Parasites in food chains

Kristina Roesel and Delia Grace

Microsporidia in the Animal to Human Food Chain: An International Symposium to Address Chronic Epizootic Disease

9 August 2015 at University of British Columbia, Vancouver

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INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

CGIAR Research Program on Livestock and Fish

CGIAR RESEARCH PROGRAM ON Agriculture for Nutrition and Health
Led by IFPRI

Outline

1. Diseases in complex food production systems
2. Selected parasites in food chains
3. The global burden of foodborne parasitic diseases
4. Approaches in assessing and managing risks from foodborne parasitic diseases

1. Foodborne diseases

Distribution of wealth based on international purchasing power. Retrieved from: http://rachelstrohm.com/2011/05/11/a-different-look-at-global-income-inequality/

High-income countries

- 70% deaths >70 years
- Non-communicable conditions
- Roughly 15% illness caused by 4 FBD

Low-income countries

- 40% deaths <15 years
- Communicable diseases
- Diarrhoea top 10 killer

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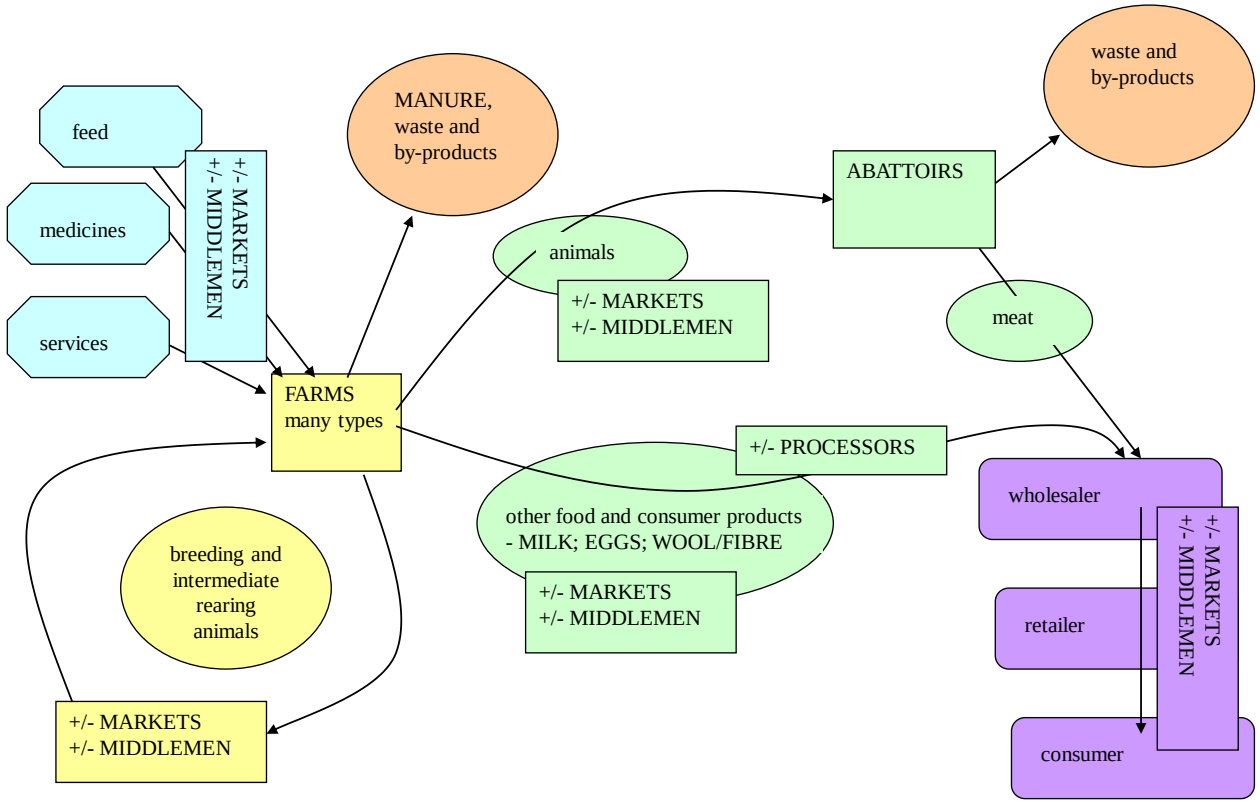
1. Foodborne diseases

