## TABLE OF CONTENTS

**SELECTED HELMINTHOSES IN ANTELOPE** ............................................................................. 3

- Introduction ............................................................................................................................................ 3
- Infections of the lungs and trachea .................................................................................................... 3
- Infections of the gastro-intestinal tract ............................................................................................... 5
  - Helminths of the oesophagus and forestomach.............................................................................. 5
  - Helminths of the abomasum ......................................................................................................... 6
  - Helminths of the small intestine................................................................................................. 10
  - Helminths of the large intestine .............................................................................................. 11
- Infections of the liver ........................................................................................................................... 12
- Infections of the cardiovascular system ........................................................................................... 15
- Infections of the skin and adnexa ..................................................................................................... 17
- Infections of the musculature ............................................................................................................ 20
- Infections of the nervous system ...................................................................................................... 20

**THE HELMINTHS OF SUIDS** ........................................................................................................... 20

- Infections of the musculature ........................................................................................................... 20
- Infections of the gastro-intestinal tract ............................................................................................. 20
- Infections of the viscera ..................................................................................................................... 21

**THE HELMINTHS OF CARNIVORES**............................................................................................ 22

- Introduction .......................................................................................................................................... 22
- Infections of the gastro-intestinal tract ............................................................................................ 22
Helminth infections of wildlife

Infections of the skin ........................................................................................................................... 23

THE HELMINTHS OF ZEBRAS ....................................................................................................... 24

Infections of the gastro-intestinal tract ............................................................................................. 24

REFERENCES ....................................................................................................................................... 25
SELECTED HELMINTHOSES IN ANTELOPE

Introduction

In many regions of South Africa sheep, goats or cattle graze the same pastures as various antelope species. Many of the helminths recovered from the antelopes are those usually encountered in domestic ruminants, especially sheep and cattle, while other helminths of cattle, sheep and antelopes are more host-specific and are rarely encountered in other species. Horak (1979) was able to artificially infect sheep with *Haemonchus contortus*, *Trichostrongylus axei*, *Trichostrongylus falcatus* and *Impalaia nudicollis* cultured from the faeces of blesbok, *Damaliscus pygargus dorcas*, naturally infected with these worms. *Haemonchus placei*, *Longistonglyus sabie*, *Trichostrongylus colubriformis*, *Trichostrongylus falcatus*, *Impalaia tuberculata* and *Cooperia hungi* likewise became established in sheep, goats and cattle infected with larvae cultured from the faeces of impala, *Aepyceros melampus*. However, *H. contortus*, *T. axei*, *T. colubriformis* and *T. falcatus* are known from sheep, and *H. placei* and *T. axei* from cattle and it is not possible to determine what role cross-infection plays in maintaining the helminth populations in all four the host species.

Infections of the lungs and trachea

The nematodes *Dictyocaulus africana*, *Dictyocaulus filaria*, *Dictyocaulus viviparus*, and *Bronchonema magna* occur in the bronchi and trachea of a variety of antelopes. Although the last named species was originally described as *Bronchonema* by Mönnig, it was placed in the genus *Dictyocaulus* where it remained for a long time before being transferred back into its original genus, *Bronchonema*.

The *Dictyocaulus* species and *B. magna* in their natural hosts produce lesions similar to, but never as severe as, those seen in domesticated ruminants. Initially, the worms cause alveolitis, followed by bronchiolitis and finally bronchitis as they become mature and move to the bronchi. Cellular infiltrates (neutrophils, eosinophils and macrophages) temporarily plug the bronchioles, causing the collapse of groups of alveoli leading to the clinical signs of coughing, dispnoea and breathing with an extended neck. The patent phase is associated with two main lesions, namely a parasitic bronchitis, characterized by the presence of many adult worms embedded in a white frothy mucus. Secondly, a parasitic pneumonia occurs, characterized by collapsed areas around infected bronchi. The pneumonia is the result of aspirated eggs and L1 which act as foreign bodies and provoke pronounced polymorph, macrophage and multinucleated giant cell infiltrations. Varying degrees of oedema and emphysema may also be seen (Fig. 2). Recovery starts taking place once the adult lungworms have been expelled. The lung tissue organizes and clinical signs abate.
Fig. 2: Varying degrees of emphysema and oedema of the lung can be seen in this picture of a Dictyocaulus infection. Note how thickened the edges of the lung are.

