



**FARMERS' KNOWLEDGE ON THE PREVALENCE OF PORCINE CYSTICERCOSIS
IN ARAPAI SUB COUNTY**

BY

ORAI JULIUS

BU/UG/2010/178

juliusorai@gmail.com

**A RESEARCH DISSERTATION SUBMITTED TO THE FACULTY OF
AGRICULTURE AND ANIMAL SCIENCES FOR THE AWARD OF A BACHELOR'S
DEGREE OF ANIMAL PRODUCTION AND MANAGEMENT OF BUSITEMA
UNIVERSITY**

MAY, 2013



DECLARATION

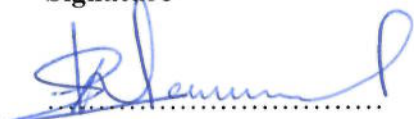
I, **ORAI JULIUS**, hereby declare that the work submitted in this dissertation is original and a result of my own study except where otherwise acknowledged. This dissertation has not been submitted for another degree award in this or any other University or institution

Signature  Date: 03/09/2013

This dissertation has been submitted for marking with the approval of the following supervisors

Signature

Date



03/09/2013

Dr. WALUSIMBI EMMANUEL BVM- (MUK)

Teaching Assistant

Department of animal production and management

Faculty of agriculture and animal sciences

Busitema University- Arapai Campus

© 2013, **ORAI JULIUS**

All rights reserved. No part of this dissertation may be reproduced, stored in any retrieval system, or transmitted in any form by any means, electronic, mechanical, photocopying, recording or otherwise without prior written permission of the author or Busitema University.



DEDICATION

I dedicate this piece of work to my dear parents, for educating me and for the tremendous support which enabled me to go through the course.

ACKNOWLEDGEMENT

I am heartily thankful to my supervisor, Dr. Walusimbi Emmanuel whose encouragement, guidance and support from concept level to the final stage of this dissertation enabled me to develop an understanding of the subject. I am certain that without his support this project would not have been possible. I also offer my sincere regards and blessings to Dr. Matovu Henry, Mr. Muyinda Robert and the entire staff of the faculty of agriculture and animal sciences for their support and extensive critique that enabled me to model this dissertation to acceptable standards. I owe sincere gratitude to all informants (farmers) and staff of Arapai Sub County, students and civil leaders who contributed relevant information for the good of this study. Thank you for your voluntary participation in the study.

Lastly, but very important, I would like to acknowledge all my classmates and friends who made my stay at Busitema University a memorable experience and for all the people who helped me a lot, thank you very much and may God bless you all.

TABLE OF CONTENTS

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
LIST OF APPENDICES	x
ABSTRACT	xi
CHAPTER ONE	1
1.1 Background and Introduction	1
1.2 Research Problem	2
1.3 Significance	2
1.4 Justification	2
1.5 General Objective	3
1.6 Specific Objectives	3
1.7 Research Questions	3
1.8 Scope	4
CHAPTER TWO	5
LITERATURE REVIEW	5
2.1 Introduction	5
2.2 Epidemiology of Cysticercosis <i>Taenia Solium</i>	5

2.3 Life Cycle	6
2.4 Characteristics of Pig Keeping By Small-Scale Pig Producers	8
2.4.1 Production systems and breeds	8
2.4.2 Housing	8
2.4.3 Feeding the pigs	8
2.5 Diagnostic Methods for Porcine Cysticercosis	9
2.5.1 Tongue examination.	9
2.5.2 Carcass evaluation.	9
2.5.3 Serological tests.	10
2.6 Treatment of porcine cysticercosis.	10
2.6.1 Praziquantel and Albendazole.	10
2.6.2 Oxfendazole.	11
2.7 Control of Porcine Cysticercosis	11
2.7.1 Pig vaccination	11
2.7.2 Pig cysticercosis treatment	12
2.7.3 Human mass treatment	12
2.7.4 Health education campaigns	12
2.7.5 Development as a control measure	12
2.8 Impact of the Disease	13
CHAPTER THREE	14
MATERIAL AND METHODS	14
3.0 Study area.	14
3.1 Sampling design:	14
3.2 Operational design:	15
3.4 Statistical design:	15

