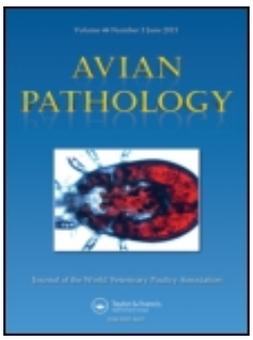

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Health studies on a group of captive helmeted guineafowl (*Numida meleagris*) in Tanzania

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SUMMARY

A small group of housed helmeted guineafowl (*Numida meleagris*) was studied over a 6-week period. Blood samples were taken on three occasions and basic haematology was performed. Clinical examination of the birds revealed a number of abnormalities including bumblefoot, inflammatory lesions on the wings and body, impaction of the preen gland and traumatic injuries. Supporting laboratory tests provided further information on the aetiology and pathogenesis of some of these disorders. Four birds died during the study: postmortem findings included oviductitis and septicaemia, visceral gout and nephropathy. Virological investigations were not carried out. The importance, when keeping guineafowl, of good husbandry, including regular handling and examination, is stressed.

INTRODUCTION

The helmeted guineafowl (*Numida meleagris*) is a native of Africa where many subspecies exist (Belshaw, 1985). It has been a domesticated species for centuries, but most captive birds in East Africa are derived from stock introduced from Europe (Williamson & Payne, 1978).

Despite the growing importance and potential of captive guineafowl in Tanzania, little research appears to have been conducted. This is in marked contrast to the situation in West and South Africa, Europe and North America, where guineafowl are kept in large numbers, and where there is an extensive literature on their management and health (Sauveur & Plouzeau, 1992). Welfare of guineafowl is attracting increasing attention in Europe (Faure *et al.*, 1993) and is of relevance to disease prevention and productivity. This concern has not yet been addressed in East Africa.

In this paper we report studies over a 6-week period on the health of a small group of captive birds in Morogoro, Tanzania.

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MATERIALS AND METHODS

The study was carried out on a group of 18 captive helmeted guineafowl (*Numida meleagris*) in Morogoro Region.

The birds had been brought into the country from France 7 years previously for breeding purposes. Those in the study were a mixture of original birds and some of their progeny.

The guineafowl were kept under a deep litter system in a pen measuring 8 × 8 × 4.5 m. The pen was made of concrete blocks, roofed with corrugated aluminium sheets and with a smooth floor covered with rice husk litter. The litter was changed irregularly, as necessary. Ventilation was provided by a large window measuring 5 × 1.5 m on one side of the pen and covered with wire gauze. On the other side, a corridor separated the pen from a second large window.

The birds were fed on locally produced poultry breeders' mash and/or layers' mash given at a rate of 100 g/day/bird. In addition there was an *ad libitum* supply of clean drinking water by means of automatic waterers.

Routine management had included surgical pinioning ('dewinging') at 1 week of age.

The guineafowl were caught on four occasions at weekly intervals. On three occasions blood was taken from some of the birds. Marking for identification was carried out using plastic leg rings (The Domestic Fowl Trust, Worcester, UK). On one occasion all guineafowl in the group were caught, blood was not taken, but each bird received a full clinical examination. Catching was effected by means of a lightweight net with a padded aluminium frame. Following capture each bird was held by one person and examined/bled by another.

Blood samples were taken from the brachial (basilic) vein just distal to the elbow (*junctura cubiti*) joint. In addition to blood in heparin, two thin blood smears were prepared. Other samples were collected using standard techniques (Cooper, 1989). Those for bacteriological culture were taken with a sterile swab and those for histopathology removed surgically, under local (lignocaine) analgesia, and fixed in 10% formalin. No attempt was made to isolate viruses.

Laboratory processing of samples was also carried out using routine techniques. In addition to aerobic bacteriology and histopathology, some cytological examination was performed. Touch preparations (impression smears) from the cut surfaces of lesions were stained with Giemsa or Hemocolor (Merck). Haematocrit (packed cell volume, PCV) was determined using a S201 M Sigma microhaematocrit centrifuge at 12,000 *g*. Haemoglobin concentration (Hb) was calculated using a cyanmethaemoglobin method in a S1201 Beckman spectrophotometer at 544 nm after dilution of 20 μl blood in 5 ml diluent containing 1 g sodium bicarbonate ($NaHCO_3$), 0.05 g potassium cyanide (KCN) and 0.02 g potassium ferrocyanide [$K_3Fe(CN)_6$] dissolved in 1 litre of water. Before measurement of absorbance the cyanmethaemoglobin solution formed after dilution was briefly centrifuged for 3 min at 2000 rpm in a Sigma 3E-1 centrifuge to eliminate nuclear precipitates which would falsely increase the absorbance. Red blood cells (RBC, erythrocytes) were counted in an improved haemocytometer

