CASE REPORT

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Fatal abomasal sand impaction in a giraffe calf (*Giraffa camelopardalis*) at the University of Ilorin zoological garden

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Abstract

A post-mortem examination was carried out on a 4-month-old giraffe which was reported dead early hours of the morning in the zoological garden, University of Ilorin. The carcass of the animal appeared slightly emaciated and on opening of the carcass the abomasum was distended with a hard mass felt inside the organ. On opening of the organ, it was filled with sand and weighing 3.8kg. Geophagia due to various factors were queried in the cause of the condition including seasonal prevalence, nutrient deficiencies, feeding regimen and also housing inadequacies. Although poor milk intake, absence of maternal nurturing and inadequate captive conditions are the most likely causes of geophagia which eventually led to the death of the animal.

Keywords: Abomasum, Sand impaction, Geophagia, Giraffe, Nigeria

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Introduction

Sand impaction occurs when sand adheres to food, soil is ingested directly, or dirt is eaten, as has been reported in foals of domestic horses (Radostits *et al*. 2000).

Sand impaction occurs in a wide variety of animals including cattle, elephants (*Elephas maximus*) (Warren *et al*. 1996), and ostriches (*Struthio camelus*) (Mushi *et al*. 1998), as well as humans (Singh, 1983). It has been reported in a cria by Sameeh & Lyall (2006) where the animal was observed eating soil.

Clinical signs of sand impaction in other animal species include depression; either diarrhea or little or no passage of feces; and mild, moderate, or even severe colic with mucosal damage (Johnston & Freeman, 1997; Fowler, 1998).

Geophagia, the deliberate ingestion of soil, has been classified as a form of pica. Geophagia in mammals has been associated with deficiencies of elements such as phosphorus, sodium, magnesium, sulphur, copper, cobalt and manganese (Kreulen & Jager, 1984). Trace element deficiencies, in particular copper, zinc and cobalt; have been incriminated in the aetiology of alopecia and wool eating habit in sheep (Fahmy *et al*., 1980; Meyer & Lohse, 2002).

Numerous health problems that are suspected to be of nutritional origin have been documented in captive giraffe. Pathologies that may relate to vitamin and mineral intake or metabolism include white muscle disease (Strafuss & Kennedy, 1973; Burton & Dierenfeld), urolithiosis (Wolfe *et al*., 2000), and dental disease (Enqvist, 2003). Pancreatic pathologies (Fox, 1938; Fowler, 1978; Lechowski *et al*., 1991; Ball *et al*., 2002), decreased ruminal absorptive surface area (Hofmann & Matern, 1988), ruminal acidosis (Clauss, 1998; Clauss *et al*., 2002), fermentative gastritis or rumenitis (Fox, 1938; Ball *et al*., 2002) and gastrointestinal ulceration (Fox, 1938; Fowler, 1978) also have been documented. This study looks to provide wildlife veterinarians and biologists working in captive conditions e.g. zoos, with best husbandry and management practices to avoid future mortalities to their captive giraffes especially calve.

Case History

The giraffe arrived at the University of Ilorin zoological garden in March, 2012 with the umbilical cord still attached indicating the animal

