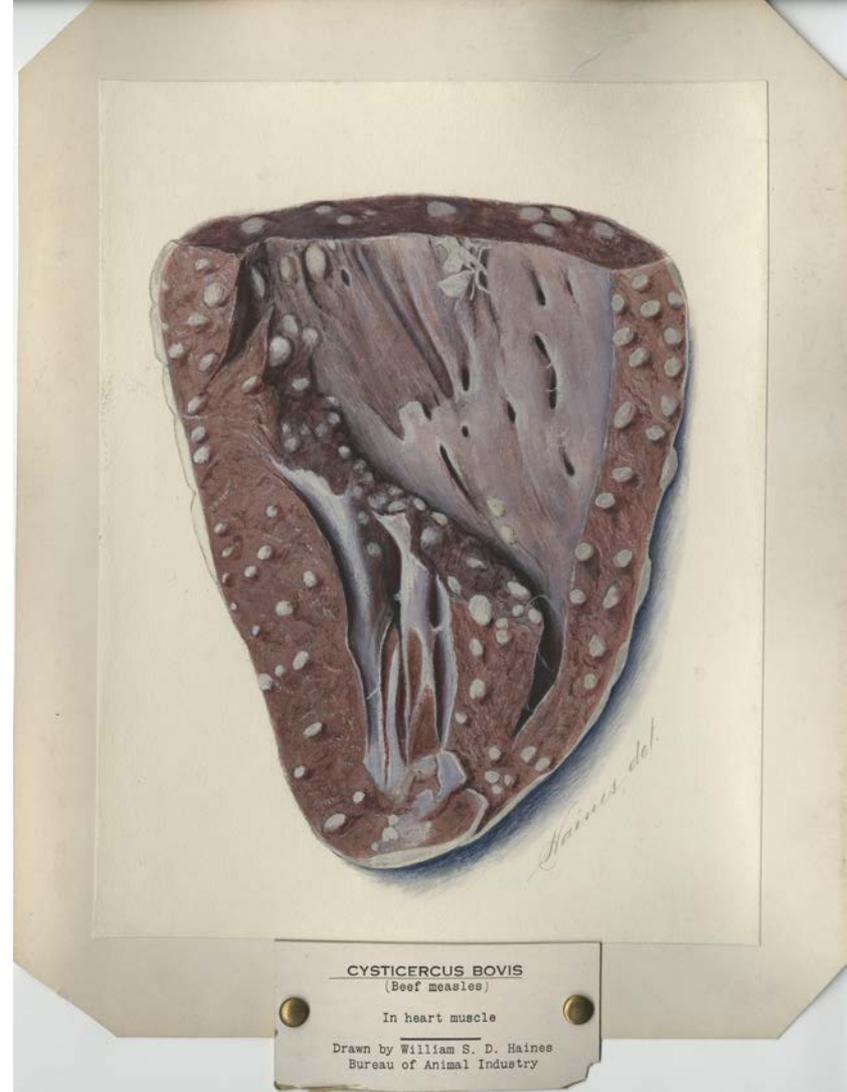
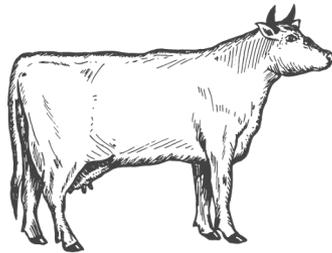


Case 10 – Taenia in beef

Duriya Charypkhan, Dima Farra, Keli Gerken, Lydia Mesarcova
Supervised by Madalena Vieira-Pinto

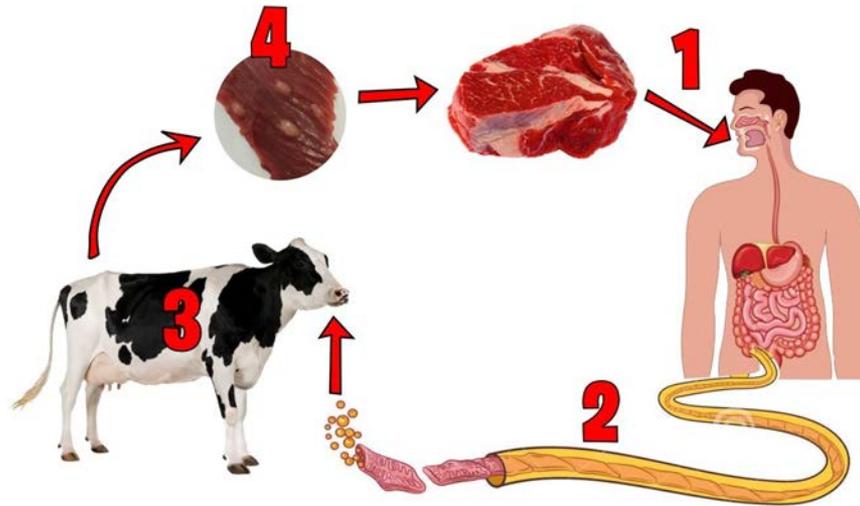


CYSTICERCUS BOVIS
(Beef measles)

