

## CASE REPORT OF SIMULTANEOUS MANIFESTATION OF HEAD SWELLING AND BUMBLE FOOT IN TURKEY STAPHYLOCOCCOSIS

ANYANWU, Madubuike Umunna<sup>1</sup>, SHOYINKA, Vincent Shodeinde<sup>2</sup> and NGWU, Maria Ifeyinwa<sup>1</sup>

<sup>1</sup>Microbiology Unit, Department of Veterinary Pathology and Microbiology, University of Nigeria, Nsukka, Enugu State, Nigeria.

<sup>2</sup>Diagnostic Pathology Unit, Department of Veterinary Pathology and Microbiology, University of Nigeria, Nsukka, Enugu State, Nigeria.

**Corresponding Author:** Anyanwu, M. U. Department of Veterinary Pathology and Microbiology, University of Nigeria, Nsukka, Enugu State, Nigeria. **Email:** [madubuike.anyanwu@unn.edu.ng](mailto:madubuike.anyanwu@unn.edu.ng)  
**Phone:** +234 8132662827

### ABSTRACT

*A freshly dead 7 months old turkey from a population of 7 turkeys and 15 chickens with a history of fighting and head lesions was presented for postmortem examination and diagnosis. Postmortem examination revealed swollen head, subcutaneous head abscesses and foot pad abscess (bumble foot) with no evidence of septicaemia and systemic infection. Diagnosis of staphylococcosis was based on isolation and identification of pure cultures of the Staphylococcus aureus from head and foot samples following standard procedures. Antimicrobial sensitivity test showed that Staphylococcus aureus isolate was resistant to ampicillin, cefuroxime and streptomycin but susceptible to ciprofloxacin, perfloxacin, erythromycin and ceftriaxone. The cause of death was likely physical rather than infectious. This report showed that head swelling and bumble foot could occur simultaneously in turkey staphylococcosis.*

**Keywords:** Staphylococcosis, Head swelling, Subcutaneous abscesses, Bumble foot, Turkey

### INTRODUCTION

Staphylococcosis in turkey is an economically important contaminative bacterial disease which has a worldwide occurrence (Quinn and Markey, 2003; Argudin *et al.*, 2013). It is caused by *Staphylococcus* species which are normal commensals of the turkeys' skin and mucous membranes (Quinn and Markey, 2003; Alfonso and Barnes, 2006; Argudin *et al.*, 2013). Opportunistically, these organisms cause infections following wound contamination especially in immunocompromised turkeys (Alfonso and Barnes, 2006; Andreasen, 2013). *Staphylococcus aureus* (a coagulase-producer) is the most frequently incriminated aetiology of staphylococcosis in turkeys (Quinn and Markey, 2003; Alfonso and Barnes, 2006; Corrand *et al.*, 2012).

*Staphylococcus hyicus* (coagulase-variable) have also been implicated (Cheville *et al.*, 1988; Andreasen, 2013).

Clinical lesions manifested by an infected turkey vary with site and route of infection/inoculation (Andreasen, 2013). Most often, the musculoskeletal system is affected and lesions such as arthritis, tenosynovitis, osteomyelitis, osteochondrosis and plantar pododermatitis (bumble foot) may be observed (Nairn, 1973; Charlton, 2006; Andreasen, 2013). Bumble foot occurs following contamination of wound in the turkeys' foot pad by the associated staphylococcal pathogen (Jensen *et al.*, 1987; Quinn and Markey, 2003; Andreasen 2013). Other parts of the turkey that may be affected and the lesions likely to be observed include the navel (omphalitis) (Andreasen, 2003; Andreasen, 2013), lungs

