

SHORT REPORT: EVALUATION OF A SELF-DETECTION TOOL FOR TAPEWORM CARRIERS FOR USE IN PUBLIC HEALTH

ANA FLISSER, ALBERTO VÁZQUEZ-MENDOZA, JOEL MARTÍNEZ-OCAÑA, EMILIO GÓMEZ-COLÍN,
RAFAEL SÁNCHEZ LEYVA, AND ROBERTO MEDINA-SANTILLÁN

Dirección de Investigación, Hospital General “Dr. Manuel Gea González” SSA, México DF; Facultad de Medicina, UNAM, México DF; Jurisdicción Sanitaria VI, SSA, Irapuato, Guanajuato, México; Merck-México, México DF

Abstract. The current study was designed to evaluate a tool for the self-identification of tapeworm carriers. Clinical and animal health care practitioners and schoolteachers were trained regarding the life cycle, risk factors, and control measures related to infection with *Taenia solium*. More than 120 small glass bottles with a few tapeworm segments fixed in formaldehyde and an instructional guide were distributed among all clinical practitioners (physicians and nurses) working in health centers. The guide contained 10 key points on how to ask questions about tapeworm infections. Information on taeniosis and cysticercosis was also provided to the general population via different media. Seven tapeworm carriers were recorded in the official epidemiology surveillance system the year previous to the study, compared with the year after the study, when 41 tapeworm carriers (37 *Taenia saginata*; 4 *Taenia solium*) were recorded. Six times more tapeworm carriers were notified after the study. All four persons with *Taenia solium* were treated, thereby eliminating the parasite and subsequently preventing any new cases of human and swine cysticercosis that might have arisen from them.

The current study is based on four widely recognized key points. 1) Human neurocysticercosis is a public health problem in Mexico.¹ It is also frequent in countries of Africa, Asia, and Latin America.² 2) Several epidemiologic studies indicate that the main risk factor for acquiring cysticercosis is the presence of a tapeworm carrier in the household.³ 3) Toilets in Europe during the past century had a design such that feces, after disposal, could be seen to detect macroscopic parasites like tapeworms and *Ascaris* (Z. Pawlowski, personal communication). 4) *Taenia solium* is an eradicable parasite.⁴

Previous studies performed in rural communities in Mexico showed that 5–6% of the inhabitants reported having released tapeworm segments (after being shown photographs and fixed specimens of proglottids). History of releasing tapeworm proglottids was reported by 3 of 4 persons infected with *Taenia* in Xoxocotla⁵ and by 3 of 5 persons in Angahuan.⁶ Infection was confirmed by presence of eggs on stool examination or by presence of proglottids post-treatment. Therefore, it was hypothesized that self-detection of tapeworm carriers might be a useful strategy in the control of human neurocysticercosis and could be attained by using the public health system.

This study was performed (Table 1) in the sanitary jurisdiction VI that corresponded to Irapuato (713,068 inhabitants), in Guanajuato state of Mexico, which is endemic for *T. solium*. Two study methods of self-detection of tapeworm carriers were widely promoted in the state: 1) training was provided to clinical and animal health care practitioners and to schoolteachers; and 2) information was communicated to the general population.

Training took place in January 1999 and consisted of a 1-day course. Physicians and nurses were based in health centers. Animal health care practitioners were also employees of the Ministry of Health. Teachers were from kindergarten, primary and junior high schools. All trainees (Table 1) were updated with information on the life cycle and morphology of the parasite life stages, clinical diagnosis, treatment and risk factors for human taeniosis as well as human and swine cysticercosis, and preventive measures. At the end of the training, small glass bottles containing a few tapeworm segments fixed in formaldehyde and an instructional guide containing

10 key points on how to ask questions about tapeworm infections were distributed to the clinical care practitioners.

During the year of the study (1999), clinical care practitioners asked every person who attended health centers, for whatever reason, if he/she or someone in the family was releasing tapeworm segments in their feces, and showed them the glass bottle with the proglottids. Persons with affirmative responses were offered praziquantel (single dose of 10 mg/kg) and, 2 hours later, milk of magnesia. Niclosamide was not used because it is not available in Mexico, and official guidelines in Mexico recommend the use of praziquantel for treatment of either asymptomatic or symptomatic tapeworm positive persons. When the affirmative response was related to a person in the home, the home was visited and treatment was administered accordingly. To identify the species of tapeworm of any affirmative-response person, a bucket was provided to collect their feces during the following 24 hours. In addition, all attendees were asked if he/she or someone in their family had late onset seizures and if they owned measly pigs (i.e., pigs infected with cysticercosis). Persons who were reported as having had seizures were asked to go to the general hospital for follow-up.

Animal health care practitioners visited abattoirs and local markets to identify pigs or pork meat infected with cysticercosis to search for their owners and to ask them to attend a health center to receive praziquantel. Of the 17 pigs with cysticercosis detected, 3 were bought from the owners and used in our research projects; the remaining 14 were identified as carcasses in abattoirs and were confiscated.

