

Wildlife Disease Research and Economic Development

*Proceedings of a workshop held in Kabete,
Kenya, 8 and 9 September 1980*

*Editors: Lars Karstad, Barry Nestel,
and Michael Graham*

A stylized, high-contrast illustration of a herd of wildebeest in a savanna landscape. The animals are depicted in orange and blue silhouettes, with some facing left and others right. The background consists of a light yellow sky and a blue and orange ground area. The illustration is positioned behind the text on the cover.

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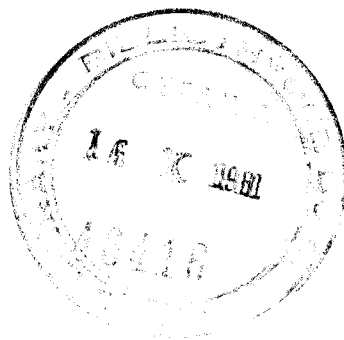
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The Role of Wild Ruminants in the Epidemiology of Nematodiasis in Kenya

E.W. Allonby¹

It has been known for many years that, on the basis of taxonomic criteria, wild ruminants and domestic ruminants share a proportion of their nematode fauna. However, studies on cross infection between the two groups have been performed experimentally on only a limited scale and even less is known about the extent to which this occurs naturally in the field.

Inevitably, therefore, any assessment of the role of wild ruminants in nematodiasis must at this stage be based largely on knowledge of the disease in domestic animals and certain hypotheses regarding the expected degree and influence of cross infection.

On the basis of taxonomic criteria it has been estimated that about 20–40% (Sachs et al. 1973; Prestwood et al. 1976; Woodford 1976) of the nematode species commonly recorded in wild ruminants are also found in domestic animals. However, of these species those likely to be of most economic significance are: (1) gastrointestinal — *Haemonchus* spp.; *Trichostrongylus* spp.; *Impalaia* spp.; *Cooperia* spp.; *Nematodirus* spp.; *Oesophagostomum* spp.; and *Trichuris* spp.; and (2) lungworms — *Dictyocaulus* spp.; *Protostrongylus* spp.; and *Muelierius* spp.

The first demonstration of experimental cross infection was in 1926 by Le Roux who infected two lambs with the larvae cultured from the feces of a Roan antelope and a blue wildebeest and later from the feces of an impala (Le Roux 1930). Subsequently a series of experiments in the 1930s by Monnig demonstrated that a number of species, including *Haemonchus*, *Trichostrongylus*, *Nematodirus*, and *Cooperia* species, could be readily transmitted experimentally to sheep (Monnig 1931, 1932, 1933).

In 1979, Horak successfully infected sheep with the larvae of *Haemonchus*, *Trichostrongylus*, and

Impalaia species cultured from the feces of naturally infected blesbok. Similarly, sheep, goats, and calves were infected with the larvae of *Haemonchus*, *Longistrongylus*, *Trichostrongylus*, *Impalaia*, and *Cooperia* species cultured from impala feces. Only the sheep and goats could be successfully infected with the *Cooperioides* and *Oesophagostomum* of impala origin.

In two experiments involving 15 Thomson's gazelles and 16 Merino sheep (Preston et al. 1979) it was shown that of the 11 species that established in gazelles from the larval culture of gazelle feces only three species, i.e. *Haemonchus*, *Trichostrongylus*, and *Cooperia*, were infective for sheep. From the sheep fecal culture only *Haemonchus* became established in both gazelles and sheep, but the results of fecal egg counts (Fig. 1) and measurements on weight, length, and spicule lengths (see Tables 1 and 2) indicated that either the gazelles had developed a better innate or acquired immunity or that

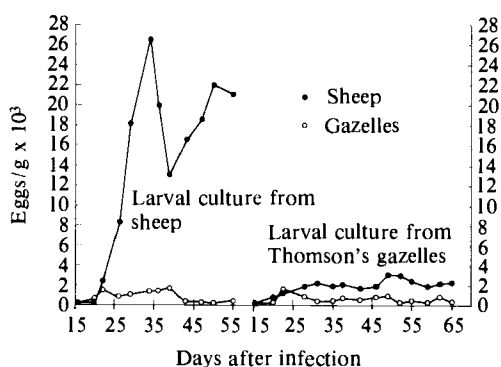


Fig. 1. The fecal egg counts of Merino sheep and Thomson's gazelles following infection with larvae cultures from sheep and gazelle feces at an infection rate of 200 larvae per kilogram of body weight: ● Merino sheep; ○ Thomson's gazelle.

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H. contortus was primarily a sheep parasite that became established to a much lesser extent in the gazelle.

Table 1. The results of mean worm recoveries in Merino sheep and Thomson's gazelles infected with larvae cultured from naturally infected sheep and gazelles.

Host	Sheep culture	Gazelle culture
Sheep	24%	4% (3.9% <i>H. contortus</i>)
Gazelles	3%	14% (1.5% <i>H. contortus</i>)

Table 2. The mean weights, lengths, and spicule measurements of *H. contortus* worms recovered from Merino sheep and Thomson's gazelles following experimental infection with larvae cultured from both sheep and gazelle feces.

	Larvae cultured from sheep		Larvae cultured from gazelles	
	Sheep	Gazelles	Sheep	Gazelles
Weight (mg)	1.02	0.18	0.93	0.16
Length (mm)	19.21	11.15	18.31	12.28
Spicules (μ m)	461	422	456	435

Economic Significance and Future Role

To assess the economic significance for domestic animals of nematodiasis in wild ruminants it is necessary to know what extent the wild ruminants contribute to overall pasture larval contamination and what additional effect this produces on the domestic stock. Because this information is not yet available, it is only possible to make estimates using the existing knowledge and to make hypotheses for the future.

Using the data known about Merino sheep (Allonby and Urquhart 1975) and what is known about Thomson's gazelles (Preston et al. 1979) it can be estimated that in an area grazed by 900 sheep and 100 gazelles that the gazelles' share of the strongyle egg output on the pasture would not exceed 0.5%. From this it must be concluded that under existing methods of control the gazelles do not play a significant part in the epidemiology of sheep helminthiasis.

However, the gazelles do act as a reservoir host so that if frequent anthelmintic treatment were adopted in an attempt to eradicate the disease, this could not be achieved because of the presence of the gazelles. Although this may not be of practical significance at present, there is evidence from recent experiments (Allonby and Preston, unpublished)

that such a regimen, i.e. of producing progressively "helminth-free" pasture, may be economically feasible and could provide scope for the use of an irradiated larval vaccine as a means of immunological control (Jarrett et al. 1960; Mulligan et al. 1961). Under such circumstances, the presence or absence of wild ruminants acting as reservoir hosts would determine the success of this approach.

Furthermore, as it is now being recognized that the subclinical effects of nematodiasis are much greater than had been previously thought, the role of wild ruminants as reservoir hosts is likely to assume more importance and greater consideration will have to be given to their role in this important disease.

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