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Asian Journal of Animal and Veterinary Advances



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## Case Report

# A Report on *Staphylococcus sciuri* Associated Pneumonia and Septicemic Shock in Grasscutters (*Thryonomys swinderianus*)

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## Abstract

**Background and Objective:** Sudden deaths from pneumonia is a common occurrence in many grasscutter farms in Ghana. Unfortunately, the cause of pneumonia remains unknown although some farmers believe it could be due to very cold environmental conditions especially during the rainy seasons. The objective of this study was to identify any microbial causation of sudden deaths due to pneumonia in grasscutters. **Materials and Methods:** Three adult grasscutters were presented for post-mortem examination with a history of sudden death. A thorough post-mortem was conducted and a morphological diagnosis was made based on gross post-mortem lesions. Lung and spleen samples were submitted for bacterial culture. Isolated bacteria were bio typed using the Bruker Matrix-Assisted Laser Desorption Ionization (MALDI) biotypes technique. Lungs, liver, spleen, trachea and adrenals were submitted for histopathological processing. Slides obtained were evaluated using light microscopy. **Results:** Post-mortem examination revealed gelatinous subcutaneous oedema at the ventral side of the neck, enlarged submandibular lymph nodes and pneumonia in all three carcasses. Microbiological evaluation of lung and spleen samples revealed *Staphylococcus sciuri*. Histopathological evaluation of lung sample showed diffuse expansion of alveolar and interlobular septae with the accumulation of eosinophilic proteinaceous precipitates admix with some dead and viable neutrophils and congestion. There was moderate to marked lymphoid depletion of white pulp in the spleen with poorly discernible colonies of coccoid bacteria. **Conclusion:** It was concluded that pneumonia in grasscutters resulting in sudden deaths could be due to infection of *Staphylococcus sciuri* and an associated shock syndrome due to septicemia.

**Key words:** Grasscutters, pneumonia, *Staphylococcus sciuri*, porcupine, buruli ulcers, wetlands, protozoa

**Citation:** Enyetornye, B., R.K. Abbiw, E. Kodua, E.I.S. Foka, K.N. Ahia, M.H. Rahman and A. Prasad, 2021. A report on *Staphylococcus sciuri* associated pneumonia and septicemic shock in grasscutters (*Thryonomys swinderianus*). Asian J. Anim. Vet. Adv., 16: 53-58.

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

The grasscutter (*Thryonomys swinderianus*) is a hystricomorph belonging to the wild rodent family Thyronomyidae. It is second to the porcupine as the largest rodent in Africa and is primarily found in the grasslands, wooded savannah and wetlands of Africa<sup>1</sup>.

In most West African countries, including Ghana, grasscutters are an important source of food, which is unaffected by any religious or cultural restrictions<sup>2</sup>. As a result, this led to their over-exploitation and unabated efforts to domesticate and thrive in captivity to prevent their possible extinction sooner<sup>2,3</sup>.

Rearing grasscutters in captivity in the Sub-Saharan African countries remains a prospective source of employment and income for many households<sup>4</sup>. It also has the potential to be a source of ecotourism and research<sup>5</sup>. The grasscutters are suggested to be an appropriate model for investigating the pathology of certain diseases, it has been used to study the clinical and histopathological presentation of *Mycobacterium ulcerans* in Buruli ulcers<sup>6</sup>. These rodents have been found to harbour pathogens such as *Trypanosoma* sp., *Babesia* sp., gastrointestinal helminths and protozoa that are capable of infecting other animals and humans<sup>7</sup>.

The domestication of grasscutter, though with a controversial success rate in the West African countries has deprived these rodents of their normal free access to feed and preferred habitat leading to precipitation of many infections and infestations<sup>8</sup>. The major diseases observed and that was presented by researchers include gastrointestinal disorders (including bloat, intestinal obstructions and helminthiasis etc.), respiratory diseases (mostly pneumonia), cardio-splenic dilation, abscesses, trypanosomiasis, babesiosis, poisoning (manioc), septic wounds and many unidentified disease episodes<sup>9</sup>.

