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Gastrointestinal Parasites of Sheep and Goat and Their Contro

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Abstract

In small ruminants, particularly goats and sheep, gastrointestinal (GI) parasites have led to serious socioeconomic and public health issues on a global scale. Goats and sheep can contract gastrointestinal parasites from helminths and protozoa, with nematodes and coccidian being the most prevalent. Parasite illnesses kill hundreds of thousands of livestock severely affecting the development of agriculture & poverty alleviation in emerging countries. Improving small ruminants' health requires knowing how these parasites work, spread, and how to diagnose them. Sustainable management strategies for controlling gastrointestinal parasites in sheep and goats, focusing on non-chemical approaches due to concerns about drug resistance and organic farming. Effective pasture management, lowering stocking rates, and improving animal nutrition to increase infection resistance are important tactics. Exposure to parasites can be reduced by regular livestock observation and grazing control.

Keywords: Small Ruminants; Gastrointestinal Parasites; Socioeconomic Issues; Epidemiology; Pathology; Sustainable Management

Introduction

The economy of our country depends heavily on livestock. It improves the rural poor's economic standing. Sheep and goat vast production systems exist in many parts of the world. They have a favorable impact on local socioeconomic activity, playing an important part in the preservation of rural communities, ecosystems, and the production of distinctive, prized delicacies, like lamb, cheeses and meat [15].

They get a range of parasites because of inadequate care, an unsanitary environment, harsh weather, or close proximity to affected animals. Sheep and goat parasitism is a serious issue that affects farmers all over the country. The sheep business suffers greatly from parasitism since gastrointestinal parasite infection is the primary factor limiting sheep productivity. Goats and sheep can contract gastrointestinal parasites from helminths and protozoa, with nematodes and coccidian being the most prevalent [3].

Gastrointestinal (GI) parasites are microorganisms that reside in the gastrointestinal tract and can lead to illnesses. Parasitic infections continues to be a leading source of illness and mortality globally. Furthermore, parasite illnesses kill hundreds of thousands of livestock severely affecting the development of agriculture & poverty alleviation in emerging countries [12].

Prevalence of Gastrointestinal parasites

The prevalence of gastrointestinal parasites is influenced by agro-climatic factors such as pasture quantity and quality, humidity, temperature, and host grazing behavior. Endoparasites are the most prevalent parasitic infections in sheep and goats. Common parasites seen in sheep and goats include coccidia, tapeworms, roundworms and liver flukes [8].

Types of GI parasites in Sheep & Goats

Protozoan (Coccidian): Coccidiosis is a parasite disease that affects a range of animals. Coccidia are small, spore-producing, unicellular protozoa that cause the infection. Coccidia are divided into several genera. The genus Eimeria causes coccidiosis in sheep & goats. More than 10 types of coccidia have been identified in this genus as infecting sheep or goats. Not all species have a similar degree of pathogenicity. In truth, only few of them typically cause disease epidemics [5].

Infection occurs orally by the ingestion of infectious sporulated oocysts from a polluted environment. Infections typically only show clinical symptoms in young individuals. The parasites

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mostly infiltrate the intestinal epithelium and the mucosa's underlying connective tissue, which can occasionally result in inflammation and bleeding [2].

Trematodes (Liver fluke): Sheep and goats are susceptible to the liver fluke. Adults mate and deposit their eggs in the liver's bile channels. The bile transports the eggs to the gut, where they are expelled as faeces. For survival, flukes require standing water. The larvae hatch and enter snails, which serve as intermediate hosts, if water is present. They cling to water plants and create a protective cyst that the animal consumes or swallows along with the water. After passing through the abdominal cavity and the small intestine, the larvae enter the liver and finally make their way to the bile duct, where they develop into adults [9].

The adult takes blood and feeds on the contents of the bile duct lining. Anemia, swelling under the jaw and weakness are the usual indications of a liver fluke infection. The worm disrupts the liver and digestion's processes, causing the animals to lose weight and produce less. The quantity of metacercariae consumed, the stage of liver development, and the type of host all affect how severe fascioliasis is [9].

Cestodes (*Moniezia spp*): The tapeworm that typically infects sheep and goats is Moniezia expansa. Although it is more prevalent in cattle, Moniezia benedeni is also present in sheep and goats. A number of additional tapeworm species use sheep and goats as intermediate hosts. Sheep and goat feces contain segments of tapeworms. It can be challenging to make a definitive diagnosis in a living animal, and occasionally a post-mortem is required to verify a correct diagnosis. Diarrhea, potbelly, & weight loss are all signs of a clinical tapeworm infection, just as they are of other roundworm infections. When tapeworm populations are high enough, they can block the gut and result in death. Sheep appear to acquire immunity to tapeworms at a reasonably young age (3–4 months) [10].

