CONTROL OF GAZELLE PARASITES AT KING KHALID WILDLIFE RESEARCH CENTRE (KKWRC), SAUDI ARABIA

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Abstract

Parasites infecting gazelles at King Khalid Wildlife Research Centre (KKWRC), Saudi Arabia, have previously been documented (Mohammed, 1992; Mohammed, 1997; Mohammed and Hussein, 1992; Mohammed and Hussein, 1994; Mohammed and Flamand, 1996; Mohammed *et al*., 2000). Gazelles under KKWRC conditions were affected by parasites due to the availability of large numbers of infective stages in the environment. Gastro-intestinal helminthic parasites of gazelles have generally a direct life cycle and infective third larval stages are normally present in animals' contaminated food. Other parasites such as protozoa can also be acquired as a result of ingesting food that is contaminated with sporulated infective oocysts. Determining the identities of various parasites infecting gazelles is the first step towards an effective control programme of specific parasites. Parasites detected in gazelles at KKWRC included gastro-intestinal helminths, gut-dwelling and cyst-forming coccidia.

Gastro-intestinal Helminths Detected in Gazelles at KKWRC

Several species of gastro-intestinal helminths parasites have been reported from gazelles at KKWRC. These included; *Haemonchus contortus, Camelostrongylus mentulatus, Nematodirus spathiger, Trichostrongylus probolurus, Trichuris cervicaprae, Strongyloides spp., Skrjabinema ovis* and *Gongylonema* sp. The main source of infection is the food provided to the gazelles that was contaminated with the third larval stage.

Haemonchus contortus

This abomasal worm is a common parasite of sheep, goat and cattle and numerous other ruminants and of cosmopolitan distribution (Soulsby, 1982). It has been detected only in the sand gazelle (*Gazella subgutturosa marica*). It has not been detected in other species of gazelles at KKWRC.

Camelostrongylus mentulatus

It is another abomasal worm, which primarily infects camels. It is also found in some other ruminants (Dunn, 1979). At KKWRC, it has been reported in 45.3%, 43.5%, 32.3% and 37.4% of the sand gazelle (*G. s. marica*); mountain gazelle (*Gazella gazella*), dorcas gazelle (*Gazella dorcas*) and erlangeri gazelle (*Gazella gazella erlangeri*) respectively.

Nematodirus spathiger

Is a common intestinal parasite of sheep, cattle, antelopes and other ruminants (Eslami *et al*., 1980; Soulsby, 1982; Wiesman and Jansen, 1980). It is the most commonly encountered parasite in gazelles at KKWRC. It has been recorded in 61.3%, 62.7%, 74.2%, and 68.1% of the sand, mountain, dorcas and erlangeri gazelles respectively. In Saudi Arabia, this parasite is commonly encountered in camels (El-Bihari and Kawasmeh, 1980). This parasite is known to occur in large numbers in the small intestine and sometimes occluding the intestinal lumen. In gazelles, this worm has been shown to be associated with blood sucking activity, which is an unusual character for this parasite.

Trichostrongylus probolurus

This parasite occurs in the abomasum as well as the small intestine of sheep, goat, camel and man and it is one of the important causes of gastro-enteritis in the subtropics. The presence of this parasite at KKWRC has been documented by Mohammed (1992). It has been reported from the sand, mountain and dorcas gazelles. This parasite has been previously recorded reported from camels in Saudi Arabia by El-Bihari and Kawasmeh (1980).

Trichuris cervicaprae

Five *Trichuris* species have been reported from gazelles: *Trichuris discolor*, *T. skrjabini*, *T. gazellae*, *T. ovis* and *T. cervicaprae* (Eslami *et al*., 1980, Mohammed, 1992). At KKWRC *T. cervicaprae* has been

reported only from mountain gazelle and dorcas gazelle. *T. cervicaprae* has also been recorded in a group of *Gazella thomsoni* whose members were losing weight at Whipsnade Zoo, UK (Kock, 1986).

Strongyloides spp.

