

Biotica  
Research

Today

Vol 3:7 <sup>644</sup>  
2021 <sup>647</sup>

## Important Parasitic Zoonosis of Livestock in Northeastern Hilly Region of India

J. K. Chamuah<sup>1\*</sup>, B. R. Maharana<sup>2</sup>,  
Vivek Joshi<sup>1</sup>, L. Ezung<sup>1</sup>, K. P. Biam<sup>1</sup> and  
S. S. Hanah<sup>1</sup>

<sup>1</sup>ICAR-NRC on Mithun, Medziphema, Nagaland (797 106),  
India

<sup>2</sup>Regional Research Station, LUVAS, Karnal, Haryana  
(132 001), India

 Open Access

### Corresponding Author

J. K. Chamuah

e-mail: [drjayantavet@gmail.com](mailto:drjayantavet@gmail.com)

### Keywords

Incidence, Parasite, Prevalence, Zoonotic

### Article History

Received in 28<sup>th</sup> July 2021

Received in revised form 29<sup>th</sup> July 2021

Accepted in final form 30<sup>th</sup> July 2021

E-mail: [bioticapublications@gmail.com](mailto:bioticapublications@gmail.com)

### How to cite this article?

Chamuah *et al.*, 2021. Important Parasitic Zoonosis of Livestock in Northeastern Hilly Region of India. *Biotica Research Today* 3(7): 644-647.

### Abstract

Studies on zoonotic parasites are very important particularly in the Northeastern region of India due to the socio-economic, cultural, and feeding habitat of the people of this region. Moreover, a congenial atmosphere in terms of temperature, relative humidity, soil pH, and rainfall are conducive for the growth and propagation of the helminth parasites in domestic animals. Among zoonotic parasites, particularly those of Sarcocystosis, Toxoplasmosis, Hydatid cyst, *Cysticercus cellulosae*, and *Cysticercus bovis* are the most common in the region due to transmission between domestic animals and human beings. Most of the aforesaid zoonotic parasites cannot be detected at antemortem; therefore it is essential to develop a serodiagnostic kit in order to diagnose these diseases at an early stage to reduce the incidence of zoonotic parasites in domestic livestock. This will help in formulating future control strategies on these parasites.

### Introduction

The Northeastern region of India is exceptionally rich in a variety of natural resources and great cultural diversity that exists among all the tribal population of this region. Approximately 70% of the livelihood activities depend on agriculture and livestock. Livestock rearing plays a key role in their lives for fulfillment of economic demands and hunger for animal protein. Furthermore, 90% of the population of the region is non-vegetarian. Because of the culture, lifestyle, and feeding habits, the people of this region are more prone to different zoonotic diseases as they consume a wide variety of meat and meat-based products. The parasitic zoonosis is one of the most important causes of the loss of productivity in domestic livestock as well as it poses a severe threat to public health. Unfortunately, the economic losses to these livestock owners, morbidity, and mortality of livestock caused by these parasitic infections have not been properly studied. The distributions, prevalence, and severity of disease are always dependent upon interactions between the parasites, host, and the vector's biology, and prevailing environmental change along with the sociocultural practice adopted by the people. This aspect needs to be considered while assessing or developing regional control programs for the northeastern region of India.

Important Parasitic Zoonosis of Northeastern Hilly Region are discussed below.

### Taeniasis and Cysticercosis

It is caused by two parasites of zoonotic importance *i.e.*, *Taenia saginata* and *Taenia solium*. Taeniasis is one of the important zoonotic parasites that affect millions of people around the globe. Prevalence is mostly seen in beef-eating

countries where hygienic is less maintained. About 75% of the population may harbor the parasites where beef forms a part of the normal diet. From the northeastern state of Assam in India, the breed wise prevalence of Porcine cysticercosis in three districts was found more in crossbred (12.53%) more than in the local breed (7.49%) (Borkataki et al., 2012). It is endemic in India particularly the Northeast Hill regions. The disease is transmitted via the ingestion of infected cysticerci in undercooked meat such as pork (*T. solium*) or beef (*T. saginata*), through the ingestion of food, the water of vegetables contaminated with the eggs. Taeniasis most often cause by *T. saginata*, showing the common symptoms of discharge of gravid proglottids from the anus, irritations and anal itching, abdominal pain, nausea, reduce appetites, and headache. The cysticerci of *T. saginata* are transmitted to humans through the ingestion of raw or inadequately cooked beef. Infected farm-workers and indiscriminate defecation by people in open fields is a potential source of contamination. Transmission can also mechanically possible by birds, earthworms, beetles that fed raw sewage sludge.