Horak et al. (1983) found a few blue wildebeest in the KNP to have fairly extensive pulmonary lesions caused by Dictyocaulus viviparus (Fig. 3). These lesions did not appear to be severe enough to cause death, but may have debilitated the animals sufficiently to make them prone to capture by predators.

*Bronchonema magna* is considered non-pathogenic for springbok, its natural host. When springbok were introduced into the Bontebok National Park near Swellendam, bontebok became infected and mortalities occurred. As soon as the springbok were removed, the mortalities stopped. The lesions in the bontebok lungs were similar to those caused by the *Dictyocaulus* species in other antelope.

Fig. 3: *Dictyocaulus* sp. at the bifurcation of the trachea

As the genus name implies, *Pneumostrongylus calcaratus* (impalas) and *P. cornigerus* (bontebok) both occur in the lung where they are so intimately associated with the lung parenchyma that it is virtually impossible to obtain intact worms. *Pneumostrongylus calcaratus* in impalas is so common that it is considered ‘normal’, and apart from localized discolouration and slight fibrosis the lesions cause no discomfort to both the host species (Fig. 4). Gallivan, Barker, Alves, Culverwell & Girdwood
Helminth infections of wildlife

(1989) describe *P. calcaratus* infection in impalas from Swaziland. Van der Walt & Ortlepp (1960) recorded mortalities in bontebok as a result of *P. cornigerus* infection.

*Protostrongylus capensis* (bontebok) and *P. etoshai* (blue wildebeest and gemsbok, respectively) occur in the lung alveoli where no lesions are produced. *Muellerius capillaris* is primarily a parasite of the lungs of sheep and goats in the Western Cape Province, and have been recovered from impalas, Grant's gazelles and okapi's in Kenya (Round, 1968). No pathogenic effects have been described.

![Image](image.jpg)

Fig. 4: The lesion caused by *Pneumostrongylus calcaratus* in the lung of an impala.

Infections of the gastro-intestinal tract

**Helminths of the oesophagus and forestomach**

The *Gongylonema* species, of which there are several, occur in the submucosa of the tongue, oesophagus or the rumen. The typical zig-zag pattern in the mucosa is the only indication of the presence of the worms. They are non-pathogenic (Fig. 5).

Like the *Gongylonema* species, adult *Calicophoron*, which live in the rumen and reticulum, are non-pathogenic (Fig. 6). Several species occur in wildlife, all of which use a freshwater snail, usually of the genus *Bulinus*, as intermediate host. Briefly, the life cycle is as follows: Eggs are released with the faeces and must be freed from the faeces, i.e. when they fall into water, before they hatch. The miracidia must enter the host within 3 hours of hatching or they will die. In the snails, the miracidia form sporocysts, then rediae, daughter and granddaughter rediae. The granddaughter rediae produce cercariae which leave the snail, and form metacercariae on the surface of the water or on vegetation. When ingested by the host, they excyst in the small intestine. After 15 to 50 days they migrate up the small intestine, through the various stomachs to end up in the rumen where they develop into the adult flukes.
Helminths of the abomasum

With the exception of the *Parabronema* spp., the helminths that occur in the abomasum have monoxenous life cycles.

A number of *Haemonchus* species occur in the abomasum of antelopes, but their pathogenicity has not been studied. From several surveys in the Kruger National Park (KNP) and in some of the KwaZulu-Natal Parks (KZNP) it became apparent that certain *Haemonchus* species are associated with certain host groups. For example, in the KNP and KZNP, *Haemonchus vegliai* (Fig. 7) is associated with the browsing antelope (kudu, nyalas and bushbuck) while impalas in the KNP harboured *Haemonchus krugeri* (Fig. 8). In areas where game and domesticated ruminants graze the same pastures, for example, sheep and blesbok or impalas, the game will harbour *Haemonchus contortus*, the primary *Haemonchus* of sheep. This has economic and managerial implications since the wild ruminants can act as reservoir hosts for resistant *H. contortus*.
Helminth infections of wildlife

Fig. 7: The tips of the spicules of *Haemonchus vegliai* from kudus.

Fig. 8: The tips of the spicules and gubernaculum of *Haemonchus krugeri* from impalas.

