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Haemonchosis in Sheep: An Overview

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Haemonchosis is a significant parasitic disease affecting sheep worldwide, caused by the blood-feeding nematode *Haemonchus contortus*, commonly known as the barber's pole worm. This parasite resides in the abomasum (the fourth stomach compartment) of sheep and is notorious for its high pathogenicity, causing substantial economic losses and animal health issues in the sheep industry, particularly in tropical and subtropical regions. The disease is characterized by severe anemia, reduced productivity, and, in severe cases, death. This article provides an overview of haemonchosis in sheep, covering its epidemiology, clinical manifestations, diagnosis, control strategies, and challenges, with a focus on sustainable management approaches.

Keywords: *Haemonchus contortus*, Sheep, Anaemia, gastrointestinal nematodiosis

Introduction: *Haemonchus contortus* thrives in warm, moist environments, making haemonchosis a predominant issue in tropical, subtropical, and warm temperate regions, such as parts of South India including Andhra Pradesh and Telangana. The parasite's life cycle is direct, with eggs passed in the feces developing into infective third-stage larvae (L3) under optimal conditions of high humidity and temperatures above 10°C. These larvae are ingested by sheep while grazing, penetrating the abomasal mucosa to develop into blood-feeding adults (Fig. 1). The life cycle can complete in as little as three weeks under favorable conditions, leading to rapid population growth. The prevalence of haemonchosis varies by climate. In tropical regions, continuous larval development poses a constant threat, while in temperate areas, larvae may enter hypobiosis (developmental arrest) as L4 larvae to survive winter, resuming development in spring, often leading to a "spring rise" in egg shedding, particularly in periparturient ewes. Climate change is expanding the parasite's range, increasing its presence in previously low-risk temperate zones, such as northern Finland.

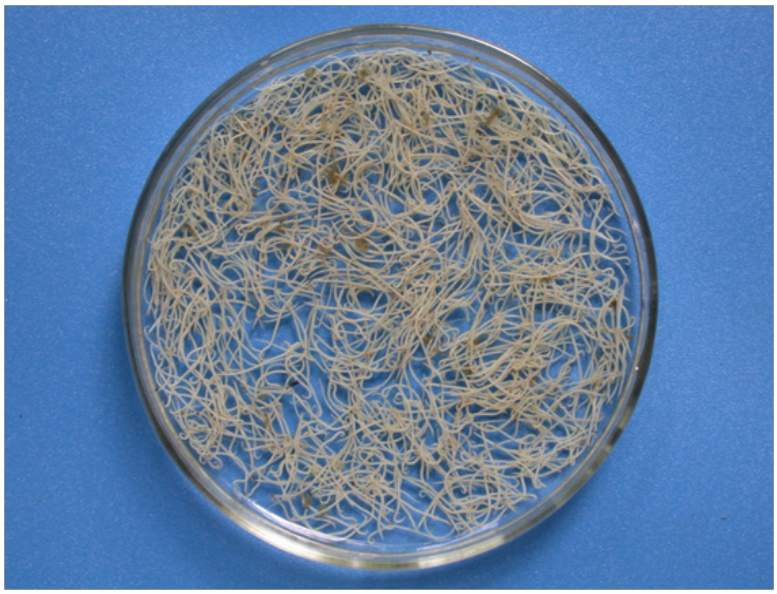

Fig.1 *Haemonchus contortus* worms collected from abomasums of sheep

Clinical Manifestations: Haemonchosis is usually manifested in three forms: hyperacute, acute, and chronic, depending on the worm burden and host factors like age, nutrition, and immune status.

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Hyperacute Haemonchosis: Caused by heavy infections (up to 30,000 larvae), this form leads to sudden death within a week, often without notable clinical signs. Severe blood loss (0.2–0.6 L/day) can result in hypovolemic shock, with hemoglobin levels dropping below 30 g/L. Young lambs are particularly susceptible. Acute Haemonchosis: Associated with moderate worm burdens (2,000–20,000 larvae), this form develops over weeks, causing anemia, hypoproteinemia, and clinical signs such as pale mucous membranes, lethargy, weakness, increased respiratory and heart rates, and submandibular edema ("bottle jaw"). The abomasum shows edema and petechiae, with blood loss leading to macrocytic normochromic anemia. Compensatory erythropoiesis may occur within 14 days, with recovery possible over six weeks if treated.

Chronic Haemonchosis: Occurs with lower worm burdens, resulting in gradual protein loss, weight loss, poor wool quality, and microcytic hypochromic anemia due to depleted iron, cobalt, and copper levels. Affected sheep may show ill thrift without overt clinical signs, making it harder to detect.

Unlike other gastrointestinal nematodes, H. contortus does not typically cause diarrhea unless mixed infections with species like Trichostrongylus or Cooperia are present.