Informative talks throughout 1999 were used to provide general information on the identification of tapeworms and preventive measures to the following different groups of people in the general population: all persons in waiting rooms at health centers; students and parents in schools; local health committees, pig breeders and farmers, military personnel; and to various civil society organizations such as religious, Alcoholics Anonymous, as well as the general population in local communities of the jurisdiction (Table 1). Messages were transmitted by radio (6 interviews), newspapers (10 interviews), wall posters (66), and broadcasting with a loudspeaker (184 hours).

TABLE 1
Educational activities

| Courses to professional personnel | | |
|--|-------------------|------------------------|
| Sector | Number of courses | Number of participants |
| Health care practitioners | 26 | 448 |
| Schoolteachers | 32 | 485 |
| Animal health care practitioners | 19 | 174 |
| Total | 77 | 1107 |
| Informative talks to the community | | |
| Persons in waiting rooms in health centers | 289 | 4315 |
| Students and parents in schools | 140 | 3810 |
| Pig breeders and farmers in their settings | 101 | 732 |
| Local health committees in the community | 25 | 290 |
| Various civil society organizations and military personnel in their settings | 51 | 1573 |
| General population in communities | 628 | 9862 |
| Total | 1234 | 20,582 |

Official epidemiologic surveillance carried out by the Ministry of Health in Mexico gathers information on diseases relevant to public health in the software called SUIVE (Sistema Único de Información en Vigilancia Epidemiológica).⁷ Data from a 1-year period preceding the intervention were used as a type of comparison group. Table 2 shows the number of tapeworm carriers and of cases with neurocysticercosis notified by jurisdiction VI to SUIVE in 1998 and 1999. Data for swine cysticercosis were obtained in the jurisdiction. Results showed that 6 times more tapeworm carriers were notified after the intervention (1999) as compared with the previous year. Similarly, detection of cases with neurocysticercosis increased 4 times and that of swine cysticercosis 8 times. Statistical analysis (χ^2) gave highly statistically significant differences; all persons attending a health center in the jurisdiction for the first time (225,855 in 1998 and 239,460 in 1999) were used as the denominator. The χ^2 value for taeniosis was 20.805, $P < 0.001$, and for human cysticercosis 28.081, $P < 0.001$.

Of the 41 tapeworm carriers identified, 37 had *Taenia saginata*. Identification was confirmed by counting the number of lateral uterine branches in mature proglottids. There are no reports in the Mexican literature comparing the frequency of *Taenia* species in human carriers. Between 1970 and 1985, the main abattoir in Mexico City processed between more than 200,000 cattle per year and reported an increase in *T. saginata* cysticercosis carcasses from 0.2% to 0.8%. It also processed approximately 400,000 pigs per year and reported a decrease in *T. solium* cysticercosis carcasses from 0.5% to 0.1%.⁸ These data are concordant with the higher number of *T. saginata* carriers detected in the current study.

The results obtained in the current study confirm previous data regarding the feasibility of self-detection of tapeworm

TABLE 2
SUIVE number of recorded cases

| Disease | 1998 (before) | 1999 (after) |
|---------------------|---------------|--------------|
| Taeniosis | 7 | 41 |
| Human cysticercosis | 16 | 68 |
| Swine cysticercosis | 2 | 17 |

carriers.^{4,5} More importantly, they demonstrate for the first time that self-detection of taeniosis has an impact on public health. This was achieved with a health education intervention targeted to clinical and animal health care practitioners, schoolteachers, and the general population. Four persons with *T. solium* were treated. This eliminated the parasite, subsequently preventing further cases of human and swine cysticercosis. Finally, this IEC (information-education-communication) approach adds no extra cost to the public health system. The local coordinators of the project worked in the Zoonoses Department of the Ministry of Health, and the people whom they trained were public employees. The 1-day course was included in this departments training program; information to the community was disseminated using public health-dedicated time and space in mass media, and posters and loudspeakers were part of routine tools used for health communication purposes in the jurisdiction.

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Authors' addresses: Ana Flisser, Dirección de Investigación, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico and Departamento de Microbiología y Parasitología, Facultad de Medicina, Universidad Nacional Autónoma de México, Ciudad Universitaria, Mexico City 04510 DF, Mexico, Telephone: 52-55-5623-2466, Fax: 52-55-5623-2382, E-mail: flisser@servidor.unam.mx, Alberto Vázquez-Mendoza, Emilio Gómez-Colín, and Iraipato, Guanajuato, Mexico. Joel Martínez-Ocaña, Dirección de Investigación, Hospital General Dr. Manuel Gea González, Secretaría de Salud, Mexico City, Mexico. Roberto Medina-Santillán, Merck-Mexico, Mexico City, Mexico.

Reprint requests: Ana Flisser, Departamento de Microbiología y Parasitología, Facultad de Medicina, UNAM, Ciudad Universitaria, México 04510 DF, Telephone: 5255-56232466, Fax: 5255-56232382, E-mail: flisser@servidor.unam.mx.

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