Nematodes

***Haemonchus contortus*:** *Haemonchus contortus* is a nematode found in the gastrointestinal tracts of sheep and goats, specifically the abomasum. It is prevalent in tropical & subtropical climates with high rainfall rates. It causes parasitic gastroenteritis and intestinal inflammation, and death can occur quickly if the infection is severe. Infected animals pass large numbers of eggs in their faeces, which hatch into the non-parasitic L1 and L2 forms. Following another molt, the infective third phase larva is consumed by grazing animals and transported to the abomasum, or actual stomach, where it experiences the third & fourth molts and matures [6].

***Trichostrongylus spp*:** *Trichostrongylus* colubriformis, *Trichostrongylus* rugatus, and *Trichostrongylus* vitrinus live in the small intestines of tiny ruminants. *Trichostrongylus* nematodes cause trichostrongyliasis in both people and animals, including cattle, sheep, and goats. The nematodes are worldwide in distribution. Sheep and goats serve as primary reservoirs for parasites, ensuring their survival. However, other organisms can serve as reservoirs for the parasite [1].

Epidemiology of Parasites

Epidemiology of Protozoan (Coccidian)

Each young animal is susceptible to coccidiosis, which typically affects calves between the ages of three weeks and six months. It has been known to inflict significant financial losses in cattle that are a year of age or older. Animals housed in overcrowded and polluted areas are susceptible to sickness. 46% of calves, 43% of yearlings, and 16% of mature cows have the condition [14].

Epidemiology of Trematode (Liver Fluke)

Cattle, sheep, and goats are among the mammals that serve as definitive hosts for the cosmopolitan parasite Fasciola hepatica, also known as the common liver fluke. When ruminants graze on polluted vegetation that harbors the fluke larvae, they contract the infection. Both chronic and acute fascioliasis can result from the infection, which is most prevalent in young animals, especially during the rainy season. Areas with humid climates have higher prevalences. Due to decreased growth, milk output, and fertility in afflicted livestock, the disease causes large financial losses [18].

Epidemiology of Cestodes (*Moniezia spp*)

Common intestinal parasites in ruminants, especially grazing animals, include *Moniezia spp*. cestodes, namely Moniezia expansa in sheep and Moniezia benedini in young cattle. The intermediary host in the tapeworms' life cycle is typically a pasture-dwelling mite. When grazing, infected ruminants consume the mites, which causes minor intestinal tapeworm infestations. Heavy infestations, despite being typically regarded as low pathogenicity, might result in minor digestive problems and stunted development of young animals. The frequency of *Moniezia spp*. is higher in summer and springtime due to grazing conditions and mite availability [11].

Epidemiology of Nematodes

Haemonchus contortus: *H. contortus* is most significant in areas with summer rainfall, particularly in coastal parts of southwestern Australia (WA) and northern New South Wales (NSW) and south-eastern Queensland [11].

The highly fertile nematode *Haemonchus contortus* quickly builds up on pastures; females can lay up to 10,000 eggs every day. The adult worms usually live for a few months, and the prepatent period is 17–21 days. It is difficult to identify since it does not induce diarrhea but instead develops deadly anemia in the abomasum through blood feeding. *H. contortus* is the most common parasite-related sickness in small ruminants, especially in the United States, and mostly affects young, not immunized animals or animals with weakened immune systems [19].

***Trichostrongylus* spp:** Due to their greater resistance to cold and desiccation, *Trichostrongylus* species are more common in regions with non-seasonal rainfall (such as central and southern NSW) and in regions with winter rainfall (such as Victoria, Tasmania, southern South Australia, and south-western Western Australia). It is a common gastrointestinal parasite in ruminants, primarily infect sheep and goats. Their larvae develop on pasture and infect grazing animals, and they flourish in moderate, humid settings. Though it usually has a less severe effect than *Haemonchus contortus*, *Trichostrongylus* can nonetheless add to the overall parasite burden in bovine populations [11].

Diagnosis of Gastrointestinal Parasites in Sheep and Goats

The three principles of veterinary diagnosis apply for diagnosing helminthiasis.