Cysticercosis refers to the tissue infection after it is being exposed to eggs of *T. solium* also referred to as the pork tapeworm. It is mainly acquired due to the contaminated and unhygienic feed or water intake along with the viable eggs of *T. solium*. In pigs, cysts are distributed in the striated muscles like the heart, tongue, and skeletal muscle like the forearm. The cysts were also found in the liver, lungs, spleen, eye, conjunctiva, and nervous system of pigs, which remain viable for a long time and causing condemnation of meat, resulting in severe economic losses to the pig producer.

The most common route is through raw-eaten vegetables which have been grown in fields irrigated with untreated sewage or wastewater. Other potential sources of fecal-oral contamination are an admixture of sewage water with drinking water in pipelines and through houseflies and cockroaches. Cysts are formed in the brain and muscles which may persist for years. Generalized muscle pain, painful nodules in the muscles, and seizures when the cysts are located in the brain are the common symptoms. Cysticerci cyst can develop in any voluntary muscle in humans and cause myositis, with fever, headache, and Eosinophilia. These cysts may block the outflow of cerebrospinal fluid and present with symptoms of increased intracranial pressure. Neurocysticercosis involving the spinal cord. Most commonly presenting as back pain and Radiculopathy.

The diagnosis of neurocysticercosis is mainly clinical, based on a compatible presentation of symptoms and findings of the imaging studies like Computed Tomography (CT) scan shows both calcified and uncalcified cysts, as well as distinguishing active and inactive cysts. MRI is more sensitive in the detection of intraventricular cysts. The prevention can be achieved by massive chemotherapy of infected individuals by Niclosamide

at 10 mg/kg body weight and Praziquantel at 10 mg/kg body weight, improving sanitation, by educating people, cooking of pork or freezing it and inspecting meat, and by treating or vaccinating pigs.

## Toxoplasmosis

It is caused by a parasite known as *Toxoplasma gondii*. Humans acquire infection by ingestion of tissue cysts present in raw or undercooked beef, lamb, pork, and ingestion of the oocysts from the soil, water, milk, or vegetables. Toxoplasmosis is present in every country of the world and seropositivity rates range from less than 10% to over 90%. Human infection is acquired by ingestion of tissue cysts in raw, poorly cooked meat of pork and lamb or ingestion of sporocysts derived from cat feces containing soil or inadequately washed vegetables. The majority of congenital infections occur when the mother acquires the infection during pregnancy. Incidence in animals and man depends on the environmental conditions like climate, animal fauna, cultural habit, and feeding habitat of the people and also varies according to the different geographical area. Toxoplasmosis infection is also acquired either by ingestion of food contaminated by mature oocyst or by eating undercooked or raw infected meat. Mechanical transmission is also possible through cockroaches and flies that can spread the oocyst mechanically. Infection as a result of laboratory, autopsy accidents, and handling without any proper care or precautionary measures, blood transfusion is also possible. In acute toxoplasmosis, clinical symptoms are mild influenza, muscle aches, and pain, swollen lymph nodes. Acute toxoplasmosis develops severe forms in young children and immuno-compromised people. This can cause encephalitis or necrotizing retinochoroiditis. Infants infected via placental transmission may be born with either of these problems or with nasal malformations. Swollen lymph nodes are commonly found in the neck or under the chin, followed by the axillae (armpits) and the groin. Enlarged lymph nodes may subside in one to two months in 60% of cases. However, a quarter of those affected takes two to four months to return to normal (Dubey et al., 2006). Most infants who are infected while in the womb have no symptoms at birth but may develop symptoms later in life. Skin lesions including roseola and erythema, multiforme-like eruptions, prurigo-like nodules, urticaria, and maculopapular lesions in acquired forms of diseases. Newborns may have punctate macules, ecchymoses, or blueberry muffin lesions (Dubey et al., 2006). In Mithun, out of 195 animals examined, only 8 (4.10%) animals were found to be suspected and one (0.51%) animal was found to be positive from the Northeastern hilly region of India (Chamuah et al., 2015).

