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Taeniasis/cysticercosis trend worldwide and rationale for control

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Abstract

Pig production has increased significantly worldwide in the recent years. Small-scale pig husbandry has become a popular source of income in rural and resource-poor communities in most of developing countries. A parallel increase of human *Taenia* carrier and human cysticercosis is expected but detailed data are not available. However, *Taenia solium* is considered responsible of over 10% of acute case admission to the neurological ward of countries where it is endemic. The control strategy that seems at the moment more promising is a combination of the different tools available and includes the identification of areas at high risk and the presumptive treatment of the suspected cases and their families. This active finding and treatment of probable tapeworm carries should be accompanied by health education and control swine cysticercosis. WHO invite all endemic countries to recognize the importance of taeniasis/cysticercosis control and to collect epidemiological data and to adopt policies and strategies for its control.

Keywords

Cysticercosis control; WHO

1 Introduction

Pig production has increased significantly in the recent years; FAO estimates the world production of pig meat at 25 million ton in 1962 and 95 million tons in 2002 [1]. During the same period the pig meat production in developed countries has doubled while the production in developing countries has increased of over ten times [1].

Small-scale and low -cost pig husbandry has become a popular source of income in rural and resource-poor communities in most of developing countries [2]. Low-cost breeding normally relay on the self-sufficiency of the pigs for food procurement: the pigs are left free in the village and normally have easy access to human excreta [3]. In addition veterinary control is frequently absent [3]. These conditions are known to increase dramatically the prevalence of swine cysticercosis.

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2 Risk evaluation for human taeniasis

The prevalence of swine cysticercosis is frequently considered an indication of the risk for the human population of acquiring taeniasis, however we consider this indicator alone not sufficient to describe the risk of infection with *Taenia solium* by the human population. Even in areas where swine cysticercosis is transmitted at low level, if the quantity of pig meat produced is high, human taeniasis can be remarkable.

For example, East Africa countries report among the highest prevalence of swine cysticercosis in the world, in the Northern areas of Tanzania the prevalence is reported to reach 37% [4]. However, the amount of pig meat produced in Tanzania (12,880 tons in 2002) is only a fraction of the pig meat production in some Asian country (for example Vietnam produced more than 1 500,000 tons of pig meat in 2002): In Vietnam, despite the lower prevalence of swine cysticercosis the amount of infected pig meat available for consumption for each individual is higher than in Tanzania (see Table 1 for calculation details).

Despite the lack of data on human aspect of the disease, the dramatic increase of pig meat consumption in recent year is expected to result in a parallel increase of human *Taenia solium* carriers and human cysticercosis. *Taenia solium* is now considered responsible of over 10% of acute case admission to the neurological ward of countries where it is endemic [5]. This explains the high impact of the disease on human health and productivity.

3 Suggested control strategy and accompanying measures

Most of the information and control experiences on human taeniasis/cysticercosis came from Latin America: where research on the disease has gained interest and the recommendations developed obtained political support [6]. Evidences from that continent [7] show that control measures to control neuro-cysticercosis should be focused on reduce the contamination by human tapeworm carries.

The strategy that is at the moment more promising is a combination of the different tools available and includes:

- (1) Identification of areas at high risk
- (2) Presumptive treatment of the suspected cases and their families.

The identification, in each country, of areas at risk can be obtained by mapping several sets of data that are normally available:

- Report from health services/hospital documenting high prevalence of epilepsy cases. To facilitate this search it would be extremely helpful to declare neuro cysticercosis a reportable disease as suggested by the World Federation of Neurology [8].
- Veterinary reports on swine cysticercosis
- Reports on presence of low cost pig husbandry

Once the areas at risk have been identified rapid tests can be eventually use to screen the population, and reduce the population to be presumptively treated. A promising self-detection tools has been recently proposed by Flisser and others [9], possible alternatives are questionnaires on food habits or on conditions of pig husbandry [10, 11].

Once the communities at high risk are identified, presumptive treatment should be offered in order to reduce the number of eggs of potentially infecting pigs and humans. The most promising drug for large-scale treatment is at the moment Niclosamide

The drug:

- is of very simple administration (single oral dose of 2 g)
- is not absorbed by the intestine [12] and therefore do not affects possible brain cysts in the tapeworm carrier as reported for Praziquantel [13]
- is extremely cheap (approximately 0.10 USD for a 2g dose)

The active finding and treatment of probable tapeworm carries should be accompanied by health education and control swine cysticercosis.

A swine vaccine recently developed [14] is showing promising results as alternative the routine pig treatment with oxafendazole three months before slaughtering [15] and can represent an accompanying measure for control.