following dilution of 20 μl blood in 5 ml diluent containing 0.5 g mercuric chloride, 5.0 g sodium sulphate and 1.0 g sodium chloride in 200 ml H_2O. Dilutions of 50 μl blood were made with 950 μl of 1% HCl to which 1 ml of 1% of gentian violet had been added. The purpose was to facilitate enumeration of leukocytes by haemolysis of erythrocytes, and staining of leukocytes by HCl and gentian violet, respectively. The erythrocyte indices, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated. Differential counts were not performed but white cells were examined and note was taken of their relative numbers.

Blood smears were stained with Giemsa and examined microscopically for parasites (protozoa and microfilariae) and abnormalities.

Birds that died during the study were examined *post mortem* and samples were taken as necessary for laboratory investigation.

RESULTS

Clinical findings are given in Table 1 and haematological results in Table 2. During the study four birds died: the postmortem findings are summarized in Table 3.

DISCUSSION

Catching and handling of the birds did not prove easy and this is relevant both to the taking of samples for pathological examination and the interpretation of findings. Guineafowl are notoriously 'flighty' (Faure *et al.*, 1993); those in this study were unaccustomed to handling and did not readily tolerate the close proximity of humans. Even with a net, capture clearly proved stressful. Restraint and sampling would have been easier if the guineafowl could have been caught in subdued light—for example, at night or by reducing illumination (Cooper, 1991).

The use of rice husk litter on a slippery surface made escape behaviour particularly hazardous. Birds were seen to slip repeatedly and one of those that died (see Table 3) had become recumbent after such an episode. The bird showed no skeletal lesions and its inability to walk was attributed to soft tissue, probably nerve, injuries.

The substrate probably also contributed to the high prevalence of foot lesions. The majority of older birds showed loss of papillae on the plantar surface of the feet and chronic 'bumblefoot' (pododermatitis) was a feature in three cases. Such changes are well recognized following trauma or unsuitable perching surfaces.

Both free-living and captive guineafowl prefer to roost in an elevated location at night (Anon, 1987) and the absence of any suitable perches may also have contributed to both the birds' wariness and the foot lesions. Perches have been shown to facilitate handling of broiler chickens (Newberry & Blair, 1993) and could have a similar effect on guineafowl.

The techniques for blood sampling proved satisfactory. Smears made from

Table 1. *Clinical examination of guineafowl*

Bird ref.	Age	Sex	Condition	Wings	Feet	Preen gland	Other	Blood taken Yes/No	Comments
1	Old	M	2	Tumour-like lesion on right wing. Pinioned.	Loss of papillae. Callus formation.	Impacted and swollen.	Abscess-like lesion on right ramus of jaw.	Y	Surgical removal of wing and jaw lesions. Non-lactose forming bacteria isolated.
2	Young	?	2	Damaged feather follicles on left wing. Pinioned.	—	—	—	Y	—
3	Old	M	3	Pinioned.	—	—	Died following skin lesion on right flank (necrotic and discharging pus).	Y	Swab from skin lesion yielded *E. coli*. PM revealed: visceral gout; ascarids in gut; abnormal testis.
4	Old	F	1	—	—	—	Died following history of recumbency.	Y	PM revealed: nephropathy; pressure sores; abnormal fat; nematode eggs in gut. Heart blood yielded no aerobic isolates.
5	Young	?	?	—	—	—	Died unexpectedly.	Y	Full PM not possible. No obvious cause of death.
6	Old	F	2	—	—	Viscous oil.	Had pendulous dilated crop.	Y	Crop drained regularly.
7	Old	?	3	Slight abrasion on left wing. Pinioned.	Loss of papillae. Digit 4 left foot twisted laterally.	Swollen and containing inspissated material.	—	Y	Swab from preen gland yielded no isolates.
8	?	?	2	Abrasions on both wings.	Old bumblefoot lesions on left foot dorsal surface. Loss of papillae on right foot.	Grossly distended. Fistula present. Mixture of normal and inspissated material.	Mobile lesion on right hand side neck approx. 1 cm diameter.	Y	—
9	Old	M	2	Abrasions on right wing.	—	Abnormal. Slightly blocked.	Mobile subcutaneous lesion on dorsum of neck approx. 1×0.5 cm.	Y	Preen gland functioned following stimulation. Swab from preen gland yielded no isolates. Surgical removal of neck lesion.

