

CONTROL OF *TAENIA SOLIUM* TAENIASIS AND CYSTICERCOSIS BY FOCUS-ORIENTED CHEMOTHERAPY OF TAENIASIS

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Abstract. The mortality, morbidity, and disability due to *Taenia solium* neurocysticercosis are common and serious health problems in some regions, including several Asian countries. Neurocysticercosis in man and cysticercosis in pigs can be controlled by treatment, in man with a single, low (2 1/2 or 5 mg/kg) and safe dose of praziquantel. The problem which remains is the identification of a *Taenia solium* taeniasis foci. The definition of a focus is: *T. solium*-infected or suspected case; household with recent case of epilepsy in family or cysticercosis in pigs; group of houses or a village with high rate of cysticercosis in pigs. In a rural area a focus can be easily identified by tracing infected pigs to their place of origin, or *in vivo* tongue examination. All people with suspected *T. solium* taeniasis in a focus should be treated.

INTRODUCTION

During the last decade one can observe a definite evolution in ideas related to *Taenia solium* taeniasis/cysticercosis (t/c) control measures. In 1982-83, the then state of knowledge was summarized (Flisser *et al*, 1982), and guidelines for surveillance, prevention, and control of t/c, elaborated with an emphasis on the zoonotic character of the infection (WHO, 1983). In 1984-88, the growing public health impact of human neurocysticercosis was obvious due to progress in immunology, diagnosis and treatment of the disease (Flisser *et al*, 1989). In 1986, for the first time control of neurocysticercosis was suggested to be based on eradication of human taeniasis rather than meat inspection, and short-term and long-term control programs were formulated (WHO, 1987). Finally, the PAHO International Workshop on Taeniasis/Cysticercosis held in Porto Alegre, Brazil in October 1990, discussed the principles of control measures in Latin America, including a short-term control program based on focus-oriented chemotherapy of taeniasis (PAHO, 1990; Pawlowski, 1990a). It is only a matter of time until this approach will be accepted by other countries where *T. solium* infection is a problem.

According to the criteria of the International Task Force for Disease Eradication based in Atlanta, USA (1990) *T. solium* infection may be a candidate for control because: (1) in several areas, neurocysticercosis is common and has a considerable impact on human health (Flisser *et al*, 1982; PAHO, 1990); (2) taeniasis in man shows a definite epidemiological vulnerability, being the only source of cysticercosis for man and pigs, a fact neglected so far; (3) effective and practical intervention is available now through the chemotherapy of human taeniasis (Cruz *et al*, 1989); (4) national and international commitment for implementation of the control measures is already present (WHO, 1987; PAHO, 1990), and (5) the cost of such intervention is acceptable, as it uses existing veterinary and medical services for defining t/c foci and distributing an inexpensive medication (less than 20 US\$ per head) (Pawlowski, 1990a).

For practical control reasons, the *T. solium* life cycle should be considered separately for two populations (Fig 1): one in rural areas (A) involved in zoonotic transmission of the infection, as well as in disseminating *Taenia* eggs causing neurocysticercosis; and another one in urban areas (B) involved mainly in fecal-oral transmission spread-

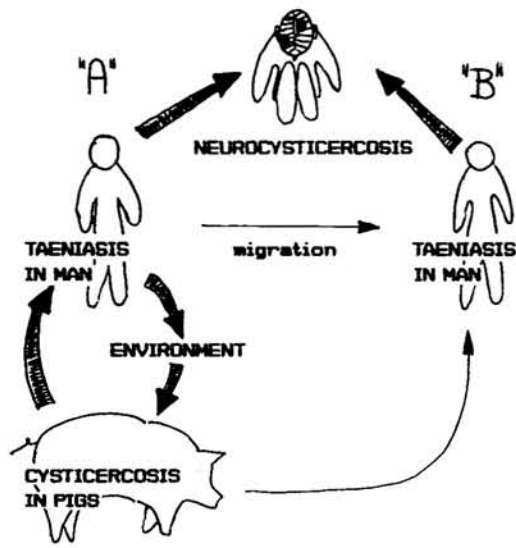


Fig 1

ing neurocysticercosis. Migration of *Taenia*-infected rural people to urban areas is an important factor in spreading neurocysticercosis there; according to Gutierrez *et al* (1990) only 34% of patients with neurocysticercosis in Mexico City were actual residents.