So far, a couple of bacteria have been isolated from grasscutters. Some of which are *Staphylococcus aureus*, *Mannheimia haemolyticus*, *Pseudomonas aeruginosa*, *E. coli* and *Micrococcus*, *Corynebacteria*, *Klebsiella* and *Bacteroides* spp.<sup>10</sup>.

Pneumonia has been reported to be one of the most important causes of death in domesticated and captive grasscutters<sup>11,12</sup>, which is followed by helminthiasis and or traumatic injuries. Interstitial pneumonia is the most prevalent form of pneumonia in grasscutters and is associated with hypersensitivity reactions, viruses and other idiopathic aetiologies.

This report describes the isolation of *Staphylococcus sciuri* from the lung and spleen tissues of dead grasscutters presented for post-mortem as well as reports the gross and histopathologic lesions associated.

## MATERIALS AND METHODS

**Study area:** The study was conducted at the School of Veterinary Medicine and Noguchi Memorial Institute for Medical Research (Animal experimentation), all of the University of Ghana, from January-April, 2020.

**Case details:** This study was carried out on three dead adult grasscutters (Fig. 1a), two males and one female (weighing 3.5, 3.0 and 2.8 kg, respectively) presented for post-mortem examination from a farm located at Legon, Accra, Ghana.

They were brought for post-mortem examination in a bid to find out the cause (s) of sudden deaths on the farm. The grasscutters were labelled as a, b and c and were examined following the procedure described by<sup>13</sup> and the alterations were recorded.

External examination revealed no abnormality nonetheless, one male was found to be severely cannibalized after death in the cage.

## RESULTS

Necropsy revealed marked haemorrhagic hydrothorax of about 15 mL of serosanguinous fluid collected (Fig. 1b). There was gelatinous subcutaneous oedema at the ventral side of the neck with the submandibular lymph nodes red wet and enlarged in all three carcasses (Fig. 1c). There were also petechial haemorrhages on the tracheal mucosa (haemorrhagic tracheitis) and froth filled the trachea, bronchioles and lungs. Lung lobes had dark red well-demarcated and depressed areas (pneumonia) (Fig. 1d). The heart was round and the kidneys showed gross changes. Spleen and lung tissues were taken for bacteriological investigations. Representative sections of liver, lung, spleen, kidney, brain, adrenals, trachea, heart, stomach and intestines were taken and fixed in 10% neutral buffered formalin for histopathological analysis.

Representative samples from the lung and spleen were collected for bacteriology and were submitted to Noguchi Memorial Institute for Medical Research, Department of Animal Experimentation (DAE) for bacteriological analyses. Inner portions of the samples were aseptically taken in 10%





Fig. 1(a-d): Images of the grasscutters and some key post-mortem lesions, (a) Three adult grasscutters were presented for post mortem examination the middle one suffered severe cannibalism and its head was eaten (arrow) after death in the cage, (b) Arrow shows hemothorax, (c) Subcutaneous oedema on the ventral side of the neck and (d) Hemorrhagic tracheitis, pneumonic lungs (red hepatization) and the heart appeared as a mulberry with cardiac tamponade (arrow)