Members of this genus are parasites of domestic and wild animals and man. Experimental infection of sheep with *Strongyloide papilosus* has proven to be fatal (Turner, 1959). The larvae of *Strongyloides* spp. were associated with the introduction of the "foot rot" organism into the skin around the hooves of sheep (Beveridge, 1934). Different gazelle species at KKWRC were found to be infected with this parasite (Mohammed, 1992; Mohammed 1997). Only eggs of the parasite, which are embryonated, have been detected during faecal examination. Unfortunately, no adult worms were detected so that the species involved could be identified. This might be attributed to the fact that the worms are so tiny and they could be low in number hence the difficulty in detecting them.

Both *Skrjabinema ovis* and *Gongylonema* sp. are non pathogenic helminth parasites and have been reported from gazelles at the centre. *S. ovis* was reported from only a few individuals of the mountain gazelle whereas *Gongylonema* sp., the oesophageal worm, has been detected in only one individual of dorcas gazelle.

Control of Gastro-intestinal Helminths Parasites

Control of gastro-intestinal nematode parasites is based on grazing management, anthelmintic treatment and integrated systems incorporating these two approaches. The above parasites have been reported from gazelles at KKWRC.

The parasites have been identified according to the morphology of adult worms (Soulsby, 1982). Faecal examination has provided evidence of parasites and their loads in certain instances where identification of eggs is easy. The identity of parasites was confirmed by the International Institute of Parasitology, U. K.

The life cycles of all these helminths parasites are direct, with the exception of the *Gongylonema* sp. which requires an intermediate host for the development of the parasite. The infective stages develop in cockroaches hence controlling cockroaches will prevent infection with this worm.

Infective 3rd larval stages of the gastro-intestinal helminths parasites are available in pasture. At KKWRC domestic animals and camels were allowed into the areas where the green fodder is cultivated. Domestic animals defaecate in pasture while grazing and the conditions are favourable for the development of the parasites' eggs into the 3rd larval infective stages. Such stages will be available in food and they are ready to be picked up by gazelles. The following measures have been adopted at KKWRC in order to minimise the number of infective larvae available for gazelles in their food:

a) Drying of alfalfa
Most of the third larval stages will be killed as a result of exposing alfalfa to direct sunlight. Hence, reducing the number of infective larvae available with food to some extent. The alfalfa will be left normally for 2-3 days until it is completely dry.

b) Anthelmintic treatment
A dose of a broad spectrum anthelmintic (Ivermectin) was given to each gazelle at the centre on an annual basis. This reduces the number of adult worms carried by different hosts. It also kills the immature stages before they develop into adults and start shedding eggs.

c) Cultivation of alfalfa within KKWRC premises
In order to eliminate contact between domestic animals and gazelles' food, it was decided to cultivate gazelles' food in an area where domestic animals and camels are not allowed. Such an area is within the KKWRC premises. Before resorting to this much effort has been put into keeping domestic animals away from alfalfa fields. That was effective to some extent, however, the fields are infected with inactive dormant larvae and it was very difficult to get rid of these. Within KKWRC breeding pens no domestic animals are allowed and fields remain clean of any larval stages, which might contaminate gazelles' food.

It is also the policy of the centre to reintroduce gazelles into the wild when they are free of helminth parasites and at the same time a dose of Ivomec will be given. By so doing we have reached to a situation where no parasites' eggs are detected in the faecal samples collected randomly from the

breeding gazelles at the centre. The level of parasitic infestation has been reduced to undetectable levels.

Coccidian Parasites in Gazelles

Gazelles at KKWRC are affected by two types of protozoan coccidian parasites. The gut-dwelling and the cyst-forming coccidia. The first group is represented by *Eimeria idmii*, *Eimeria rheemi* and *Eimeria dorcadis* (Hussein and Mohammed, 1992; Mohammed and Hussein, 1992, Mohammed and Flamanad, 1996). Cyst-forming coccidia are represented by *Toxoplasma gondii*, *Sarcocystis* spp. and *Hammondia heydorni* (Mohammed and Hussein, 1994; Mohammed 2000; Mohammed *et al*., 2000).

