative epidermitis in pigs. Vet. Microbiol. 89:83-94.

Andresen LO, Ahrens PD,augaardLBille-Hansen V (2005). Exudative epidermitis in pigs caused by toxigenic *Staphylococcus chromogenes*. Vet Microbiol.105:291-300.

Anon (2009). Analysis of the baseline survey on the prevalence of methicillin-resistant *Staphylococcus aureus*(MRSA) in holdings with breeding pigs, in the EU, 2008 [1] - part A: MRSA prevalenceestimates. EFSA Journal 7, Article 1376.

Bailey WR, Scott EG (1962). Diagnostic microbiology.C. V. Mosby Company, St. Louis, MO.

Brown RW (1983). Bio-types of *staphylococcus epidermidis* and *Micrococcus* organisms, isolated from intramammary infections, reclassified into species of the genus *Staphylococcus (epidermidis, hyicus, Xylosus, and Sciuri)* Cornell Veterinarian 109.

Cadness-Graves B, Williams GJ, Harper AA. (1943). Slide test for coagulase positive staphylococci. Lancet 1:736–738.

Chen S, Wang Y, Chen F, Yang H, Gan M Zheng SJ (2007). A highly pathogenic strain of *Staphylococcus sciuri*ca used fatal exudative epidermitis in piglets. PLoS One 2:e147.

Cowan ST, Steel KL (1974). Manual for the identification of medical bacteria.2d ed, London; New York: Cambridge University Press, pp.193-227.

Devriese LA, Hajek V (1980). Identification of pathogenic staphylococci isolated from animals and foods derived from animals. J Appl. Bacteriol. 49:1–11.

Devriese LA (1980). Sensitivity of staphylococci from farm animals to antibacterial agents used for growth promotion and therapy, a ten year study. Ann. Rech. Vet. 11:399-408. [PubMed] 72.

Devriese LA (1984). Identification and Characterization of *Staphylococci* isolated from cats .Vet. Microbiol.9, (3) 279-284 .

Koontz PF, Faber EJ (1963). A taxonomic study of some gram-negative, non-farmentingbacteria. Can. J. Microbiol. 9(4):499-507.

Kovacs N. (1956). Identification of *Pseudomonapyocyanea* by the oxidase reaction. Nature (London) 178:703.

Nishifuji K, Sugai M, AmagaiM (2008). Staphylococcal exfoliative toxins: "molecular scissors" of bacteria that attack the cutaneous defense barrier in mammals. J. Dermatol. Sci. 49:21-31.

Park C, Kang B (1986). Studies on exudative epidermitis in pigs; isolation and some properties of *Staphylococcus hyicus* subsp. *hyicus*from diseased and healthy pigs. Kor. J. Vet. Res. 26:251-257.

Poutrel P (1984). (Nouzilly,France)- Udder Infection of goats by Coagulase-Negative *Staphylococci.* Vet. Microbiol. 9(2):131-137.

Teranishi H, Shimizu A, Kawano J, Kimura S (1987). Antibiotic resistance of *Staphylococcus hyicus* subsp. *hyicus* strains isolated from pigs, cattle and chickens. Nippon Juigaku Zasshi 49:427-432.

Underdahl NR, Grace OD, Twiehaus MJ (1965). Porcine exudative epidermitis: Characterization of bacterial agent. Am. J. Vet. Res. 26, 617-624.

vanDuijkeren E, Ikawaty R, Broekhuizen-Stins MJ, Jansen MD, Spalburg EC, de Neeling AJ, Allaart JG, van Nes A, Wagenaar, JA, Fluit AC (2008).Transmission of methicillinresistant *Staphylococcusau reus* strains between different kinds of pig farms. Vet Microbiol. 126:383-389.

Wegener HC, Skov-Jensen EW (2006). Exudative Epidermitis, in: Diseases of Swine edited by Straw BE, Zimmerman JJ, D'Allaire S, Taylor DJ. 9th ed. Ames, Iowa: Blackwell Pub, pp 675-679.

Wegener HC, Schwarz S (1993). Antibiotic-resistance and plasmids in *Staphylococcus hyicus* isolated from pigs with exudative epidermitis and from healthy pigs. Vet. Microbiol. 34:363-372.