3rd National Congress Of Animal parasitic Diseases and Zoonoses

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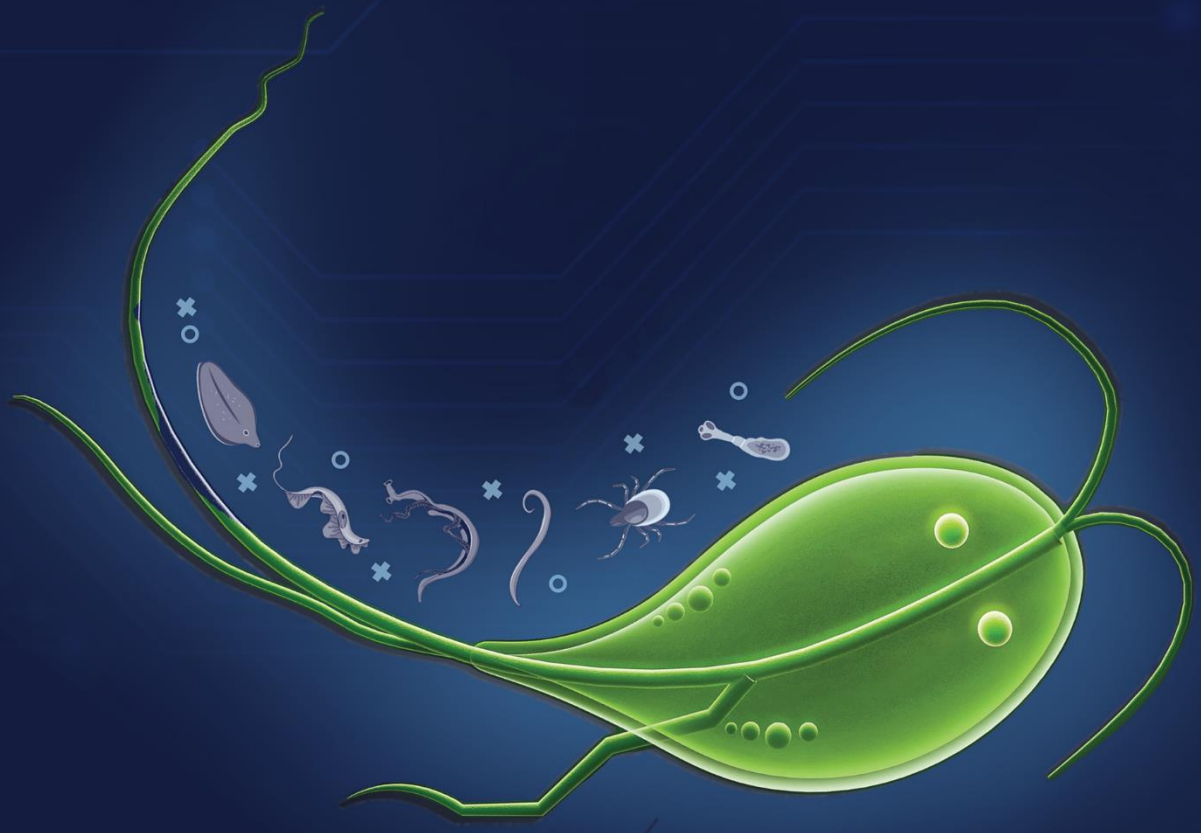

سومین کنگره ملی بیماری‌های انگلی دام و بیماری‌های انگلی مشترک انسان و حیوان

3rd

دانشگاه فردوسی مشهد

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National Congress of Animal Parasitic Diseases and Zoonoses

Ferdowsi University of Mashhad - September 2025

سومین کنگره ملی
بیماری‌های انگلی دام و انگل‌های مشترک انسان و حیوان

The 3rd National Congress Of Animal Parasitic Diseases and Zoonoses

دانشگاه فردوسی مشهد، ۲۶ و ۲۷ شهریور ۱۴۰۴

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ایمیل: Paravet3@um.ac.ir تارنما: Paravet3.um.ac.ir