Organic/extensive farming



Urbanization

Globalization

1. Foodborne diseases

Retrieved from: https://www.youtube.com/watch?v=1XBwjQsOEeg

taeniasis, toxoplasmosis

Chagas disease

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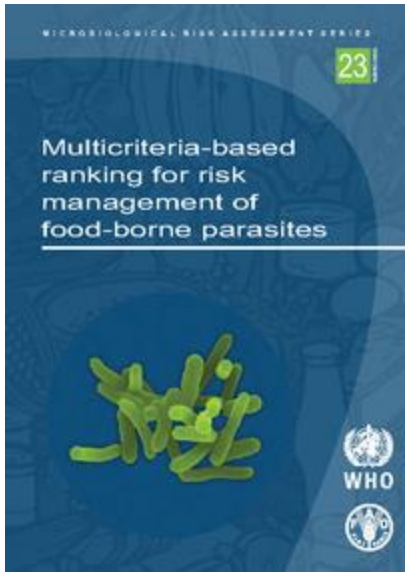
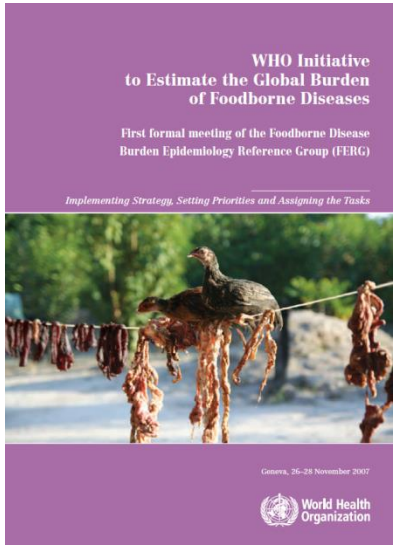
2. Selected parasites in food chains



FAO/WHO (2014) Multicriteria-based ranking for risk management of food-borne parasites. Microbiological Risk Assessment Series



WHO (2007) *First formal meeting of the Foodborne Disease Burden Epidemiology Reference Group (FERG): Implementing Strategy, Setting Priorities and Assigning the Tasks*.

- Intestinal protozoa
- Intestinal nematodes
- Foodborne protozoa
- Foodborne trematodes
- Foodborne nematodes
- Foodborne cestodes

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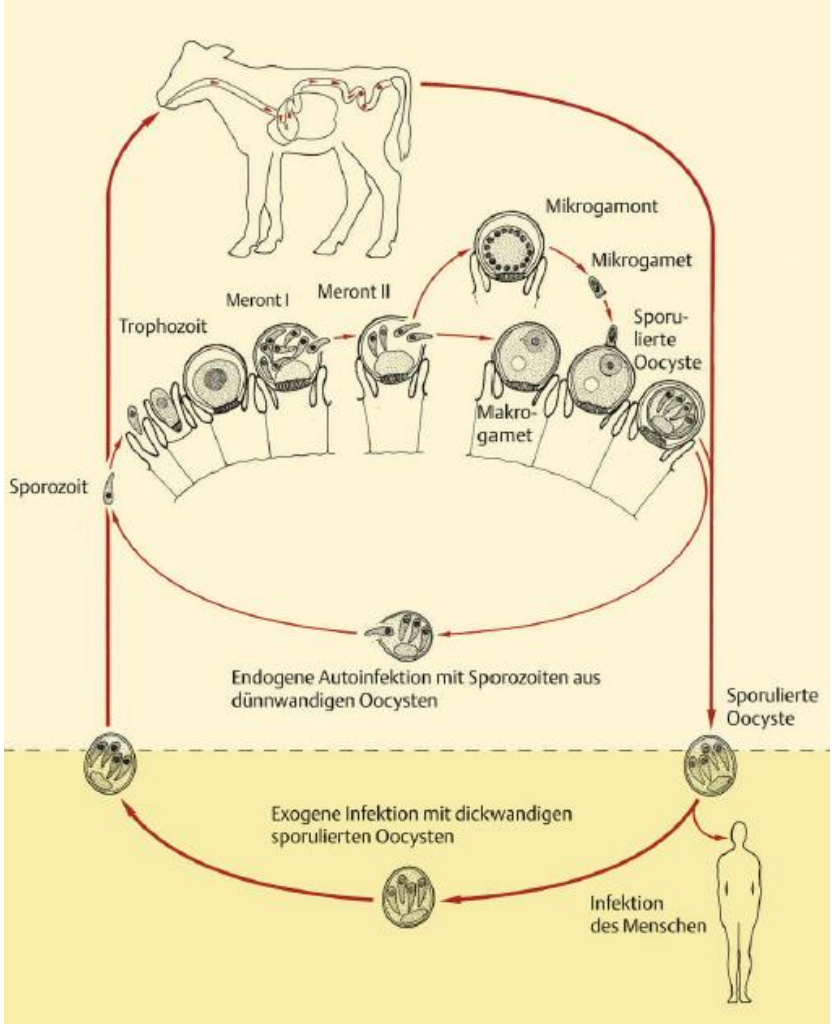
2. Selected parasites in food chains - intestinal protozoa



Source: Eckert et al. (2005)

- *Giardia*, *Entamoeba* spp.
  - Americas
  - Source: drinking water
- *Cryptosporidium* spp.
  - Africa
  - Immunocompromised
  - Source: water, fruit, raw vegetables