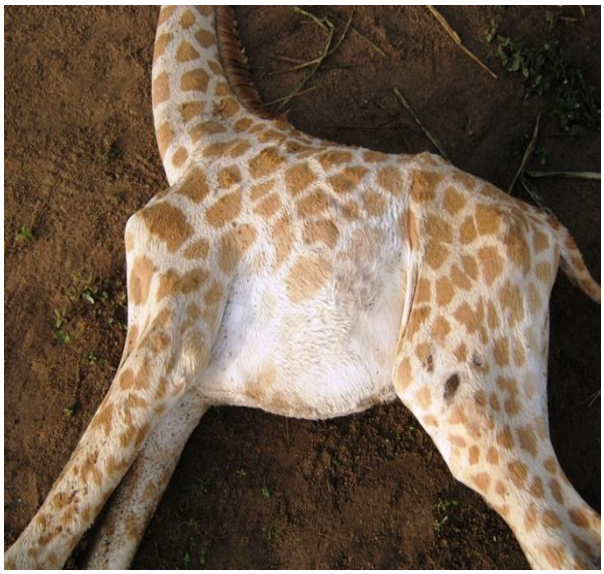

Plate 1: Emaciated carcass

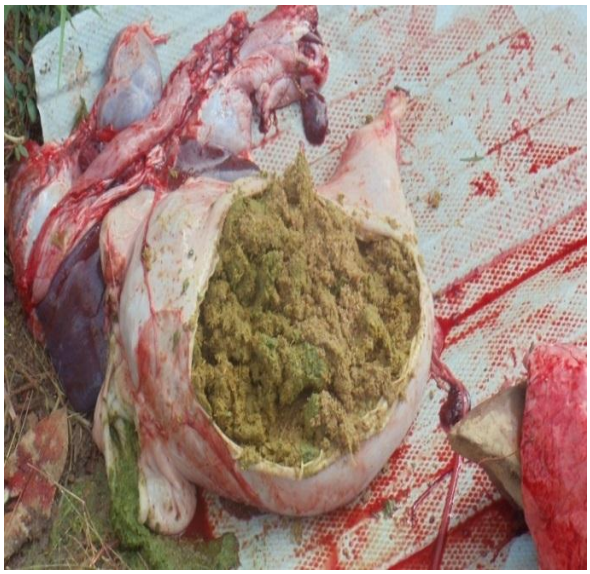

Plate 2: Enlarged abomasum filled with sand

was less than 2 months old (Langman, 1977). The animal was fed with about 4 litres of whole milk (cattle) twice daily for the first month of introduction to the zoo without any mineral supplementation. It was housed in a 7 by 7 foot pen with sharp sand as bedding material. On the second month of introduction the animal, milk feeding was ceased; instead the animal was fed about 1 kg of wheat offal, guinea corn and leaves of the African copaiba balsam tree (Igi-iya) *Daniellia oliveri* (Quattrocchi, 2012) as food. The animal was found dead 3 weeks later by the zoo workers. No signs of colic or abdominal discomfort were noticed before closing hours a day prior to death.

A postmortem examination was carried out in an attempt to diagnose the cause of death. The entire carcass was slightly emaciated (Plate 1) with a resolved wound on the medial aspect of the right forelimb at the level of the carpus. On opening of the carcass it was noticed that the abomasum was very large and distended with a hard mass felt inside. On dissecting through the gastrointestinal tract, there were large deposits of sand filling the abomasum which weighed 3.8kg (Plate 2). No other peritoneal lesions were observed. All other organs appeared normal.

Discussion

First-year giraffe calf mortality in captivity may be as high as 45% as reported by Lackey & LaRue, (1997) and as high as 75% in the wild due to predation (Foster, 1966). Wasting and sudden death are frequently reported in the literature and anecdotally; malnutrition and peracute mortality syndrome (Fox, 1938), serous fat atrophy and peracute mortality syndrome (Fowler, 1978), mineral imbalances and wasting (Junge & Bradley, 1993), poor milk intake (Flach *et al*., 1997), hypoglycemia and chronic energy malnutrition (Ball *et al*., 2002), therefore the sudden death is not a strange occurrence in giraffes. At this time, the true proportion of captive
giraffe mortality caused by nutritional pathologies is unknown.

Geophagia and osteophagia is a common feature of the feeding routine of the southern giraffe (*Giraffa camelopardis giraffa*) during the months from April to November and geophagia was primarily exhibited by sub-adult giraffe (Langman, 1978). Although all age classes can be affected as it is a common behaviour in free-ranging giraffe (Seeber *et al.,* 2012). The ultimate cause of the geophagia is still uncertain (Neser, 2001). This incidence occurred in the month of May.

Due to the association of the condition to mineral deficiencies (Kreulen & Jager, 1984); A deficiency in cobalt has been associated with pica in cattle (Kreulen & Jager, 1984) and a zinc deficiency has been implicated as a cause of geophagia in children (Hambidge *et al*., 1987). It is possible that lack of supplementation of essential minerals in the milk could also be the cause of the problem as hand reared giraffe calves should be given supplements like calcinol, evion and other feed concentrates in milk (Khadri & Valandikar, 2002).

In calves and sheep that are temporarily deserted by their dams, hunger was suggested as a driver for geophagy (Neser, 2001). The recorded quantity to be fed to hand reared giraffe calves at 2-4 months is 1.2-1.6 litres of milk 6 times daily and supplement with browse and concentrates (Khadri & Valandikar, 2002).

The use of sharp sand as bedding gave an avenue and availability of sand to be consumed hence materials like straw, saw-dust or mulch can be used instead (Lorraine, 2003). Control of sand impaction has been achieved by preventing access to pastures that contain sand and by not feeding animals on the ground (Johnston & Freeman, 1997).

Hediger (1955) and Hediger (1964) considered restricted movement due to space limitations to be one of the primary contributors to captivity-induced stress, and some of the earliest studies of abnormal behaviour in captive animals supported this contention (Levy, 1944). More recent work has also suggested an adverse effect of confinement in small spaces. In one study of the impact of captivity on 35 different species of carnivore, infant mortality in captivity and stereotypic locomotion in the form of pacing was found to correlate positively with species home range size in the wild (Clubb & Mason, 2003; Clubb & Mason, 2007). The 7 by 7 foot pen was therefore considered grossly inadequate and a larger perimeter fencing of 200 by 300 feet was constructed.

Evidence of the ingestion of small quantities of soil by calves and lambs is frequently observed during routine post mortem examinations (Graham *et al*., 1994), therefore making it difficult to achieve a clinical diagnosis of the problem.

Calf mortality due to poor milk intake has been reported by Flach *et al*. (1997), in this case, we strongly believe that milk withdrawal was the primary cause of death coupled with inadequate captive conditions; as the second infant giraffe which had its milk intake and quality boosted survived and is doing well till date in the 200 by 300 feet perimeter fencing constructed by the zoo. This to our knowledge is the first reported case of Fatal Abomasal sand impaction reported in wild ruminants in Nigeria.

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