3.5 Data presentation: _____	15
3.6 Ethical Consideration _____	15
CHAPTER FOUR _____	16
RESULTS _____	16
4.1 Demographic characteristics of respondents: _____	16
4.2 Pit Latrine Coverage and Garbage Disposal _____	16
4.3 Pig management practices. _____	17
4.4 Farmers Knowledge on prevalence of porcine cysticercosis infections _____	20
4.5 Lingual prevalence of porcine cysticercosis. _____	23
CHAPTER FIVE: _____	24
DISCUSSION OF RESULTS _____	24
CHAPTER SIX: _____	28
6.1 Conclusions _____	28
6.2 Recommendations _____	29
REFERENCES _____	30
Appendices _____	35
Appendix 1: Questionnaire _____	35
Appendix 2: education poster designed highlighting the causes and effects of Taenia solium infections in the community. _____	38

LIST OF TABLES

Table 1: Presence of latrines and garbage pits and their usage in homesteadPage 16

Table 2: Lingual prevalence of cysticercosis per parishPage 21

LIST OF FIGURES

Figure 1: Pig husbandry practices on feeding.....	Page18
Figure 2: Frequency of Deworming.....	Page19
Figure 3: Management system.....	Page20
Figure 4: Farmers ability to diagnose pigs infected with <i>Taenia solium</i>	Page21
Figure 4: Farmers perception on transmission of <i>Taenia solium</i> to pigs.....	Page22
Figure 5: Farmers' perception on transmission of taenia solium to humans.....	Page22

LIST OF ABBREVIATIONS

AGDP	Agricultural Gross Domestic Products
CC	Cysticercus Cellulosea
EITB	Enzyme-Linked Immuno-electrotransfer Blot
ELISA	Enzyme Linked Immuno Absorbent Assay
FAO	Food and agriculture Organization
GDP	Gross Domestic Product
MRI	Magnetic Resonance Imagery
NAADS	National Agricultural Advisory Services
NCC	Neurocysticercosis
SPSS	Statistical Package for Social Scientists
WHO	World health Organization

LIST OF APPENDICES

Appendix 1: Questionnaire

Appendix 2: Educational poster designed to highlight causes and effects of *Taenia solium*

ABSTRACT

Understanding pig farmer's knowledge on prevalence of porcine cysticercosis is a very important strategy for successful eradication of porcine cysticercosis and human Taeniasis. This study was carried out in the three selected parishes of Arapai Sub County, Soroti district, Eastern Uganda. The study aimed at determining pig farmers knowledge on *Taenia solium* infections, pig management practices, and lingual prevalence of porcine cysticercosis. Findings from the study indicated that (44.4%) of the respondents were not aware of the presence or prevalence of porcine cysticercosis in the area, the sex and level of education of the farmers was noted to have an impact on the knowledge of porcine cysticercosis prevalence in Arapai Sub County ($p < 0.05$). A lingual prevalence of 6.2% was also indicated. In addition, a substantial number (60.5%) did not have any knowledge on how pigs get infected with tape worms, and 79.0% did not also have knowledge on how humans get infected with *Taenia solium*, 74.1% were aware of someone with epilepsy in the community, 13.6% knew someone who was diagnosed of tape worms in the last 12 months. This was an indication that *Taenia solium* infections were prevalent in the community. Many of the respondents (25.9%) did not also have latrine, thus practice open air defecation which allows roaming pigs to access fecal matter containing tape worm eggs.

In their management practices; Feeding of the pigs was mostly on kitchen leftovers, pastures and homemade feeds (43%). Pigs fed on such feeds have lowered immunity and hence have reduced resistance to tape worm infections, 58% of the farmers irregularly deworm their pigs, and lastly confinement (tethering 43%, free range 24%, total enclosed 3.7%). The study therefore revealed that porcine cysticercosis exists in Arapai Sub County and the farmers do not have proper knowledge on the life cycle of *Taenia solium*, diagnosis of the disease. The management practices on feeding, confinement and deworming are also at low levels. It was also found that some farmers still practice open air defecation.

Further research should be conducted, Community based public health education should be carried out, promotion of pit latrine digging, proper garbage disposal, better management practices for pigs should be promoted among the farmers to prevent roaming of pigs, improve feeding of their pigs and follow recommended deworming regimes, Veterinary doctors should be recruited to inspect the pork consumed by the community members, Mass deworming of pigs and treatment of human carries should always be observed to disrupt the cycle.

CHAPTER ONE

1.1 Background and Introduction

Porcine cysticercosis is a zoonotic disease caused by a tape worm called *Taenia solium*. The life cycle of this cestode depends on both man and the pigs. The pig is the intermediate host and harbors larval stage (Cysticercus) of the parasite in muscle tissue, while human beings (the definite host) harbors adult stage of the parasite in small intestine.