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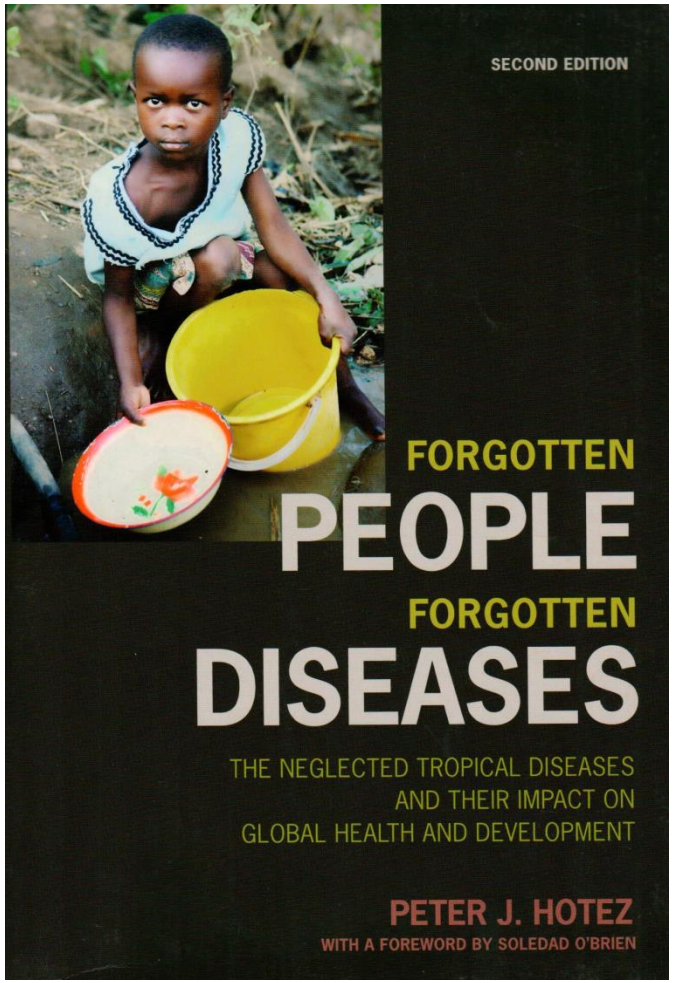
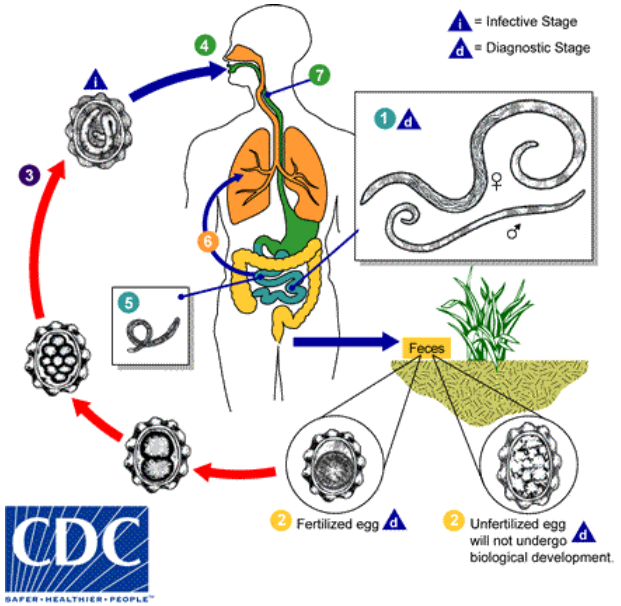
2. Selected parasites in food chains - intestinal nematodes



- *Ascaris lumbricoides*
  - Neglected tropical disease
  - Source: water, soil, pigs ?