Fig. 9: *Haemonchus vegliai* in the abomasum of a kudu.

Deaths of sable and roan antelopes and kudus because of resistant *H. contortus* infections are known. In all cases the clinical signs and gross pathological lesions were the same as for similar infections in sheep.
Teladorsagia, Ostertagia and Longistrongylus all belong to the subfamily Ostertagiinae, and all produce more or less the same kind of lesions in their antelope hosts (Figs. 10 & 11). The lesion is essentially a nodular abomasitis, caused by hyperplasia of the mucosa, which in turn is caused by the nematodes that develop and live in the abomasal glands (Pletcher, Horak, De Vos & Boomker, 1984). The helminths have been described from a variety of antelopes and no adverse effects because of the infection have been seen. Basson, Kruger & McCully (1968, cited in Basson, McCully, Kruger, Van Niekerk, Young, De Vos, Keep & Ebedes, 1976) however, saw fatal cases of ostertagiosis caused by Ostertagia ostertagi in eland that were kept in small camps.

**Fig. 10:** Nodules caused by *Ostertagia ostertagi* in the abomasum of an eland.

**Fig. 11:** Nodules caused by *Longistrongylus sabie* in the abomasum of an impala from the Kruger National Park (arrow).
Helminth infections of wildlife

Fig. 12: Lateral view of the spicules of *Trichostrongylus thomasi*.

Fig. 13: Lateral view of the spicules of *Trichostrongylus axei*.

*Trichostrongylus thomasi* (Fig. 12) is the species usually found in the abomasum of a number of antelope species and it is the counterpart of *Trichostrongylus axei* (Fig. 13) of domesticated ruminants. This author has neither seen clinical signs nor has he seen lesions as a result of the presence of this parasite.

Different species of *Parabronema* (Fig. 14) parasitize elephants, rhinoceroses, buffaloes and giraffes in South Africa, and of camels, sheep, cattle and buffaloes in North Africa. All make use of a stomoxid fly, *Haematobium* or *Lyperosia*, as intermediate host. The fly larva ingests eggs or first stage larvae of the nematode. The nematode larvae develop to the second stage in the fly larva, and have developed to the infective third stage by the time the fly emerges from the pupa. The fly has to be ingested, either with water or food for the life cycle to continue. Large numbers of worms are often present in the abomasum or stomach, and may or may not cause gastric ulcers.
Helminth infections of wildlife

Fig. 14: *Parabronema skrjabini* in an ulcer in the stomach of an elephant. The lesions in giraffe are very similar.

Helminths of the small intestine

Although immature *Calicophoron* (= *Paramphistomum*) spp. (Fig. 15) cause serious disease in susceptible domestic animals, clinical disease has, to the best of my knowledge, not been described in antelope in South Africa, although recently a case in nyalas occurred in the North West Province. This case occurred in animals kept in an enclosure and the intermediate hosts were present in the water supply, a trough.

The strongylid nematode *Agriostomum* (Fig. 16) occurs in the posterior part of the small intestine, where it on occasion produces ecchymoses on the mucosa. Despite the worms being fairly often encountered, the life cycle is unknown and no clinical signs or pathology have been described.

Fig. 15: Immature *Calicophoron* collected by washing faeces from an affected animal through a sieve.
Helminth infections of wildlife

The family Trichostrongyldae is well represented in all antelope and the commonly encountered genera are *Cooperia*, *Cooperiodes*, *Nematodirus*, *Impalaia*, *Paracoperia* and *Trichostrongylus*. As is evident from Table 5, there are numerous species of especially *Cooperia* and *Trichostrongylus*. Large numbers of worms of any or all the genera mentioned above can occur in antelope, but clinical signs are rarely seen.

*Bunostomum trigonocephalum* was present in 3 out of 12 impalas culled at Pafuri in the KNP, and all three were approximately 8 months old. Neither showed any clinical disease or macroscopic lesions (Boomker & Horak, unpublished data). Small numbers of *Gaigeria pachyscelis* have been recorded from blue wildebeest in the KNP, and mostly in the 4-12 month old antelopes, again without clinical signs or macroscopic lesions (Horak *et al.*, 1983).

*Moniezia benedeni* and *Moniezia expansa* as well as *Avitellina* are widely spread in antelope throughout southern Africa, but no clinical disease has been recorded. These tapeworms are usually seen in young animals.

