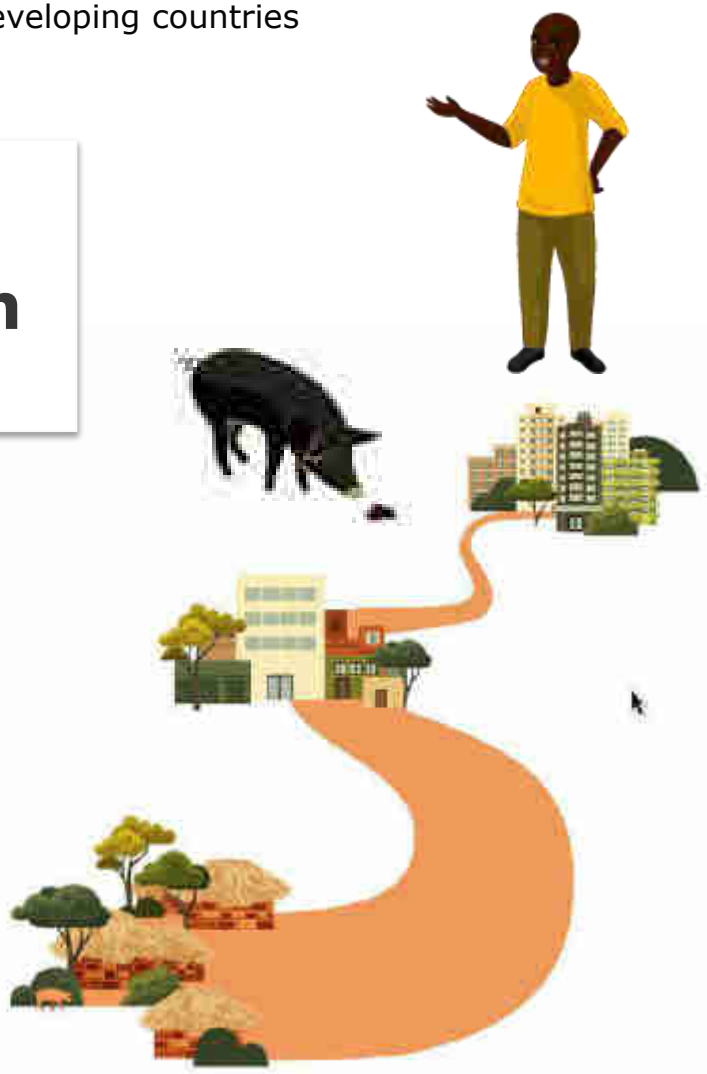
Evaluation of the learning outcome in Tanzania when using an online learning platform (The Vicious Worm) created for information sharing and learning about cysticercosis in developing countries

The Vicious Worm

An electronic health education tool – assessed in Tanzania

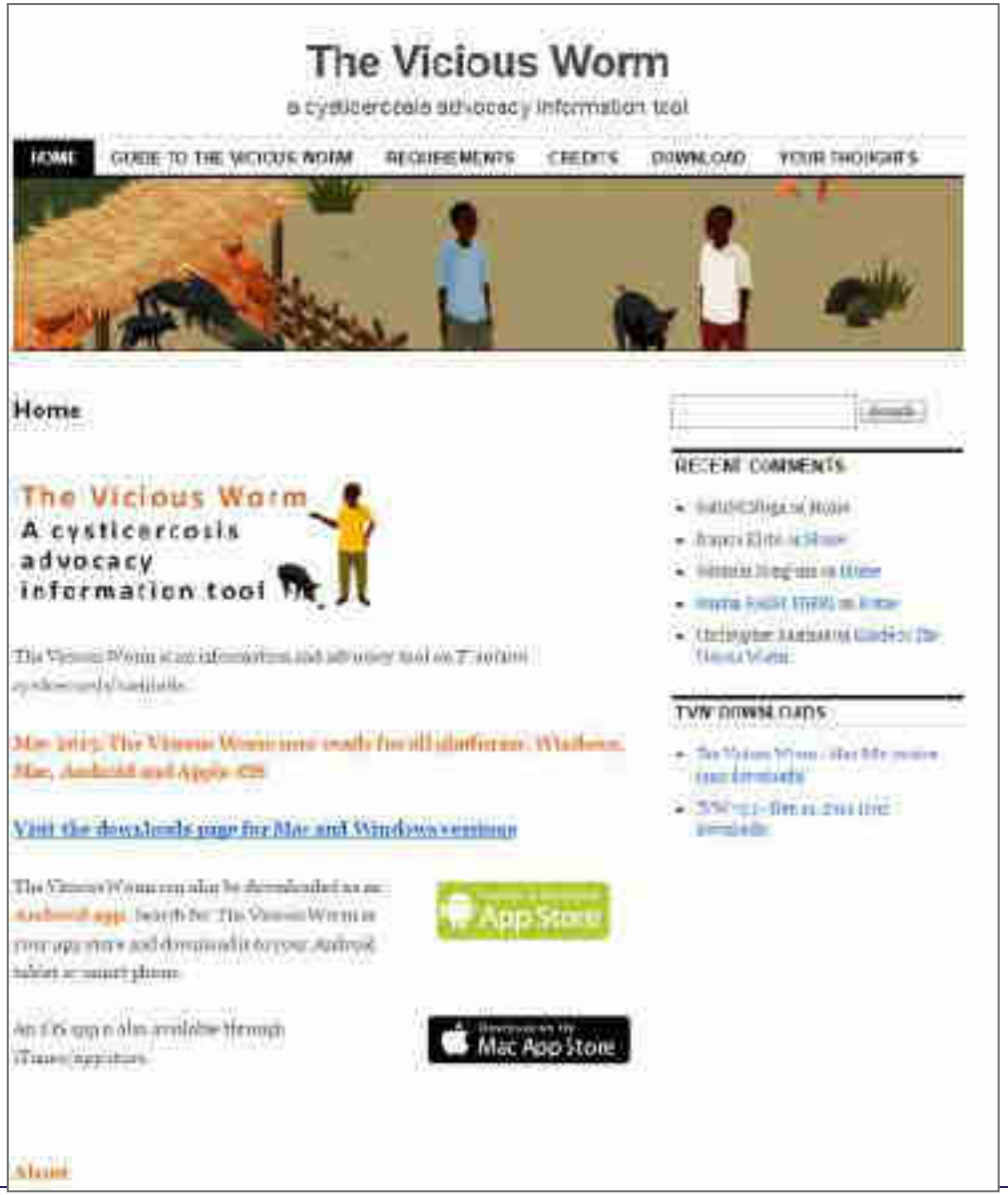


M. V. Johansen, C. Trevisan, S. Lauritsen, R. L. Ertel, P. Magnussen, & U. C. Braae

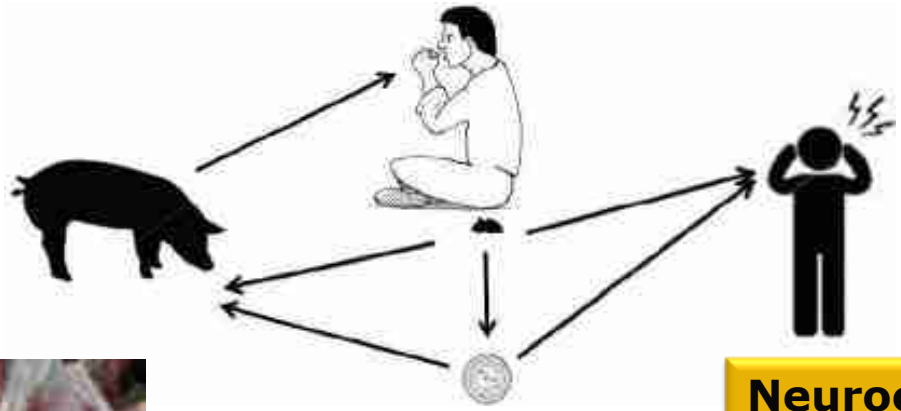
Section for Parasitology and Aquatic Diseases
Department of Veterinary Disease Biology
Faculty of Health and Medical Sciences
University of Copenhagen, Denmark