One has to consider two *Taenia* cycles: a biological one and an economic one. The latter involves (Fig 2) small businesses in rural areas, for which selling pigs is a considerable source of income, needs little investment and has small running costs; unlicensed pig dealers who are in-

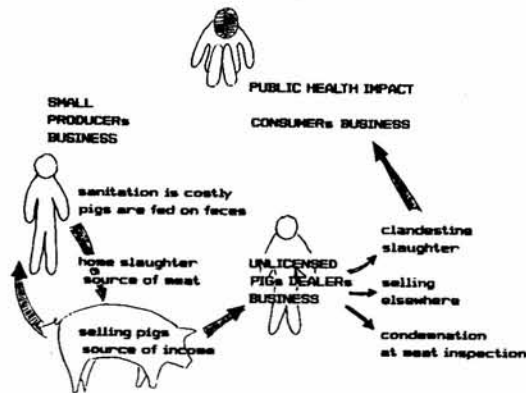


Fig 2

terested in buying cheaply (an infected pig costs less) and selling at the usual price; consumers' businesses, which are not in operation in most developing countries. Many pigs are reared in unsanitary conditions, fed on feces and distributed without any meat inspection. In several areas in Ecuador only 20% of slaughtered pigs are inspected (Cruz *et al*, 1989) and this percentage has a little chance of being increased under severe condemnation rules that create negative motivation towards meat inspection. A compromise between the rural poor business people and health inspections in *T. solium* endemic areas can only be made by offering pig producers a way to stop spreading *Taenia* eggs to other humans and pigs by organized focus-oriented chemotherapy of taeniasis (Fig 3).

The idea of short-term interventions by focus-oriented chemotherapy has been supported by recent observations on focality of *T. solium* infections in endemic areas in Ecuador (Cruz *et al*, 1989) and in Mexico (Sarti *et al*, 1990; Camacho *et al*, 1990). The study in Ecuador (Cruz *et al*, 1989) showed that in Andean areas, endemic for *T. solium* infections, 56% of examined households had pigs, 56% of those pigs had access to human feces, and meat inspection has not been practiced in 80% of the households. A mass treatment intervention revealed that the distribution of *T. solium*

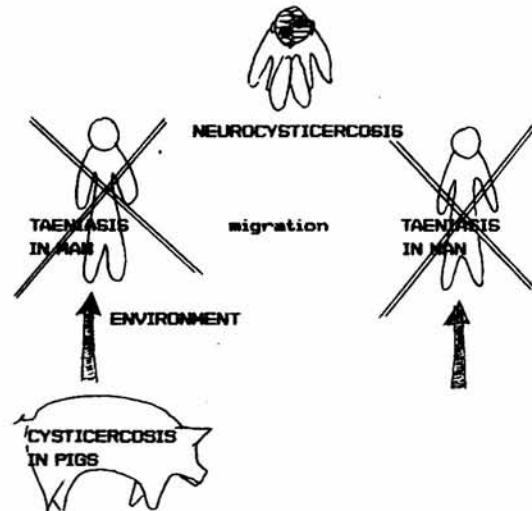


Fig 3

taeniasis varied according to localities and households. In 5 localities out of 26 examined, the reported prevalence rates for *T. solium* taeniasis was between 7.4% and 21.1%; another 5 localities were free of taeniasis. *T. solium* taeniasis was concentrated in 115 households among the 2,602 examined, which means that 7.2% of the population was living in "infected" households. Many of these households could be easily identified by tracing pig cysticercosis found at slaughter back to the farm of origin or by *in vivo* examination of pig tongues at the farm itself (Cruz *et al*, 1989; Gonzalez *et al*, 1990). In Mexico, out of 15 million pigs inspected, 1.55%, ie, 200,000 were found infected (Acevedo, 1990); these data are hardly used for identification of the foci of t/c and eradication of taeniasis in man, as the only source of infection both for man and for pigs.

The definition of t/c focus has been proposed in 1989 (Cruz *et al*, 1989) and finally elaborated in 1990 (PAHO, 1990) as: (1) *T. solium*-infected or suspected individual; (2) household with a recent case of epilepsy in a family, or cysticercosis in pigs; (3) group of houses or a village with high rates of cysticercosis in pigs.

Focus-oriented short-term control programs can easily be implemented in several endemic areas. Their implementation needs only better local medical and veterinary services cooperation, better supply of effective anthelmintics, support in transportation to the foci in peripheral areas, and training of local services in epidemiological surveillance and practical implementation and evaluation of control measures. A recent study performed in Poznan demonstrated that a 2 1/2 mg dose of praziquantel was fully effective in 124 human carriers of *T. saginata* (Pawlowski, 1990b). The efficacy of such a low dose of praziquantel in taeniasis lowers much both the risk and the cost of chemotherapeutic intervention. In a study in Ecuador, it was shown that population-oriented chemotherapeutic intervention was well accepted and that it has a definite effect on promotion of the local health activities in addition to the immediate reduction of *T. solium* infections in man and exposure to neurocysticercosis (Cruz *et al*, 1989).

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