**Helminths of the large intestine**

*Oesophagostomum* is a large genus of which two species are commonly encountered in antelopes. These are *Oesophagostomum columbianum* (Fig. 17) and *Oesophagostomum walkerae*. The former nematode species has been recorded from at least 18 antelopes, but no mention is made on the pathogenicity of the parasites in their respective hosts. *Oesophagostomum radiatum* is fairly common in buffaloes in the KNP but the infection is mild (Basson *et al.*, 1970). The nodules that are commonly seen in sheep and goats, and even cattle, are much less conspicuous in antelope.

Several species of the genus *Trichuris* parasitize wildlife. *Trichuris globulosa*, one of the more commonly encountered species, occurs in 8 antelope species. It is, however, a rare finding in buffaloes and the infection is invariably very mild (Basson *et al.*, 1970), as it is in the majority of antelopes. Because of its monoxenous life cycle, and the infective larva that occurs in a thick-
walled egg, large numbers can build up in enclosures and under intensive conditions. In private collections or zoos, this parasite is one of the most troublesome.

![Image of intestines with nodules](image)

**Fig. 17:** A piece of large intestine with the nodules that is so characteristic of *Oesophagostomum* infections in ruminants.

### Infections of the liver

Pletcher, Horak, De Vos & Boomker (1988) describe the lesions caused by *Cooperioides hepaticae* in impalas from the KNP (Fig. 17), and came to the conclusion that members of this genus are usually considered of minor pathological significance, unless present in large numbers and in combination with other trichostrongyles. Gallivan, Barker, Culverwell & Girdwood (1996) described lesions caused by hepatic parasites in general, in the same antelope from Swaziland. Despite the nematodes being present in the majority of impala that were examined during several surveys, clinical signs have never been observed.

![Image of greenish discoloration](image)

**Fig. 17:** The greenish discoloration is due to an eosinophil accumulation in the bile duct of an impala as result of *Cooperioides hepaticae* infection. (Reproduced with permission of Dr. Wilmien Luus-Powell, University of Limpopo).
Helminth infections of wildlife

*Monodontus giraffae* is an extremely common parasite of the bile ducts of giraffe and causes mild to severe cholangitis, depending on the number of worms present (Basson et al., 1971).

Fasciolosis seems to be a rare occurrence in free-living antelope. Basson et al. (1970) did not find a single case in the 100 buffalo they examined in the southern part of the KNP. Boomker (1990) examined 386 browsing antelope from all over the country and the northern parts of Namibia and found a single grey rhebuck in the Bontebok National Park to harbour only two *Fasciola* specimens. Boomker & Horak (unpublished, 1980 – 1990) did not find *Fasciola* spp. in any of the 162 impalas examined from five localities in the KNP, and neither did Heinichen (1973) in the north-eastern region of KwaZulu-Natal. However, Horak (1978) found *Fasciola gigantic* in one of 36 impala at Nylsvley, Limpopo Province, where they shared pastures with cattle.

Even though antelope seem to be resilient to infections with *Fasciola*, cases of acute fasciolosis are known. These, however, were present on game farms, or where antelope were overcrowded. In the dry north-western part of Limpopo Province metacercariae of *Fasciola* were found in water troughs, together with the intermediate hosts, *Lymnaea truncatula*.

Contrary to *Fasciola*, the non-pathogenic liver tapeworm, *Stilesia hepatica* (Figs. 18 & 19) has a high prevalence in a variety of antelope. Buffalo from the KNP, however, did not harbour *Stilesia* (Basson et al., 1970).

Cysticercosis due to the metacestodes of *Taenia hydatigena* is a common finding at necropsy of a number of antelope (Fig. 20). After the egg has been eaten, the oncosphere or hexacanth larva hatches and burrows through the wall of the small intestine, crosses the abdominal cavity and enters the liver. It migrates through the liver parenchyma for a while and leaves the liver in the vicinity of the bile duct. It attaches to the mesenterium in the immediate vicinity of the liver. The infection is dependant on the presence of jackal, Cape hunting dogs or domestic dogs. Boomker (1990) found these cysticerci in blue and grey duikers, but associated pathology was not seen. Round (1968) lists 15 species of intermediate hosts for this tapeworm, including warthogs and bushpigs.