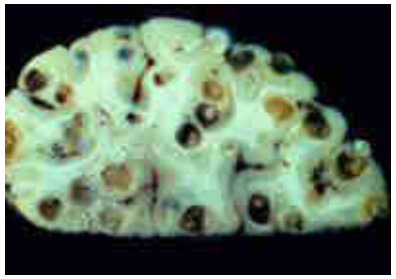
www.theviciousworm.org

WHAT
WHERE
WHEN
WHO
WHY
+
outcome



WHAT: *Taenia solium* cysticercosis/taeniosis





Neurocysticercosis causes
Epilepsy, hydrocephalus, meningitis, increased intracranial pressure

Estimated worldwide ??

5-10 mill people (taeniosis)

>15 mill people (cysticercosis)

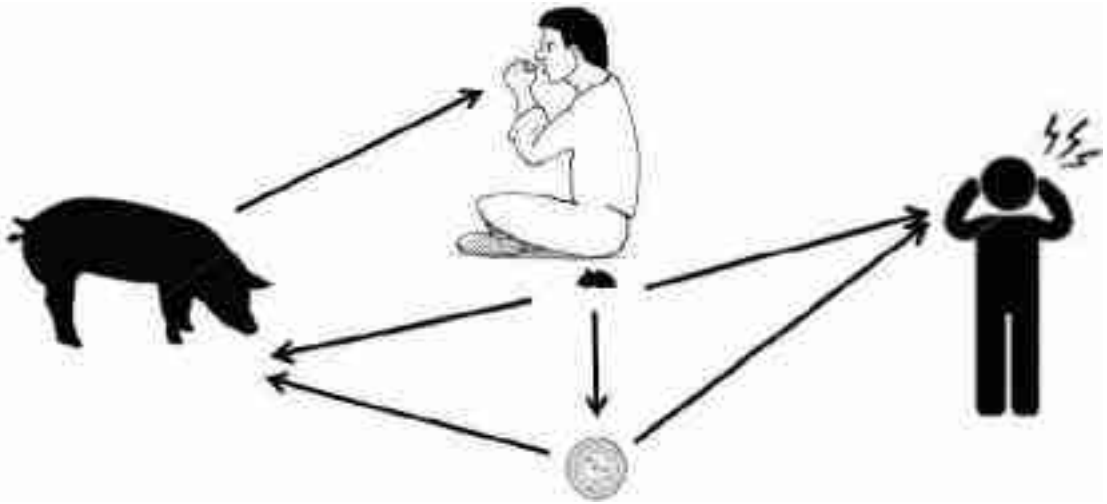
> 50 mill pigs (cysticercosis)

(WHO, 2010)

Consequences

- Stigmatisation
- Incapacitation
- Reduced household income
- Loss of important protein source
- Reduction in trade
- Public health costs
- 1/3 of 50 mill epileptic cases due to NCC

Taenia solium cysticercosis: Outcome ?



