CORRESPONDENCE

Potential Elimination of Active *Taenia solium* Transmission in Africa

TO THE EDITOR: Taeniasis and cysticercosis due to *Taenia solium* are major foodborne parasitic zoonoses that severely affect public health, social, and economic sectors, with the burden of neurocysticercosis estimated at 2,788,426 disability-adjusted life-years.[1] A study involving an integrated intervention program in humans and pigs showed elimination of transmission of *T. solium* in Peru.[2] This study provided important proof of concept; however, similar studies of *T. solium* elimination have not been completed in sub-Saharan Africa, where the prevalence of this infection and the level of poverty are higher than in Peru.[3]

We conducted the CYSTISTOP study (Clinical Trials.gov number, NCT02612896), which involved a 2-year integrated intervention in humans and pigs in eastern Zambia, where taeniasis and cysticercosis are hyperendemic, to evaluate the feasibility of eliminating *T. solium* in sub-Saharan Africa. The prevalence of porcine cysticercosis (the primary outcome measure, as determined by carcass dissection) and the prevalence of human taeniasis (the secondary outcome measure, as determined by enzyme-linked immunosorbent assay for coproantigen detection) at baseline and after the intervention were assessed in an intervention group (eight intervention villages comprising 1084 people and 184 pigs at baseline) and compared with the prevalences in a negative control group (seven villages comprising 1329 people and 290 pigs at baseline).

Anthelmintic agents (praziquantel for humans at a dose of 10 mg per kilogram of body weight, and oxfendazole for pigs at a dose of 30 mg per kilogram), vaccine for pigs (TSOL18 recombinant vaccine at a dose of 1 ml), and health education were provided six times (every 4 months) between March 2015 and December 2017 (details are provided in the Supplementary Appendix and in the protocol, including the statistical analysis plan, available with the full text of this letter at NEJM.org). This intervention package was selected because it had been shown to have the highest probability of eliminating *T. solium* in the cystiSim agent-based simulation model.[3] Some of the praziquantel used in the study was provided free of charge by the World Health Organization. In the control villages, only annual health education was implemented.

We calculated that a sample of 34 to 40 animals in each group would provide the study with 80% power to detect an 80% reduction in prevalence (assuming an initial prevalence of 25 to 30%), with the use of a one-sided likelihood ratio test at a 5% significance level. The effect of the intervention on the prevalence of porcine cysticercosis and taeniasis was estimated with the use of a generalized linear mixed model for binomial data implemented in a Bayesian framework.

The study was approved by institutional review boards and ethics committees at the University of Zambia (Lusaka, Zambia) and the Uni-

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versity of Antwerp and the Institute of Tropical Medicine (both in Antwerp, Belgium), and written informed consent was obtained from all the adult participants. Written or oral assent from children younger than 18 years of age and written informed consent from the children's parents or guardians were obtained.

The average treatment coverage in the eligible human and pig populations was 93.5% and 86.0%, respectively. The average prevalence of active porcine cysticercosis in both the intervention and control villages was 32% at baseline. After the intervention, the prevalence was 0% in the intervention villages and 25% in the control villages; these results indicate a significantly higher reduction in the intervention group (P<0.001) (Fig. 1). The prevalence of taeniasis in the intervention villages decreased from 16% at baseline to 2% after the intervention (P<0.001).

The integrated interventions in humans and pigs eliminated viable infection in the pig hosts and significantly reduced the prevalence of taeniasis caused by *T. solium* in the intervention villages. Our findings provide evidence that elimination of *T. solium* transmission may be possible in sub-Saharan Africa.

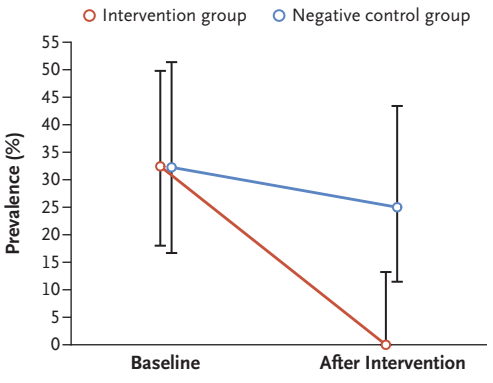

Figure 1. Prevalence of Active Porcine Cysticercosis at Baseline and after the Intervention in the Study Groups.

Active porcine cysticercosis was determined by the presence of viable cysticerci. I bars represent 95% confidence intervals.

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A data sharing statement provided by the authors is available with the full text of this letter at NEJM.org.

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