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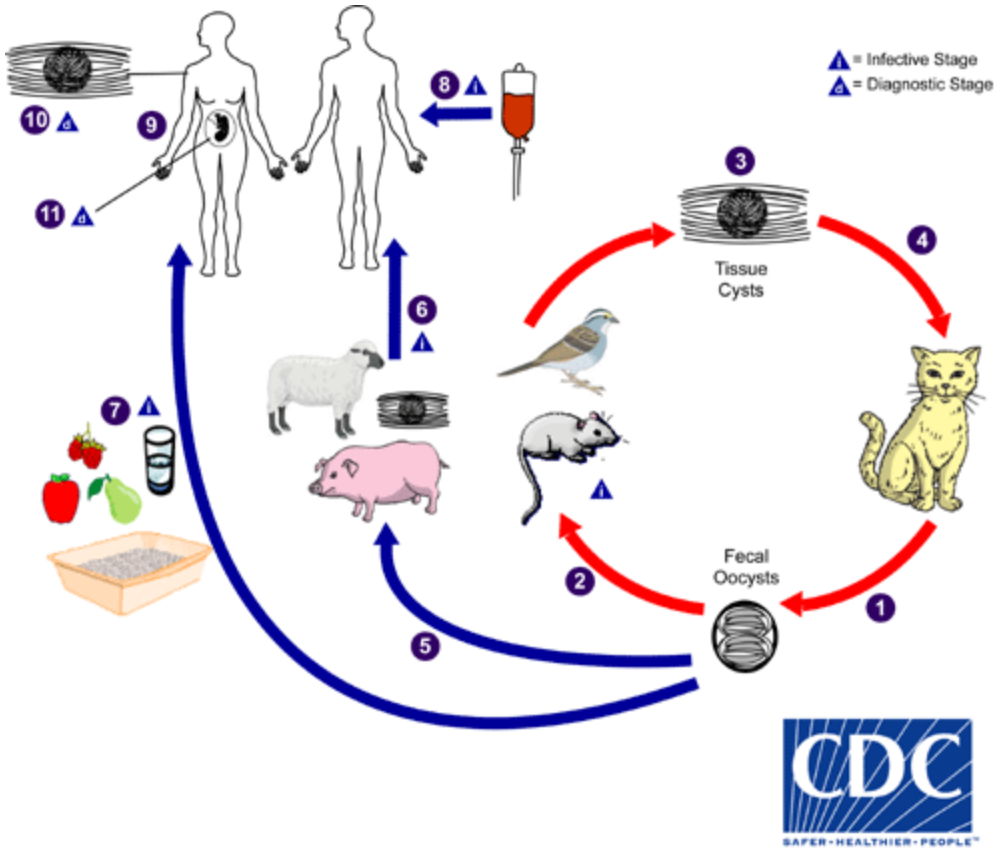
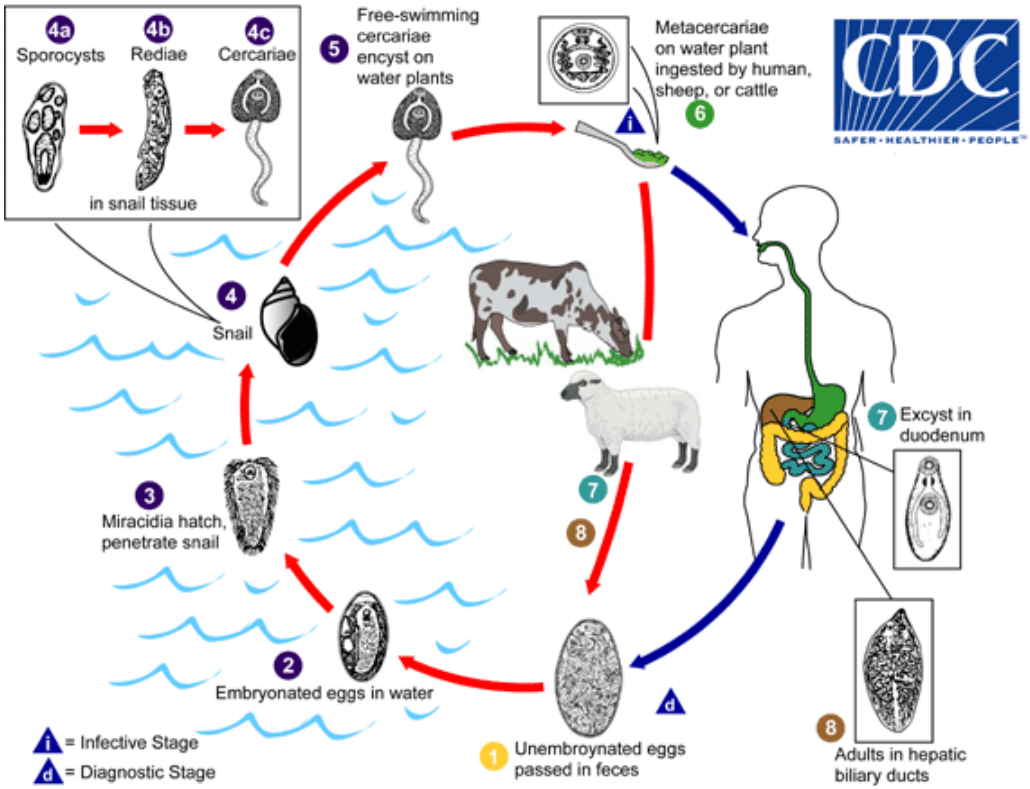
2. Selected parasites in food chains - foodborne protozoa



- *Toxoplasma gondii*
  - 2 human pathogen development stages
  - Sources: water, soil, cat litter; undercooked meat
  - Maternal infection, immunocompromised
  - Livelong infectivity

2. Selected parasites in food chains - foodborne trematodes



- *Fasciola* spp.
  - Source: water, plants
- *Opisthorchis* and *Chlonorchis* spp.
  - Source: freshwater fish
  - Severe sequelae

