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Zoonotic Role of the Grasscutter

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1. Introduction

Zoonoses have affected human health throughout times, and wildlife has always played a role. Wildlife has long been recognized as potential sources for infectious diseases in humans and domestic animals. Diseases of wildlife have historically gained attention primarily when they were considered a threat to agricultural systems and the economic, social, or physical health of humans (Andrew et al, 2009). Today, zoonoses with wildlife reservoirs constitute a major public health problem, affecting all continents. The importance of such zoonoses is increasingly recognized, and the need for more attention in this area has to be addressed (Kruse et al., 2004). Wildlife can be defined as free-roaming animals such as mammals, birds, fish, reptiles, and amphibians living in a natural undomesticated state.

Zoonoses are infectious diseases which can be passed between vertebrate animals and humans. A high proportion of noticeable human diseases are zoonotic. They exclude diseases transmitted from human to human via an arthropod vector e.g. malaria (NR International managers of the Livestock Production Programme (LPP), 2006). Taylor et al, (2001) catalogued 1,415 known human pathogens and reported that 62% were of zoonotic origin. Wild animals seem to be involved in the epidemiology of most zoonoses and serve as major reservoirs for transmission of zoonotic agents to domestic animals and humans (Kruse et al., 2004). Zoonoses with wildlife reservoirs are typically caused by various bacteria, viruses, and parasites, whereas fungi are of negligible importance (WHO, 1999).

2. The grasscutter

The grasscutter (*Thryonomys swinderianus*), variously known as the marsh cane-rat, ground hog and in francophone West Africa, the aulacode or incorrectly, the agouti is a rodent but not a rat proper, since it belongs to the Hystricomorpha (porcupine family). This rodent subclass embraces similar species in both the old and new world, species which were originally classified according to the differentiation of the masticatory musculature (Simpson, 1974).

The grasscutter has thickset body, measuring up to 40cm to 60cm in addition to a 20cm - 25cm tail (Fitzinger, 1995), (See Plate 1). Its average weight fluctuates between 2kg to 4kg in the females and 3kg to 6kg in the males (Baptist and Mensah, 1986, Adjanahoun, 2002, Jori et al, 1995 and Merwe, 2000). Its furs comprise a mixture of brown reddish and gray hairs that vary depending on its habitat (Jori and Chardonnet, 2001). Some other authors reported that the skin and hair (fur) as well as limbs and tails are easily torn out (Rosevear, 1969; kingdom, 1974). This makes the animal very difficult to catch and even more difficult to handle after capture.

The grasscutter is a quick runner and a skilled swimmer, despite the blunt snout. Its visual powers are relatively poor, making communication to be based only on hearing and well developed sense of smell. This rodent can live up to four years in captivity (Jori and Chardonnet, 2001). It is a monogastric herbivore like the rabbit and other rodents; it is a good food converter and often practices coprophagy (Hemmer, 1992). They are considered delicacy, high prized source of protein and agricultural pest of cereals and other crops (Yeboah and Adamu, 1995).



Plate 1. The grasscutter (*Thryonomys swinderianus*), matured adult measures 40-60cm long; weighs 2-6 kg; mixture of reddish brown and grey fur; monogastric herbivore; quick runner; skilled swimmer; poor vision; good sense of smell; lives up to 4 years in captivity; Induced ovulator; Gestation period 150-156 days; litter size up to 6.

3. Distribution and habitat of the grasscutter

The grasscutter is found only in Africa (Rosevear, 1969; Baptist and Mensah, 1986; Adoun, 1993). In West Africa where grass provides its main habitat and food, it is commonly known as the “grasscutter” or the “cutting grass”, while in other parts of Africa particularly Southern Africa, where it is closely associated with cane fields, it is called the “Cane rat”.

The grasscutter is found in grasslands and wooded savannah throughout the humid and sub-humid areas, south of the Sahara (National Research Council, 1991), specifically from Senegal to parts of the Cape Province in South Africa (Rosevear, 1969). The giant cane rat can also be found in any where there is dense grass, especially reedy grass growing in damp or wet places (Asibey, 1974a). They do not inhabit the rain forest, dry scrub or desert regions (National Research Council, 1991). Its distribution is determined basically by the availability of adequate or preferred grass species for food (National Research Council, 1991).

In West Africa, the grasscutter is not considered a threatened or disappearing species of wildlife (Baptist and Mensah, 1986). On the contrary, forest clearance in the Guinea zone has

expanded its ecological habitat from the Savannah region into cropped areas and secondary forest, following agricultural encroachment on forests (Baptist and Mensah, 1986).