In heart muscle

Drawn by William S. D. Haines
Bureau of Animal Industry

Life cycle and risk factors for *Taenia saginata*



Direct transmission cycle (Risk is at farm)

Human risk

Consumption of cyst from infected meat*

Animal risk

Indiscriminate consumption of human feces

- Farm worker open defecation
- Illegal application of sewage to grazing areas
- Access to contaminated surface water (high density populations)
- Solid vs slatted floors
- Introduction infected animals to herd

*Meat that has not been properly cooked or frozen before cooking

Health burden of *Taenia saginata*

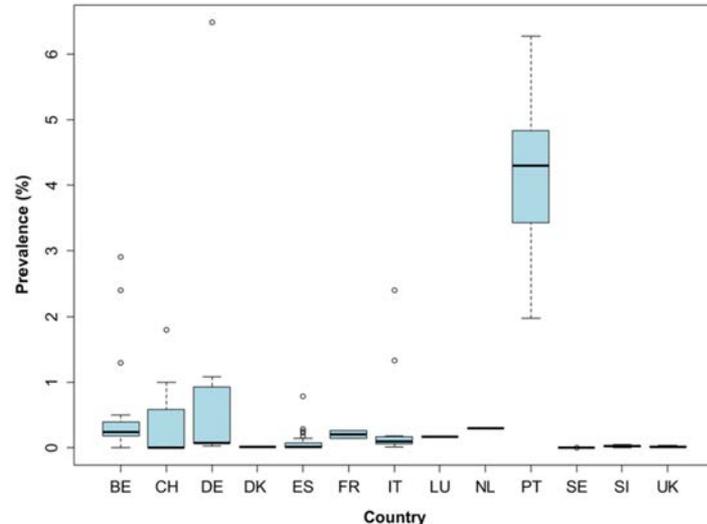
- Not included in WHO priority foodborne parasitic diseases list (2010)
- Risk dependent on cultural context of country and production styles & method of detection

Kenya (smallholder production): Human serology 0.30% (Fevre et al, 2017)

Europe (semi-intensive/intensive farms): Various levels but overall low,

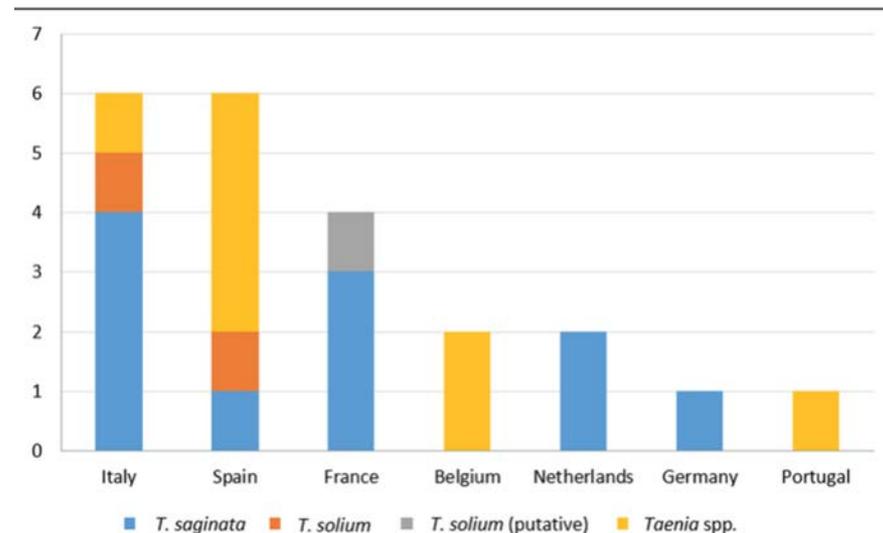
Figures taken from: Laranjo-González et al. Parasites & Vectors (2017) 10:349

Bovine prevalence (meat inspection) in western Europe after 1990.