10	Old	?	2	Severe abrasion on right wing and slight on left wing. Tumour-like lesion on left wing.	Plantar scabs. Small swelling at distal end digit 3 left foot (painless).	Impacted and warm, yellow inspissated material.	Mobile subcutaneous lesion on dorsum of neck 2 cm diameter.	Y	Surgical removal of wing, digit and neck lesions.
11		F	—	—	—	—	Died following signs of tachypnoea, mucous discharge from beak and diarrhoea.	Y	PM revealed: oviductitis; respiratory tract damage.
A	Young	?	2	Granulation tissue on left wing.	—	Not examined.	—	N	—
B	Old	M	2	Moderate abrasion right wing.	Rough scales — both feet.	Feathers around the gland dark but normal preen oil.	—	N	—
C	Old	?	2	Tumour-like lesion 3 × 4.5 cm on right wing. Mild abrasion left wing.	Right foot with old hard bumblefoot scab on caudal aspect. Hard callus on left foot.	Dry, dirty and slightly inspissated material.	Hard subcutaneous swelling cranial to sternum below crop. Swelling on left eyelid.	N	—
D	Old	M	2	Left wing— keratinous debris. Trapped feathers.	—	Inspissated material and oil.	Skin wound left flank, others elsewhere on body.	N	Swab from preen gland yielded no isolates.
E	Young	?	2	Damaged feather follicle.	—	Dry, but functioning.	—	N	—
F	Young	?	2	Mild abrasion on left wing.	—	—	—	N	—
G	Old	?	2	Left foot— chronic bumblefoot. Right foot —digit 4 distorted.	Duct blocked Inspissated material escaping through fistula. Following handling oil began to flow.	Tumour-like lesion on side left-hand neck.	—	N	Aspirate from foot yielded no isolates.

Table 2. *Haematological results (three sample times)*

Bird no.	rbc ($\times 10^{12}$/l)			Hb (mmol/1)			pcv (1/1)			mcv $\times 10^{-15}$ l			mch $\times 10^{-15}$ mol			mchc^{mmol}			Smears
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
1	1.1	1.6	1.7	3.24	6.48	6.48	0.27	0.33	0.29	240	206	171	2.94	4.05	3.81	12.0	19.6	22.3	NAD NPS
2	2.1	1.6	1.9	5.09	9.02	9.26	0.35	0.37	0.34	170	231	179	2.42	5.63	5.78	14.5	24.4	27.2	NAD NPS
3	2.1	1.7	1.8	7.64	10.88	10.88	0.27	0.54	0.43	130	318	239	3.64	5.18	6.00	28.2	20.1	26.3	NAD NPS
4	1.9	1.4	2.7	6.71	8.1	9.02	0.35	0.36	0.34	180	257	126	3.53	4.26	3.34	19.2	22.5	26.5	NAD NPS
5	1.9	1.4	1.9	4.63	6.94	6.25	0.32	0.32	0.21	170	228	110	2.43	3.65	3.28	14.5	21.7	29.8	NAD NPS
6	1.1	1.8	2.8	5.09	9.26	8.56	0.38	0.38	0.41	340	211	146	4.62	5.14	3.06	13.4	24.4	20.9	NAD NPS
7	1.1	1.7	2.1	6.48	6.71	6.71	0.32	0.34	0.23	290	200	110	5.89	3.95	3.20	20.2	19.7	29.2	NAD NPS
8	1.3	1.8	1.8	5.09	6.71	7.64	0.33	0.27	0.31	250	150	172	3.91	3.73	4.24	15.4	21.6	24.6	NAD NPS
9	0.75	1.6	2.5	6.71	7.17	13.42	0.40	0.45	0.50	530	281	200	8.94	4.48	5.37	16.8	15.9	26.8	NAD NPS
10	1.3	2.1	2.0	4.63	8.1	6.25	0.34	0.34	0.34	261	263	170	3.56	3.85	3.12	13.6	23.8	18.4	NAD NPS
11	1.8	1.8	1.8	4.86	10.41	6.02	0.36	0.39	0.25	200	189	139	2.70	5.78	3.34	13.5	30.6	24.1	NAD NPS
Mean	1.495	1.68	2.09	5.47	8.16	8.22	0.34	0.37	0.33	251	225.6	160.2	4.38	4.52	4.05	16.5	22.2	25.0	