Pathophysiology: H. contortus is a voracious blood feeder, with each adult worm consuming up to 50 µL of blood daily, leading to significant blood loss (over 100 mL/day in heavy infections). This causes anemia, characterized by reduced erythrocyte counts, hemoglobin concentrations, and packed cell volume (PCV). Hypoproteinemia results from plasma protein loss, leading to decreased oncotic pressure and edema, often visible as bottle jaw. The parasite's presence in the abomasum induces mucosal hyperplasia, increases abomasal pH, and impairs protein digestion, reducing nutrient absorption and contributing to malnutrition.
Diagnosis: Haemonchosis diagnosis relies on clinical, parasitological, and post-mortem findings:
Clinical Diagnosis: The FAMACHA© system, developed in South Africa, is a key tool for identifying anemia by assessing conjunctival color on a 1–5 scale (1 = healthy, 5 = severely anemic) (Fig 2). This allows selective treatment of affected animals, reducing anthelmintic use. Clinical signs like bottle jaw, pale mucous membranes, and lagging behind the flock also support diagnosis.

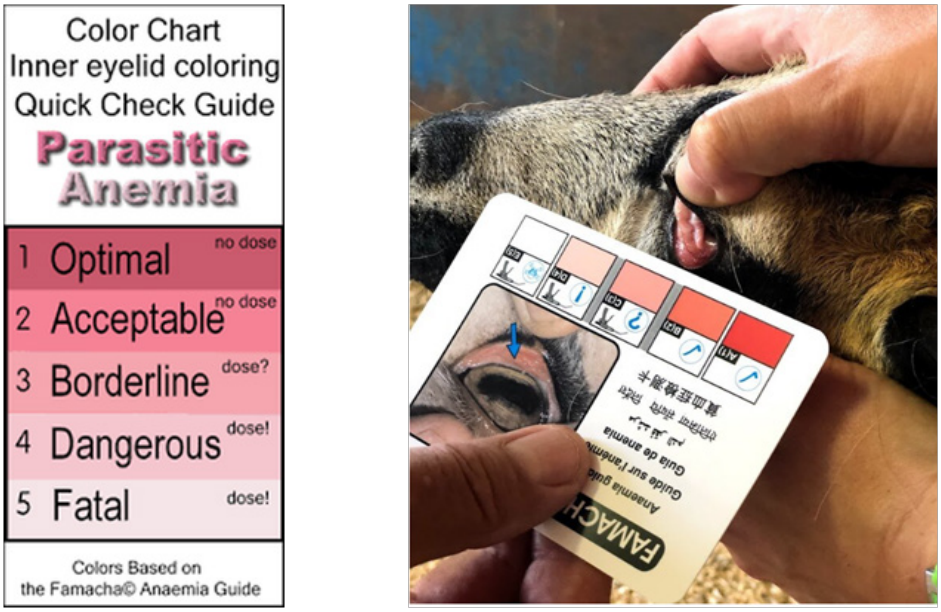

Fig 2 FAMACHA SCORE CARD

Parasitological Diagnosis: Fecal egg counts (FECs) using the modified McMaster method quantify worm burdens, with counts above 4,000 eggs per gram (epg) indicating significant haemonchosis. However,

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Haemonchus eggs are morphologically similar to other strongylids, requiring larval culture for confirmation. Post-Mortem Findings: Autopsy reveals large numbers of H. contortus (up to 20,000 adults) in the abomasum, with petechiae, edema, and unclotted blood on the gastric mucosa.

Control Strategies: Controlling haemonchosis is challenging due to widespread anthelmintic resistance, environmental persistence, and diagnostic difficulties. Integrated management strategies include:
Anthelmintic Treatment: Drugs like benzimidazoles, macrocyclic lactones (e.g., ivermectin), levamisole, closantel, and monepantel are used, but resistance is a growing issue. Selective treatment based on FAMACHA scoring or FECs helps preserve drug efficacy by maintaining refugia (untreated parasite populations). Leaving 10% of a flock untreated has been shown to delay resistance.

Grazing Management: Rotational grazing reduces larval exposure by moving sheep to cleaner pastures, minimizing reinfection. Quarantine drenching of new stock prevents introducing resistant worms.
Nutritional Management: High-protein diets enhance host resilience, as sheep on low-protein diets are more susceptible to severe haemonchosis. Supplementation with yeast or bioactive forages (e.g., Medicago species) has shown promise in reducing larval counts.

Future Directions: Sustainable control of haemonchosis requires integrated approaches combining selective anthelmintic use, grazing management, nutritional support, and genetic selection. Advances in genomics and proteomics may identify novel vaccine targets, while molecular tools could enhance resistance gene identification. Research into bioactive forages and non-chemical controls (e.g., copper oxide wire particles) offers promise. Continuous monitoring using tools like FAMACHA and FECs, alongside farmer education, is critical for effective management.

Conclusion: Haemonchosis, caused by Haemonchus contortus, is a major threat to sheep health and productivity, particularly in warm, humid regions. Its impact on anemia, growth, and mortality underscores the need for effective control. While anthelmintics remain a cornerstone, resistance necessitates integrated strategies, including grazing management, nutrition, genetic selection, and vaccination. Addressing challenges like resistance and climate-driven spread will require ongoing research and farmer collaboration to ensure sustainable sheep production.