Aetiology: *Taenia solium*

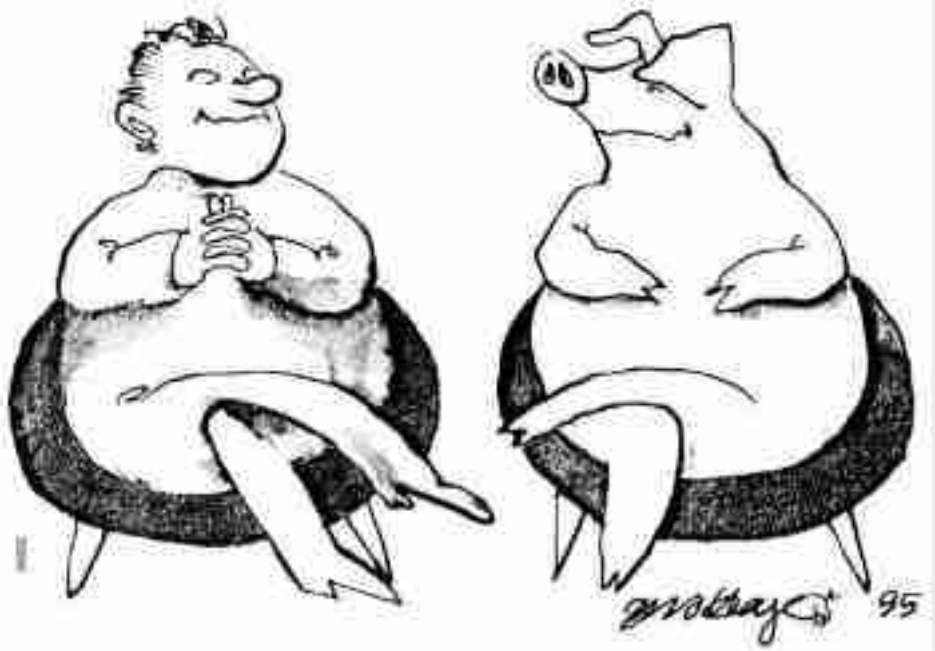
Disease: Neurocysticercosis

Symptoms: Epilepsy, headache

Sequelae: Stigmatization, decreased working capacity

Outcome: Trafic accidents, falls, burns, drawning

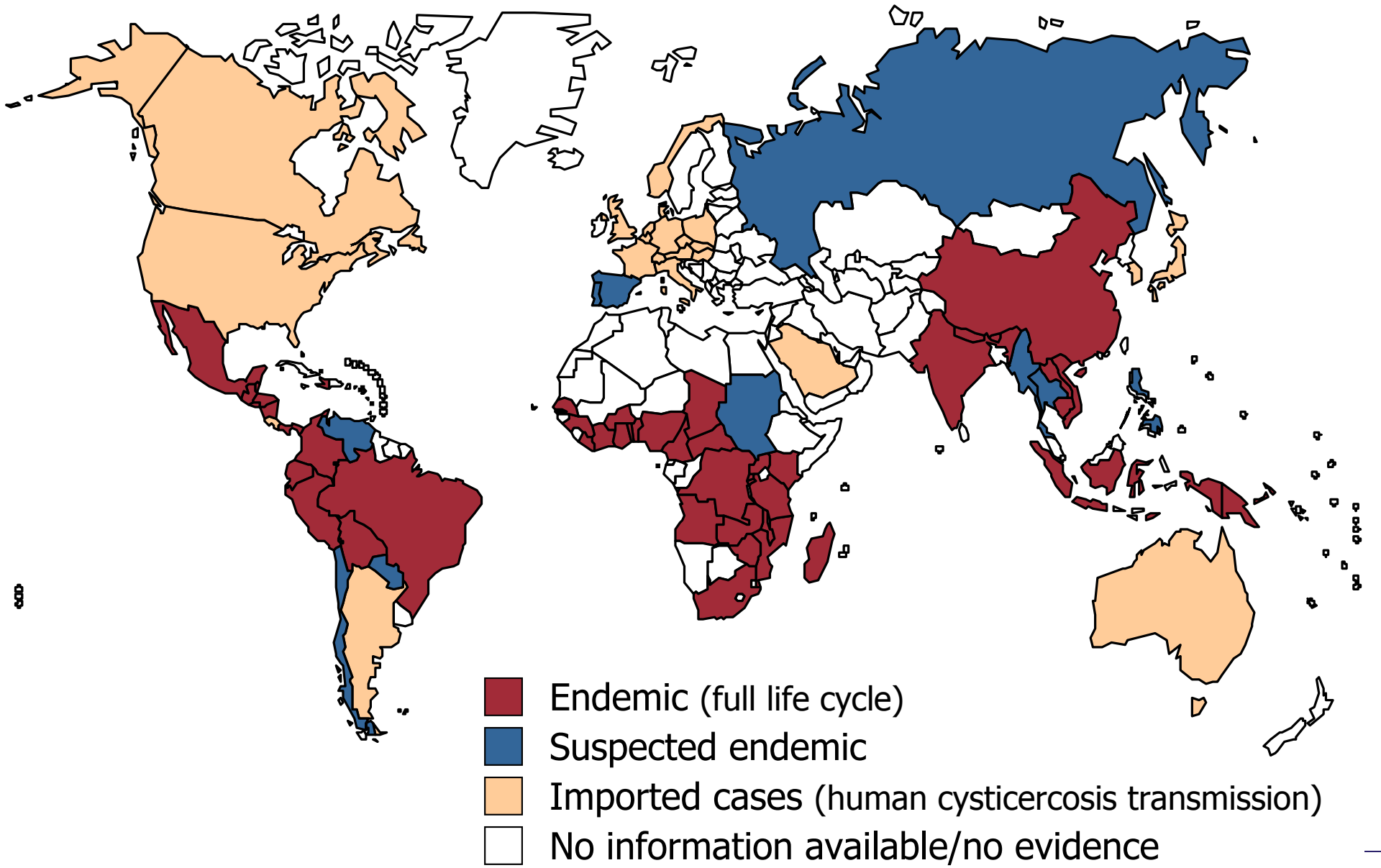
One Health problems cost more than DALYs!



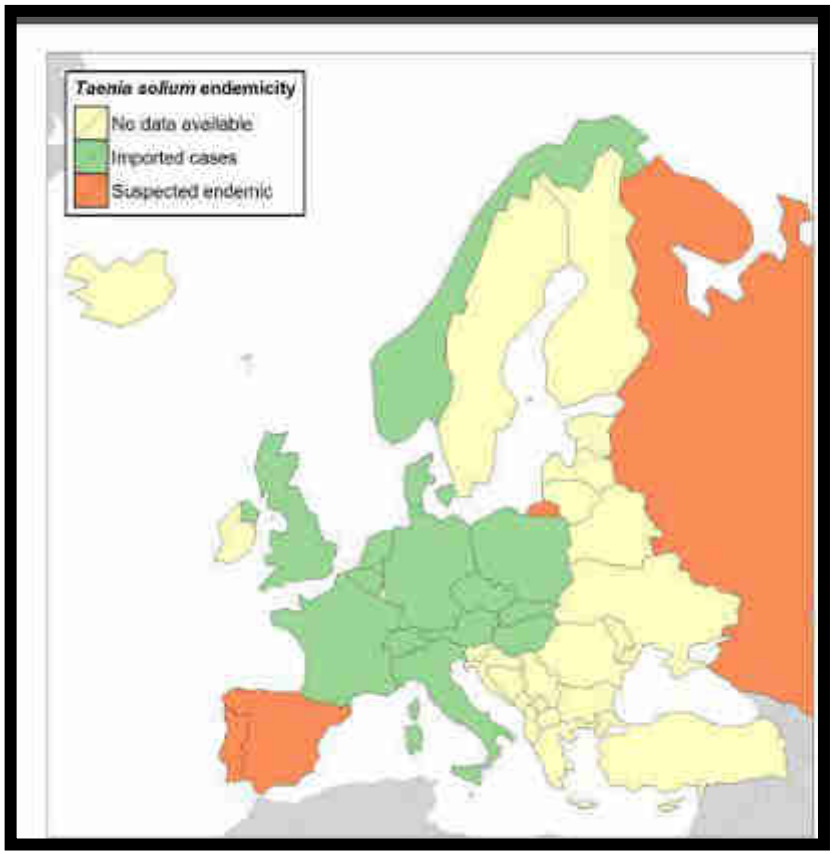
Burden	(Human	+ Animal) =	Total
Non-monetary	DALY	?	?
Monetary	€	€	**€**
Societal cost	**DALY+**	**€**	**?**

Environmental cost ???

WHERE: Worldwide distribution of *T. solium* cysticercosis



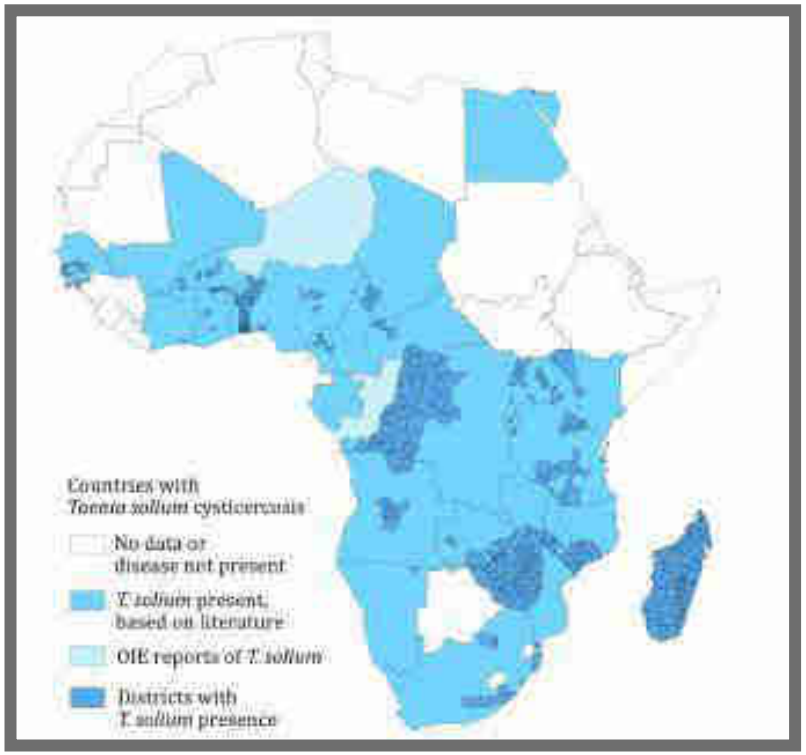
Moving regionally*: T. solium* distribution in Europe and Africa



CYSTINET: *T. solium* distribution in Europe
Devleesschauwer et al. 2015

T. solium in Africa

- ✓ Since 1984: 141 reports
- ✓ Reported from 29/54 countries
- ✓ Reported in 476 districts



Braae et al. 2015

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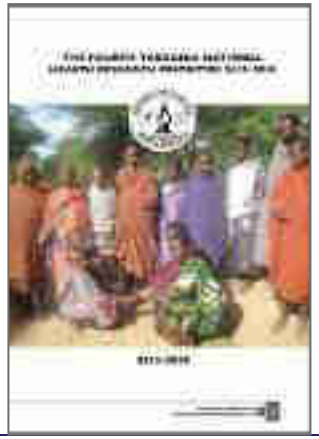
WHO are the stakeholders