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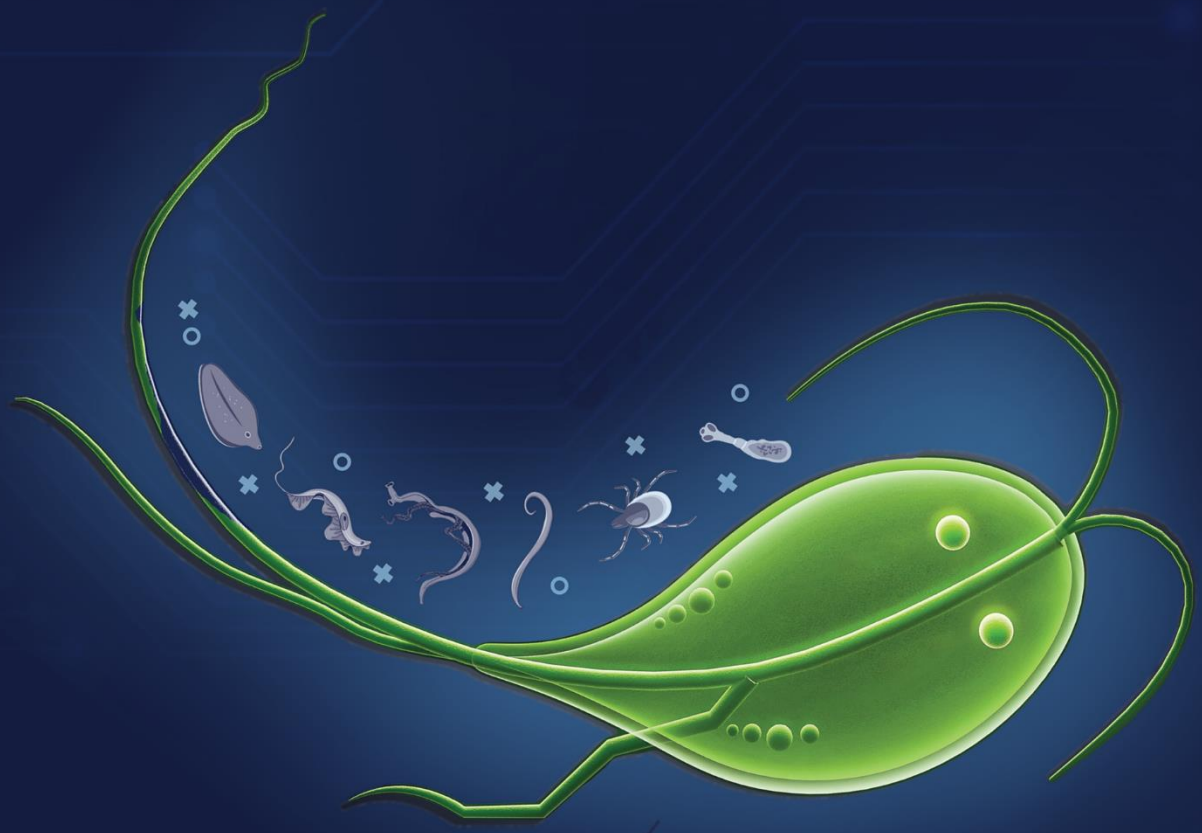
ORAL PRESENTATION



Effects of Some Parasitic Infections on the Physiology of Central Feeding Behavior and Energy Balance in Birds

Farshid Hamidi[1]

Corresponding author: Farshid Hamidi, Farshidhamidi@um.ac.ir

1. *Department of Basic Sciences, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran.*

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Abstract

Background: Intestinal parasitic infections are among the important factors that disrupt energy balance and feeding behavior in birds. These parasites disrupt the physiological function of the digestive tract by damaging the intestinal mucosa, reducing absorption, and stimulating immune responses. Reduced nutrient digestibility, changes in enzyme secretion, and increased energy expenditure to combat inflammation are common consequences of these infections, which directly affect energy balance.

Methods: Several sources were reviewed on this subject. Animal behavior refers to any action, reaction or activity that an animal performs in response to various stimuli or for various reasons. Of course, these internal changes are accompanied by the appearance of specific behavioral signs, including decreased appetite, altered feeding patterns, aggression and reduced motivation to search for food.