![Fig. 18: *Stilesia hepatica* in the common bile duct and gall bladder of a red duiker, *Cephalophus natalensis*](image-url)
Helminth infections of wildlife

Fig. 19: *Stilesia hepatica*. Note the thickened bile ducts to the right side of the liver.

Fig. 20: The typical appearance and localization of the metacestodes of *Taenia hydatigena*, also known as *Cysticercus tenuicollis*.

Fig. 21: This photograph of cysts in a sheep liver is presented as illustration of cystic hydatidosis.

Hydatid cysts of *Echinococcus granulosus* (Fig. 21) were found in one kudu out of the 386 antelope examined by Boomker (1990) and Basson *et al* (1970) found a 5% prevalence in the buffaloes they...
Helminth infections of wildlife

processed. Hydatids were not found in the impalas examined by Heinichen (1973), Horak (1979) and Boomker & Horak (unpublished data). Hydatidosis, or cystic echinococcosis does not seem to be of importance in the larger nature reserves but could theoretically become problematic on game farms.

Infective nymphs of the pentastome genus *Linguatula* are often encountered in antelope (Fig. 22). They utilize antelope as intermediate hosts and the large carnivores, especially lions, as final hosts. The nymphs tunnel in the liver without causing haemorrhage and were found in 63.2% of kudus (Horak, Boomker, Spickett & De Vos, 1992), 21.8% of blue wildebeest (Horak, De Vos & Brown, 1983) and 35.5% of warthogs (Horak, Boomker, De Vos & Potgieter, 1988), all surveyed in the KNP. It is interesting that kudus, which are browsing antelope, have the highest prevalence of this parasite, whereas blue wildebeest, which graze short grass, have the least.

![Fig. 22: Infective nymphs of *Linguatula nuttalli* on the liver of a kudu.](image)

**Infections of the cardiovascular system**

*Elaeophora sagitta* (=*Cordophilus sagittus*) occurs in aneurisms in the coronary vessels (Fig. 23) as well as in the small branches of the pulmonary artery especially in the diaphragmatic lobes (Fig. 24). McCully, Van Niekerk, & Basson (1967) described the pathology of *Elaeophora*-infections in kudus, bushbuck and buffaloes and Pletcher, Boomker, De Vos & Gardiner (1989) those in kudus from the KNP. Lesions containing live and dead worms were found in bushbuck and kudus from the KNP, bushbuck and nyala in the northern KZN Parks. The infection seems to occur primarily in the tragelaphine antelope, i.e. kudu, bushbuck and nyala, and rarely occur in buffaloes and cattle. According to Young & Basson (1976) nearly half of 33 eland transferred from the Addo Elephant National Park to the Kruger National Park died suddenly from acute cardiac arrest. Post-mortem examination revealed prominent heart lesions, notably subepicardial aneurysms, associated with the presence of *Elaeophora sagitta*. In the pulmonary arteries the worms cause a villous proliferation.
Fig. 23: An opened aneurism in a coronary vessel of a kudu. The rather large *Elaeophora* is visible at the left.

Fig. 24: *Elaeophora* in the distal pulmonary artery, in the diaphragmatic lobe of a kudu. Note the villous proliferation in especially the top artery.

*Schistosoma* spp. are common in those animals that are dependant on water, and have been recorded from baboons (Fig. 25), zebras, hippopotami, giraffes, buffaloes and at least 13 species of antelopes in southern Africa. According to Basson *et al.* (1970), lesions are particularly pronounced in the ‘river buffaloes’, the old bulls that have been expelled from a herd, in the KNP. Severe phlebitis and thrombosis of the mesenteric veins was described in one of these buffaloes (Fig. 26). Eighteen of the 96 kudus examined (18.8%) in the KNP had schistosomes in the liver and mesenteric veins (Boomker *et al.*, 1989b). The prevalence of *Schistosoma* in impalas from Malelane, KNP was 4.9% and that from the same antelopes from Skukuza, 11.5% (Boomker & Horak, unpublished data). Conversely, no schistosomes were recovered from impalas from Nylsvley (Horak, 1978), impalas from a farm in northern KwaZulu-Natal (Anderson, 1983) and reedbuck in the moist St Lucia area, KwaZulu-Natal (Boomker *et al.*, 1989a).
Helminth infections of wildlife

Fig. 24: Granulomata caused by the eggs of a *Schistosoma* sp. in the rectum and bladder of a baboon.