Pigs acquire the infection following ingestion of embryonated eggs (Oncospheres) or gravid proglotids passed out to the environment with human feces from a carrier individual (i.e., fecal contamination) (Tirido, 2004). Upon hatching Oncospheres crosses the intestinal wall, migrate to muscles and transform into larval vesicles (Cysticerci) i.e., larval form of the parasite resulting into condition known as Porcine Cysticercosis. Cysticercosis is the presence of *T. solium* Cysticerci in tissues. Man acquires the tape worm by ingesting uncooked/undercooked pig meat (pork) infected with *Taenia solium* Cysticerci, latter on these Cysticerci develop into adult form in human small intestine leading to Taeniasis.

Porcine cysticercosis and human Taeniasis caused by *Taenia solium* are public health problems in many endemic countries where the prevalence of this zoonosis is promoted by certain cultural, socioeconomic and poor sanitary conditions. Other factors promoting prevalence of the disease include contact between human and pigs' feces, lack of veterinary inspection of pork, consumption of undercooked pork meat, consumption of unclean vegetables and water contaminated with infected human feces and, finally, poor personal hygiene (e.g. Not washing of hands before eating and after defecating (Sarti *et al.*, 1997).

In order to eradicate the *Taenia solium* infections and hence improve the wellbeing of smallholder pig farmers in Arapai, full understanding of the farmer's knowledge on *Taenia solium* infection is important. Therefore, this study was carried out to assess farmer's knowledge on prevalence of porcine cysticercosis in pigs.

REFERENCES

- Allan, J.C., Mencos, F., García-Noval, J., Sarti, E., Flisser, A., Wang, Y., Liu, D. & Craig, P.S. (1993). Dipstick dot ELISA for the detection of *Taenia* coproantigens in humans. *Parasitology* 107: 79-85.
- Anyanzo, T. (1999). Prevalence of *Cysticercosis cellulosae* in three sub-countries of Moyo Country, Moyo District, Uganda. Bachelor of Veterinary Medicine special report, Makerere University
- Boa, M.E., O.L. Jessen, A.A., Kassuku and A.L. Willingham. (2001). Proceedings of the 18th International Conference of the World Association for the Advancement of Veterinary Parasitology, 26/30 August 2001, Stresa, Italy.
- Carpio, A. (2002). Neurocysticercosis update: An update. *The Lancet infectious diseases* 2: 571-762.
- DeGiorgio, C.M., Sorvillo, F., & Escueta, S. P. (2005). Neurocysticercosis in the United States: review of an important emerging infection. *Neurology* 64: 1486.
- Del Brutto, O. H., Sotelo, J. (1988). Neurocysticercosis: an update. *Review of Infectious Diseases* 10: 1075-1087.
- Del la Garza, Y., Graviss, E.A., Daver, N.G., Gambarin, K.J., Shandera, W.X., Schantz, P.M. & White, A.C., Jr. (2005). Epidemiology of neurocysticercosis in Houston, Texas: *American Journal of Tropical Medicine and Hygiene* 73: 766-770.
- Flisser, A., Sarti, E., Lightowers, M., Schantz, P. (2003). Neurocysticercosis: regional status, epidemiology, impact and control measures in the Americas. *Acta Tropica*. 00: 1-9
- Food and Agriculture Organization of the United Nations. (1998). Rural women and food security: Current situation and perspectives. FAO, Rome, Italy.
- García, L., and Bruckner, D.A. (1997). Intestinal cestodes. In *Diagnostic medical parasitology* (ed. García L. and Bruckner D.A.), pp. 308-330. ASM Press, Washington, D.C.

