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Popular article**Role of nutrition in Controlling GI Parasites****Rojita Yengkhom¹, Ehtesham Ahmad² and Safeeda Begum³**¹Assistant Professor, Department of Animal Nutrition, COVAS, BASU, Patna, Bihar²BVSc Student, COVAS, BASU, Patna, Bihar³Assistant Professor, Department of Veterinary Medicine, COVAS, BASU, Patna, Bihar*Corresponding author: rojitayeng11@gmail.com

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ABSTRACT

This popular article provides a brief description of the role of nutrition in controlling gastro-intestinal parasites in livestock and therefore, improves their production potential. The GI parasites infestation may lead to decrease feed intake, reduce in nutrient utilization, absorbed nutrients were diverted away from production purposes to a high survival priority, loss of body weight, malnutrition, sometimes death. Synergistic interrelationship exists between host, nutrient levels and GI parasites. Animal health and well being can be improved by providing high quality protected nutrients in balanced proportion through dietary supplementation, by feeding energy and protein rich diet as well as by balancing the mineral content of the feedstuff. Therefore, the article will focus specifically on how dietary and nutritional approaches can be used to manage GI parasites and promote overall well-being.

Keywords: Gastro-Intestinal Parasites, Livestock, Nutritional Approaches**INTRODUCTION**

Gastrointestinal parasites in livestock may cause livestock health issues, reduced productivity, weakened immune system, economic losses, and zoonotic potential. Parasites and their severity of infection to the host depend on the characteristics such as breed, age, nutrient status of the host, and environmental factors (Pathak and Tiwari, 2012). Although GI parasites have some beneficial traits like potential for immunomodulation and treatment of autoimmune diseases for livestock, the negative impacts of GI parasites overshadow any potential benefits. Therefore, it is extremely important to implement effective parasite management strategies to minimize the negative effects on animal health and productivity. GI parasites in livestock can be controlled through the following methods:

- a) Pastoral management practices like rotational grazing, grazing younger animals before older ones, alternate grazing with other species, resting pastures, reducing stock density, and manure management,
- b) Targeted anthelmintics treatment,

- c) Biological control methods such as nematophagus fungi, copper oxide particles to reduce the fertility of female parasites,
- d) Other management practices like nutritional management, genetic selection, nutraceuticals and phototherapy etc.

Well-nourished animals cope better and overcome infection with GI parasites quicker than malnourished ones (Wells, 1999). Moreover, vulnerable groups are young ones, pregnant, and lactating dams. Talking about nutritional management, supply of energy and protein rich diet, and balanced mineral supply are the two important factors in protection from nematode infection (Sykes and Coop, 2001). Improved nutrition may also lead to an increase in host resilience. Therefore, the article will focus specifically on how dietary and nutritional approaches can be used to manage GI parasites and promote overall well-being.

Nutrition-GI parasites-Host-Interrelation

The nutritional status of the host has long been considered as a major factor in influencing host-parasite relationship and the pathogenesis of parasite infections. Even though the mechanism underlying are not clear, supply of metabolizable energy and metabolizable protein source or balancing of nutrients through diet improved resistance to helminthes infection of growing animals (Pathak and Tiwari, 2012). The interaction between host nutrition and GI parasites is complex and bidirectional. Parasites can cause loss of appetite, interfere with the absorption of nutrients, alter host metabolism, leading to inefficient use of absorbed nutrients and potentially disrupting protein and energy metabolism as well as endogenous protein loss into the GI tract (Muturi *et al.*, 2005). On the other hand, host nutrition has also impact on establishment, development, adaptation, survival and virulence of parasite populations, increased host's ability to mount an effective immune response against parasites.

Nutritional Manipulation to Control GI Parasites

Protein supplementation: Protein supplementation can play a vital role in controlling GI infections, particularly in individuals with weakened immune systems. It can support the immune system by providing the necessary amino acids for antibody and immune cell production, thus improving resistance to infections and helping to fight infections. Animals do need to be exposed to the infective larvae of GI parasites in order to experience the developmental stages within their bodies typically up to 12 weeks, for the immune system to develop a sufficient response. However, this period is dependent on many factors like genetics, age and nutrition.