Fig. 25: Severe phlebitis and thrombosis of the mesenteric veins of a buffalo, caused by *Schistosoma mattheei*.

**Infections of the skin and adnexa**

Approximately 16% of the buffaloes in the KNP have lesions of one or more of the three species of *Onchocerca* which occur in buffaloes. The infection manifests as small nodules in the subcutis of the mainly the thoracic, sternal and abdominal regions, but are also present in eyelids, the prepuce and testis (Basson *et al.*, 1970). Unidentified *Onchocerca* spp. occurs in thirteen species of antelope throughout southern Africa as well as in leopards in Tanzania (Round, 1968).
During the late 1980’s and early 1990’s a skin condition was noticed in buffaloes in the KNP, from which *Parafilaria bassoni*, a filarid nematode that has previously only been recorded from springbuck in Namibia, was recovered. Haemorrhagic perforations or bleeding points were seen dorsally and laterally on the body. Complications due to bacterial infection that cause subcutaneous abscesses, and a type 1 hypersensitivity, that caused large ulcers were seen in a small number of animals. Red-billed oxpeckers often enlarged the bleeding points by feeding on the blood and skin, in the process causing large ulcers. The oxpeckers also played an important part in limiting the spread of the helminths by ingesting blood that contains eggs and first stage larvae (Keet, Boomker, Kriek, Zakrisson & Meltzer, 1997) (Figs. 26-28).

**Fig. 26:** Microfilaria of an *Onchocerca* sp. In the blood of a buffalo.

**Fig. 27:** The lesion caused by *Parafilaria bassoni* starts out as a small bleeding point.
Occasionally the coenuri of *Taenia multiceps* may be found under the skin or in the intermuscular connective tissue of blue wildebeest, oryx and roan antelope, all three being intermediate hosts. The coenuri are recognized by the flabby "sac" in which numerous protoscoleces are seen. Contrary to what is observed in antelope, only those oncospheres of *T. multiceps* that end up in the central nervous system and spinal cord of sheep will develop into coenuri. The adult tapeworm occurs in dogs and jackals.

A whole host of microfilariae of which the adult worms are not known, have been reported in the literature, from dik-dik in Ethiopia, giant African otter in the Democratic Republic of the Congo, zebra, waterbuck, bushbuck and warthog in South Africa and steenbuck in Mozambique (Neitz, 1931; Van den Berghe, Chardome & Peel, 1957; Round, 1968; Palmieri, Pletcher, De Vos & Boomker, 1985). These microfilariae may be those of *Setaria* species, which are quite common in many antelope and warthog in South Africa, or they may represent new species of filarid nematodes. The microfilariae have not been associated with any pathology. However, microfilariae, presumably those of *Elaeophora*, were associated with mononuclear myocarditis (Basson et al., 1971; Boomker et al., 1989b).
Helminth infections of wildlife

Infections of the musculature

The cysticerci of a number of cestodes are known to occur in a variety of the antelope as well as in warthogs and bushpigs. Most common are those of Taenia crocutae, Taenia hyaenae, Taenia regis and Taenia gonyamai. These can be identified with some measure of accuracy when the hook sizes are compared. Neither the tapeworms themselves in the small intestine of the carnivores nor the cysticerci in the muscles and abdominal cavity of the herbivore intermediate hosts seem have any effect.

Basson et al. (1970) found 29% of the buffaloes they examined in the KNP to be infected with cysticerci, but Boomker et al. (1989b) found only 11.3% of kudus in the KNP to be infected and 3% of reedbuck near Himeville, KwaZulu-Natal, were infected with Taenia hydatigena larvae (Boomker et al., 1989a).

Infections of the nervous system

Setaria labiatopapillosa was found in gemsbok and waterbuck, and both were associated with eosinophilic cerebrospinal pachymeningitis (Basson et al., 1971).

THE HELMINTHS OF SUIDS

Infections of the musculature

In wildlife Trichinella spiralis has the sylvatic cycle which involves lion, spotted hyaena, black-backed jackal, multi-mammate mouse, warthog and Africa civet. South of the Sahara and especially in East Africa, Trichinella nelsoni appears to be the more important one in wildlife. Experimental infections of domestic pigs with T. nelsoni and T. spiralis from meat of wild animals in the KNP have indicated that the nematode can adapt, and may thus become an important zoonosis in future (Young & Kruger, 1967).