International arena

Regional/National arena



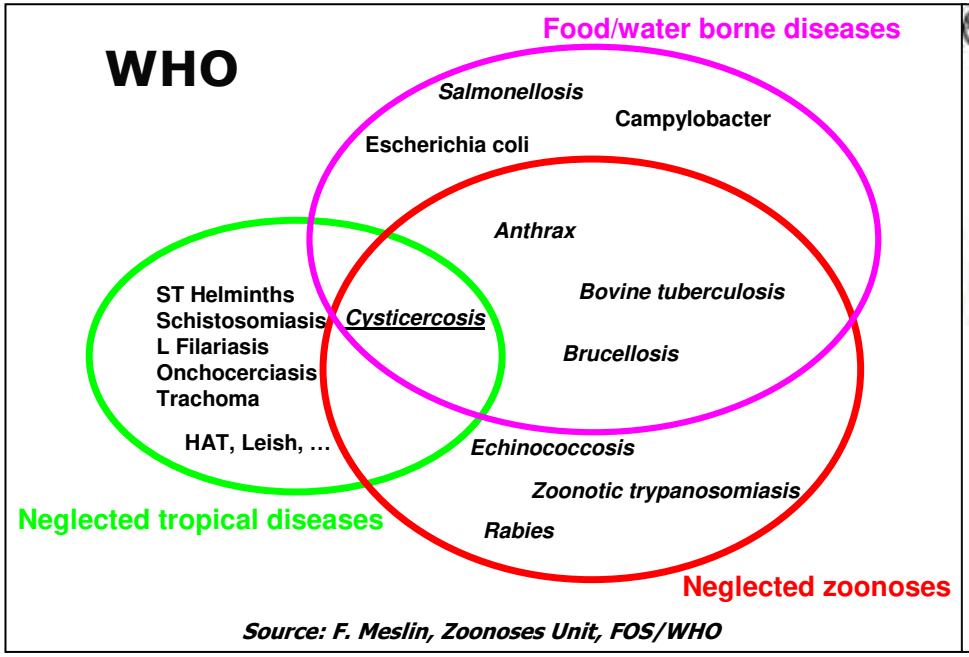
Local arena

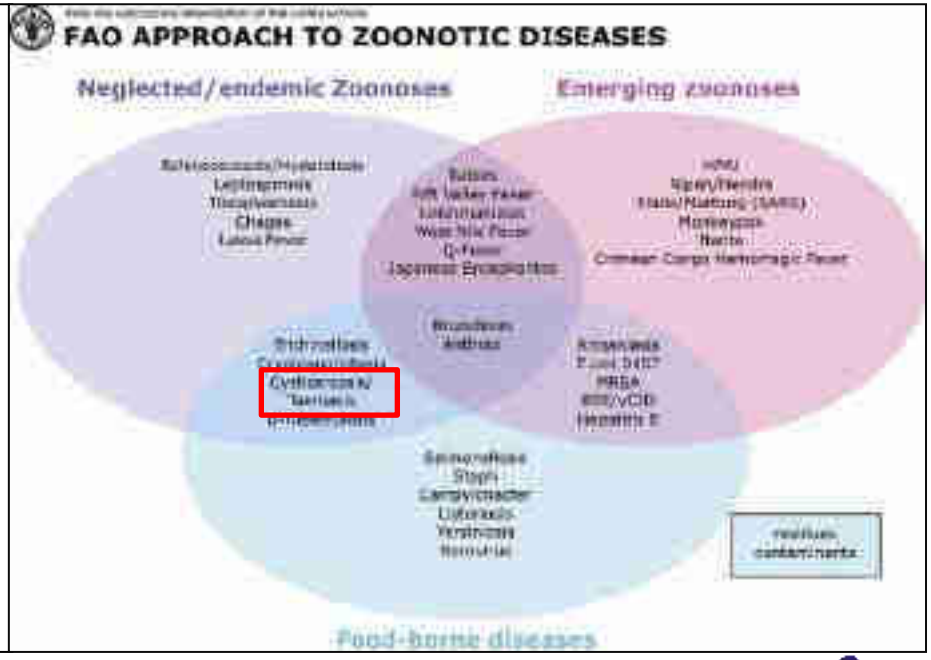
International focus on *Taenia solium* cysticercosis

In 1993: the International Task Force for Disease Eradication (Carter Centre) declared 6 diseases eradicable:

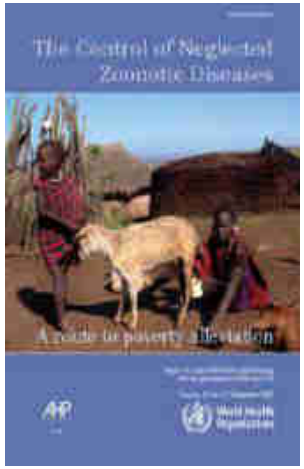
1. Poliomyelitis
2. Rubella
3. Mumps
4. Dracunculiasis
5. Lymphatic filariasis
6. **Cysticercosis**

2007





Neglected Tropical Diseases (NTD) and Neglected Zoonotic Diseases (NZD)



Neglected Tropical Diseases

1. Dengue
2. **Rabies**
3. Trachoma
4. Buruli ulcer
5. Yaws
6. Leprosy
7. Chagas disease
8. **African trypanosomiasis**
9. **Leishmaniasis**
10. **Cysticercosis**
11. Dracunculiasis
12. **Cystic echinococcosis**
13. **Foodborne trematodiasis**
14. Lymphatic filariasis
15. Onchocerciasis
16. Schistosomiasis
17. Soil-transmitted helminthiases

Neglected Zoonotic Diseases

1. **Rabies¤**
2. **Cysticercosis¤**
3. **Echinococcosis¤**
4. **Foodborne trematodiasis¤***
5. Zoonotic trypanosomiasis
6. Anthrax
7. Bovine tuberculosis
8. Brucellosis
9. Leishmaniasis

¤: Focus NZD by WHO
*: Not among the original NZD

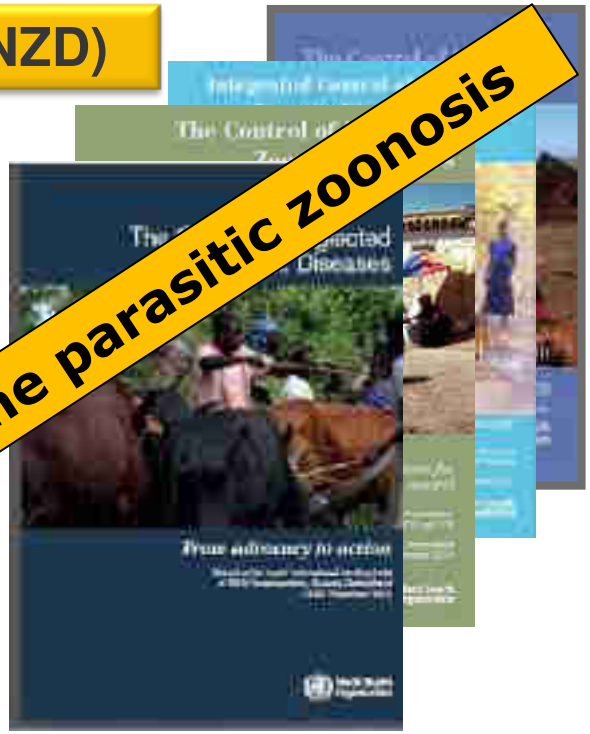
The history of 'Neglected Zoonotic Diseases' (NZD)

First meeting, Geneva, 2005, aimed at promoting and justifying the integrated NZD prevention and control within the 'One Health ' concept.

Second meeting, Nairobi,2007, tackled some of the practical, institutional, political and resources related issues associated with this initiative.

