

Review Article

Development of Rapid Pre and Post Mortem On-farm Diagnostic Test Kit for Porcine Cysticercosis (Pork Tapeworm)

Jesca Nakayima*

National Livestock Resources Research Institute, P.O. Box 5704, Nakyesasa, Wakiso, Uganda

*Corresponding author: Jesca Nakayima, National Livestock Resources Research Institute, P.O. Box 5704, Nakyesasa, Wakiso, Uganda

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Executive Summary

The goal of this project is to enhance sustainable productivity, value added and competitiveness of the pig industry in Uganda through easier, user-friendly and more accurate diagnosis, control and prevention of *Taenia solium* cysticercosis. The enhanced control and prevention of the infection is also expected to increase pork trade and food safety, prevent human infections and eliminate a health risk that has both social and economic implications.

Background

A zoonotic tapeworm *Taenia solium* transmitted among humans and between humans and pigs causes cysticercosis. Humans acquire taeniosis (tapeworm infection) when they eat raw or undercooked pork meat contaminated with cysticerci, the larval form of *T. solium*. When ingested, the cysticerci establish in the intestine of humans, become adult tapeworms and shed eggs in human feces that can infect in turn other humans and pigs by direct contact or by indirect contamination of water or food.

Epidemiological studies of porcine cysticercosis (pork tapeworm) require identification of pigs harbouring viable *Taenia solium* cysticerci and estimates of the degree of exposure to the parasite in the pig population destined for human consumption. Stool microscopy for diagnosis of taeniosis is inefficient and thus it is not recommended unless there is a specific indication and no suitable alternative. Even with multiple samples and concentration of large volumes of stool sample, sensitivity of stool microscopy does not exceed 60 to 70% (Allan *et al.* 1993). Diagnosis of taenia eggs and proglottids in definitive hosts doesn't distinguish between *T. solium* and *T. saginata* of pigs and cattle respectively. However, given that the prevalence of infection with either species is usually low, the role of parasitologic diagnosis in control programmes is relatively minor. For diagnosis of cysticercosis, histological confirmation of excised cysts is rarely required, nor easily undertaken except in a small proportion of patients with subcutaneous nodules where biopsy can provide diagnostic support. Currently, few copro-PCR techniques and non-commercial copro-Ag-ELISA assays are available. In contrast to the PCR assay, most copro-Ag-ELISA assays are genus, not species specific and thus cross-react with *T. saginata* (beef tapeworm). Antibody detection tests require parasitic cysts or tapeworm excretory/secretory material as a source of antigen. Assays using recombinant or synthetic antigens if available would be more suitable. Intermediate hosts diagnosis in pigs (porcine cysticercosis) can be made by tongue inspection, antibody or antigen detection, or by postmortem inspection at slaughterhouses. Rapid lingual examination for cysts is an inexpensive but insensitive test (Willingham 2006). Likewise, diagnosis by detection of cysts at slaughter of pigs is also insensitive. Uganda is ranked the biggest consumer of pork in the world. Roast pork with beer is a booming business in Uganda. This half cooked pork is a high risk for the transmission of porcine cysticercosis yet routine deworming is not commonly practiced by Ugandans. Diagnosis of porcine cysticercosis in humans and pigs ante-mortem is not developed in Uganda hence many cases go untreated. We intend to develop and evaluate a recombinant antigen for rapid diagnosis of porcine cysticercosis, lateral flow assay and LAMP assay. This will contribute to the control of this zoonotic disease in Uganda for instance neurocysticercosis; epilepsy [1-4].

Porcine cysticercosis is a zoonotic disease, it is highly prevalent in humans, livestock (12.2-25.7%) and wild suidae. Uganda is the topmost consumer of pork in the world. Mostly in form of roast pork with beer. This is half cooked pork with the risk of transmission of neuro-cysticercosis in humans. This increases the incidence of epilepsy in Uganda. Hence controlling porcine cysticercosis improves not only livestock health & productivity but socio-economics and public health.

Given the magnitude of the problem of porcine cysticercosis in Uganda, The physical tests applied for its diagnosis are not sensitive, hence the need for more sensitive point of care and field tests. Physical tests are done at the point of slaughter or postmortem. There is however need for field based diagnostics to direct treatment and control, thus improving livestock health and production as well as human health. Research has been done mostly on the prevalence of porcine cysticercosis in Uganda. However, no effort has been done to improve the disease diagnosis. The overall apparent sero-prevalence (12.2%) reported by Kungu 2015; while previous reports (25.7%) by Nsadhha and others (2014) in Lake Kyoga basin. Effective disease control depends on accurate diagnosis.

Keywords: Animal health, Animal production, Pigs, Zoonotic diseases, Biotechnology, Uganda

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