- History
- Clinical symptoms and pathological conditions
- Laboratory aids

When diagnosing helminth infections in ruminants, the most often used tests are total worm counts and fecal worm egg counts (FECs), preferably with speciation through larval culture and differentiation.

The most straightforward way to identify gastrointestinal (GI) parasites is by necropsy. It is easy to see adults of Haemonchus, Bunostomum, Oesophagostomum and Trichuris. However, with the exception of their motions in fluid ingesta, significant diseases with Ostertagia, *Trichostrongylus*, Cooperia and Nematodirus are hard to detect (especially those species that spread throughout meters of intestine). Staining with a strong iodine solution for five minutes and then decolorizing the background gut material with 5% sodium thiosulphate (or "hypo") will make these tiny nematodes easier to see in GI tract washings, especially when contrasted with a white backdrop [11].

Pathogenesis of Parasites

Pathogenesis of Protozoan (Coccidian)

The cryptic cells of the large intestine mucosa are infected and destroyed by the most virulent species of coccidia. This is due to the ruminant's lengthy small intestine, which offers a lot of host cells and the capacity for massive parasite reproduction with little harm. To a certain degree, the large intestine can compensate for reduced nutritional absorption. It is more likely that coccidia that infiltrate the large intestine will result in pathological alterations, especially if a lot of oocysts are consumed quickly. There is no compensating effect from other parts of the gut, and the overall cellular turnover is substantially lower here [16].

Pathogenesis of Trematode (Liver Fluke)

The primary factors that determine a liver fluke pathogenicity are its migration pattern, host preference site, and host defense mechanisms. The main elements that highlight parasite pathogenicity and immunity-evasion are their physical irritation of host tissues and their excretion/secretion of different proteases, antioxidant substances, harmful metabolites, and immunogenic chemicals [4].

Pathogenesis of Cestodes (*Moniezia spp*)

In ruminants, cestodes often have minimal pathogenic impact. However, when a significant amount of worms are present in young animals, a clinical condition may be observed that includes anorexia, decreased gut motility, and, less frequently, gut rupture and peritonitis [7].

Pathogenesis of Nematodes

H. contortus: The blood-sucking nematode *Haemonchus contortus* can cause severe infections in goats that can result in acute anemia and death. Less severe infections might result in edema and iron deficiency anemia, which can show up as sub-mandibular oedema [16].

***Trichostrongylus* spp:** When the larvae of *Trichostrongylus* species migrate to the small intestine or abomasum , they infect ruminants, resulting in irritation and damage to the mucosa. Adult worms cause ulcers and poor nutrient absorption because they feed on tissue and blood. This creates an immunological reaction that leads to anemia, diarrhea, and weight loss. Malnutrition and, in extreme situations, death can result from heavy infestations [16].

Control and management Strategies of Gastrointestinal Parasites

Small ruminant gastro-intestinal parasite (GIN) infestations may compromise animal welfare and result in significant financial losses. The search for sustainable alternatives has been compelled by the emergence of organic farming methods, the growing public awareness of medication residues in agricultural goods, and the emergence of parasite strains that are resistant to current treatments [13].

Alternative methods exist for preventing and managing parasite illnesses in systems that raise sheep and goats. The foundation for low pasture infection rates for grazing animals is laid by effective pasture management, which has proven advantageous and provides solutions that can be successfully implemented to the majority of farming scenarios with applicable knowledge about host-parasite interactions and Numerous potential management techniques, such as reducing the stocking rate and conducting frequent, thorough animal condition monitoring, can also help to maximize the health status of the animals. In the context of non-chemotherapeutic management strategies, the impact of nutritional status was also examined. It was discovered that animals with optimal nutrition are better equipped to handle the negative consequences of worm infestation. Different grazing management techniques can reduce host infection by reducing contact with infectious larvae [17].

Conclusion

In conclusion, parasites of the gastrointestinal tract in sheep and goats present a serious threat to the welfare and productivity of livestock, with a variety of nematode, trematode, cestode, and protozoan infections resulting in large financial losses. Controlling these illnesses requires effective management techniques, such as pasture management, nutritional optimization, and the proper application of anthelmintics. Improving animal health requires an understanding of these parasites' pathophysiology, epidemiology, and diagnostics. Alternative, sustainable control strategies need to be investigated in light of the growing concerns about drug resistance and organic farming. The future of small ruminant farming depends on ongoing research and the application of integrated parasite management strategies.

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