- Gonzalez, A.E., Cama, V., Gilman, R.H., Tsang, V.C., Pitcher, J.B., Chevera, A., Castro, M., Montenegro, T., Verastegui, M., Miranda, E. (1990). Prevalence and comparison of serological assays, necropsy, and tongue examination for the diagnosis of porcine cysticercosis in Peru. *American Journal of Tropical Medicine and Hygiene*; 43:194–199.
- Gonzalez, A.E., Falcon, N., Gavidia, C., Garcia, H.H., Tsang, V.C., Bernal, T., Romero, M., Gilman, R.H. (1997). Treatment of porcine cysticercosis with oxfendazole: A dose-response trial. *Vet Rec* 141:420-422.
- Grove D.L (1990). *Taenia solium* and cysticercosis. In *A history of human helminthology* (ed. Grove D.L), pp. 355-383. CAB International, Wallingford.
- Guijt, I. and Shah, K.M. (1998) *The Myth of Community: Gender Issues in participatory development*. Intermediate Technology Publications Ltd., London.
- Kagira, J. M., Kanyari, P. W., Maingi, N., Githigia, S. M., Ng'ang'a, J. C., and Karuga, J. W. (2010). Characteristics of the small holder free-range pig production system in Western Kenya, *Tropical Animal Health and Production* 42 (5): 865 – 873.
- Kimbi, E. C., Maiseli, A. G., Kaijage, J. T., Mussei, A. N. (2001). Report on local feed resource base, feeding systems and feeding practices for pig production in Rungwe and Mbozi district. Reported to international review programme: ARI-Uyole, Mbeya, Tanzania.
- Kisakye, J. J. M., Masaba, S. C. (2002). Cysticercosis *cellulosea* in Pigs' slaughtered in and around Kampala city. *Uganda Journal of Agricultural sciences*, 7:23-2.
- Kusiluka, L., and Kambarage, D. (1996). Diseases caused by Helminthes. Epidemiology in: *Diseases of Small Ruminants: A Handbook*. Common diseases of sheep and goats in sub-Saharan Africa. <http://www.smallstock.info/research/reports/R5499/ch-helminths.htm>
- Lekule, F.P., Kyvsgaard, N.C. (2003) Improving pig husbandry in tropical resource-poor communities and its potential to reduce risk of porcine cysticercosis. *Acta Tropica* 87: 1117-

- Mafojane, N.A., C.C. Appleton., R.C. Kreeck., L.M. Michael and A.L. Willingham. (2003). The current status of neurocysticercosis in Eastern and Southern Africa. *Acta Tropica*. 87: 25-33.
- Murrell, K.D. (2005). Epidemiology of Taeniosis and Cysticercosis. In: WHO/FAO/OIE Guidelines for the Surveillance, Prevention and Control of Taeniosis/Cysticercosis. editor. OIE, Paris; p. 27-43.
- Richar Iván Rodríguez Hidalgo. (2007). The epidemiology of taenia spp. and cysticercosis in Ecuador; Master of Science Thesis, University of Gent.
- Mutua, F.K., S.M. Arimi., W.O. Ogara., and E. Schelling. (2010). Farmer perceptions on indigenous pig farming in Kakamega District, Western Kenya. *Nordic J. Afr. Stud.*, 19(1): 43-57
- Mutua, F.K., T.F. Randolph., S.M. Arimi., P.M. Kitala., S.M. Githigia., A.L. Willingham and M. Francis. (2007). Palpable lingual cysts, a possible indicator of porcine cysticercosis, in Teso District, Western Kenya. *J. Swine Health Prod.*, 15(4): 206-212.
- Ngowi, H., Kassuku A, Maeda G, Boa, M., Carabin, H., Willingham, A.L. (2004). Risk factors for prevalence of porcine cysticercosis in Mbulu District, Tanzania. *Vet Parasitol.*; 120:275–283.
- Ngowi, H.A., A.A. Kassuku, G.E.M. Maeda, M.E. Boa, H. Carabin and A.L. Willingham III, (2004). Risk factors for the prevalence of porcine cysticercosis in Mbulu District, Tanzania. *Vet. Parasitol.* 120(4): 275-283.
- Nsoso, S. J., Mosweu, S., Malela L and Podisi, B. (2004). A survey on population, distribution, management and utilization of indigenous Tswana pigs in Southern Botswana, *Animal Genetic Resources Information* 34: 83 - 96.
- Obonyo, F. O., Maingi, N., Githigia, S. M., and Ng'ang'a, C. J. (2013). Farming practices and risk factors for transmission of helminthes of free range pigs in Homabay District, Kenya. *Livestock Research for Rural Development*. Volume 25, Article #36. Retrieved May 13, 2013, from <http://www.lrrd.org/lrrd25/3/bon25036.htm>