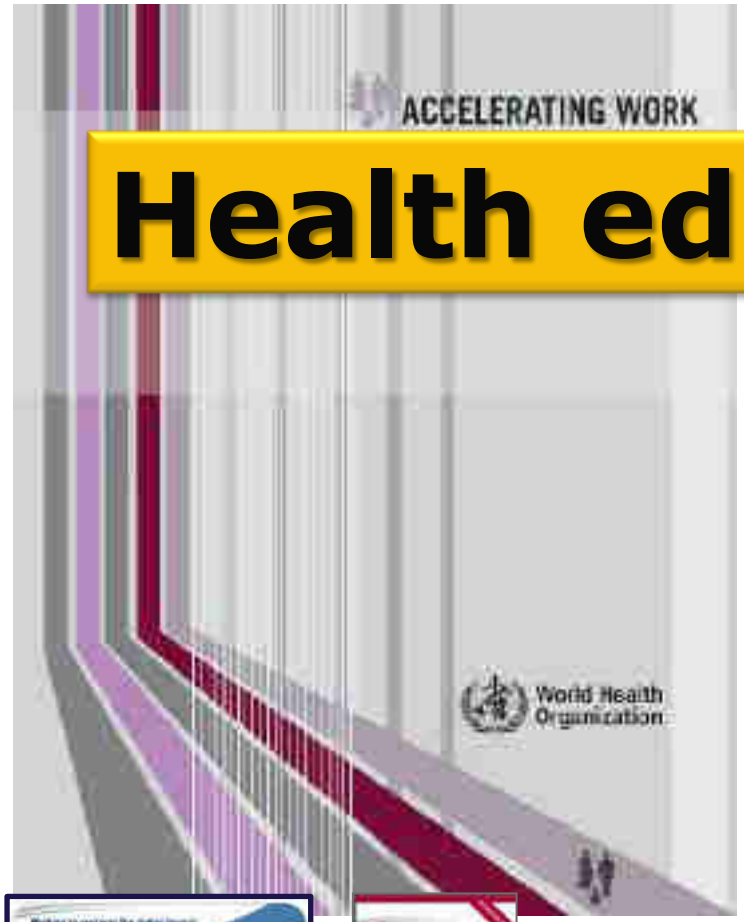
Third meeting, Geneva, 2012, developed a [illegible]ap for NZD prevention and control.

Fourth meeting, Geneva, 2014:



FAO, OIE, WHO 2014: *T. solium*: The number one parasitic zoonosis

Tackling NTD: a pro-poor strategy on a grand scale WHO 2010

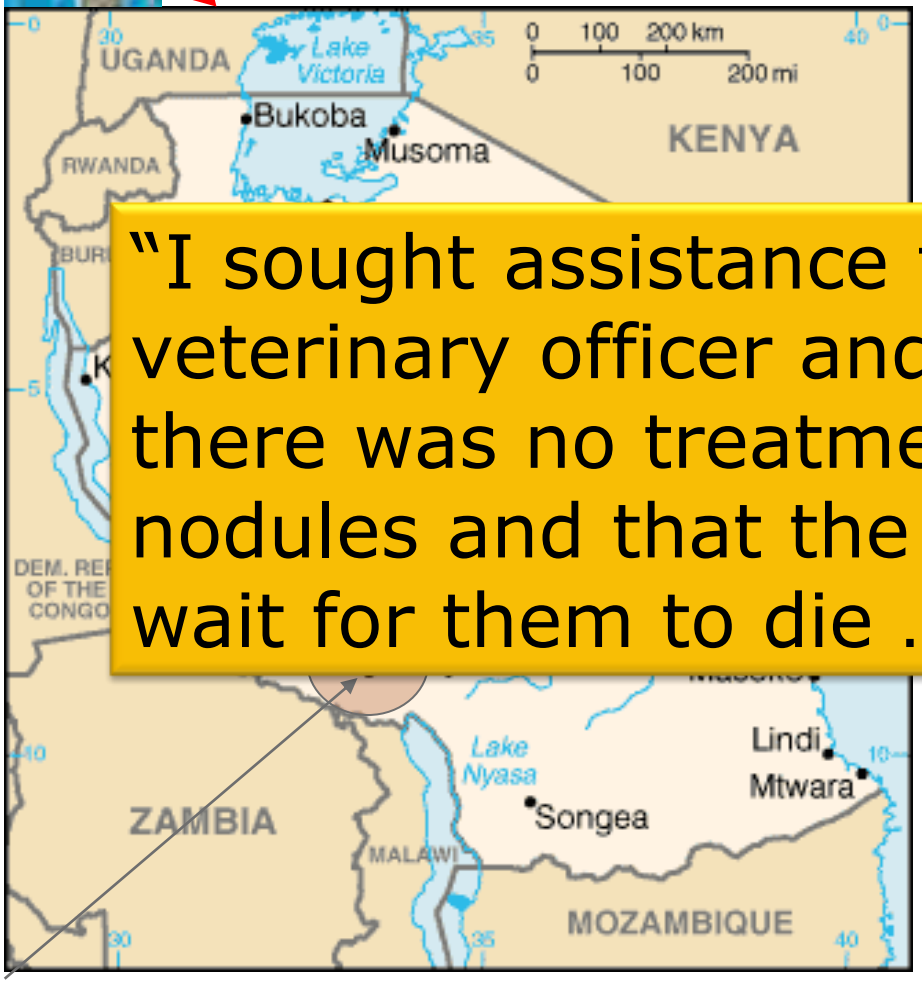


Health education?

s to combat NTDs

1. Preventive Chemotherapy
2. Innovative and intensified disease management
3. Vector control and pesticide management
4. Safe drinking-water, basic sanitation and hygiene services
5. Zoonotic-disease management

WHY: Study site in Mbeya, Tanzania 2006 -



Mbeya region, Tanzania, 2.7 mill people (2012)

350,000 pigs (NSCA 2007/2008)

T. solium prevalence

1. Porcine prevalence: 30.0%
2. Human taeniosis: 5.2%
3. Human cysticercosis (Ab): 45.3%

"I sought assistance from our field veterinary officer and he told me that there was no treatment for white nodules and that the best I can do is to wait for them to die …" (a 41years old man)

✓ Eating human faeces

Human cysticercosis = Witchcraft

✓ Walking barefoot
✓ Eating pork
✓ Mother to child
✓ Drinking dirty water

(Kalange, 2011)

WHY: Conclusion from studis in Mbeya


Photo: U. Braae

1. **Lack of farmers knowledge**
2. **Lack of knowledge among professionels**
3. **Practices favoring transmision**

(Kalange, 2011)

Mbuzi ya ulaya
Mbuzi katoliki } **= European goat**

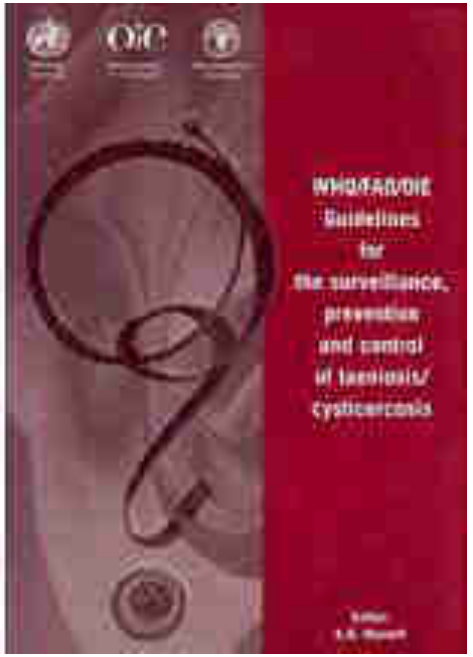
Local name for pork

***T. solium* is a socially determined disease!**
Health education will be essential for control!

Strategies for health education regarding *T. solium* cysticercosis/taeniosis

Current WHO/FAO/OIE guidelines:

"In developing countries health education should be closely integrated with development of primary health care and not directed exclusively towards taeniosis and cysticercosis…"



Health education in sub-Saharan Africa in the years to come:
Specific >< non-specific
intervention tool?