Results: Studies have also shown that parasitic infections can alter the composition of the gut microbiota, thereby affecting the neural and hormonal pathways associated with food intake and metabolism.

Conclusion: Focusing on avian feeding behavior, this article demonstrates the physiological and behavioral aspects of how gastrointestinal parasites affect physiological feeding behavior and how local disturbances in the gut can lead to widespread changes in behavior and energy balance. The aim of this review is to highlight the importance of physiological interpretation of behavioral findings in veterinary studies of avian animals, especially in situations where changes in feed intake or feeding behavior may be only a secondary sign of an underlying pathology.

Keywords: Physiological effects, Feeding behavior, Birds, Energy balance, Parasitic infections.

Introduction:

Parasitic infections, especially in farmed species such as poultry, can be an important challenge in maintaining health and growth and productivity. These parasites not only directly attack tissues, but also affect basic behaviors such as feeding, drinking, and locomotion by causing physiological disorders and stimulating immune responses.

In birds, the hypothalamus functions as a central hub where feeding behavior is orchestrated through the activity of its specialized nuclei. The arcuate, lateral, ventromedial, paraventricular, and dorsomedial regions act in concert to sense metabolic cues and translate them into signals of hunger or satiety. These nuclei are not passive relay stations; rather, they are dynamic centers where orexigenic and anorexigenic pathways converge and are finely tuned. For poultry, especially broiler chickens, this regulation directly shapes growth, feed efficiency, and even responses to environmental challenges (1).

One of the first signs of parasites in birds is a decrease in food consumption and a change in feeding patterns. This is particularly common in gastrointestinal infections such as coccidiosis (caused by Eimeria spp.). In this disease, direct damage to the intestinal mucosa reduces the ability to absorb nutrients and provokes pain during digestion. Such a reaction leads to a decrease in the bird's desire to eat, even in conditions of starvation. Also, in infections with roundworms such as Ascaridia galli, the physical presence of the parasite in the small intestine can cause partial obstruction, a feeling of fullness, and subsequently a decrease in the frequency of visits to the feeder to eat (2). In infections such as Heterakis gallinarum (nematode parasite that lives in the cecum of some birds) or Capillaria spp. (around 30mm in length), although the severity of clinical signs may be less severe, birds experience a gradual decrease in weight gain and a decrease in feed conversion ratio. This decrease usually occurs in the absence of severe outward signs, and only by carefully assessing weight changes, recording feeding behavior, and ultimately performing a necropsy can the underlying cause be identified (3).

The present paper, focusing on the impact of common parasites on birds, examines the behavioral and metabolic changes caused by these factors.

Materials and Methods:

Numerous articles and sources were reviewed that had investigated and experimented on bird food intake and the function of hypothalamic nuclei, and on the other hand, some studies showed a decrease in this function in parasitic infections. These connections and dependencies were further investigated.

Results and Discussion:

Reduced feed intake, together with increased metabolic costs due to the activation of the immune system, ultimately leads to energy imbalance in infected birds. In many cases, birds not only lose weight but also lose their fat and protein reserves. Numerous studies have shown that in chronic parasitic infections, the daily growth rate is significantly reduced, in other words, the growth of these birds lags behind their age group.

Interestingly, sometimes infected birds not only eat less, but their eating patterns also change. For example, decreased concentration during feeding, frequent interruptions of eating, and restlessness have been observed. These behaviors may be due to the effects of inflammation on the central nervous system and appetite control pathways, which, have been discussed in other sections (4).

Functional Behaviors

Animal behavior refers to any action, reaction, or activity that an animal performs in response to various stimuli or for various reasons. For example, some birds migrate to tropical regions with the onset of the cold season. There is also an interesting behavior in the case of worker ants, in that they spend the spring and summer collecting food and carrying it to their nest. Even a turtle goes into its shell when it senses danger. Many animals, when faced with an enemy, assume a frightening appearance, raise their hair, and appear larger than they really are. These are examples of animal behavior.