Trichinellosis is largely asymptomatic in wildlife and man is the main sufferer. Adult worms in the intestine of humans cause nausea, diarrhoea and vomiting, and when the larvae enter the muscles, oedema of the eyelids and face occurs, and respiratory distress is sometimes seen.

Taenia spp. metacestodes are sometimes seen, depending on how much contact there is with humans and their dogs, or wild carnivores. In large game reserves, the incidence and prevalence of muscle cysticercosis is low. Cysticerci of Taenia solium, Taenia hydatigena, Taenia crocutae, Taenia hyaenae and Taenia regis have been recorded (Round, 1968; Boomker et al., 1991). As is the case with cysticerci in domestic animals, little pathology is caused.

Infections of the gastro-intestinal tract

Physcocephalus sexalatus is a spirurid nematodes that utilizes an intermediate host, usually a dung beetle, in its life cycle. It occurs in the stomach of warthogs and bushpigs and only when present in massive numbers do they cause gastritis.
The genera *Oesophagostomum* and *Murshidia* (Fig. 29) are large genera that contain numerous species and that are particularly abundant in elephants, rhinoceroses and wild pigs. Six species of *Oesophagostomum*, of which *Oesophagostomum mocambiquei* and *Oesophagostomum mwanzae* were the most common, and two of *Murshidia* have been described from the large intestine of warthogs and bushpigs and were present in vast numbers. An average of 35,000 for the former and 16,725 for the latter nematodes were recovered, a total of almost 52,000 worms per animal (Horak, Boomker, De Vos & Potgieter, 1988; Boomker, Horak, Booyse & Meyer, 1991b). Clinical oesophagostomosis was not reported and macroscopic lesions were limited to a few petechiae in the caecum and colon (Boomker, unpublished data, 1989).

*Ascaris phacochoeri* was constantly found in surveys done in different parts of South Africa, and its prevalence varied from 30.7 to 57%. No reports of this nematode causing disease in free-living warthogs and bushpigs could be found.

The anoplocephalid tapeworms *Moniezia mettami* and *Paramoniezia phacochoeri* are regularly encountered in young warthogs, in which they do not cause disease. The same applies to the trematode *Gastrodiscus aethiopicus*, which is also found in zebras.

![Fig. 30: The anterior part of *Murshidia hamata* illustrating the strongly developed oesophagus and head that is clearly set off from the rest of the body.](image)

**Infections of the viscera**

A number of wild carnivores have been reported to have adult *Echinococcus* spp. worms, including black-backed jackal, Cape hunting dogs, hyaenas and lions (Verster & Collins, 1966; Young, 1975), and the wildlife cycles of *Echinococcus* spp. exists in the larger game reserves. The larger prey species, which are the antelope, warthogs and bushpigs act as intermediate hosts for the tapeworm, but the prevalence is not high. Eight warthogs out of the 52 examined in the KNP had hydatid cysts, a prevalence of 15.4%, while in the near-by Hoedspruit nature reserve, where the larger carnivores do
Helminth infections of wildlife

not occur, the prevalence was only 3.6% (Horak et al., 1988; Boomker et al., 1991). The reason for the low prevalence is the absence of the carnivore final hosts, thus breaking the life cycle. It is also possible that the warthogs that harboured the hydatid cysts were from the KNP or even neighbouring, large private reserves where the carnivores occur.

THE HELMINTHS OF CARNIVORES

Introduction

As is the case with the antelope and pigs, the carnivores are also not affected by worms, given that they are well-fed and that the worm-infections are not overwhelming. It is quite conceivable that the high mortality of young lions is due to malnutrition combined with parasite infections, especially the hookworms Ancylostoma and Galonchus. Little is published on helminths diseases of free-living lions and leopards (Boomker, Penzhorn & Hotak, 1997).

Infections of the gastro-intestinal tract

Ancylostoma and Galonchus are virulent blood suckers and can cause severe anaemia in a very short time.

Spirocerca lupi has been recorded from a growth on the oesophagus of a lion that was kept at a zoo.