Very few projects have assessed the impact of health intervention

Table 3. Health Education Programs

Country	Year	Population & Coverage	Reduction			Improvement		Follow-up period	Citation
			Human Cysticercosis	Porcine Cysticercosis	Taeniasis	Knowledge	Good Practise		
Tanzania	2002-5	Farmers 62%		43%		Significant in control and	Reduction in consumption of infective	12 months	(Ngowi et al., 2009, Ngowi et al.,
	2	sellers/producers							Joshi, 2001, Jimba et al., 2003, Joshi et al., 2001)
Kenya	2006-8	Pig farmers 46% (Busia) 37% (Kakamega)	Not reported			Increased more in those attending workshop	Significant increase in tethering	24 months	(Wohlgenut et al., 2010)
China	1994-6/6-8	Not reported	66%		95%	Not reported		2 yrs.	Reviewed by (Wu et al., 2012)
Mexico	1992-3	Teachers, health personnel, students, community members	Not reported	77% Significant ($p<0.05$)	Non-significant (1yr) 56% reduction (3yrs)	Significant increase	50% reduction in free-range pigs	1yr & 3yrs	(Sarti et al., 1997) (Sarti et al., 1998)

Specific health education in Northern Tanzania 2002 -2005:
Reduced incidence of porcine cysticercosis in the intervention villages by **43%** compared to the controls one year after intervention (Ngowi et al., 2008).

WHO landscape analysis: control of *Taenia solium,* (WHO, 2015)

WHO: Regional stakeholder

Cysticercosis Working Group of Eastern and Southern Africa (CWGESA) 2001 –

5th General assembly Maputo, MZ, Sep. 2007

CYSTINET

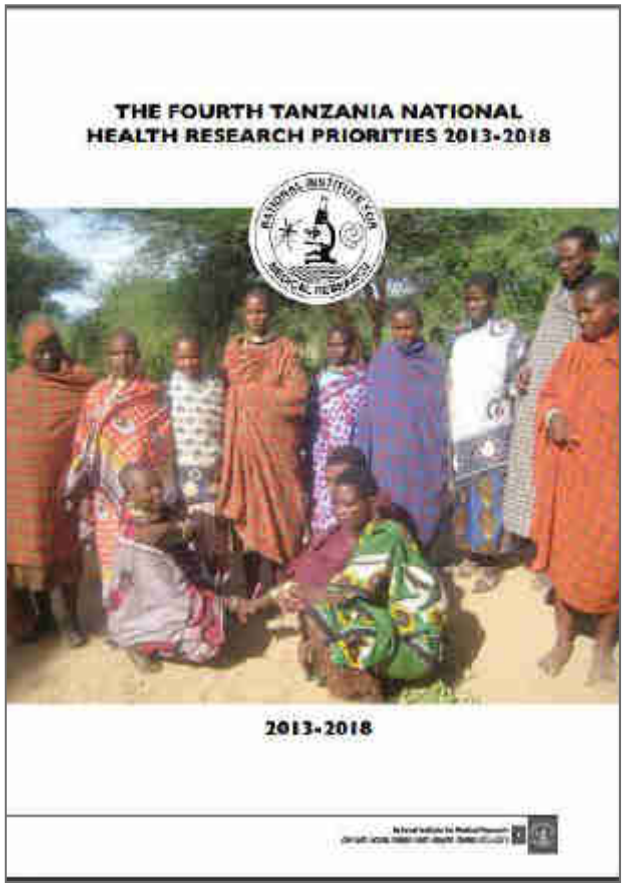
CYSTINET – EU COST ACTION

CWGESA aims to:
Act as a forum where partners can increase awareness, advocacy and transdisciplinary collaboration on *T. solium* cysticercocis/taenosis problems.

CWGESA has: 12 member countries from multidisciplines & multisectors.

WHO: National stakeholder – MoH Tanzania

NMRI 2013: *T. solium* now high priority on the National Health Priority List



WHY: Intervention tools for control of *T. solium* cysticercosis in sub-Saharan Africa (CWEGESA)

1. Treatment of taeniosis cases
2. Preventative chemotherapy (MDA)
3. **Health education**
4. Improved pig husbandry
5. Improved meat inspection and processing
6. Improved sanitation
7. Anthelmintic treatment of pigs (N.A.)
8. Vaccination of pigs (N.A.)

The long way from creation to production of The Vicious Worm

The first sketch

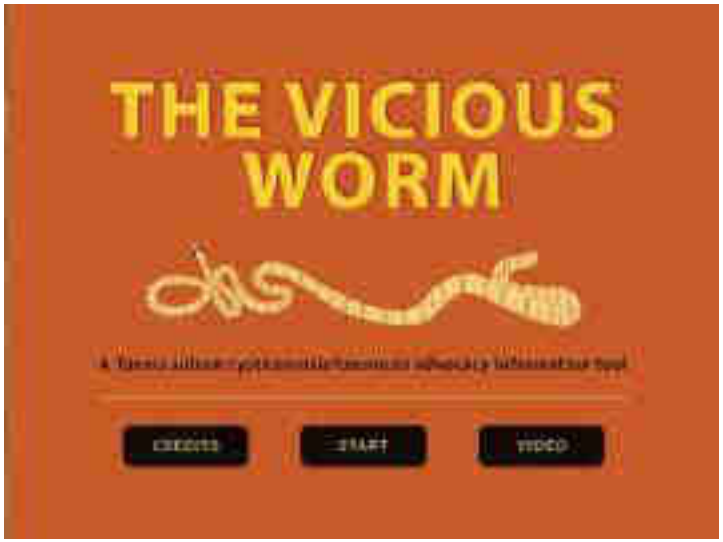
The program is available from its homepage and as an app for ANDROID & I-PHONE

1. The idea
2. Literature
3. Study boards
4. Pictures
5. Drawings
6. *Revision*
7. Programming
8. *Revision*
9. Beta-version
10. Pre-testing
11. *Revision*
12. Pilot testing
13. *Revision*
14. Launch

An artist

INIQ

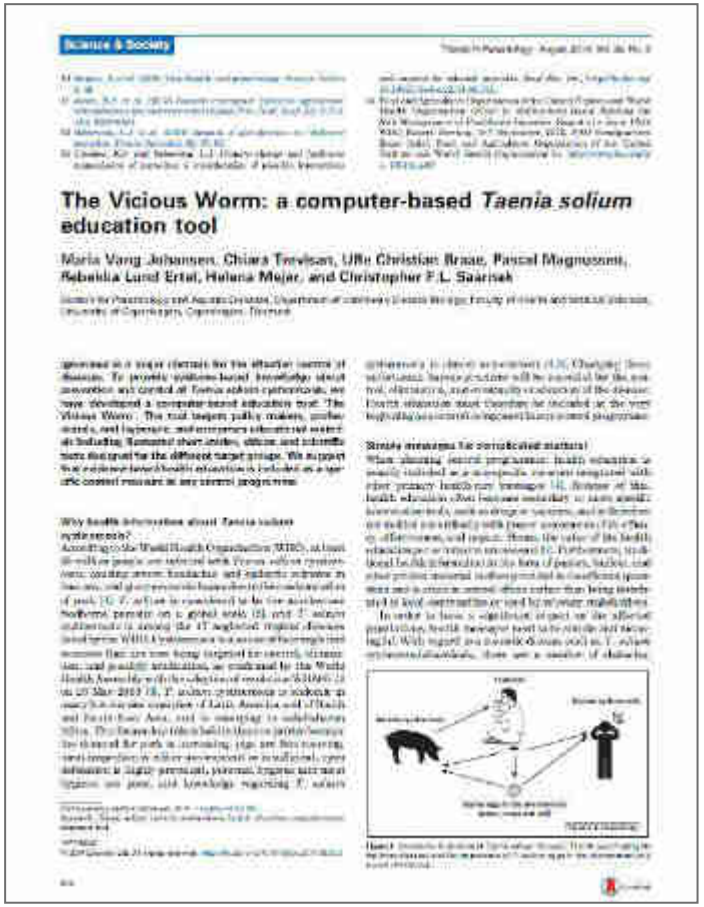
Programmer



www.theviciousworm.org

The Vicious Worm

An electronic flexible distance learning course based on current knowledge for different target audiences