Many research studies reported that the effects of nutrition to the immunity are based on the metabolizable protein, as many of the immune system components are proteins in nature (Kyriazakis and Houdijk, 2006), for example, immunoglobulins, mucoproteins and the interleukins. It is also reported that young lambs can resist the establishment of an artificial parasite infection better and they consequently grow faster when their diet had been supplemented with meat and bone, and soya bean meal containing 20% crude CP, as compared to diet containing 10% CP with equivalent amounts of energy (Coop, 1996). Once the requirements for growth are satisfied, the immune response becomes more effective with the addition of supplementary protein.

There is abundant evidence regarding the positive impact of increasing the protein level more than the energetic one (Coop and Kyriazakis, 2001), even though energetic diet will definitely helps to overcome the infection in severely affected animals. However, the potential of metabolisable protein to resist GI parasite infections depends on the requirement relative to its supply in the diet and demand for other competing physiological functions.

Fats and Energy supplementation: Fats and energy supplementation when fed with dietary protein can potentially reduce parasitic load and enhance the immune response. Research results showed greater immune response against GI parasitic infections in fish oil supplemented sheep than sheep fed with other linoleum acid dietary sources. Diets with oil or protected /bypass fat sources containing n-3 and n-6 fatty acids may become an interesting GI parasite control strategies [muturi et al., 2005], as n-3 PUFAs have anti-inflammatory properties and n-6 PUFAs are generally known for their pro-inflammtory effects. Two groups of *Trichostrongylus Colubriformis* infected lambs were fed with n-3 fatty acids and n-6 fatty acids. Lambs fed n-3 fatty acids had significantly more worms than those fed n-6 or neutral lipids. As development of protective immunity to *T. colubriformis* is thought to involve local inflammation, this result is consistent with the hypothesis that dietary omega-3 lipid is exerting an anti-inflammatory effect on the local immune response [Afonso et al., 2013]

Mineral and Vitamin supplementation: The amount of trace minerals required for normal metabolism in animals is usually <100 mg/Kg (McDowell, 1992), and their quantity in the serum of animals is around 2 ug/ml (Suttle, 2010). Trace minerals play significant roles in controlling gut health and immune response, even though they are needed by the animals in very little amount. Young sheep infected with GI parasites cannot utilized Ca and P efficiently. It has also been reported that the GI parasitic infection in gastro-intestinal tract adversely affects the calcium, phosphorus and magnesium deposition in growing animal, which can further affect bone mineralization (Koski and Scott, 2003). Zinc plays a vital role to develop a strong immune response against GI parasites (Koski and Scott, 2003). Iron had presumably no direct effect on GI parasites control; however, supplementation of iron improves host performance as it restores the iron that is lost from the body through blood during GI parasitic infections. Supplementation of Copper oxides particle (5g) was found to decrease the number of *Trichostrongylus Colubriformis* and *Haemonchus contortus* by 56 and 96%, respectively; but had no significant effect on *T. colubriformis* in lamb. Feeding balanced minerals is crucial for overall health and many researchers have reported adverse effects of feeding both excess and mineral deficient diets. Excess manganese may increase the occurrence of infection as GI parasites require it for their growth and survival and perhaps toxic to immunity response. Dietary selenium is also an essential micronutrient that helps to obtain optimal immune responses. Through its incorporation into seleno-proteins, Se is involved in regulating oxidative stress, redox, and other crucial cellular processes in nearly all tissues and cell types, including those involved in innate and adaptive immune responses.

Like minerals, vitamins have diverse functions. Vitamin A is necessary for immune cell function . On the other hand, vitamin E provides protection against free radicals. Many researchers have reported the importance of Vitamin A and E in general animal health and disease resistance.

Vitamin D3 was found to increase lymphocytes circulation, eosinophil vacuolization percentage and thus favor Th2 immune response, a hallmark of GI parasitic infection.

CONCLUSION

Nutrition plays an important role in controlling GI parasites by influencing the host's ability to resist infection, cope with its effects, and have even direct impact on the parasite population, however more specific research work is needed in the future to understand better. In fact, it would be easier to address many of the nutritional questions about parasitism in non-ruminant hosts because they have a less complicated digestive system. This popular article has attempted to explain the direct and compounded effect of nutrition on GI parasites control, health status, and productive performance of livestock.

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