(pneumonia) (Linares and Wigle, 2001; Andreasen, 2003; Andreasen, 2013) and skin (gangrenous dermatitis) (Andreasen, 2013). Nevertheless, bumble foot is not a pathognomonic (specific) lesion for staphylococcosis having been reported in other diseases of turkeys such as colibacillosis, mycoplasmosis, salmonellosis, granulomatous or fibrinous tenosynovitis and articular gout (Charlton, 2006). Skin lesions in turkeys have also been reported in cases of zinc deficiency, fowl pox and cannibalism (Charlton, 2006; Clauer, 2009; Bermudez, 2013; Tripathy, 2013). The occurrence of other musculoskeletal lesions without bumble foot in turkeys, further indicating that bumble foot is not pathognomonic for turkey staphylococcosis have been severally reported (Nairn, 1973; Riddel, 1980; Kibenge *et al.*, 1982; Julian, 1985; Jensen *et al.*, 1987).

No researcher has documented simultaneous manifestation of head swelling with subcutaneous abscesses and bumble foot in turkey staphylococcosis. Head swelling have been reported in other diseases of turkey such as colibacillosis, salmonellosis, mycoplasmosis and turkey coryza (Charlton, 2006). Diagnosis of avian staphylococcosis is based on isolation and identification of the associated staphylococcal organism(s) in wound swabs and/or postmortem tissues (Andreasen, 2003; Alfonso and Barnes, 2006; Quinn and Markey, 2006). Moreover, there is very little information in the available literature on avian staphylococcosis in Nigeria. And only a study has been conducted in chickens in northern region of the country (Suleiman *et al.*, 2013). In this study, the simultaneous manifestation of head swelling and bumble foot in turkey staphylococcosis is reported in Nsukka, Southeast, Nigeria.

## MATERIALS AND METHODS

A freshly dead seven months old turkey with swollen head and head skin lesions was presented to the Department of Veterinary Pathology and Microbiology, University of Nigeria, Nsukka, in December 2013. Anamnesis revealed that the turkey was a gift and the benefactor kept it together with other adult

turkeys and 15 chickens in his backyard where they roam about freely. Few days later, the owner observed that the turkeys pecked each other at the head during fighting. Few weeks thereafter, one of the turkeys had swollen head which latter subsided without treatment sometime in November, 2013. Early December 2013, the owner observed that the turkey in this case had swollen head with lesions, but few days later it died. None of the chicken showed any sign of infection.

Postmortem examination of the presented carcass was done following standard procedures. Exudates from the head and foot swellings were aseptically aspirated using sterile syringes and processed in the Microbiology Laboratory, Department of Veterinary Pathology and Microbiology, University of Nigeria, Nsukka within 10 minutes of collection. The exudates were cultured on nutrient agar (NA), MacConkey agar (MCA) and *Mycoplasma* agar (MA). The NA and MCA plates were incubated at 37°C for 24 hours aerobically. The MA was incubated at 37°C for 72 hours in microaerobic environment after which the plates were examined under stereomicroscope. Preliminary identification of the isolates was done using morphological characteristics (colonial and microscopic), while the final identification was done by conducting biochemical tests (haemolysis, catalase, coagulase and mannitol fermentation) (Quinn and Markey, 2003). Antibiotic susceptibility test of the isolates was done by agar disc diffusion procedure (CLSI, 2012). Eight antibiotic discs were used. They include: ciprofloxacin (5µg), perfloxacin (5µg), erythromycin (15µg), ceftriaxone (30µg), cefuroxime (30µg), ampicillin (10µg), gentamicin (10µg) and streptomycin (10µg). Homogenate of the isolates was made in 0.85% saline and adjusted to 0.5 McFarland's turbidity standard (CLSI, 2012). Plates containing Mueller-Hinton agar were inoculated using sterile swab sticks. The discs were strategically placed on the inoculated agar plates and incubated for 18 hours at 37°C, after which the inhibitory zone diameter (IZD) was measured and recorded. For each antibiotic disc and each isolate, the test was performed in triplicate and the mean IZD calculated. The isolates were classified as resistant,

intermediate-resistant or susceptible to each of the antibiotic following the Clinical and Laboratory Standards Institute criteria for aerobic isolates (CLSI, 2012).