NAD = no abnormalities detected; NPS = no parasites seen.

heparinized blood proved to be of sufficient quality, other than some distortion of leukocytes, to permit microscopical examination. The haematological results were broadly similar to those reported by Awotwi & Boohene (1992), working in Ghana, but all values were lower. The results were, however, consistent (Table 2). The failure to detect blood parasites was interesting and may reflect the fact that these birds were kept indoors away from possible arthropod vectors. *Leucocytozoon* spp. have been described from guineafowl in Tanzania (Fallis *et al.*, 1973) and a number of other species of blood parasites reported from free-living birds in South Africa (Earlé *et al.*, 1991). Orajaka & Nweze (1991) did not detect haemoparasites in guineafowl in a small survey in Nigeria.

Surgical removal of lesions on feet, wings and neck/head was carried out with relatively few problems and yielded samples suitable for pathological examination. Local analgesia using small volumes of lignocaine was tolerated, as has been reported by others (Mouli, 1988). A hand-held battery-operated cautery (MDS, Florida) was usually adequate to control slight or moderate haemorrhage.

The lesions on wings proved to be inflammatory in nature. No organisms were seen in sections nor could they be cultured but mixed inflammatory cell (granulocyte/macrophage) infiltration was a feature of histological sections. These lesions appeared to be associated with surgical pinioning. Although pinioning of wings is useful in order to prevent escape, it has some disadvantages in that birds may find it difficult also to escape from predators, and roosting behaviour may be impaired. When guineafowl are kept indoors it is probably preferable either not to pinion them, and to facilitate management by habituating them to humans, or partially to clip the primary feathers on one wing. When surgical pinioning *is* performed it must be done properly and humanely. The alula should be left intact to help protect the end of the bones (Gandal & Amand, 1982).

Lesions on other parts of the body also proved to be infectious in nature but were generally well encapsulated and organisms were usually not seen in histological sections. An exception was one foot lesion, a smear of which showed coccobacilli. A neck lesion examined cytologically showed many small bacilli and sheets and flakes of keratin reminiscent of 'feather cysts' (Cooper & Harrison, 1993). These and other findings illustrated the usefulness of cytology in avian diagnostic work, especially in countries such as Tanzania where the preparation of histopathological sections can be expensive (Mellau & Cooper, 1994).

The high prevalence of preen gland abnormalities is of interest and relevance. In most cases, the glands appeared to be impacted, with little evidence from bacteriological or cytological tests of bacterial involvement. Abscesses and granulomas of the gland are recognized in pet birds (Arnall & Keymer, 1975; Altman, 1982) but are usually associated with inflammation and pain. That some impactions in the guineafowl were long-standing was evidenced by the finding of fistulae lateral to the uropygial gland, through which viscous ('toothpaste-like') secretion was escaping. Less severely affected birds had

Table 3. *Postmortem findings in four guineafowl*

Bird no.	Gross findings	Laboratory findings	Comments
11	Inflamed oviduct and mesometrium. Pulmonary congestion. Petechiae on heart.	Histology confirmed oviductitis and septicaemia	Antemortem showed tachypnoea, viscous discharge from mouth and diarrhoea prior to death.
3	Dehydrated, lungs congested. Urates on pericardium and liver. Abnormal testes. Nematodes, *Heterakis* sp., in gut, eggs in faeces.	Histology confirmed visceral gout. Renal lesions. Dilated and abnormal seminiferous tubules.	Had necrotic skin wound on flank (*E. coli* isolated), treated with sulphonamides.
4	Pressure sores on body and limbs. Damaged claws. Abnormal fat in body cavity. Pale liver and kidneys. Nematode eggs in faeces.	Histology showed chronic nephropathy and steatitis. No aerobic isolates from heart blood.	Recumbent for several days before death.
5	Postmortem autolysis, no obvious lesions.	Not performed	Died overnight: hence delay before submission for examination.

dry, dirty glands; normal or slightly inspissated preen oil could be expressed. In most cases, the glands improved in appearance and function within a week of clearing and draining.