The Immunofluorescence Antibody Test (IFAT), Latex Agglutination Test (LAT), Direct Antiglobulin Test (DAT), Sabin-Feldman dye test, Complement fixation test, Modified agglutination test, and Enzyme-linked Immunoassay (ELISA)

are used more commonly used serological tests for diagnosis of toxoplasmosis. In congenitally infected babies, detection of *Toxoplasma*-specific IgA antibodies is more sensitive than IgM detection. Detection of *T. gondii* in human blood samples, Cerebrospinal Fluid (CSF), and amniotic fluid may also be achieved by using the polymerase chain reaction.

### Hydatid Cyst

**H** ydatid cyst is a zoonotic disease, one of the growing concerns in developing countries like India, and as far as India is concerned, the Northeastern region of India is gaining attention in this regard due to the socio-economic, cultural, and feeding habitat of the people of the regions. Among zoonotic parasites, *Cystic echinococcosis* (CE), caused by the metacestode stage of the tapeworm *Echinococcus granulosus* is a neglected zoonotic disease-producing economic loss in animals, high morbidity and mortality rates in humans. The geographical distribution and endemicity of CE differ by country as well as by region and are influenced by different biotic and abiotic factors. Moreover, high environmental egg concentration in a specific rural area can be an epidemiologically important issue related to CE transmission. The life cycle of an *E. granulosus* involves a definitive host (dogs or other canids) for the adult *E. granulosus* that occurred in the intestine and an intermediate host (sheep and other herbivores) for the tissue-invading metacestode (larval) stage particularly found in the liver, lungs, spleen, kidney, eye and even in the brain. Humans are only incidentally infected through consumption of infected meat containing hydatid cysts with viable protoscoleces. Different workers have reported the prevalence of hydatid cysts; however, molecular characterization of parasites is very scanty.



Figure 1: Hydatid cyst of spleen recovered from Mithun (*Bos frontalis*)

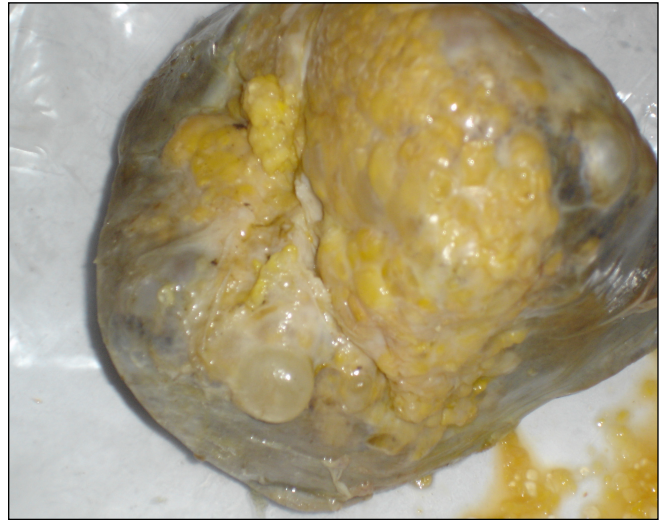


Figure 2: Hydatid cyst in liver recovered from Mithun (*Bos frontalis*)

### Clinical Symptoms

**A** mong different helminths, hydatidosis is one of the diseases, which affect all domestic livestock, and in Mithun causing pressure atrophy of the affected organs. Symptoms and lesions may vary depending on the organs affected (Chamuah, 2005). Due to the asymptomatic nature of infection in livestock, surveillance for cystic echinococcosis in animals poses a serious problem for diagnosis. Antemortem diagnosis of hydatidosis is a difficult task, although it can easily be diagnosed post-mortem. Based on molecular probes like internal transcribed spacer region (ITS), ribosomal DNA, and the mitochondrial enzyme Cox1 and Nad1, *Echinococcus granulosus* genotypes have been identified (Chamuah *et al.*, 2016). Interestingly, *E. ortileppi* the most zoonotic parasite has been also identified from Mithun.