Science & Society

The Vicious Worm: a computer-based *Taenia solium* education tool

Maria Vang Johansen, Chiara Trevisan, Ulla Christian Braae, Pascal Magnussen, Rebekka Lund Ertel, Helena Mejer, and Christopher F.L. Saarnak

Provides information at three different levels regarding *T. solium* cysticercosis/ taeniosis:

1. Transmission
2. Diagnosis
3. Treatment
4. Prevention

THE VICIOUS WORM

A *Taenia solium* cysticercosis/taeniosis advocacy information tool

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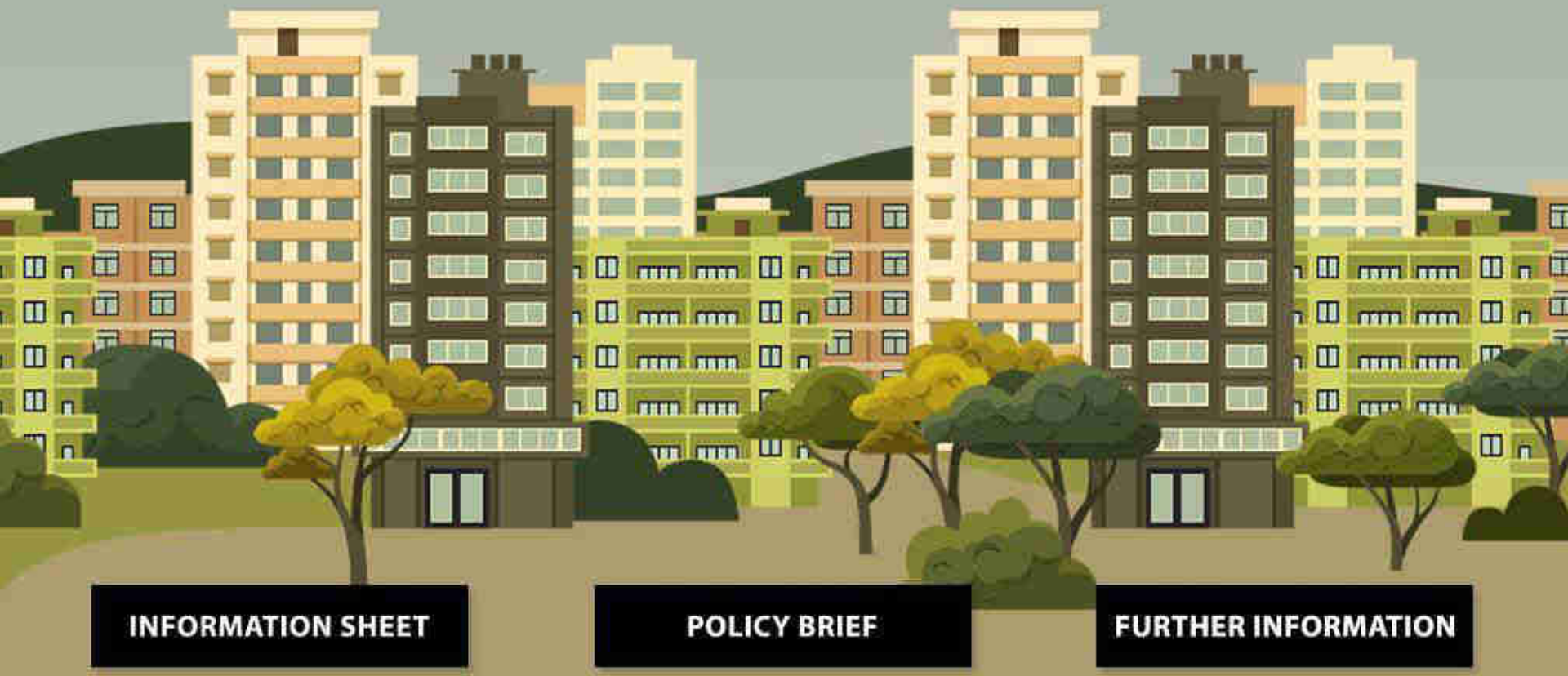
CREDITS START VIDEO