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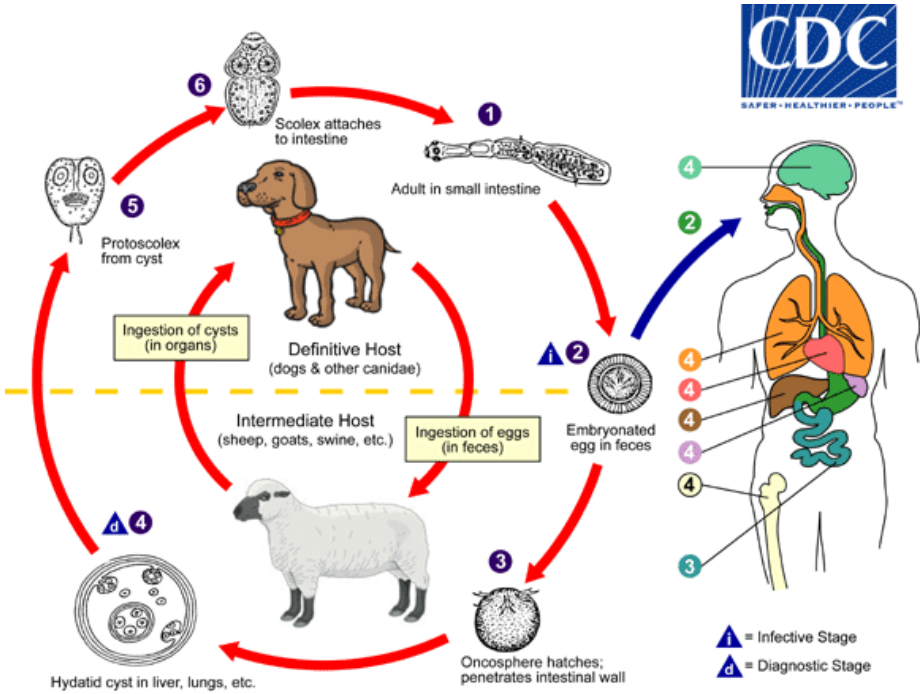
2. Selected parasites in food chains - foodborne cestodes



- Potentially fatal
- *Taenia* spp.
  - Source: Taeniasis vs. NCC
  - NTD imported to N. America
- *Echinococcus* spp.
  - Source: water, fruit, raw vegetables
  - Canadian dogs

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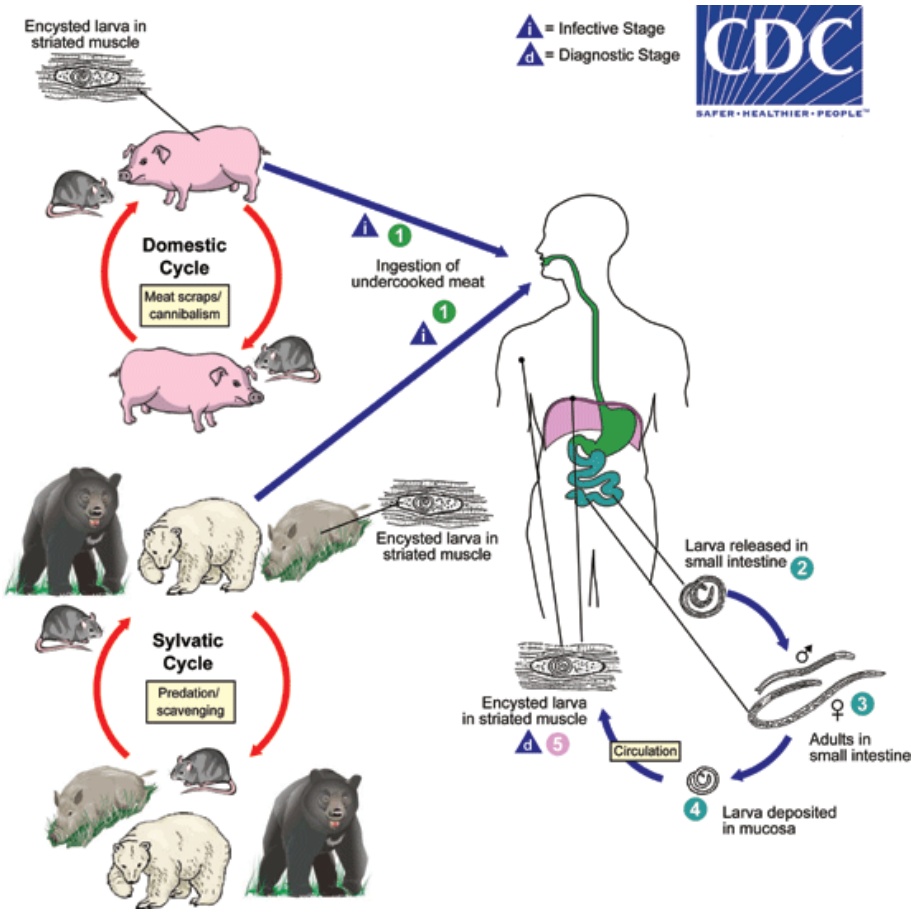
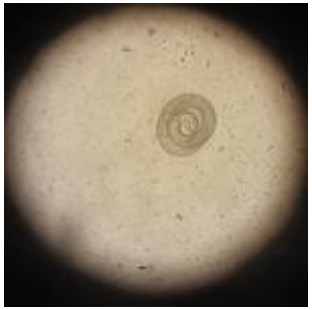
2. Selected parasites in food chains - foodborne nematodes



