PARASITES OF AFRICAN RHINOS: A DOCUMENTATION

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INTRODUCTION

In free-living wild animals a balance usually exists between hosts and parasites. Both have evolved together over the millenia. The presence of parasites under these conditions is usually incidental and of limited clinical significance. Under stressful conditions, such as droughts and especially human interference such as capture, captivity, transportation and release into strange surroundings, the host's immune system is suppressed, the balance is disturbed and parasite populations may escalate to such an extent that clinical symptoms become evident.

In this paper we attempt to document all the parasites which have been recovered from both black (*Diceros bicornis*) and white rhinos (*Ceratotherium simum*). Very few, if any, quantitative studies have been conducted; the records are primarily random collections or observations.

PROTOZOA

Trypanosoma species

Trypanosoma brucei[6,22], *Trypanosoma congolense*[23] and *Trypanosoma vivax*[22,24] have been reported from black rhinos. These tsetse fly-borne blood parasites cause Nagana in livestock. Wild animals born in tsetse-infested areas often serve as reservoir hosts of trypanosomes, but clinical trypanosomosis only manifests when these animals are stressed. Mortalities due to trypanosomosis have been reported in recently-captured young black rhinos in Tanzania after 9-25 days in captivity[22]. The deaths of four out of five white rhinos introduced to the tsetse-infested Zambezi Valley of Zimbabwe were attributed to trypanosomosis[46]. As these rhinos originated from KwaZulu Natal and had been kept in a tsetse-free area in southern Zimbabwe, they had never been exposed to trypanosomes. Chronic trypanosome-related health problems, including abortions, arose in white rhinos introduced into Meru National Park in Kenya from KwaZulu Natal[24].

Babesia and *Theileria* species

Large Babesias, as yet unnamed, have been reported from black rhinos in Kenya[6] and from white rhinos in KwaZulu Natal[5]. Babesiosis was regarded as the cause of death of two black rhinos[22]. Small piroplasms, either *Babesia* sp. or *Theileria* sp. but probably the latter, have been reported from

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black rhinos in East Africa[6,7] and KwaZulu Natal[5,14]. Small piroplasms were seen in 42,8% of young white rhinos and 23,9% of adults examined in KwaZulu Natal[5].

Balantidium

Balantidiosis has been reported in white rhinos[36]; the paper was not seen by us.

ARTHROPODS

Ticks

The majority of tick species are not host-specific, but are found on a great variety of vertebrate hosts. It is not surprising, therefore, that 40 tick species have been recovered from black and white rhinos (Table 1), though there is little doubt that the vast majority of these records represent incidental infestations only. Three species, however, are primarily rhino parasites. Two, *Amblyomma rhinocerotis* and *Dermacentor rhinocerinus*, have been collected from both black and white rhinos in many parts of eastern, central and southern Africa[15,49]. The third species, *Amblyomma personatum*, has been recorded from black rhinos, originally from Gabon and Kenya and subsequently also from Tanzania[49,54,57]. With the great reduction in black rhino numbers that has occurred in recent years this tick could easily become extinct. A fourth species, *Amblyomma sparsum*, has a strong predilection for black rhinos, although it has been recorded from a wide range of other mammalian hosts and also reptiles[49,54,57]. All these ticks are large, ornate species. Unfed adults of *A. rhinocerotis* are *ca* 9 mm long and have a pattern of dark reddish-brown spots and stripes on an ochre-yellow background. *D. rhinocerinus* are 6-8 mm long and the male bears yellow-ochrous blotches on a chocolate-brown background[15,60]. The male of *A. personatum* is distinguished by having a dark brown figure resembling a flying bird on the pale background of its scutum. *A. sparsum* also has a brownish pattern of spots and stripes against a yellowish background. As its name implies, *Cosmiomma hippopotamensis* was originally described from hippos (*Hippopotamus amphibius*), but black rhinos are now regarded as its most likely host[4,54]. Common sites of tick attachment are skin folds in the perineal region, in and around the ears and around the eyes.