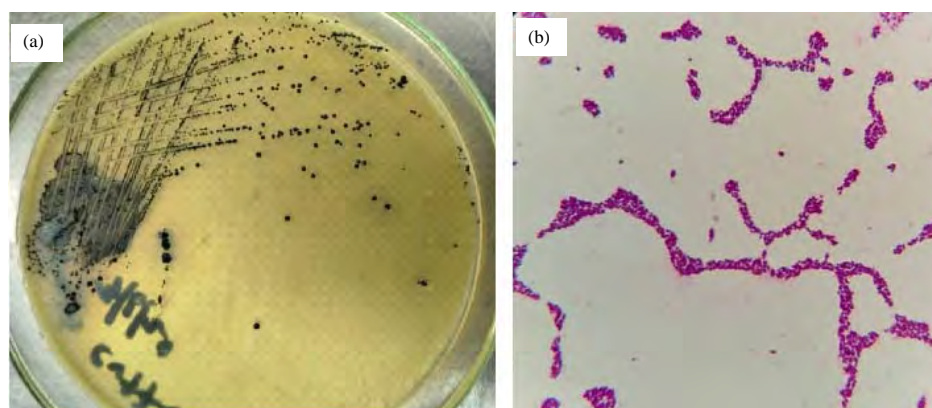


Fig. 2(a-b): Results of primary bacteriological analysis, (a) Morphology (uniform, dark colonies) of *Staphylococci sciuri* on baird parker agar and (b) Gram stain visualized gram-positive coccoid bacteria, clustered in grape-like structures

Table 1: Bacterial culture and isolation test results

Sample id	Organism best match	Score value	Organism second best match	Score value
A	<i>Staphylococci sciuri</i>	2.09	<i>Staphylococci sciuri</i>	1.89
B	<i>Staphylococci sciuri</i>	2.03	<i>Staphylococci sciuri</i>	1.80
C	<i>Staphylococci sciuri</i>	2.05	<i>Staphylococci sciuri</i>	1.86

peptone by sterilizing their surfaces with a hot blade. Collected samples were incubated at 37°C and 5% Carbon dioxide (CO<sub>2</sub>) for 6 hrs. Smears were prepared directly from the 10% peptone for microscopy which showed *Staphylococci* spp. Sub-culture from 10% peptone was made on Baird Parker Agar (BPA) selective media for *Staphylococci* spp. (mostly *S. aureus*). Morphological analysis revealed the growth of uniform, dark colonies after

24 hrs of incubation (Fig. 2a.) Gram-stain indicated a pure culture of Gram-positive cocci in the cluster in grape-like aggregates under a light microscope (Fig. 2b).

Further identification was carried out to the species level with the aid of Matrix-Assisted Laser Desorption/Ionization (MALDI) that showed an unequivocal presence of *Staphylococci sciuri* as the organism present in the collected samples (Table 1).

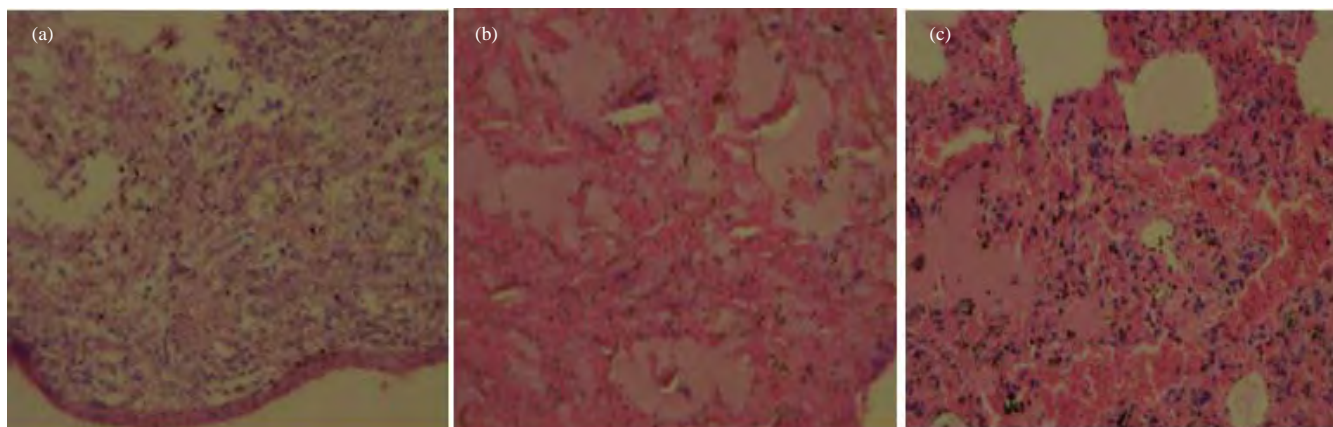


Fig. 3(a-c): Histopathologic features of some selected organs, (a) Section of spleen showing lymphoid depletion of white pulp with poorly discernible colonies of coccoid bacteria, (b) Section of liver parenchyma showing discrete foci of necrosis and (c) Section of lung showing an expansion of alveolar and interlobular septae which is moderately expanded by the accumulation of eosinophilic exudates