In the village

In the town

Visit the town for technical information

In the City

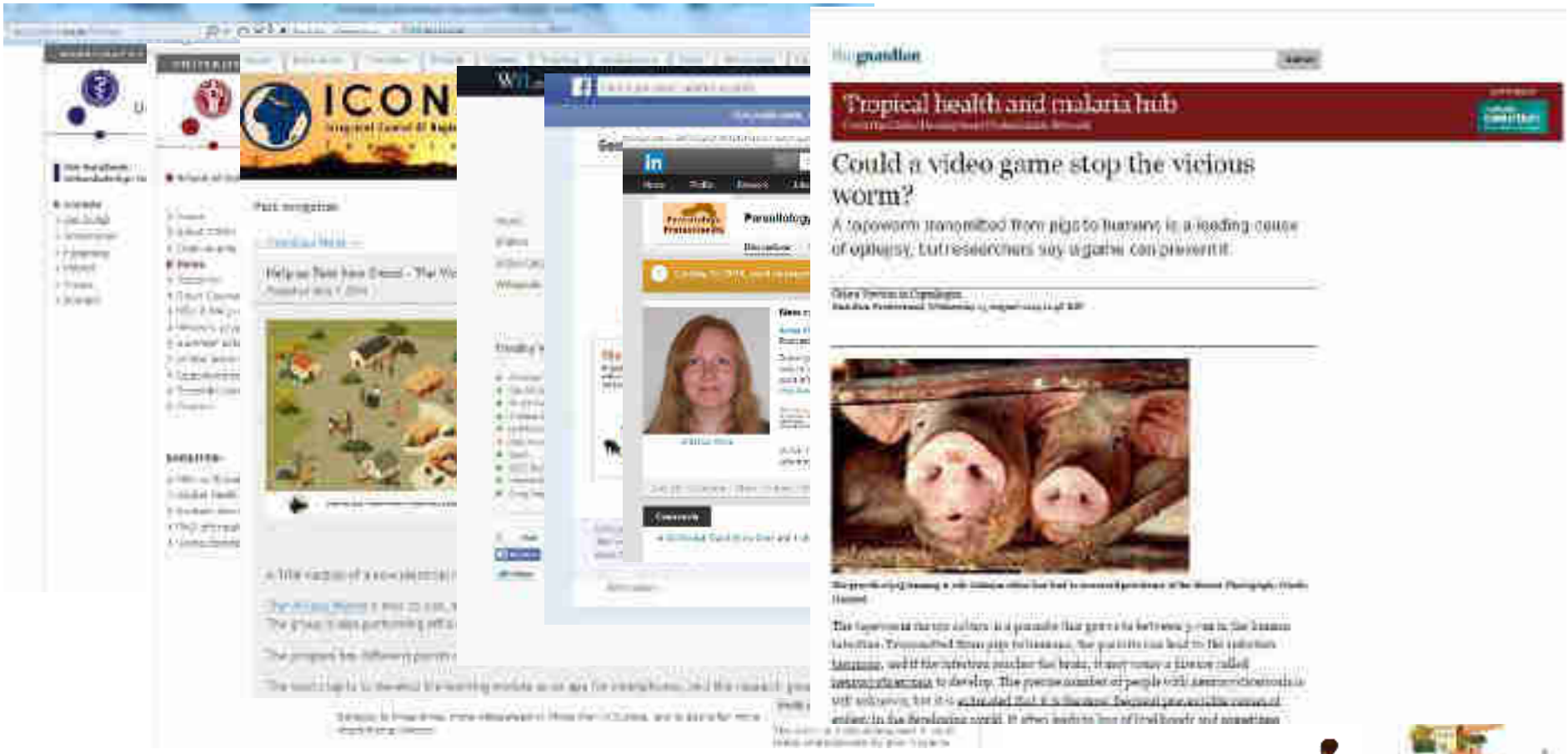


INFORMATION SHEET

POLICY BRIEF

FURTHER INFORMATION

Launch of The Vicious Worm 2014



The Vicious Worm A cysticercosis advocacy information tool

Evaluation of the learning outcome of TVW

The aim of the study was to assess the learning outcome and practice changes for health and agricultural professionals in Tanzania after they were introduced to the electronic learning tool TVW.

The study was conducted by two Master students:
Rebekka L. Ertel (2014) and Sophie Lauritsen (2015)

Study subjects: Professionals (n=79 -> 64)

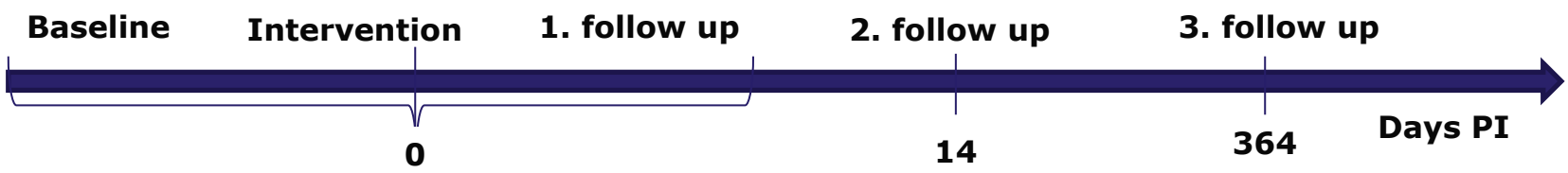
Agriculture sector (n=58 -> 49)
10 veterinarians, 3 meat inspectors,
17 agriculture/livestock extension officers,
28 agriculture/livestock diploma students

Health sector (n=21 -> 13)
5 health officers, 6 medical officers,
10 assistant medical officer students

Education level
Certificate: 5
Diploma: 56
Bachelor: 13
Master: 5

Evaluation of the learning outcome of TVW

DESIGN



1. Baseline: Test (24 multiple choice questions about *T. solium*)
2. Intervention: 1½ hours playing with TVW on a computer
3. First follow up: Test (24 multiple choice questions – in different order) + interview and focused group discussions (FGD) + observations
4. Second follow up: Test (24 multiple choice questions - in different order) (R. Ertel)

5. Third follow up: Test (24 multiple choice questions - in different order) + FGD + observational study (S. Lauritsen)

Evaluation of the learning outcome of TVW

Conclusion – R. Ertel

- **Knowledge significantly improved**: immediately after and two weeks after the intervention. Not significant in agriculture sector two weeks after. Sector was a significant **factor for improvement** – high baseline knowledge => less improvement!

- **FGD** and observations showed a **general positive attitude**. The study subjects found 'The Vicious Worm' efficient, simple and appealing. Accessibility was questioned

- **Suggestions for improvement** were translating to Swahili, adding sound, including other diseases and providing supplement material in paper form

The improvements in knowledge and the positive attitude indicated that 'The Vicious Worm' could be a useful tool for health education interventions regarding *T. solium*

Evaluation of the learning outcome of TVW

Conclusion – S. Lauritsen – one year after

- 64 out of the 79 professionals agreed to participate
- The 64 participants worked in 16 out of 21 regions in Tanzania
- Participants had significantly improved their knowledge from baseline to third follow-up
- 82% of the participants had used the program after the introduction
- No correlation between frequency of use and test score
- Strong correlation between level of education and test score

Evaluation of the learning outcome of TVW

Conclusion – S. Lauritsen

50/64 informants had taken action to prevent *T. solium* by:

- ✓ Changing Bylaws
- ✓ Educating others
- ✓ Showing The Vicious Worm
- ✓ Organising village meetings
- ✓ Improving latrines and pig pens
- ✓ Setting up hand washing stations
- ✓ Improving kitchen hygiene and cooking practices

Photos: U.Braae, R. Lund, S. Lauritsen

Evaluation of the learning outcome of TVW

Conclusion

- Professionals in Tanzania were after the 1½ hours introduction to TVW able to:
- Learn and maintain high level of knowledge regarding *T. solium* transmission, prevention and control
- Educate others regarding prevention of *T. solium*
- Facilitate the change of many risk practices using locally available resources
- Spread the word to 16/21 regions as they got employments after graduation in Mbeya

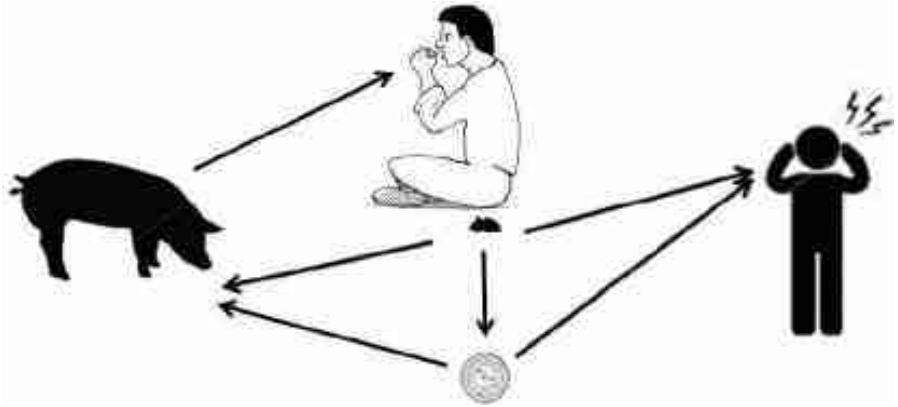
We believe:
Control of *Taenia solium* requires a One Health approach

Proper cooking

Knowledge

Latrines & hygiene

Meat inspection



Human treatment

Pig treatment

Fencing of pigs

Vaccination of pigs

TAK

Acknowledgements to our key collaborators:

Faustin Lekule
Helena Ngowi
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Ewans Kabemba
Wendy Harrison
Andrea Winkler
Veronika Schmidt
Pierre Dorny
Sarah Gabriel
Brecht Devleesschauwer
Arve Lee Willingham

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Benefit	Direct/ indirect	Short term/ long term	Individual/ community	Capacity building
Human health				
Animal welfare				
Environment				

Harm	Direct/ indirect	Short term/ long term	Individual/ community	Cost
Human health				
Animal welfare				
Environment				