Similarly in Ghana, the grasscutter has penetrated the high forest where there is intensive maize, cassava, sugarcane, young cocoa, coconut, oil-palm, pineapple and egg plant cultivation (Asibey, 1974b). However, *Thryonomys swinderianus* has often been encountered in the vicinity of water courses just as both species have also been found in the same environment in East Africa (Kingdom 1974).



Plate 2. The grasscutter feeding on Guinea grass (*Panicum maximum*).

4. Characteristics of the grasscutter

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The meat of the grasscutter is the most preferred among wild rodents (Asibey and Eyeson, 1973; Clotey 1981) and exploited in most areas as a source of animal protein (Vos, 1978; Asibey, 1974; National Research Council, 1991). Being the most preferred (Martin, 1985) and most expensive meat in West Africa (Baptist and Mensah, 1986; Asibey and Addo, 2000), it contributes to both local and export earnings of most of these countries (Asibey, 1969; National Research Council 1991; Baptist and Mensah, 1986; GEPC 1995; Ntiamoa-Baidu, 1998). For these reasons, the grasscutter is therefore hunted aggressively.

Unfortunately, its collection from the wild results in the destruction of the environment through setting of bush fires by hunters (National Research Council, 1991; Yeboah and Adamu, 1995; Ntiamoa-Baidu, 1998).

However, a great number of farmers in the sub-region have commenced the domestication of the grasscutter (National Research Council, 1991; Addo. 2002), thus making it more readily available. It is hoped that this venture will help the farmers to gain economic benefit and also reduce the environmental destruction that accompanies its collection from the wild.

5. Important zoonotic diseases in the grasscutter

Major diseases of economic and zoonotic importance in sub Sahara Africa are maintained by wildlife. The grasscutter serves as a reservoir host for several of these diseases, which includes human and animal trypanosomiasis, babesiosis, plasmodiasis, some zoonotic gastrointestinal helminths and protozoa (Opara and Fagbemi, 2008). Grasscutters harbor various types of parasites without showing obvious clinical manifestations, suggesting that they serve as reservoir hosts for parasitic agents that infect man and his animals. They are equally capable of transmitting some of the gastrointestinal parasites which are zoonotic in nature, especially if the meat is not properly cooked (Nwoke, 2001). For instance, some parasites responsible for zoonoses and communicable diseases to man and animals such as nematodes (*Ascaris*, *Bunostomum*, *Oesophagostomum*, *Strongyloides*, *Trichostrongylus* *Toxocara*); trematodes (*Fasciola*, *Schistosoma*); Cestodes (*Taenia*) and acanthocephalan (*Moniliformis*) occur in the grasscutter and their public health significance is worthy of note.

6. Blood protozoan parasites

There have been reports of few cases of naturally occurring blood parasites of the cane rats (Namso and Okaka, 1998), since they co-habit with other animal species. For example, Ntekim and Braide (1981) reported the occurrence of *Trypanosoma lewisi* in the blood of wild rats.

Much is not yet known about the blood parasites of the grasscutters.

Opara et al (2006) reported a natural infection of both the captive - reared and wild grasscutters with *Trypanosoma species*. The authors suggested that failure of establishment of clinical trypanosomiasis in these rodents could be attributed to the nature of food varieties the grasscutters consume.

They equally reported the occurrence of *Plasmodium* in the grasscutter. This is the causative organism of malaria in man and animals. It was commonly encountered in these rodents, suggesting that they serve as reservoirs of infection in the study areas. Malaria parasitaemia in humans is wide-spread in the study area and had been reported by Akpa and Iwuala, (1983) and Egwunyenga et al (1996).

Trypanosoma sp. recorded the highest prevalence of 25.0%, by the blood protozoan parasites. The organism causes African trypanosomiasis in animals and sleeping sickness in humans (Soulsby, 1982). Rodents are natural hosts of *Trypanosoma* species and the parasites are transmitted by fleas to these animals (Soulsby 1982). It is therefore likely that grasscutters may serve as reservoirs of infections for humans and their livestock, given the close proximity of these animals to human habitations and livestock houses. Perhaps, these rodents were equally infected during the course of their roaming around homes. For example, amplification of some genomic DNA for trypanosomes in his study (Opara, 2011), suggested that some of the grasscutters were infected with *Trypanosoma simiae*, which causes fulminating disease of pigs, trypanosomiasis in sheep, goats, and monkeys (Seifert, 1996). Human population expansion and encroachment, deforestation and other habitat changes have often driven wildlife close to human habitation.

