

Review Paper

**TAENIASIS, A SIGNIFICANT PARASITIC ZOOONOTIC DISEASE: A
CRITICAL REVIEW**

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Abstract: Taeniasis is a parasitic disease due to infection with tapeworms belonging to the genus *Taenia*. Two parasites important in Taeniasis are *Taenia saginata* (beef tapeworm) and *Taenia solium* (pork tapeworm). Taeniasis is generally asymptomatic, but severe infection causes weight loss, dizziness, abdominal pain, diarrhea, headaches, nausea, constipation, chronic indigestion, and loss of appetite.

Keywords: Parasitic disease, *T. saginata*, *T. solium*.

Introduction

Taeniasis is a group of cestode infections which are important zoonoses. Taeniasis is a parasitic disease due to infection with tapeworms belonging to the genus *Taenia*. Two parasites important in Taeniasis are *Taenia saginata* (beef tapeworm) and *Taenia solium* (pork tapeworm). These are classified as Cyclozoonosis because they require more than one vertebrate species to complete developmental cycles. Taeniasis is generally asymptomatic, but severe infection causes weight loss, dizziness, abdominal pain, diarrhea, headaches, nausea, constipation, chronic indigestion, and loss of appetite. A type of taeniasis called cysticercosis is caused by accidental infection with the eggs of *T. solium* from contaminated food and water. It is known as the most pathogenic form caused by tapeworms [1]. A specific form of cysticercosis called neurocysticercosis is said to be the most common infection of the central nervous system.

***Taenia saginata* (Beef tapeworm)**

This parasite is virtually global in distribution, wherever beef is eaten. Highly endemic regions where prevalence rates exceeding 10% exist in some African countries, south of the Sahara in Eastern Mediterranean countries and in parts of USSR. There is moderate prevalence in Europe, generally in most of the Indian subcontinent, Southern Asia and in

Japan, Australia, Canada and USA are generally regarded as low endemic area with high prevalence rate below 0.1%. The larval stage of *T. saginata* i.e. *Cysticercus bovis* occurs almost all over the world. In some East African countries 30 – 80 % prevalence rates had been noted. In European countries it is found in 0.3 – 0.4 % of slaughtered animals.

Parasite is 5 – 12 m long and about 1000 proglottids. It occurs in small intestine of man. Gross morphology is similar to *T. solium* except that scolex is unarmed.

Life cycle

Life cycle pattern is similar to that of *T. solium* but in *T. saginata* the *Cysticercus bovis* or Metacestode develops in the striated and cardiac muscles of cattle about 10 weeks after the infection. Human beings become infected by eating uncooked or insufficiently cooked meaty beef. Adult tapeworm develops in small intestine about 100 days after infection.

***Taenia solium* (Pork tapeworm)**

Taenia solium (Pork Tapeworm) is of 3–5 m long, composed of 800 – 900 proglottids, present in small intestine of man.

T. solium infection is endemic in many countries, where pigs are consumed i.e. in Latin America, Africa, some parts of Europe and USSR. It is endemic in India and has been widely reported. The Human Cysticercosis caused by *T. solium* is far more important public health problem than Human Taeniasis.

Life cycle

The gravid proglottids, each containing about 40,000 eggs are passed in the faeces of infected person. Pigs which are intermediate host swallow ground segment and eggs are present in the faeces. About 10 weeks after infection *Cysticercus cellulosae* or Metacestode develops in striated and cardiac muscle of pig. The pork which is infected with *C. cellulosae* known as Measly pork. The adult tapeworm develop in the intestine of man about 100 days after infection.

Mode of transmission [2,3 and 4]

1. Through ingestion of infective Cysticerci in undercooked beef (*T. saginata*) or pork (*T. solium*).
2. Through ingestion of food, water or vegetables contaminated with eggs.
3. Auto-infection may occur through hand to mouth infection of eggs lodged in unwashed hand.

Incubation period

Incubation period for adult tapeworm is 8 – 14 weeks.

Clinical symptoms

The impact of tapeworm infection in man is difficult to quantify because in the majority of cases don't lead to clinical ill health except occasional abdominal discomfort, anorexia and chronic indigestion. Straying of proglottids may sporadically cause appendicitis and cholangitis. The most serious risk of *T.solium* infection is Cysticercosis. Taeniasis is generally asymptomatic and is diagnosed when a portion of the worm is passed in the stool. It is not fatal, although cysticercosis can cause epilepsy and neurocysticercosis can be fatal [2,5,6].