It seems likely that the preen gland dysfunction was attributable to the dry conditions under which the birds were kept. A large shallow bowl of water or weekly spraying of birds with water can stimulate normal preening behaviour. Dustbathing, an important part of guineafowl behaviour (Belshaw, 1985), was not regularly observed in the birds in the study group, possibly because rice husks are not a suitable alternative to soil.

The dry, lustreless appearance of the plumage was attributable mainly to preen gland dysfunction, but a nutritional deficiency may have contributed and could perhaps also have predisposed to gout and body lesions. The birds were fed only on poultry mash; guineafowl fare better on a varied diet and this should ideally include various plants and invertebrates (Belshaw, 1985). Ectoparasites can also cause plumage changes; several species have been reported from guineafowl elsewhere in Africa (Okaeme, 1988), but were not detected on any of the birds in the group.

Although this study was carried out on only a small group of birds over a short period of time, it provided useful preliminary information on the health of captive guineafowl. Very little has been published about the species in Tanzania and there is a need for a greater veterinary input. It is clear from this study that good husbandry, coupled with regular handling and clinical examination, can contribute substantially to health and welfare.

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RESUME

Etude sanitaire d'un groupe de pintades casquées élevées en captivité (*Numida meleagris*) en Tanzanie

Un petit groupe de pintades casquées (*Numida meleagris*) a été etudié en captivité pendant une période de six semaines. Des échantillons de sang ont été prélevés en trois occasions et des analyses hématologiques effectuées. L'examen clinique des oiseaux a révélé certaines anomalies comme des lésions du coussinet plantaire, des inflammations des ailes et du corps, l'impaction de la glande uropygiale et des traumatismes physiques. Des tests complémentaires en laboratoire ont donné d'autres informations sur les causes et la pathogénie de certains de ces troubles. Quatre oiseaux sont morts pendant cette étude: les résultats d'autopsies ont révélé des affections telles que la salpingite, la septicémie, la goutte viscérale et la néphropathie. Il est extrêmement important, lorsqu'on élève des pintades, d'avoir de bonnes conditions d'élevage, une surveillance et des examens réguliers.

ZUSAMMENFASSUNG

Untersuchungen über den Gesundheitszustand einer Gruppe in Gefangenschaft gehaltener Helmperlhühner (*Numida meleagris*) in Tansania

Eine kleine Gruppe eingestallter Helmperlhühner (*Numida meleagris*) wurde während einer sechswöchigen Zeitspanne untersucht. Es wurden dreimal Blutproben entnommen und elementare hämatologische Untersuchungen durchgeführt. Die klinische Untersuchung der Tiere zeigte eine Anzahl von Anomalien wie Fußballenschwellung, entzündliche Veränderungen an Rumpf und Flügeln, Verstopfung der Bürzeldrüse und traumatische Verletzungen. Ergänzende Laboruntersuchungen lieferten weitere Informationen über die Ätiologie und Pathogenese einiger dieser Leiden. Vier Tiere starben im Laufe der Untersuchung; die Sektionsbefunde umfaßten Eileiterentzündung und Septikämie, Eingeweidegicht und Nephropathie. Virologische Untersuchungen wurden nicht durchgeführt. Die Wichtigkeit von gutem Management bei der Haltung von Perlhühnern, einschließlich regelmäßiger Untersuchungen und Beschäftigung mit den Tieren, wird betont.

RESUMEN

Estudios realizados en un grupo de gallinas pintadas cautivas sanas

Se studió un grupo pequeño de gallinas pintadas (*Numida meleagris*) cautivas durante un periodeo de 6 semanas. Se tomaron meustras de sangre en tres ocasiones y se realizó un estudio hematológico. El examen clínico reveló ciertas alteraciones tales como abscesos plantares, lesiones inflamatorias en las alas o el cuerpo, impactación glandular y lesiones traumáticas. Pruebas de laboratorio dieron más información acerca de la etiología y patogenia de alguno de estos procesos. Cuatro aves murieron durante este período y el estudio anatomopatológico reveló oviductitis, septicemia, gota visceral y nefropatia. No se realizaron estudios virológicos. Se discute la importancia de un manejo adecuado y periódico en la cría de gallinas pintadas.