- *Trichinella* spp.
  - Direct foodborne parasitic disease
  - Source: undercooked pork and game meat



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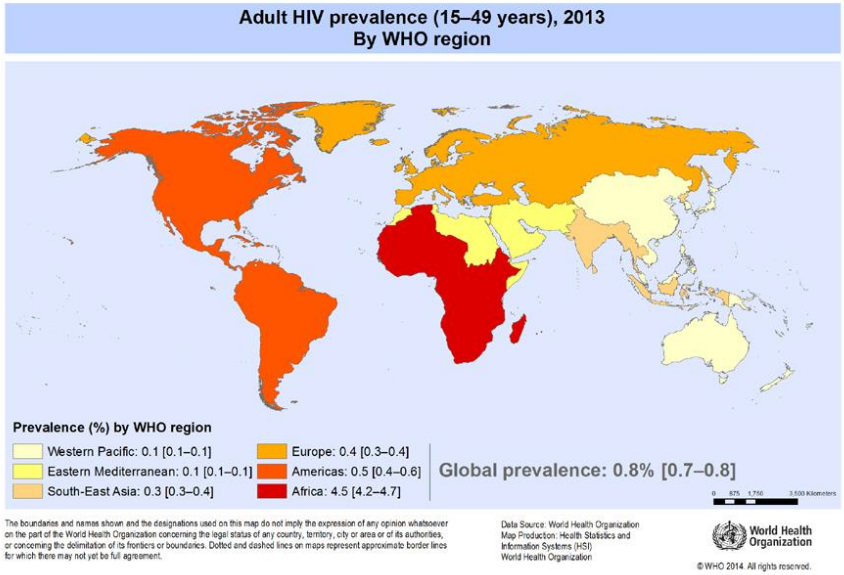
3. The global burden of foodborne parasitic diseases



Retrieved from: http://www.who.int/gho/hiv/hiv_013.jpg?ua=1

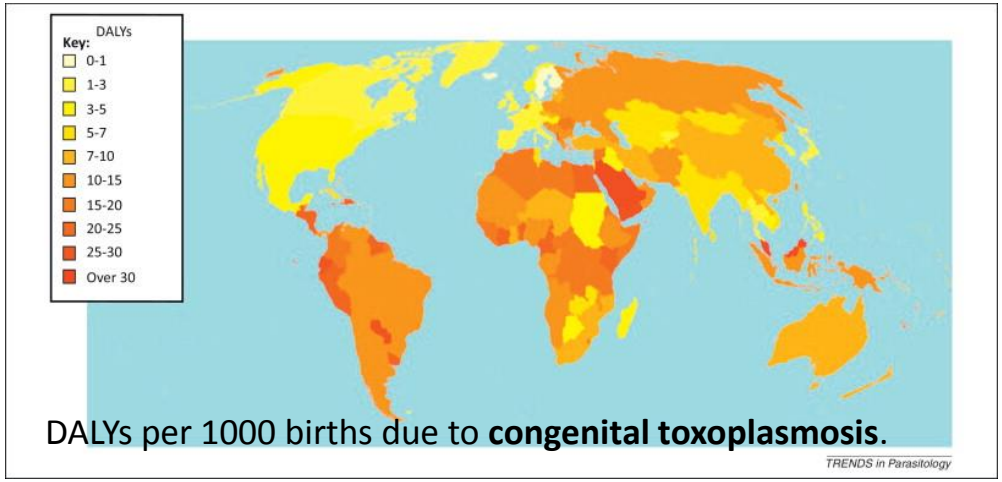
- YOPI

Common metric:

Years of life lost to premature death

\+ Years lived with disability

= Disability Adjusted Life Year (DALY)



DALYs per 1000 births due to **congenital toxoplasmosis**.