Babesia sp. yielded a prevalence rate of 9.4%. This figure was close to that (5.4%) reported by Ajayi et al (2007) from rodents in Jos, Plateau State. Furthermore, Babesiosis caused by *Babesia bigemina* and *Babesia bovis* have been reported in Nigeria (Leeflang et al, 1976) and ticks have been incriminated in their transmission (Iwuala and Okpala, 1978, James-Rugu and Itse, 2001). Ticks were also observed on the bodies of the grasscutters examined.

7. Gastrointestinal helminth parasites

The examination of the GIT of wild grasscutters revealed endo-parasites comprising of 14 species of nematodes, 5 trematodes, 4 cestodes and 1 acanthocephalan (Opara and Fagbemi, 2008). The nematodes were identified as *Ascaris* sp., *Bunostomum* sp., *Cooperia* sp., *Gaigaria* sp., *Gongylonema* sp., *Haemonchus* sp., *Heterakis* sp., *Mammomonogamus* sp., *Metastrongylus* sp., *Oesophagostomum* sp., *Strongyloides* sp., *Toxocara* sp., *Trichostrongylus* sp. and *Trichuris* sp. The trematodes included *Cotylaphoron* sp., *Dicrocoelium* sp., *Gastrodiscus* sp., *Paramphistomum* sp. and *Schistosoma* sp., while the cestodes were *Avitellina* sp., *Moniezia* sp., *Taenia* sp. and *Thysaniezia* sp. The acanthocephalan identified was *Moniliformis* sp. Other workers such as Mpoame (1995), Odumodu, (1999), Yeboah and Simpson (2001) and Ajayi et al (2007) had reported some of these parasites in Cameron, Anambra (Southeastern Nigeria), Ghana and Jos (North central Nigeria) respectively.

Some of the helminths encountered in the rodents in this study are of public health importance, because they cause zoonotic infections in both man and his livestock. For example, the prevalence of *Ascaris* in the grasscutters is enough to cause public health concern because of the closeness of the rodents to human habitation. Human ascariasis due to *Ascaris lumbricoides* is very common in Nigeria, with prevalence rates reaching 85.5% in primary school pupils (Holland et al, 1989). Judging by the relative ease with which *A. lumbricoides* establishes itself experimentally in pigs, a monogastric animal like man, it is not impossible that *Ascaris* transmission may be on-going between rodents and man with his livestock in the study area. *Bunostomum* sp. (a canine hookworm) is notable for its involvement in cutaneous larva migrans in man. Equally, some species of *Strongyloides* have

also been incriminated in this phenomenon (Soulsby, 1982). It was a surprise to observe the infection of the grasscutters by *Mammomonogamus* sp., which is basically a nematode of mammals in Asia and South America. Although *M. loxodontus* occurs in the trachea of the African elephants and *M. nasicola* has also been observed in the nasal cavities of ruminants in Cameroon (Soulsby 1982 and Cox, 1982). The occurrence of *Oesophagostomum* sp. in these rodents suggests danger to man and his livestock because of the closeness of the grasscutters to human dwellings.

Furthermore, human oesophagostomiasis has been reported in Nigeria (Fabiya, 2001). The prevalence of *Toxocara* sp. among grasscutters in this study shows that the rodents serve as reservoir hosts. The larvae of the helminth cause visceral larva migrans in children.

Trichuris sp. prevalence in the grasscutters was moderately high. This result has further confirmed that rodents transmit zoonotic parasites to man and animals. Trichuriasis is widespread in Nigeria and has been reported by Okpala (1961) and Holland et al (1989). The parasite causes rectal prolapse, anaemia, finger clubbing and retarded growth in man (Jung and Beaver 1951; Bowie et al, 1978 and Gilman et al 1983). Weight loss and formation of nodules in the caecal wall which leads to diarrhea and anorexia in pigs.

Trichostrongylosis is characterized by persistent diarrhea and wasting. In lambs and calves, heavy losses from lack of growth and death commonly occur.

Gastrodiscus sp., a trematode reported in this study causes gastrodiscoidiasis and has been reported in the caecum of man elsewhere (LaPage, 1963, Soulsby, 1982). It is not unlikely that human infections may exist in Nigeria because of the close proximity of these rodents to man and his habitation.

Dicrocoelium sp., although in a study carried out in our laboratory seemed to have lower prevalence rate (14.2%) than elsewhere (Manas et al, 1978) in cattle (34%), sheep (23%) and goats (45%), the rate is capable of infecting man and other livestock (Soulsby, 1982). Wild animals are commonly affected and serve as reservoir hosts for domestic stock, while rabbits maintain the infection for considerable periods (Soulsby, 1982).

Outbreaks of Paramphistomiasis generally occur in the drier months, when the snail population becomes concentrated around areas of natural water and these areas in the dry months also have the most palatable grazing and thus, there is concentration of animals including snails and metacercariae over a small area resulting in heavy infections.