Flies

Glossina species - tsetse flies

Although the occurrence of trypanosomes in rhinos indicates that tsetse flies may feed on rhinos, they are not generally considered to be preferred hosts of the flies. In Kenya,however, *Glossina longipennis*, a tsetse species living in low densities in the typical dry bushveld habitat favoured by black rhinos, was found to feed primarily on rhinos[23,56]. Stereo-electron micrographs of the labellar armature of *G. longipennis* indicate that it is specialised for feeding on elephants and rhinos[34].

Gyrostigma species - rhinoceros bot flies

This genus is closely related to *Gasterophilus,* the horse bot flies. *Gyrostigma pavesii* occurs in both rhino species. The flies are 24-35 mm long, with an orange and reddish head, a predominantly deep black thorax with a central reddish line, and a black abdomen with a reddish tip[60,61]. The adults are short-lived and do not feed, their mouthparts being rudimentary. The female deposits her eggs mainly in front of and below the anterior horn and between the two horns. The larvae which hatch from the eggs are *ca* 2 mm long. These larvae are thought to migrate in the epidermal tissue of the cheeks and mouth to the oesophagus. The second and third stage larval stages are found in the stomach, where they grow up to 4 cm long. Mature larvae leave the host with the faeces and pupate in the soil. The flies hatch after *ca* 6 weeks. Zumpt[60] stated that the adults are rarely seen in the field and represent great rarities for the collector. This is largely explained by the fact that they live only a few days. Another reason lies in their behaviour: they stay in the close vicinity of rhinos, their only hosts, and who would approach a rhino armed only with a fly-net? *Gyrostigma conjungens,* a smaller species, parasitises black rhinos in East Africa.

Rhinomusca dutoiti

This blood-sucking fly is closely related to the stable fly (*Stomoxys calcitrans*). The larvae develop only in rhino dung, and the adults feed on both rhino species[59 60]. These flies are somewhat larger than a house fly (*Musca domestica*), and have a stout, horn-coloured proboscis. A similar species, *Rhinomusca brucei*, occurs in East Africa.

Lyperosia species

This small fly has been found in association with black rhinos in Kenya[31]. The adult flies spend their life closely associated with their host, and the females fly down and lay their eggs on freshly-deposited dung before returning to their feeding place on the host. The use of dung middens by rhinos ensures a continuously moist breeding place for the flies.

HELMINTHS

The diversity of helminth species is extensive. At least 40 known species have been reported in the two rhinos discussed here. While most of these are nematodes, two trematodes and two cestodes have been reported. Several strongylid nematode genera predominate, including *Khalilia*, *Kiluluma*, *Murshidia* and *Quilonia*. The most abundant species is a small pinworm, *Probstmayria*, which was recorded in black rhinos in South Africa and Namibia in numbers of 399 000 000 in a single animal (R C Krecek, unpublished). *Probstmayria* is an example of a nematode not previously recorded. Its absence from the literature may be attributed to the method of previous collections. *Probstmayria* is 2-3mm in size and unless collection of the worm parasites is complete, i.e. quantitative samples are collected for microscopic examination, it is quite possible to miss recovery of these nematodes. Often new species are revealed in a host when quantitative studies are undertaken. In recent zebra helminth studies, six new nematode species were revealed when quantitative studies were done[40]

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Table 1: A list of ticks recovered from white and black rhinos