Behavior is a set of actions that an animal performs or does not perform in response to a stimulus. There are two types of stimuli for behavior: internal stimuli and external stimuli. Hunger and thirst are internal stimuli. The smell of food, the sight of an enemy or another person are external stimuli for behavior. One of the most important behaviors in birds, which is also indirectly very important for humans, is feeding behavior (1,5).

In addition to decreased appetite and growth retardation, parasitic infections are often accompanied by changes in the bird's general behavioral pattern. Infected birds are usually less inclined to move, play, and even respond to environmental stimuli. Decreased level of consciousness, standing with a retracted neck, drooping wings, and sometimes half-open eyes are among the symptoms that, although not specific, can be used as early signs of subacute or chronic infection along with other indicators. This allows for timely diagnosis.

Some studies have shown that the time spent resting and sitting per day in infected birds increases by up to twofold. This behavior, which is also a kind of tendency to isolate, is probably due to a feeling of digestive discomfort, muscle weakness, or the immune system's attempt to save energy. In severe infections, birds may even selectively restrict their intake of certain compounds, such as high protein or minerals, experiencing a type of selective anorexia! This condition can be considered in interpreting the physiological state of the bird (5).

The link between hypothalamic inflammation and energy control

Currently, there is no direct and definitive research information on the effect of parasitic infections on the specific function of hypothalamic nuclei in energy balance and feeding control. However, there are some relevant pathways and preliminary studies that may shed light:

Inflammation in the hypothalamus, even in the absence of a parasitic agent, can lead to dysregulation of energy balance and appetite. For example, the hypothalamus plays a central role in the control of food intake and energy expenditure; and inflammatory disorders (such as activation of microglia and astrocytes) may contribute to decreased appetite, weight loss, or even obesity (5).

One study suggests that Trypanosoma brucei (the causative agent of sleeping sickness) can enter the arcuate nucleus of the hypothalamus through specific areas such as the median eminence. It has also been suggested that: Parasitic infections can alter behavioral or biological signals in brain centers; for example, Toxoplasma gondii can inhibit the host's anxiety response, possibly involving effects on the hypothalamus or limbic system (6).

Direct studies of the effects of parasites on the hypothalamus in the context of energy balance are still limited. However, the entry of some parasites such as Trypanosoma brucei into hypothalamic regions can have consequences on the central function of this region. On the other hand, hypothalamic inflammation, which can be caused by various infections, affects appetite and energy regulation. Nuclei such as the arcuate nucleus, VMH, DMH and LH play a critical role in the regulation of feeding and energy (7).

Areas such as the median eminence provide a relative permeability to blood signals, allowing cytokines to reach the environment surrounding the arcuate nucleus via various pathways. This access can alter the activity of neurons controlling appetite. Studies with Trypanosoma brucei and other parasites have shown that parasite invasion and local inflammation occur in ME/ARC and are associated with behavioral-metabolic changes (8).

Diagnostic applications of physiology in parasitology

In situations where laboratory tests or necropsy are expensive or time-consuming, feeding behavior and growth rate can be used as early, non-invasive and inexpensive indicators (9). This approach has high practical value, especially in industrial flocks with high volume and the need for rapid monitoring. In infections such as ascariasis or capillariasis, which are generally chronic and asymptomatic, the use of modeling changes in feed intake, feed conversion rate and bird alertness level can be useful in designing automated monitoring algorithm. This issue has presented a new path for researchers in the connection between physiological sciences , veterinary medicine and new technologies and their integration (3).

Parasitic infections affect avian physiology through various central and peripheral pathways, the most prominent of which include decreased appetite, impaired energy balance, reduced growth, and behavioral changes. Also parasitic infections can also release inflammatory or proinflammatory factors directly or indirectly (via host immune stimulation), and these factors can signal through specific structures around the arcuate nucleus, particularly the median eminence (ME) and other "periventricular structures", and affect the neuronal populations of the arcuate nucleus.

Finally, the link between behavioral physiology and parasitology is a dynamic and promising path for future research, field studies, and applied projects in the field of avian veterinary medicine.

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