- Pandey, S.C. (2005). Lingual cysticercosis: Indian Journal of Plastic Surgery; 38, 2:160.
- Pardini, A.X., Peralta, R.H., Vaz, A.J., Machado, L.R. & Peralta, J.M. (2002). Use of *Taenia crassiceps* Cysticercus antigen preparations for detection of antibodies in cerebrospinal fluid samples from patients with neurocysticercosis (*Taenia solium*): Clinical and Diagnostic Laboratory Immunology 9; 190-193.
- Pawlowski, Z.S. (2002). *Taenia solium*: basic biology and transmission. In *Taenia solium* cysticercosis: from basic to clinical science (ed. Singh G. and Prabhakar S.), pp. 1-14. CABI Publishing, Wallingford, U.K.
- Phiri, I. K., Ngowi, H., Afonso, S., Matenga, E., Boa, M., Mukaratirwa, S., Githigia, S., Saimo, M., Sikasunge, C., Maingi, N., Lubega, G.W., Kassuku, A., Micheal, L., Siziya, S., Krecek, R. C., Noormahomed, E., Vilhena, M., Dorny, P. A., Willingham III, A. L. (2003). The emergence of *Taenia solium* cysticercosis in Eastern and Southern Africa as a serious Agricultural problem and public health risk. *Acta Tropica*, 87:13-23.
- Phiri, A.M. (2006). Common conditions leading to cattle carcass and offal condemnations at abattoirs in the Western Province of Zambia and their zoonotic implications to consumers: *Journal of South African Veterinary Association* 77: 28-32.
- Prasad, K.N., Prasad, A., Gupta, R.K., Pandey, C.M. & Singh, U. (2007). Prevalence and associated risk factors of *Taenia solium* taeniasis in a rural pig farming community of north India: *Transactions of the Royal Society of Tropical Medicine and Hygiene* 101: 1241-1247
- Rajshekhkar, V., D. D. Joshi, N.O. Doanh, N. van De and Z. Xiaonong. (2003). *Taenia solium* Taeniosis/cysticercosis in Asia: epidemiology, impact and issues. *Acta Trop.*, 87: 53-60
- Sabo, E. (2006). Participatory assessment of the impact of women in agriculture programme of Borno State, Nigeria, *Journal of Tropical Agriculture* 44 (1-2): 52- 56.
- Schantz, P.M. (2002). *Taenia solium* cysticercosis: an overview of global distribution and transmission. In *Taenia solium* cysticercosis: from basic to clinical science (editors. Singh G. and Prabhakar S.), pp. 63-74. CABI Publishing, Wallingford, U.K.

- Schantz, P.M., Cruz M., Sarti, E., and Pawlowski, Z. (1993). Potential eradicability of taeniasis and cysticercosis. *Bulletin of the Pan American Health Organization* 27,397-403.
- Shey-Njila, O., P. A. Zoli, J. Awah-Ndukum., N. E. Assana., P. Byambas, P. Dorny., J. Brandt and S. Geerts, (2003). Porcine cysticercosis in village pigs of North-West Cameroon. *J. Helminthol.*, 77: 351-354.
- Shrestha, N. P., Edward, S. A., Robertson, J. F. (2002). Factors affecting reproductive performance in the Nepalese Pakhri-bas pig: effect of nutrition and housing during gilt rearing: *Asia-Australian Journal of Animal Sciences* 15 (1): 72-78
- Swai, E. S., Kaaya, E. J., Mshanga, D. A., and Mbise W.E. (2010). Survey on gastrointestinal parasites of non descript dogs in and around Arusha Municipality, Tanzania, *International Journal of Animal and Veterinary Advances* 3(2): 63 – 67
- Waiswa, C., Ferve, E., Nsadha, Z., Sikassunge, C., Willingham III, A. L. (2009). Porcine cysticercosis in South-east Uganda: Seroprevalence in Kamuli and Kaliro Districts. *Journal of Parasitological Research*.
- Wanzala, W., Onyango-Abuje, J.A., Kang'ethe, E.K., Zessin, K.H., Kyule, N.M., Baumann, M.P., Ochanda, H. & Harrison, L. J. (2003). Control of *Taenia saginata* by post-mortem examination of carcasses. *African Health Science* 3: 68-76.
- White, A.C. (2000). Neurocysticercosis: Update on epidemiology, pathogenesis, diagnosis and management. *Ann. Rev. Med.*, 51: 187- 206.
- World Health Organization. (2003). Control of Neurocysticercosis: Report by the Secretariat. A56/10.
- Z. Nsadha., M. Saimo., C. Waiswa I , I.M. Nabwire, A. Nkwole , C.S. Sikasunge , A.L. Willingham III., R. Mutagwanya., G. W. Lubega., L. Ojok. (2011). Trans-boundary porcine cysticercosis: a possibility on Uganda's borders. *Africa Journal of Animal and Biomedical Sciences* 6(1), ISSN: 1819-4214
- Zoli, A., O. Shey-Njila, E. Assana, J. Nguekam, P. Dorny., J. Brandt and S. Geerts. (2003). Regional status, Epidemiology and Impact of *Taenia solium* cysticercosis in Western and Central Africa. *Acta Trop.*, 87: 35-42