

# A four-legged hen with two cloacae and three caeca

A.O. Olatunji-Akioye<sup>1</sup>, S.G. Olukole<sup>2</sup>, A.M. Musa<sup>3</sup>, A.O. Suleiman<sup>4</sup>

1- Department of Veterinary Surgery and Reproduction, Faculty of Veterinary Medicine, University of Ibadan, Nigeria

2- Department of Veterinary Anatomy, Faculty of Veterinary Medicine, University of Ibadan, Nigeria

3- Department of Livestock & Veterinary Services, MANR, Lafia, Nigeria

4- Department of Animal Health and Production, University of Abuja, Nigeria

## SUMMARY

Here we report a fourteen-month-old four-legged local hen in Nigeria with two cloacae and three caeca. The hen walked with only the normal two limbs, which were larger and cranial to the extra two limbs. The extra limbs were usually suspended in the air and pointed caudally during motion, being attached to the pygostyle by cartilage and skin tissue. Investigations of the bird were carried out using radiology, necropsy findings and biometry. The intestines occupied the caudodorsal portion of the abdominal cavity with three caeca attached at the terminal end of the ileum; two on the right side of the median plane and one on the left. The right caecum was fused and had a divided distal end, terminating in two blind sacs. The hen had two cloacal openings, one on each side of the median plane and was observed to consistently defecate only through the right. The findings from our work provide information on multiple developmental abnormalities in the hen.

**Key words:** Four limbs – Hen – Intestinal variations

## INTRODUCTION

A number of avian congenital abnormalities have been well described in the literature. These include a duplicated lower intestinal tract, intestinal herniation, axial skeletal abnormalities, inherited retinopathy, embryologic malformations involving the small intestine, impaired vision associated with retinal defects, and abnormalities involving the reproductive system (Chapman et al., 1997; Ebako et al., 2002). The development of the chicken limb can be traced to an outgrowth of ectoderm and mesoderm along the lateral surface of the body of the chick embryo. Limb development has been associated with the growth of these cartilaginous regions and the intervening presumptive joints persist as densely packed regions of flattened cells.

The limb is shaped by the processes of cell division and differentiation followed by specific areas of cell death (Saunders et al., 1982; Dyce et al., 2002). Establishing a separation between developing articular ends of discrete elements in the embryonic limb is a vital event during joint formation and skeletogenesis. The earliest commitment of cells to such a fate is evident in areas of blastemal mesenchyme found interposing each pair of developing cartilaginous condensations (Osborne et al., 2002).

Correspondence to:

Dr Samuel G. Olukole, Department of Veterinary Anatomy, Faculty of Veterinary Medicine, University of Ibadan, Nigeria. Phone: +2348033574752.

E-mail: deborolukole@yahoo.com

Submitted: March 6, 2010

Accepted: April 7, 2010



**Figure 1.** A four-legged local chick at 12 weeks of age showing the disposition of the extra limbs during motion.



**Figure 2.** Radiograph of the chicken showing the bone cortices, normal articular cartilage and pygostyle with bone density.

This report investigates the structural aberrations in a fourteen-month-old four-legged local hen with three caeca and two cloacal openings, one on each side of the median plane. It employs radiography, necropsy findings and gross morphometry to understudy the bird.

### CASE REPORT

The bird used for this study was a fourteen-month-old hen. It was from a brood of chicks hatched naturally by a local hen and was reared with other normal-legged chicks under the semi-intensive method of poultry management. It had two cloacal openings, one on each side of the median plane, and it was observed to consistently defecate only through the right cloaca. Its growth was stunted but it was usually active, walked with only the normal two limbs, which were larger and cranial to the



**Figure 3.** Picture showing parts of the gastrointestinal organs of a hen with 3 caeca and two cloacae. A: Left caecum; B: Left medial caecum; C: Left lateral caecum; D: Left cloaca; E: Right cloaca; F: Distal part of ileum.

extra legs. During motion, the extra legs were usually suspended in the air and pointed caudally. The extra legs were attached to the pygostyle by cartilage and skin tissue (Fig. 1). All the joints in both extraneous legs were fused. Both the normal and extraneous legs had four toes each.

### Radiographic studies

The dorsoventral view of the chicken revealed that the four limbs of the chicken had bone density, and the points of attachment revealed the presence of joint capsules, confirming the presence of true joints. All four limbs' long bones had areas of radiolucence indicating areas of articular cartilage and all had intact cortices (Fig. 2).

The rudimentary limbs had thicker cortices on the femurs and a slight bowing of the distal ends. The normal limbs appeared to share an attachment with the extra limbs at the hip region, which appeared more proximal at the level of the lungs, suggesting a shortening of the trunk (Fig. 2). This explains the bird's stunted growth. The soft tissue in the region of the pygostyle had a density approaching bone density, which suggests that the soft tissue had been invaded by bone cells (Fig. 2). The phalanges were normal in density and morphology.