Schistosomes of rodents and birds have often been proved to be the sources of human *Schistosoma* cercariae that cause "swimmers Itch" when they penetrate human skin.

Tapeworm infection such as those from *Avitellina*, *Moniezia*, *Taenia* and *Thysaniezia* species have little or no effect on the health of adult farm animals, but infection in the young animals may cause failure to thrive. Tapeworms, when they increase in length, may coil and block the intestinal tract (small intestine), the result is that food passage becomes impossible and the animal develops emesis. Tapeworms feed on digested nutrients in the small intestine and hence the animal loses weight. The cestodes encountered in this study are very common in the tropics and subtropics. Heavy infection by these parasites may cause abdominal symptoms such as anorexia, vomiting, diarrhea and pains. Prevalence of these cestodes has been documented in Nigeria (Enyenihi, 1980) and rodents have been implicated in their transmission to man (Akinboade et al, 1981; Yunusa et al, 1998).

The occurrence of *Moniliformis* sp. among the grasscutters is of public health significance, especially in rural areas of tropical rainforest of southeastern Nigeria. *Moniliformis* is a rodent parasite of cosmopolitan distribution. It has been reported in man in different parts of the world (Moayed et al, 1971), including Nigeria (Ikeh et al, 1992, Anosike et al, 2000). Of worry is the involvement of rodents and their allies in emergence or re-emergence of human and animal diseases.

8. Gastrointestinal protozoan parasites

Gastrointestinal protozoan parasites were also encountered among the wild grasscutters. Those found were *Eimeria*, *Entamoeba* and *Gardia* species. This finding suggests that the grasscutters might have ingested the mature infective oocysts along with pastures contaminated with human and animal faeces. Some of these grasscutters were caught near human habitations, where faeces are indiscriminately passed in the bush. *Eimeria* is a major coccidia of importance in domestic animals, causing blood stained diarrhea, emaciation and constipation during the final stage of development (Soulsby, 1982). It also affects rats, mouse and guinea pigs.

Entamoeba sp. causes dysentery in man and many species of monkey, dog, cat, rat and pig (Soulsby, 1982). The hosts acquire the infection orally with cysts or per rectum with the trophozoites leading to an acute amoebic dysentery.

Gardia sp. is always found in the duodenum, other parts of the small intestine and occasionally in the colon of man (Soulsby, 1982), causing acute, sub acute to chronic diarrhea and duodenal irritation with an excess mucous production.

9. Conclusion and recommendations

In recent years, domestication of the grasscutters is becoming popular as an alternative source of bush meat and animal protein which are seriously needed by Nigerians.

Grasscutters harbored various types of parasites without showing obvious clinical manifestations, suggesting that they may be serving as reservoir hosts for parasitic agents that infect man and his animals. They are equally capable of transmitting some of these parasites which are zoonotic in nature, if the grasscutter meat is improperly cooked. For instance, some parasites responsible for zoonoses and communicable diseases to man and animals such as nematodes (*Ascaris*, *Bunostomum*, *Oesophagostomum*, *Strongyloides*, *Trichostrongylus* *Toxocara*); trematodes (*Fasciola* *Dicrocoelium*, *Gastrodiscus*, *Schistosoma*); Cestodes (*Taenia*) and acanthocephalan (*Moniliformis*) and their public health significance especially in rural areas of tropical rainforest of southeastern Nigerian is worthy of note.

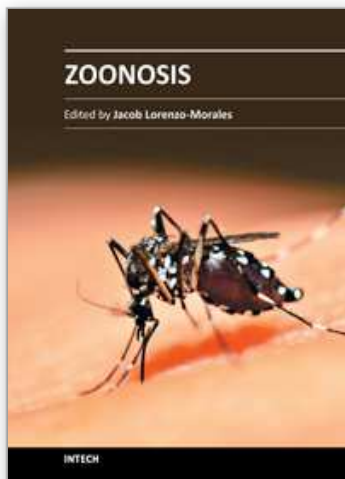
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Zoonosis

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Zoonotic diseases are mainly caused by bacterial, viral or parasitic agents although "unconventional agents" such as prions could also be involved in causing zoonotic diseases. Many of the zoonotic diseases are a public health concern but also affect the production of food of animal origin thus they could cause problems in international trade of animal-origin goods. A major factor contributing to the emergence of new zoonotic pathogens in human populations is increased contact between humans and animals. This book provides an insight on zoonosis and both authors and the editor hope that the work compiled in it would help to raise awareness and interest in this field. It should also help researchers, clinicians and other readers in their research and clinical usage.

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