Diagnosis

Diagnosis of taeniasis is mainly using stool sample, particularly by identifying the eggs. However, this has limitation at the species level because tapeworms basically have similar eggs. Examination of the scolex or the gravid proglottids can resolve the exact species [7]. But body segments are not often available, therefore, laborious histological observation of the uterine branches and PCR detection of ribosomal 5.8S gene are sometimes necessary [8 and 9]. Ziehl–Neelsen stain is also used for *T. saginata* and *T. solium*, in most cases only the former will stain, but the method is not entirely reliable [10]. Loop-mediated isothermal amplification (LAMP) is highly sensitive (approx 2.5 times that of multiplex PCR), without false positives, for differentiating the taenid species from fecal samples [11].

Prevention and control

Taeniasis can be controlled by following methods:

1. Treatment of infected person
2. Meat inspection
3. Health education
4. Adequate sewage treatment and disposal

Early detection and early treatment of *T. solium* cases is essential to prevent human cysticercosis. Affective drugs i.e. Praziquantel and Nuclosamide are available. Surgical removal of symptom producing cyst is indicated. In many countries *T. solium* has been controlled by meat inspection and by the proper housing and feeding of pig. Through cooking of beef and pork is the most effective method to prevent pollution of soil, water and food with human feces. Washing of the hands before eating and defecation are important health educational messages. Improvement of living condition especially safe treatment of sewage used for farming should be aimed.

Treatment

1. Praziquantel in a single dose @ 10 mg/kg body weight and repeated after 14 days, then after 3 months.
2. Niclosamide @ 60 – 80 mg /kg body weight/day (maximum of 2gm/day) for 5 – 7 days.

References

- [1] Neglected Tropical Diseases. cdc.gov. June 6, 2011. Retrieved 28 November 2014.
- [2] Garcia, Oscar H. Del Brutto, Hector H. (2014). *Taenia solium*: Biological Characteristics and Life Cycle. Cysticercosis of the Human Nervous System. (1., 2014 ed.). Berlin: Springer-Verlag Berlin and Heidelberg GmbH & Co. KG. pp. 11–21. ISBN 978-3-642-39021-0.
- [3] Roberts, Larry S. and Janovy, Jr., John (2009). Gerald D. Schmidt & Larry S. Roberts' *Foundations of Parasitology* (8 ed.). Boston: McGraw-Hill Higher Education. pp. 348–351. ISBN 978-0-07-302827-9.
- [4] Transmission of taeniasis/cysticercosis. Retrieved 13 March 2014.
- [5] About Taeniasis/cysticercosis. Retrieved 13 March 2014.
- [6] Signs, symptoms and treatment of taeniasis/cysticercosis. Retrieved 13 March 2014.
- [7] Jr, Larry S. Roberts, John Janovy, (2009). Gerald D. Schmidt & Larry S. Roberts' *Foundations of parasitology* (8th ed.). Boston: McGraw-Hill. ISBN 0-07-128458-3.
- [8] González, L.M., Montero, E., Harrison, L.J., Parkhouse, R.M. and Garate, T. (2000). Differential diagnosis of *Taenia saginata* and *Taenia solium* infection by PCR. *J. Clin. Microbiol.*, 38 (2): 737–744.
- [9] Zarlenga DS. (1991). The differentiation of a newly described Asian taeniid from *Taenia saginata* using enzymatically amplified non-transcribed ribosomal DNA repeat sequences. *Southeast Asian J. Trop. Med. Public Health*, 22 (suppl): 251–255.
- [10] Jimenez, J.A., Rodriguez, S., Moyano, L.M., Castillo, Y. and García, H.H. (2010). Differentiating *Taenia* eggs found in human stools - Does Ziehl Neelsen staining help? *Tropical Medicine & International Health*, 15 (9): 1077–1081. doi:10.1111/j.1365-3156.2010.02579.x.
- [11] Nkouawa, A., Sako, Y., Li, T., Chen, X., Wandra, T., Swastika, I.K., Nakao, M., Yanagida, Nakaya, K., Qiu, D. and Ito, A. (2010). Evaluation of a loop-mediated isothermal amplification method using fecal specimens for differential detection of *Taenia* species from humans. *Journal of Clinical Microbiology*, 48 (9): 3350–2. doi:10.1128/JCM.00697-10.