BE, Belgium; CH, Switzerland; DE, Germany; DK, Denmark; ES, Spain; FR, France; IT, Italy; LU, Luxembourg; NL, The Netherlands; PT, Portugal; SE, Sweden; SI, Slovenia; UK, United Kingdom

Number of **human cases** in western Europe (1990–2015)



Bovine cysticercosis as an important meat-borne hazard

Zoonotic disease with little clinical importance

*Not the same as pig tapeworm infection (*Taenia solium*)

In bovines, **importance is economic**

Longer processing times

Meat can not be sold fresh



Economic impact of *Taenia saginata*

Case example: Belgium

Per year, 15 carcasses (generalised infections) + 1,168 carcasses (localized) detected during meat inspection

- Most of burden on cattle owners: € 3,408,455/year
(insurance costs >> value loss from freezing > total condemnation)
- The slaughterhouses suffered an economic impact of €210,806/year.
- Insurance companies make profit of €2,322,337/year.
- Human economic burden (Deworming primarily)
10,991 patients annually and amounted to a maximum of €795,858/year
- Trade implications



Farm categorization

A	B	C	D
Semi-intensive grazing system herd Stay 3 months Indoor at night Outdoors during day and monitored by shepherd Good sanitary conditions	Semi-intensive grazing Stay 2 years Indoor during night Indoor at night Outdoors during day and monitored by shepherd Access to surface water No sanitary conditions for the employees	Intensive fattening units Stay 8 months Indoor only on solid floor Water not controlled	Intensive fattening units Stay 8 months Indoor only on slatted floor good sanitary conditions for the employees
All dewormed once and purchase <i>T. saginata cysticercus</i> negative calves. None are <u>allow</u> dogs in the stables			

Farm categorization - Main risk factors

	Farm A	Farm B	Farm C	Farm D
Access to outdoor	X	X		
Sanitation devices not provided to employees		X	X	
Presence of shepherds during grazing	X	X		
The water supplied to the animals in the stable is taken from outside		X	X	
Access to non-controlled surface water during grazing	X	X		
Access to slurry and manure is unknown	X	X		
Solid Floor			X	



Abattoir Categorization

FSMS Component	
1	FCI as it is now
2	FCI with additional WG2 suggestions (= improved FCI)
3	Financial penalisation of farmers
4	Pre-slaughter, inside lairage interventions (shearing/clipping) (only C,
5	Preselection of herds before slaughter (WP2)
6	Logistic slaughter
7	Adapting line speed
8	GMPs & GHPs
9	Hygiene assessment systems (SCORE FIXED)
10	Staff training
11	Other PRPs (pest control, storage conditions etc.) (SCORE FIXED)
12	HACCP
13	Carcase interventions at slaughter
14	Chilling
15	Carcase freezing
16	Use different sale channels (SCORE FIXED)
17	Inform and follow up with farms
18	Monitoring and continuous improvement (SCORE FIXED)
19	Microbiological testing
20	Communication (SCORE FIXED)
21	Internal auditing

Abattoir 1

Score
1.00
1.00
1.00
0.50
1.00
1.00
1.00
1.00
0.50
1.00
0.50
0.88
0.75
1.00
1.00
0.50
1.00
0.50
1.00
0.50
1.00
17.63

High

Abattoir 2

Score
1.00
0.00
0.00
0.00
1.00
0.00
0.00
0.08
0.50
0.00
0.50
0.00
0.00
0.00
0.50
0.50
0.00
0.50
0.50
0.50
0.50
0.50
0.33
5.42

Low

Abattoir 3

Score
0.50
0.00
0.00
0.00
0.50
1.00
0.00
0.42
0.50
0.25
0.50
0.63
0.50
0.50
0.50
0.50
0.50
0.50
0.50
0.50
0.50
0.50
0.50
8.79

Medium

Factors of importance for *Taenia saginata*

Logistic of slaughter/ line speed:
Sufficient time for the personal to properly inspect the meat

Freezers: In case of positive carcasses

Meat inspection at abattoir

Legislative framework of bovine meat inspection -

Commission Implementing Regulation (EU) 2019/627 - uniform practical arrangements for the performance of official controls on products of animal origin intended for human consumption

two types of procedures of post mortem inspection:

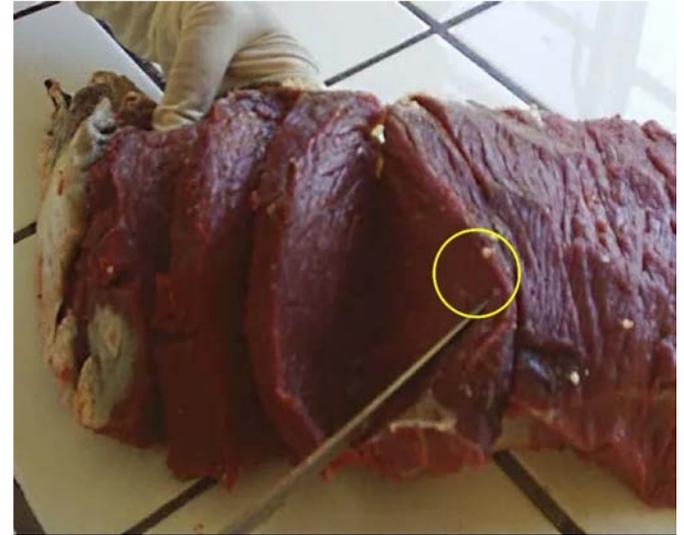
- young bovine animals (Art.18) - mostly visual inspection, incision when possible risk
- other bovine animals (Art.19) - additional techniques, palpation and incisions (for the purpose of diagnosing cysticercosis, incision into the masseters!)