Gut-dwelling Coccidia

Eimeria spp. are intestinal protozoan parasites commonly encountered in gazelles at KKWRC especially in fawns. *Eimeria idmii* has been reported in 34% of the idmi gazelle at the centre whereas *E*. *rheemi* has been detected in 48% of the sand gazelle. *Eimeria dorcadis* has been reported recently in 25% of the dorcas gazelle. *E*. *rheemi* was found to be associated with pathogenicity in experimental reem gazelles and examination of many samples from gazelles suffering from diarrhoea resulted in detection of large numbers of *E*. *rheemi* oocysts. The same situation was observed in idmi and dorcas gazelles. Many cases suffering from haemorrhagic enteritis were found to have eimerian oocysts when intestinal scrapings were examined microscopically. This is an indication that such eimerian parasites may be pathogenic and produce clinical coccidiosis.

Control of Intestinal Coccidian Parasites

Maintaining clean and dry feeding areas plays an important role in controlling the number of infective oocysts ready to be ingested by gazelles. At KKWRC the feeding sites are cleaned on a daily basis and the area around the water troughs is kept dry all the time. It is not always easy to keep this going throughout the year, as during the rainy season it would be difficult to ensure dryness of the area. Hence a dose of coccidiostat, during this season, is given to all gazelles in order to reduce the numbers of oocysts shed by the infected gazelles. Treatment of infected gazelles is a common practice at KKWRC and administration of sulphonamide compounds orally for ten days normally treats infected gazelles. Gazelles at the centre are regularly screened for coccidian parasites and infected gazelles will then be treated accordingly.

Cyst-forming Coccidia

Sarcocystis parasites are among the most commonly encountered cyst-forming coccidian parasites in gazelles. They are detected from tissue of gazelles after digesting the muscles and extracting the cystic stages of the parasite. The definitive host for these parasites was found to be the Arabian red fox (*Vulpes vulpes arabica*). The parasite has been reported in 74% of sand gazelle, 55% of mountain gazelle, 84% of dorcas gazelle, 36% of the erlangeri gazelle and 56% of Thomson's gazelle. Gazelles raised at KKWRC main enclosure were found to show high prevalence rate of this parasite compared with those raised in the breeding pens of the centre. High prevalence of the parasite has been detected in adult gazelles compared with the juvenile ones from all gazelle species.

Toxoplasma gondii is a zoonotic cyst-forming coccidian parasite and has been encountered in gazelles at KKWRC (Mohammed and Hussein, 1994). Felines are the definitive hosts for this parasite. Mohammed and Hussein (1994) reported 4.7% prevalence of this parasite among gazelles at KKWRC. *Toxoplasma gondii* cysts were reported from the brain of sand and mountain gazelles. It was found to be associated with neurological signs especially in sand gazelle. Both *Sarcocystis* and *Toxoplasma gondii* cause abortion in domestic animals and *T*. *gondii* causes abortion in man. At the centre the incidence of abortion was low and was not found to be associated with these parasites.

Hammondia heydorni is generally non-pathogenic and the tissue cyst stages are yet to be studied. The parasite was only described from the oocysts shed by carnivores after consuming muscles or other tissues from herbivores, which are believed to harbour cystic stages. It has been reported in the mountain gazelle and the Arabian red fox was found to act as a definitive host for this parasite. No pathology was associated with this parasite in either the definitive or the intermediate hosts.

Control of Cyst-forming Coccidia

In an effective control programme the life cycle of the cyst-forming coccidia must be broken. This will minimise the infective stages contaminating the environment. For *Sarcocystis* parasites, contact between the red fox and the gazelles was not allowed. Gazelles have been removed from the old animal

enclosure, where gazelles were left free and contact with foxes was common, to the new breeding pens where contact with foxes is not allowed. Gazelles are fed concentrate ration in addition to the green fodder. The concentrate ration is kept in area where no carnivores were allowed to contaminate the food. Even contamination of alfalfa fields was minimised by preventing carnivores from resting on these fields. Burning dead bodies has played a big role in breaking the life cycle of cyst-forming coccidia.
So control of cyst-forming coccidia in gazelles and other animal species can be brought about by the simple, low-tech solution of keeping animal feed in a fenced area or closed container.

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