## RESULTS

Postmortem examination revealed that the head skin lesions were points of localized and fluctuant swellings on the snood and other parts of the head (Figure 1). On aspiration, the volume of the pooled exudate from the head swellings was 1.1ml in volume. The exudate was viscid and yellowish in colour indicating subcutaneous abscesses. The foot and digital pads were swollen, inspissated and had ulcerative point of infection (Figures 2a and 2b). Aspirated content from the foot pads was 0.5ml in volume, viscid and grayish-yellowish indicating foot pad abscess (bumble foot). On incision, the content of the foot pads were pyogranulomatous in nature. No gross lesion was observed in any of the visceral organs or joints. Based on these postmortem findings, the diagnoses were staphylococcosis, salmonellosis, colibacillosis, mycoplasmosis, granulomatous or fibrinous tenosynovitis, turkey coryza and articular gout. From the cultured samples, growths on NA were pure cultures of discrete, circular, medium-sized, smooth, glistening and creamy-whitish colonies. Microscopically, the isolates were Gram-positive cocci arranged in clusters indicating they were *Staphylococcus*. Biochemical tests showed that both isolates produced catalase, coagulase, haemolysis on blood agar and fermented mannitol. Based on these characteristics, the isolates were identified as *Staphylococcus aureus*. Both isolates were sensitive to ciprofloxacin, perfloxacin, erythromycin, and ceftriaxone, intermediately-resistant to gentamicin but resistant to ampicillin, cefuroxime and streptomycin, indicating they were the same strain.

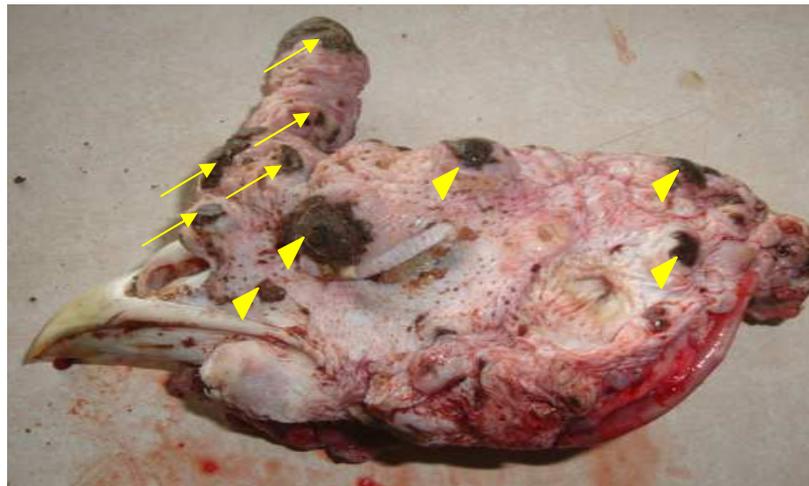
## DISCUSSION

Staphylococcosis in turkey with simultaneous occurrence of swollen head and bumble foot is reported in this study. Swollen head observed may be due to inflammation following head