### Sarcocystis Infection

**S** arcocystis also considered as one of the important meat-borne emerging zoonotic parasites in both domestic, wild animals, and human beings. Herbivores and omnivores animals are their intermediate hosts and carnivores and man are the final hosts. *Sarcocystis* species form septate cysts in different organs of the body such as the heart, diaphragm, esophagus, skeletal muscle, eye, tongue, and rarely the brain of domestic animals such as cattle, buffaloes, pigs, sheep, goats, and other animals. Infection with some species of *Sarcocystis* such as *S. boincanis* caused decreased feed intake and milk production. Poor productivity, lameness, recumbency, and abortion have also been attributed to *Sarcocystis* species. *S. Canis* was associated with encephalitis, hepatitis, and generalized coccidiosis in dogs. *Sarcocystis hominis* from beef and *Sarcocystis sui hominis* from pork infect human beings resulting development of fever,

headache, and myalgia with elevated serum enzyme levels, and eosinophilia is always confirmed by finding *Sarcocystis* in muscle biopsy specimens. From the northeastern state of Assam, the occurrence of sarcocystosis in cattle was evaluated by modified Agglutination test (MAT), Agar gel precipitation test (AGPT), counter immunoelectrophoresis (CIEP), and Indirect haemagglutination test (IHAT), (Kalita *et al.*, 2015). The severity of the disease is closely related to the dose of infection and the immune status of the host. The developmental stages in the vascular endothelial cells of the inner organs are more harmful than those in the muscular or nervous tissue. The species affecting ruminants are considered the most pathogenic and new infections are of special significance.

### Conclusion

Zoonotic parasitic diseases which are prevalent in India and are of serious concern are taeniasis, cysticercosis, and toxoplasmosis. All these diseases are transmitted either by direct contact or by ingestion of pathogens. They usually manifest as chronic infections and affect various important organs of our body. Most of them are associated with significant morbidity and mortality. Though there are wide arrays of diagnostic tests available for these diseases which range from microscopic detection of the pathogens to sophisticated molecular diagnostic methods, serological tests would be the mainstay of the laboratory diagnosis in the Indian scenario as they would be cost-effective. Rigorous

surveillance and mass deworming with suitable anthelmintic will be the ultimate aim and goal for the people of the north-eastern hilly region to safeguard the people.

### References

- Borkakati, S., Islam, S., Borkakati, M.R., Goswami, P., Deka, D.K., 2012. Prevalence of porcine cysticercosis in Nagaon, Morigaon, and Karbianglong district of Assam, India. *Veterinary World* 5(2), 86-90.
- Chamuah, J.K., Sakhrie, A., Khate, K., Vupru, K., Rajkhowa, C., 2015. Seroprevalence of *Toxoplasma gondii* in Mithun (*Bos frontalis*) from the northeastern hilly region of India. *Journal of Parasitic Diseases* 39(3), 560-562.
- Chamuah, J.K., 2005. Studies on some aspects of parasites of Mithun (*Bos frontalis*). M.V.Sc. A thesis submitted to Assam Agricultural University, Khanapara, and Guwahati, p. 22.
- Dubey J.P., Hodgins, E.C., Hamir, A.N., 2006. Acute Fatal Toxoplasmosis in Squirrels (*Sciurus carolinensis*) with Bradyzoites in Visceral Tissues. *Journal of Parasitology* 92, 658-659.
- Kalita, M., Sarmah, P.C., Singh, S.K., 2015. Evaluation of modified agglutination test in the detection of antibodies against *Sarcocystis cruzi* and *Sarcocystis hirsuta* of cattle. *International Journal of Recent Scientific Research* 6(8), 5968-5970.