Retrieved from Torgerson P.R. et al., 2014. *The global burden of foodborne parasitic diseases: an update.* Trends in Parasitology, Volume 30, Issue 1, 2014, 20 – 26. http://dx.doi.org/10.1016/j.pt.2013.11.002

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3. The global burden of foodborne parasitic diseases

	possible global burden (DALYs)	animal health costs
intestinal protozoa:		
Giardia, *Entamoeba* and *Cryptosporidium* spp.	? x 10^5-10^6	unknown, but likely to be high
intestinal nematodes:		
Ascaris lumbricoides	1.3 x 10^6	likely high if infective for pigs
foodborne protozoa:		
Toxoplasma gondii	2-8 x 10^6	possibly substantial
foodborne trematodes:		
Fasciola, *Opisthorchis*, *Clonorchis* spp.	>0.5 x 10^6	animal fasciolosis is very high
foodborne nematodes:		
Trichinella spp.	?	control programs are a large financial burden
foodborne cestodes:		
Echinococcus spp.	2-5 x 10^7	US$2 x 10^9
Taenia solium	2-5 x 10^6	unknown
for comparison:		
HIV	59 x 10^6	
malaria	34 x 10^6	
tuberculosis	34 x 10^6	

Possible magnitude of annual global burden of selected foodborne parasitic diseases (adapted from Torgerson et al., 2011)

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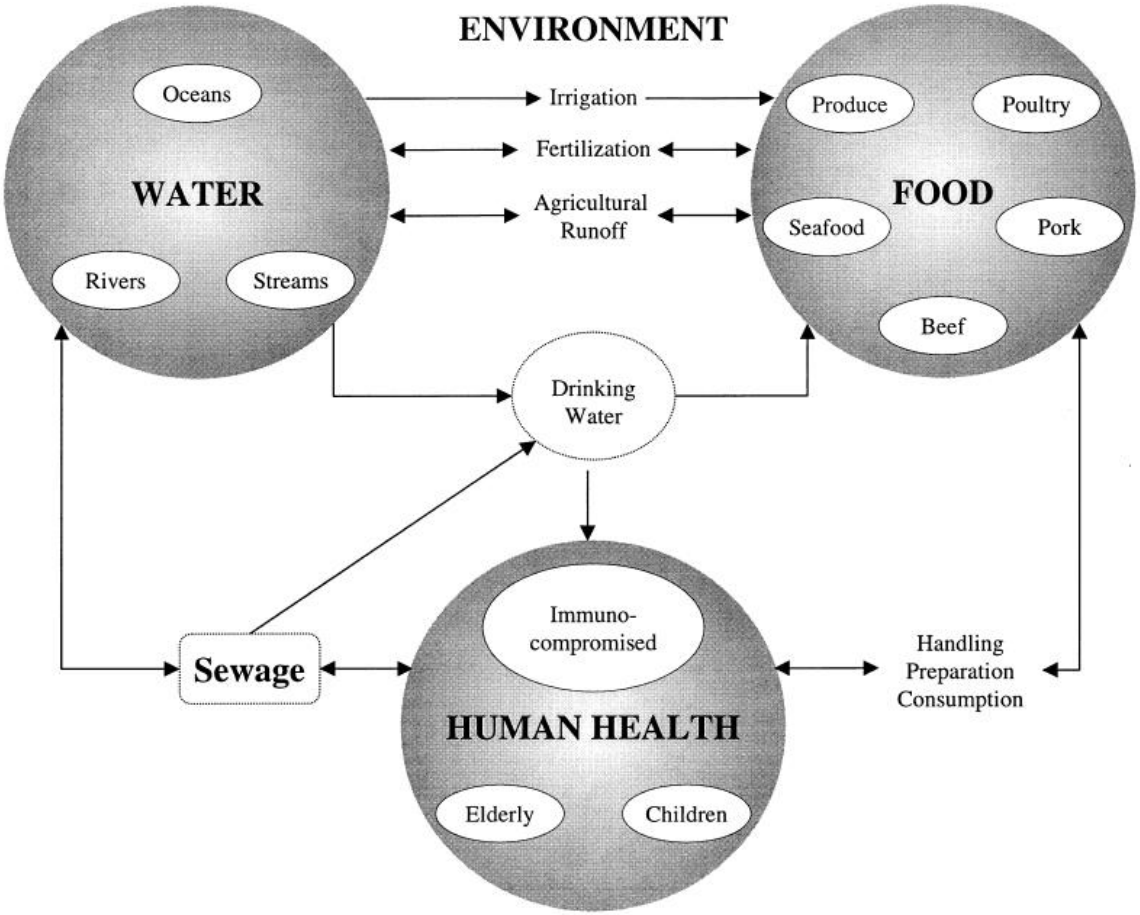
4. Approaches in assessing and managing risks from foodborne parasitic diseases