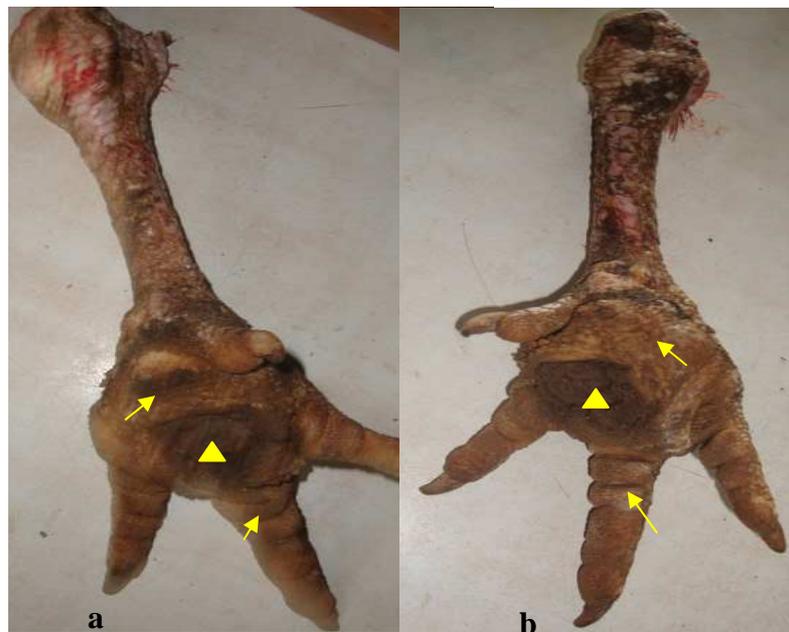
trauma due to pecking by the other turkeys. *S. aureus* isolated from the head abscesses was due to contamination of the skin wounds by the organism. The consequent inflammatory activities of phagocytic cells controlled the spread of *S. aureus* in circumscribed fashion (abscesses) (Akpavie, 2004). *S. aureus* is a pyogenic (pus-forming) bacterial organism (Quinn and Markey, 2003) hence the viscid grayish-yellowish exudates (pus) from the head and foot abscesses. Distortion of integument integrity is a predisposing factor for staphylococcosis in turkeys (Andreasen, 2003; Alfonso and Barnes, 2006; Argudin *et al.*, 2013). The cannibalism that manifested in head injuries may be due to competition for food, space and/or flock mates (Clauer, 2009).

*S. aureus* isolated from the head wounds could have been transmitted from the beak of turkey(s) that elicited the wounds, or on the skin of the infected turkey itself, or other turkeys and chickens that were in contact with the dead turkey. The wounds may have been contaminated on contact with these sources since *S. aureus* is a normal commensal of turkey's integument (Quinn and Markey, 2003; Andreasen, 2013; Argudin *et al.*, 2013). The restriction of the subcutaneous abscesses to the head and foot was because those were the route of entry of the organism (Andreasen, 2013). Absence of lesions on the viscera suggested that there was no spread of infection. This may suggest that there was neither septicaemia nor systemic infection.

Isolation of *S. aureus* from the foot pad swellings indicated that the ulcerative wound on the foot pads was contaminated by the *S. aureus* and this resulted to the foot pad abscesses (bumble foot) (Quinn and Markey, 2003; Cheng *et al.*, 2011). The wound on the foot pads could have been caused by inappropriate perching and/or walking conditions (such as sharp-cornered plastic or metallic perches, and wood splinters) in the environment in which the turkey was kept. Ulcerative point of infection observed on the foot pads were strong indication that the bumble foot resulted from foot pad infection rather than systemic infection.



**Figure 1: Swollen head of turkey with lesions and subcutaneous abscesses on the snood (arrow) and other parts of the head (arrow head)**



**Figure 2: Swollen foot and digital pads (bumble foot) (arrow) of turkey with ulcerative point of infection on both legs (arrow head) 2a: left leg, 2b right leg**

There was no lameness in the turkey at the early stage, but the bumble foot was pyogranulomatous and in the chronic stage (Quinn and Markey, 2003; Andreasen 2013; Argudin *et al.*, 2013). Pyogranulomatous bumble foot resulted from fibrinous exudates forming part of masses of necrotic tissue and surrounded by a granulomatous cellular reaction (Akpavie, 2004). Absence of gross lesions in the viscera and other parts of the body further

suggested that there was no ascending infection from the bumble foot.

Resolution of the head lesions in one of the in-contact turkeys, may suggest a kind of self-limiting infection. This may suggest variation in susceptibility among turkeys. Moreover, the absence of the lesions on any of the in-contact chickens may be because the chickens did not injure themselves as the turkeys.