Cysticercosis-related epilepsy is a debilitating disease and requires extremely expensive treatment once established. The cost-effectiveness of the control strategy is therefore very high. WHO invite all endemic countries to recognize the importance of taeniasis/ cysticercosis and to collect epidemiological data and to adopt policies and strategies for its rationale control.

References

- [1]. FAO Nutritional Data FAOSTAT. Commodity balances livestock and fish. 2005. Accessible at <http://faostat.fao.org/faostat/collections?version=ext&hasbulk=0&subset=nutrition>
- [2]. Engels D, Urbani C, Belotto A, Meslin F, Savioli L. The control of human (neuro)cysticercosis: which way forward? *Acta Trop.* 2003; 87:177–82. [PubMed: 12781394]
- [3]. Lekule FP, Kyvsgaard NC. Improving pig husbandry in tropical resource-poor communities and its potential to reduce risk of porcine cysticercosis. *Acta Trop.* 2003; 87:111–7. [PubMed: 12781385]
- [4]. Phiri IK, Ngowi H, Afonso S, Matenga E, Boa M, Mukaratirwa S, et al. The emergence of *Taenia solium* cysticercosis in Eastern and Southern Africa as a serious agricultural problem and public health risk. *Acta Trop.* 2003; 87:13–23. [PubMed: 12781374]
- [5]. Garcia HH, Del Brutto OH. *Taenia solium* cysticercosis. *Infect Dis Clin North Am.* 2000; 14:97–119. [PubMed: 10738675]
- [6]. Flisser A, Sarti E, Lightowlers M, Schantz P. Neurocysticercosis: regional status, epidemiology, impact and control measures in the Americas. *Acta Trop.* 2003; 87:43–51. [PubMed: 12781377]
- [7]. Garcia HH, Gonzalez AE, Gilman RH. Cysticercosis Working Group in Peru. Diagnosis, treatment and control of *Taenia solium* cysticercosis. *Curr Opin Infect Dis.* 2003; 16:411–9. [PubMed: 14501993]

- [8]. Roman G, Sotelo J, Del Brutto O, Flisser A, Dumas M, Wadia N, et al. A proposal to declare neurocysticercosis an international reportable disease. *Bull WHO*. 2000; 78:399–406. [PubMed: 10812740]
- [9]. Flisser A, Vazquez-Mendoza A, Martinez-Ocana J, Gomez-Colin E, Leyva RS, Medina-Santillan R. Short report: evaluation of a self-detection tool for tapeworm carriers for use in public health. *Am J Trop Med Hyg*. 2005; 72:510–2. [PubMed: 15891122]
- [10]. Silva-Vergara ML, Prata A, Vieira Cde O, Castro JH, Micheletti LG, Otano AS, Franquini Junior J. [The epidemiological aspects of taeniasis-cysticercosis in an endemic area of Lagamar, Minas Gerais] [Article in Portuguese]. *Rev Soc Bras Med Trop*. 1995; 28:345–9. [PubMed: 8668834]
- [11]. Sarti E, Schantz PM, Plancarte A, Wilson M, Gutierrez OI, Aguilera J, Roberts J, Flisser A. Epidemiological investigation of *Taenia solium* taeniasis and cysticercosis in a rural village of Michoacan state, Mexico. *Trans R Soc Trop Med Hyg*. 1994; 88:49–52. [PubMed: 8154000]
- [12]. Pearson RD, Hewlett EL. Niclosamide therapy for tapeworm infections. *Ann Intern Med*. 1985; 102:550–1. [PubMed: 3977200]
- [13]. WHO Model Prescribing Information. Drug Used in Parasitic Diseases. Second Edition. World Health Organization; Geneva: 1995.
- [14]. Lightowers MW. Vaccination for the prevention of cysticercosis. *Dev Biol (Basel)*. 2004; 119:361–8. [PubMed: 15742647]
- [15]. Gonzales AE, Garcia HH, Gilman RH, Gavidia CM, Tsang VC, Bernal T, Falcon N, Romero M, Lopez-Urbina MT. Effective, single-dose treatment of porcine cysticercosis with oxfendazole. *Am J Trop Med Hyg*. 1996; 54:391–4. [PubMed: 8615453]

Table 1

Estimation of the risk of acquiring taeniasis in Tanzania and Vietnam

Country	Tanzania	Vietnam
Tons of pig meat produced in 2002 (tons)	12 880	1 653 000
Estimated prevalence of swine cysticercosis (range)	15% - 30%	0.5% -1%
Tons of infected meat produced/consumed in 2002 (tons)	1 932 – 3 864	8 250 -16 530
Total population (million)	37	80
Average quantity of infected pig-meat per inhabitant	50 g – 100 g	100 – 200 g