1. OneHealth/Ecohealth concepts
2. Integrated value chain research
3. Participatory epidemiology

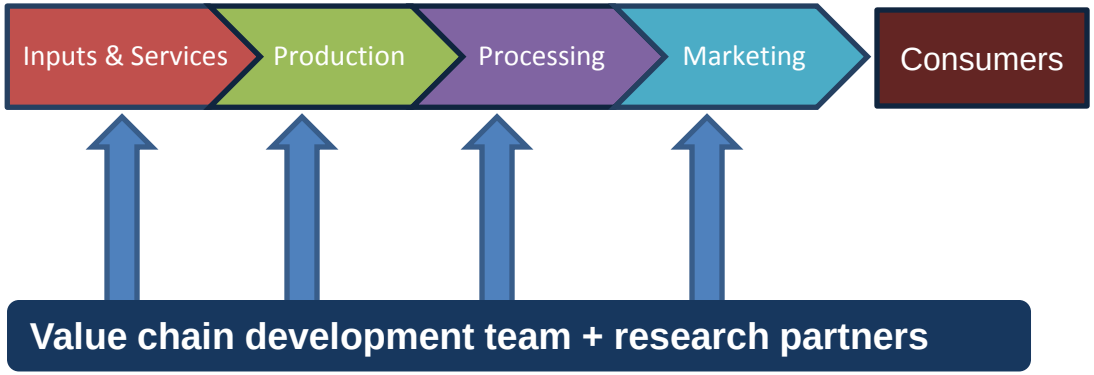
One Health

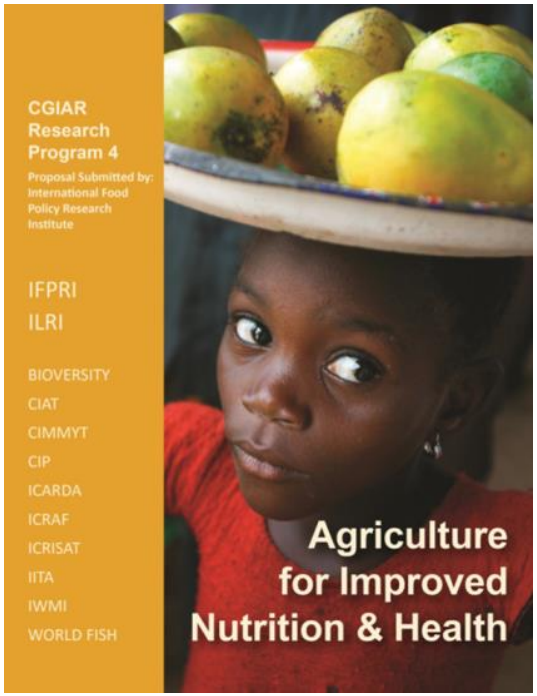


Theresa R Slifko, Huw V Smith, Joan B Rose, 2000. **Emerging parasite zoonoses associated with water and food.** International Journal for Parasitology, Volume 30, Issues 12–13, 2000, 1379–1393. http://dx.doi.org/10.1016/S0020-7519(00)00128-4

Integrated value chain assessment

R4D integrated to transform selected value chains
In targeted commodities and countries.





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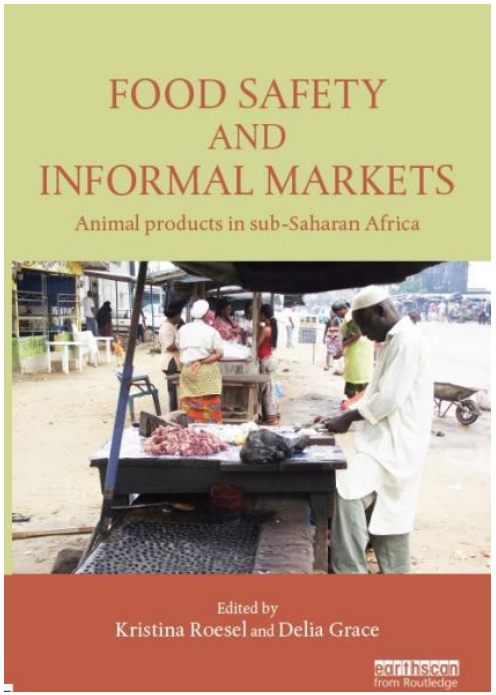
Participatory epidemiology



CAC framework for food safety risk analysis, adapted by ILRI/BMZ Safe Food, Fair Food project (2008-2011)

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Asante sana!

- CGIAR Research Program on Agriculture for Nutrition and Health (A4NH), led by the International Food Policy Research Institute
- CGIAR Research Program on Livestock and Fish, led by the International Livestock Research Institute
- Local and international research and investment partners
- OECD Trade and Agriculture Directorate for travel funding and SIP organizing committee for facilitation

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P O Box 30709, Nairobi 00100, Kenya
Phone: + 254 20 422 3000
Fax: +254 20 422 3001
Email: ILRI-Kenya@cgiar.org

P O Box 5689, Addis Ababa, Ethiopia
Phone: +251 11 617 2000
Fax: +251 11 617 2001
Email: ILRI-Ethiopia@cgiar.org

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