Hence there was no portal of entry for penetration of the staphylococcal organism in the chickens. However, it is possible that there were wounds on some of the chickens, yet they were not infected. This scenario may suggest variation in susceptibility between chickens and turkeys, and therefore a study to authenticate this speculation is needful. Resistance of the *S. aureus* isolate to ampicillin, cefuroxime and streptomycin suggested that the organism had developed resistance to these antibiotics.

Other possible causes of skin lesions, swollen head and bumble foot in turkeys were eliminated based on the postmortem and microbiological results. Because pus was aspirated from the head and foot pad swellings, fowl pox and zinc deficiency were eliminated. In fowl pox, the pock skin lesions contain inclusion bodies and/or diphtheritic membranes in the mouth and eyes (Charlton, 2006; Tripathy, 2013), whereas no subcutaneous accumulation is seen in zinc deficiency (Bermudez, 2013). Turkey coryza and mycoplasmosis were eliminated as possible cause(s) of the swollen head because no evidence of respiratory infection (such as catarrhal/mucoid tracheitis, tracheal hyperaemia, air sacculitis or sinusitis) was observed during postmortem examination (Barnes, 2003; Charlton, 2006). Absence of growth on MCA eliminated colibacillosis and salmonellosis, while absence of growth on MA eliminated mycoplasmosis. In addition to the isolation of *S. aureus*, presence of pus from the bumble foot eliminated granulomatous/fibrinous tenosynovitis and articular gout in which there would be no exudation and uric acid crystals would be seen in the cavity of swelling in articular gout (Charlton, 2006).

The fact that *S. aureus* was the sole aetiopathogenic agent isolated from the cultured exudates confirmed that the head and foot lesions were as a result of staphylococcosis. Because there was no evidence of septicaemia and systemic infection, it is believed that the cause of the turkey's death may be physical (such as trampling by the other turkeys and chickens) since it had bumble foot and probably was lame. This report has shown that head swelling and subcutaneous abscesses could

possibly occur with or without bumble foot in turkey staphylococcosis.

## REFERENCES

- AKPAVIE, S. O. (2004). *General Veterinary Pathology*. Stirling-Horden Publishers Limited, Ibadan, Nigeria.
- ALFONSO, M. and BARNES, H. J. (2006). Neonatal osteomyelitis associated with *Staphylococcus aureus* in turkey poult. *Avian Diseases*, 50(1): 148 – 151.
- ANDREASEN, C. B. (2003). Staphylococcosis, Pages 798 – 804. In: SAIF, Y. M., BARNES, H. J., GLISSON, J. R., FADLY, A. M., McDOUGALD, L. R. and SWAYNE, D. E. (Editors), *Diseases of Poultry*, 11<sup>th</sup> Edition, Iowa State University Press, Ames, IA, USA.
- ANDREASEN, C. B. (2013). Overview of staphylococcosis in poultry. [http://www.merckmanuals.com/vet/poultry/staphylococcosis/overview\\_of\\_staphylococcosis\\_in\\_poultry.html](http://www.merckmanuals.com/vet/poultry/staphylococcosis/overview_of_staphylococcosis_in_poultry.html). Accessed November 3, 2014.
- ARGUDIN, M. A., CARIOU, N., SALANDRE, O., GUENNEC, J. L., NEMEGHAIRE, S. and BUTAYE, P. (2013). Genotyping and antimicrobial resistance of *Staphylococcus aureus* isolates from diseased turkeys. *Avian Pathology*, 42(6): 572 – 580.
- BARNES, H. J. (2003). Miscellaneous and sporadic bacterial infections. Pages 798 – 804 In: SAIF, Y. M., BARNES, H. J., GLISSON, J. R., FADLY, A. M., McDOUGALD, L. R. and SWAYNE, D. E. (Editors), *Diseases of Poultry*, 11<sup>th</sup> Edition, Iowa State University Press, Ames, IA, USA.
- BERMUDEZ, A. J. (2013). Mineral deficiencies in poultry. [http://www.merckmanuals.com/vet/poultry/nutrition\\_and\\_management\\_poultry/mineral\\_deficiencies\\_in\\_poultry.html](http://www.merckmanuals.com/vet/poultry/nutrition_and_management_poultry/mineral_deficiencies_in_poultry.html). Accessed November 3, 2014.
- CHARLTON, B. R. (2006). *Avian Disease Manual*. 5<sup>th</sup> Edition, International Book Distributing Company, India.
- CHENG, A. G., DeDENT, A. C., SCHNEEWIND O. and MISSAKAS, D. (2011). A play in