Cylicocyclus spp. occurs in nodules in the stomach of lions and leopards, and a non-pathogenic Physaloptera spp. in that of cheetahs.

Toxocara and Toxascaris presumably behave in the same way in lions as they do in cats and dogs, and therefore have a more severe influence on the young animals that on the older ones. These ascarids compete with the host for available nutrients.

Several Taenia species occur in the small intestine of lions and leopards, and as is the case with similar species in dogs, the tapeworms do not seem to do significant damage. Species include Taenia regis, Taenia crocutae, Taenia hyaenae and Taenia gonyamai.

Echinococcus is one of the worst helminth zoonoses and man is an intermediate host. Whenever dealing with carnivores, including cats and lions, one should always wear gloves, and definitely not eat, drink or smoke. The strain of Echinococcus that is found in lions is known as Echinococcus granulosus felidis as it is the strain that infects felids, while E. granulosus granulosus infects canids.

The tapeworm genera Mesocestoides and Dipylidium have been recorded from lions and leopards, but are of little importance.
Helminth infections of wildlife

![Image of fully grown Echinococcus sp. from the intestine of a lion. The helminths are very close to their actual size.](image)

**Fig. 31:** Fully grown *Echinococcus* sp. from the intestine of a lion. The helminths are very close to their actual size.

![Image of an opened hydatid cyst with the hydatid sand, which are protoscoleces of the next generation of *Echinococcus*.](image)

**Fig. 32:** An opened hydatid cyst with the hydatid sand, which are protoscoleces of the next generation of *Echinococcus*.

**Infections of the skin**

A surprisingly large number of lions in the KNP suffer from cutaneous dirofilariosis, caused by the filarid nematode *Dirofilaria sudanensis*. Clinically it manifests as a large soft lump under the skin, but does not seem to cause much discomfort. The nematode is an extremely long one that lies curled up in the subcutis.
THE HELMINTHS OF ZEBRAS

Infections of the gastro-intestinal tract

A large variety of nematodes occur in the gastro-intestinal tract of zebras. These include the ascarid *Parascaris*, the spirurids *Draschia* and *Habronema*, the strongylid genera *Strongylus* and *Triodontophorus* and a whole host of cyathostomins, such as *Cyclicodontophorus*, *Cyclicostephanus*, *Cyathostomum*, *Cyclicocyclus*, *Poteriostomum*, and *Oesophagodontus*. The Habronematidae are represented by *Habronema* and *Draschia*, while *Oxyuris equi* (Oxyuridae) and *Trichostrongylus thomasi* (Trichostrongylidae) are usually present in small numbers. The Family Atractidae are tiny worms and occur in tens of thousands rather than tens or hundreds.

Krecek (1984) listed the helminths from 10 zebras shot in the KNP and a summary of the range of numbers of the helminth families that were collected is presented in Table 7.
Helminth infections of wildlife

Table 7: The numbers of worms recovered from zebras from the KNP

<table>
<thead>
<tr>
<th>Nematode family</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongylidae</td>
<td></td>
</tr>
<tr>
<td>Strongylinae</td>
<td>1 - 137</td>
</tr>
<tr>
<td>Cyathostominae</td>
<td>1 - 159 491</td>
</tr>
<tr>
<td>Cyathostominae</td>
<td></td>
</tr>
<tr>
<td>Atractidae</td>
<td>2 - 24 206 530</td>
</tr>
<tr>
<td>Habronematidae</td>
<td>4 - 1 864</td>
</tr>
<tr>
<td>Oxyuridae</td>
<td>5 - 1 515</td>
</tr>
<tr>
<td>Trichostrongylidae</td>
<td>20 - 580</td>
</tr>
</tbody>
</table>

Anoplocephala and Anoplocephaloides are tapeworms that occur in the small intestine, and are not associated with lesions or clinical disease.

Gastrodiscus aethiopicus has been recorded from zebras but its pathogenicity, if any, is unknown.

In conclusion, as far as helminthoses in wildlife are concerned, it is probably best expressed by Robbie Bain’s (2003) comment: “For the time being, an African perspective of the helminths of wildlife is best summed up with the image of the zebra grazing the savanna – fat, happy and full of worms”.

REFERENCES


Helminth infections of wildlife


Helminth infections of wildlife


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