Tick species	White rhino	Black rhino S.Africa	Black rhino E. & C. Africa	Reference
Amblyomma cohaerens			X	13
Amblyomma eburneum			X	53
Amblyomma gemma			X	53, 57
Amblyomma hebraeum	X	X		1, 49
Amblyomma lepidum			?	49
Amblyomma personatum*			X	49, 53, 57
Amblyomma rhinocerotis*	X	X	X	1, 21, 49, 53
Amblyomma sparsum			X	49, 53, 57
Amblyomma tholloni			X	49, 53, 57
Amblyomma variegatum	X		X	49, 53, 57
Cosmiomma hippopotamensis*		X		, 54
Dermacentor rhinocerinus*	X	X	X	1, 21, 49, 53, 57
Haemaphysalis leachi		?		49
Haemaphysalis silacea		X		Horak (unpubl.)
Hyalomma albiparmatum			X	49, 53, 57
Hyalomma impeltatum			X	57
Hyalomma impressum			X	30
Hyalomma marginatum rufipes			X	49, 53
Hyalomma truncatum	X	X	X	1, 49
Rhipicephalus appendiculatus	X	X	X	1, 49, 53
Rhipicephalus sp. near *bequaerti*		X		1
Rhipicephalus capensis		?		49
Rhipicephalus compositus			X	49, 53, 57
Rhipicephalus humeralis			X	49, 53, 57
Rhipicephalus hurti			X	53, 57
Rhipicephalus jeanneli			X	53, 57
Rhipicephalus kochi			X	57
Rhipicephalus longus			X	53
Rhipicephalus lunulatus			X	55
Rhipicephalus maculatus	X	X	X	1, 49, 53
Rhipicephalus muehlensi		X		1, 49, 53
Rhipicephalus pravus			X	53
Rhipicephalus pulchellus			X	49, 53, 57
Rhipicephalus sanguineus			X	30, 49
Rhipicephalus senegalensis			?	49

Rhipicephalus simus	X	X	X	1, 49, 53, 57
Rhipicephalus supertritus			X	49
Rhipicephalus zambeziensis	X			Horak (unpubl.)
Rhipicephalus ziemanni			?	49
Rhipicephalus zumpti		X		1

* Rhinos are preferred hosts

Table 2: Helminth parasites of white and black rhinos

Parasite	White rhino	Black rhino, S. Africa	Black rhino, E. & C. Africa	Reference
Trematodes				
Brumptia bicaudatum			X	20
Gastrodiscus aegyptiacus	X			44
Cestodes				
Anoplocephala diminuta			X	39
Anoplocephala gigantea	X	X	X	26, 32, 33, 37, 42, 43, 60
Nematodes				
Grammocephalus intermedius			X	27
Habronema spp.	X			58
Habronema khalili		?	?	10
Khalilia rhinocerotis			X	27
Kiluluma africana		X	X	25, 45, 47, 60
Kiluluma brevicauda			X	48
Kiluluma brevivaginata			X	48
Kiluluma cylindrica			X	48
Kiluluma goodeyi		X	X	25, 48, 60
Kiluluma macdonaldi			X	45, 48
Kiluluma magna		X	X	10, 25, 45, 47
Kiluluma pachyderma		X	X	10, 25, 47
Kiluluma rhinocerotis		X	X	10, 25, 45, 47
Kiluluma solitaria		X	X	10, 25, 45, 47
Kiluluma stylosa			X	18, 19, 41, 52
Murshidia africana			?	10
Murshidia aziza			X	10, 27
Murshidia bozasi			X	10, 27
Murshidia memphisia			X	10, 27

Murshidia omoensis			X	10, 27, 28
Murshidia pugnicaudata	X			Boomker & Booyse (Unpubl.)
Necator americanus			•	3
Oxyuris equi		X		25
Oxyuris karamoja	X	X	X	2, 39, 51, 60
Parabronema rhinocerotis			X	16
Parabronema roundi			X	11, 39
Physocephalus sexalatus		?	?	10
Probstmayria species		X		Krecek & Boomker (unpubl.)
Quilonia africana			X	10, 28
Quilonia parva			X	28
Setaria africana		X		9
Stephanofilaria dinniki		X	X	12, 17, 38, 39, 50
Strongylus tremletti			X	22, 37
Thelazia sp.			X	39
Trichuris sp.			••	35

• Calcutta Zoo

•• London Zoo