

Neurocysticercosis: A Foreign Parasite Looking for “Permanent Resident” Status?

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Neurocysticercosis (NCC), a parasitic disease endemic in the developing world, is now being seen more often in the developed world. Neurocysticercosis is the infection of the nervous system and eye by the larval stage of the *Taenia solium*, a tapeworm that is harbored in the intestine of the pig and the human. Its proglottides release eggs into the stools, and the lack of proper hand hygiene, allows the transmission from human to human (Figure 1).

While the lay knowledge believe that is a disease transmitted by the ingestion of raw pork infected with cysticercosis, the ingestion of it would only allow the development of intestinal taeniasis. Untreated taeniasis in the context of poor hand hygiene, would allow the development of NCC in other humans, but also there have been reports of “direct auto-infection”¹.

Neurocysticercosis is the most common cause of epilepsy worldwide, due to the fact that most of the globe population lives in its developing area (Figure 2), where the disposal of faeces is sometimes not adequate. In most cases, epilepsy represents the primary or only manifestation of NCC, and the seizure

semiology is related to the number and location of the parasites.

Neurocysticercosis can also cause hydrocephalus, when located in the ventricles; headaches, are usually due to increased intracranial pressure. Ischemic strokes are due to obstruction of blood flow. Focal neurological deficits often relate to space-occupying cystic lesions.

Interesting variations relate to location/geography, although this has not been studied in detail. In Latin America, cysticercosis has a preference for the central nervous system (CNS), and usually its “debut” is characterized by the presence of many CNS lesions in different stages of life. In Asia, particularly the Indian subcontinent, cysticercosis has a predilection not only for the CNS, but also for the muscle. In India, NCC usually presents as a single, calcified lesion.

The cause of seizures in NCC is still unknown, as there are millions of patients with asymptomatic cysticercosis. Intense gliosis with subsequent inflammation has been described to be responsible for epileptogenesis², but perhaps mechanical pressure or the metabolic demands exerted by the parasites on

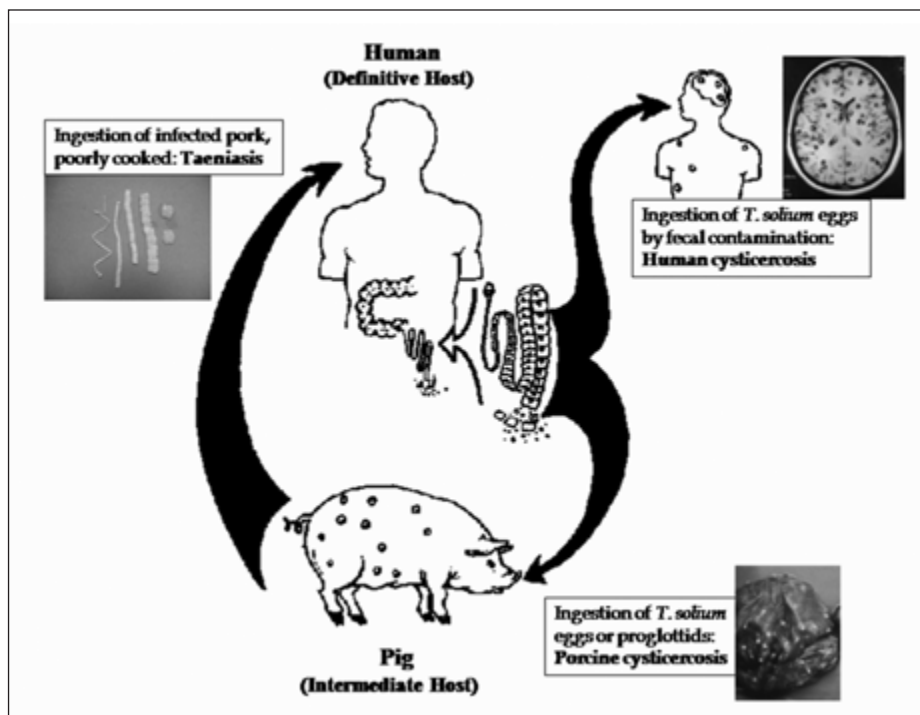


Figure 1: Cycle of life of the cysticercus. Adapted with permission from Garcia HH, Martinez SM (Eds). *Taenia solium taeniasis/cysticercosis*. 2nd Ed. Lima: Editorial Universo; 1999: 346 p.



Figure 2: Map of the world indicating endemic areas of cysticercosis (modified from and taken with permission from Roman G et al, *Bull World Health Organ* 2000; 78(3): 399).

the brain parenchyma could also be important in the pathogenesis of NCC-related epilepsy³. Furthermore, NCC has been linked to the possible development of mesial temporal sclerosis (MTS), the most common substrate of medically-intractable focal epilepsy. The development of MTS does not appear to be related only to inflammatory mechanisms from frequent seizures due to NCC affecting the temporal lobes, as NCC lesions outside the temporal lobe have also been linked to the development of MTS. This controversial topic warrants further research; and given the fact that NCC is unique because it is the only infection or process where large numbers of normal persons are commonly infected with a seizure-causing agent, properly designed studies of affected populations can be used to answer fundamental questions about the genesis and treatment of epilepsy⁴.

As Dr. Del Brutto has reported in this issue⁵, most cases in Canada have been described in immigrants and in Canadians returning home from endemic areas, but there has been some “native Canadian” cases, most likely the result of being in contact with carriers of taeniasis.

The current migratory patterns will allow us to see not only diseases that were eradicated from this land decades ago, but also diseases that have never been seen. An example is NCC. Neurocysticercosis is an important public health problem in developing countries, as well as industrialized nations like Canada. Cysticercosis imposes serious economic losses, not only because it affects individuals in their productive ages, but also infected animals represent a burden to the swine industry in endemic areas⁶. Given the outbreak of NCC in Brooklyn, NY in 1992, and the increasing number of cases in California, cysticercosis is now a reportable disease in all the states of the Union, and they are closely surveyed by the CDC. This has allowed the identification of local cases in areas that were considered free of disease⁷. Adequate surveillance and reporting of NCC cases, might allow us to identify sources of exposure,

and hopefully would allow us to decrease the incidence of this parasitic disease in Canada that otherwise seems determined to stay permanently.

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