- four acts: *Staphylococcus aureus* abscess formation. *Trends in Microbiology*, 19(5): 225 – 232.
- CHEVILLE, N. F., TAPPE, J., ACKERMANN, M. and JENSEN A. (1988). Acute fibrinopurulent blepharitis and conjunctivitis associated with *Staphylococcus hyicus*, *Escherichia coli*, and *Streptococcus* sp. in chickens and turkeys. *Veterinary Pathology*, 25(5): 369 – 375.
- CLAUER, P. J. (2009). *Cannibalism: Prevention and Treatment*. Virginia Cooperative Extension, Virginia, USA.
- CLSI (2012). Performance Standards for Antimicrobial Susceptibility Testing. *Clinical and Laboratory Standards Institute (CLSI) Twenty Second Informational Supplement M100-S22*, 32(3): 62 – 78.
- CORRAND L., LUCAS, M. N., DOUET, J. Y., ETIENNE, C. L., ALBARIC, A. O., CADEC, A. and GUERIN, J. L. (2012). A case of unilateral periorbital cellulitis and mandibular osteomyelitis in a turkey flock. *Avian Diseases*, 56: 427 – 431.
- JENSEN, M. M., DOWNS, W. C., MORREY, J. D., NICOLL, T. R., LEFEVRE, S. D. and MEYERS, C. M. (1987). Staphylococcosis of turkeys: portal of entry and tissue colonization. *Avian Diseases*, 31: 64 – 69.
- JULIAN, R. J. (1985). Osteochondrosis, dyschondroplasia and osteomyelitis causing femoral head necrosis in turkeys. *Avian Diseases*, 29: 854 – 866.
- KIBENGE, F. S. B., ROBERTSON, M. D., WILCOX, G. E. and PASS, D. A. (1982). Bacterial and viral agents associated with tenosynovitis in broiler breeders in Western Australia. *Avian Pathology*, 11: 351 – 359.
- LINARES, J. A. and WIGLE, W. L. (2001). *Staphylococcus aureus* pneumonia in turkey poults with gross lesions resembling aspergillosis. *Avian Diseases*, 45: 1068 – 1072.
- NAIRN, M. E. (1973). Bacterial osteomyelitis and synovitis of the turkey. *Avian Diseases*, 17: 504 – 507.
- QUINN, P. J. and MARKEY, B. K. (2003). *Concise Review of Veterinary Microbiology*, 2<sup>nd</sup> Edition, Blackwell Publishing Limited, Oxford.
- RIDDEL, C. A. (1980). Survey of skeletal disorders in five turkey flocks in Saskatchewan. *Canadian Journal of Comparative Medicine*, 44: 275 – 279.
- SULEIMAN, A., ZARIA, L. T., GREMA, H. A. and AHMADU, P. (2013). Antimicrobial resistant coagulase positive *Staphylococcus aureus* from chickens in Maiduguri, Nigeria. *Sokoto Journal of Veterinary Science*, 11(1): 51 – 55.
- TRIPATHY, D. N. (2013). Fowl pox in chickens and turkeys. [http://www.merck-manuals.com/vet/poultry/fowlpox/fowlpox\\_in\\_chickens\\_and\\_turkeys.html](http://www.merck-manuals.com/vet/poultry/fowlpox/fowlpox_in_chickens_and_turkeys.html). Accessed November 3, 2014.