### Necropsy findings

Necropsy revealed that the tongue, trachea, cervical esophagus, crop, thoracic esophagus, proventriculus, and ventriculus of the hen were all in their respective anatomical positions. The intestines occupied the caudodorsal portion of the abdominal cavity with three caeca attached at the terminal end of the ileum: two on the right side of the median plane and one on the left. The right caecum was fused and had a divided distal end terminating in two blind sacs, each with a width similar to those of the left lateral and medial caeca (Fig. 3). However, the three caeca were similar in length. The rectum was dilated, with two cloacal openings: one on each side of the dorsolateral aspect of the cloacal elevator muscle. The biometric observations of the caeca, cloacae and four limbs of the bird were carried out as described by Olukole (2009). The left cloaca had a length and width of 8.0 cm and 3.2 cm, respectively, with an external cloacal diameter of 0.7 cm (Table 1). The right cloaca had a length and width of 3.4 cm and 1.5 cm, respectively, with an external

diameter of 1.5 cm (Table 1). The osteological dimensions of the normal and extra legs of the bird are shown in Table 2. The left and right normal limbs, like the extra limbs, were symmetric in dimension. However, the normal limbs were longer and stronger than the extra limbs. The two extra limbs were attached by cartilage and skin tissue to the dorsal aspect of the pygostyle vertebrae (Fig. 1) while all four limbs were attached by connective tissue.

**Table 1.** Morphometry of the caecum and cloaca of a four-legged hen. NA- Not applicable.

Organ (cm)	Length (cm)	Width (cm)	External diameter (cm)
Right lateral caecum	6.5	1.0	NA
Right medial caecum	6.8	0.9	NA
Left caecum	5.9	3.3	NA
Right cloaca	3.4	1.5	1.5
Left cloaca	8.0	3.2	0.7

**Table 2.** Morphometry of the limbs of a four-legged hen. Data represent the average of the respective left and right limbs.

Bone	Length of the Normal limbs (cm)	Length of the Extra limbs (cm)
Femur	6.2	5.9
Tarsal	9.2	7.6
Metatarsal	5.7	4.6
1 <sup>st</sup> Toe	1.5	1.1
2 <sup>nd</sup> Toe	3.8	2.7
3 <sup>rd</sup> Toe	4.5	3.7
4 <sup>th</sup> Toe	3.2	2.0

### COMMENTS

The developmental abnormalities reported here are presumed to have occurred during embryogenesis. Thus, the four legs, three caeca and two cloaca could be the result of certain mutations during embryogenesis. Developmental abnormalities may be induced in chicken embryos at 4 days of incubation, when organogenesis is well established (Karnofsky, 1965). However, certain environmental factors could have been responsible for, or added to, the development of the observed congenital abnormalities. Numerous reports of structural malformations have implicated chemicals and physical factors (Okoye, 1988).

The present report is similar to previous findings in a broiler chicken, where four legs, two cloacae and three caeca were observed and reported (Ebako, 2002). It is also similar to the findings of Emikpe et al. (2006) in a layer chicken. Nevertheless, the present report appears to be the first of multiple develop-

mental abnormalities in a naturally hatched local chicken in Nigeria, especially the defecation by the chicken only from the right cloacal opening. The diameter of the right cloacal opening being twice the size of the left confirms that the bird defecated through it. The frequency of multiple developmental abnormalities in chickens has been estimated at about one to two every four years (Ebako et al., 2002). There is a need for developmental studies geared towards a better understanding of the causes of multiple abnormalities in poultry, especially commercially reared ones.

## REFERENCES

- CHAPMAN HD, BEASELY JN, HACKER AB (1997). Broiler chicken with a duplicated lower intestinal tract. *Avian Dis*, 41: 1003-1005.
- DYCE KM, SACK WO, WENSING CJC (2002). *Textbook of Veterinary Anatomy*. 2nd ed. W.B. Saunders.
- EBAKO GM, MORISHITA TY, MATTOON JS (2002). Four-legged broiler chicken with two cloacae and three ceca. *Avian Dis*, 46: 234-238.
- EMIPKE BO, OZEGBE PC, OHORE OG, OLUWAYELU DO (2006). Four-legged chicken with left bifid caecum and two cloacae. *Bull Anim Hlth Prod Afr*, 54: 302-304.
- KARNOFSKY DA (1965). The chick embryo in drug screening; survey of teratological effects observed in 4-day chick embryo. In: Wilson JG, Warkany J (eds). *Teratology: principles and techniques*. University of Chicago Press, Chicago, IL, pp 194-213.
- OKOYE JO, AZUZU IU, GUGNANI HC (1988). Paralysis and lameness associated with aflatoxicosis in broilers. *Avian Pathol*, 17: 731-734.
- OLUKOLE SG (2009). Morphometric analysis of the kidneys of the adult domesticated African great cane rat (*Thryonomys swinderianus*). *Eur J Anat*, 13: 117-120.
- OSBORNE AC, LAMB KJ, LEWTHAITE JC, IJOWTWAITE GP, PITSILIDES AA (2002). Short-term rigid and flaccid paralyzes diminish growth of embryonic chick limbs and abrogate joint cavity formation but differentially preserve pre-cavitated joints. *J Musculoskel Neuron Interact*, 2: 448-456.
- SAUNDERS JW, Jr (1982). Patterns, problems, principles. In: *Developmental biology*. MacMillan Publ. Co., New York, pp 324.