For diagnosis of cysticercosis - low sensitivity (10% - 30%), especially in lightly infected carcasses



Art. 24: Indications of a possible risks in relation to cysticercosis Indicating additional procedures

- FCI (Food Chain Information)
- Status of holding of provenance - farm risk categorisation
- The findings of the *ante-mortem* inspection
- The findings of the *post mortem* inspection
- Additional epidemiological data or other data from the holding of provenance
- Laboratory analyses (ELISA, PCR)



Art. 30: CA may decide, that incision of the masseters at post-mortem inspection is not compulsory if:

- Specific **serological** test used
- Animals coming from a **holding free of cysticercosis**
- **No case** of cysticercosis in the population in the last **5 years**



Decision on meat

- Localized form - non infected parts fit for human after treatment (freezing)
- General infection - unfit for human consumption

Harmonised epidemiological indicators for *Taenia saginata* in bovines

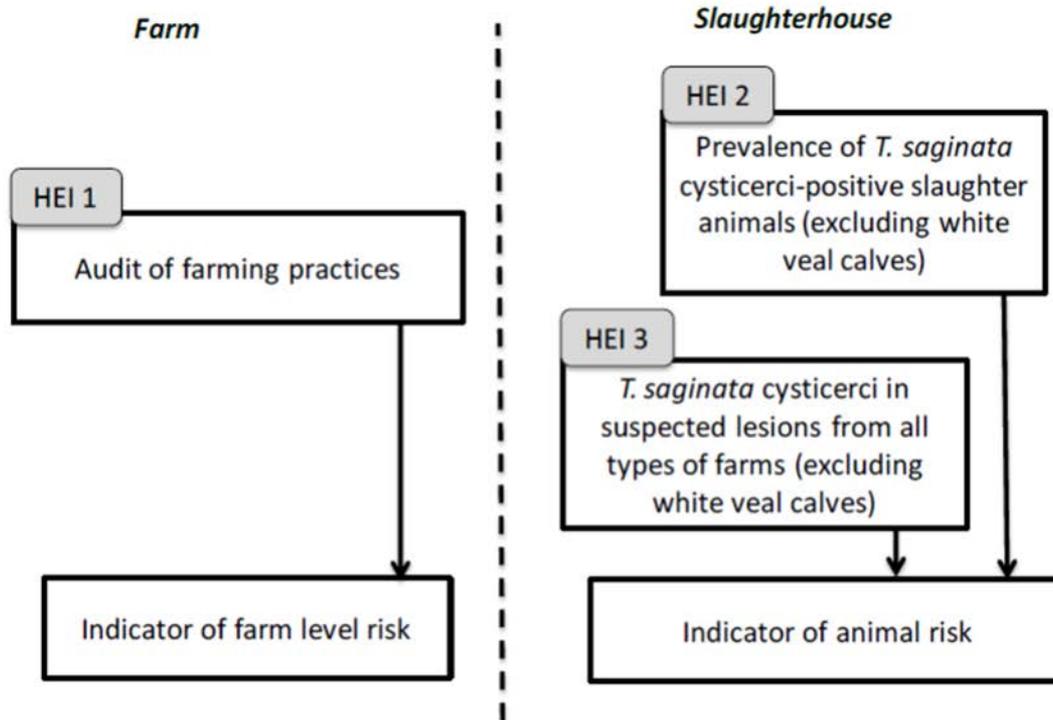


Figure 4: Schematic diagram illustrating the harmonised epidemiological indicators for *Taenia saginata* in bovine meat.



HEI1



Audit husbandry conditions *at the farm*

avoid contact of livestock with possible source of infection

Ex: Purchase policy

Access to pasture

Surface water, flooding

Vicinity of consequent human activity

Vicinity of water treatment plant

Tapeworm carrier on the farm



HEI2



Prevalence of positive animals detected by **serology**

at the *slaughterhouse level*

direct and indirect methods

detecting circulating parasite antigens by ELISA - viable cysticerci

detecting the hosts antibody response to cysticercus infection



HEI3



at the *slaughterhouse level*

Confirmation of *Taenia saginata cysticerci* in suspected lesions by using **PCR**

HEI1: audit on farm



- access to outdoor
- shepherds present during grazing
- access to non controlled surface water
- access to slurry and manure



Has a blast freezer, sterilizes knives etc



- access to outdoor
- no sanitation dev. for employees
- shepherds present during grazing
- water from outside
- access to non controlled surface water
- access to slurry and manure

HEI3: PCR
HEI2: ELISA



No freezer



HEI1: audit on farm

- no sanitation dev. for employees
- water from outside
- solid floor



has conventional freezing facilities available for freezing