Histopathological evaluation of the representative sections of selected organs revealed interesting findings. There was moderate to marked lymphoid depletion of white pulp in the spleen. Associated with these areas were poorly discernible colonies of coccoid bacteria (Fig. 3a). Representative sections from the liver parenchyma, showed discrete foci of necrosis (Fig. 3b). The lungs revealed diffusely expansion of alveolar and interlobular septae which was moderately expanded by the accumulation of eosinophilic proteinaceous precipitates and showed the presence of both dead and viable neutrophils and congestion (Fig. 3c).

## DISCUSSION

Post-mortem examination of the three grasscutters revealed gelatinous subcutaneous oedema at the ventral side of the neck and pneumonia. Microbiological evaluation of lung and spleen samples revealed *Staphylococcus sciuri*. *Staphylococcus sciuri*, is a coagulase-negative *Staphylococcus* that was mostly isolated from the skin of rodents, ungulates, carnivores, marsupials and sometimes from other mammals, sand and natural waters<sup>14</sup>. It has been regarded as a non-pathogenic commensal over the years.

However, recently, *Staphylococcus sciuri* has been incriminated in deadly cases of the exudative epidermis in piglets<sup>15,16</sup>, dermatitis in dogs<sup>17</sup> and mastitis in cattle<sup>18-20</sup>.

A major cause of mortality in domesticated grasscutters have been reported to be pneumonia but the aetiology

remains unknown so far<sup>21</sup>. The isolation of *Staphylococcus sciuri* from the lungs and spleen of three adult grasscutters who were reported to have died suddenly corroborates *Staphylococcus sciuri* associated septicaemia, pneumonia and eventual death of these animals. *Staphylococcus sciuri* has been incriminated in life-threatening infections such as endocarditis, peritonitis, septic shock and wound infections although, the incidence was commonly in humans<sup>22-24</sup>. Due to this, the perception that organisms belonging to the coagulase-negative *Staphylococcus* group (including *Staphylococcus sciuri*, *rodentium*, *lentus*, *vitulinus*) have been considered as mere contaminants is changing as many species have emerged as one of the important causes of nosocomial infections in humans<sup>25,26</sup>.

Although *Staphylococcus aureus* is known to be the prime pathogen in this genus due to its versatility as a pathogen of both veterinary and medical relevance.

The other species are gradually gaining the attention of the scientist due to their high emerging disease-causing potential and ability to carry *mecA* gene which was known to be held responsible for anti-microbial resistance<sup>27</sup>. In humans, however, vancomycin-resistant strains of *Staphylococcus sciuri* have been reported<sup>28</sup>. In the Institute of Cancer Research (ICR), mice are associated with subcutaneous abscess and dermatitis caused by *Staphylococcus sciuri* suggesting possible systemic infection with time<sup>29</sup>.

To the best of our knowledge, there have not been any reports of *Staphylococcus sciuri* associated pneumonia in

grasscutters in the past. Thus, investigations are required to protect the species and livelihood of captive grasscutters farmers from this malady.

### CONCLUSION

In conclusion, this study identified *Staphylococcus sciuri* as the likely cause of pneumonia which is a common occurrence in grasscutters in Ghana. Septicemia, due to bacteremia leads to septicemic shock and sudden death in these valuable animals. It is therefore recommended that further studies be conducted to identify suitable antibacterial or herbal remedies to this malady.

### SIGNIFICANCE STATEMENT

This study discovers that *Staphylococcus sciuri* could be a major cause of sudden deaths in most grasscutter farms in Ghana. The study will help the researcher to uncover possible preventive and treatment protocols for this canker. Thus new dawn of grasscutter domestication may be seen in Ghana and Africa at large.

### ACKNOWLEDGMENT

We acknowledge Professor Boniface Baboreka Kayang for providing the grasscutters for post mortem examination and his immense contributions in the field of grasscutter research.

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