Some insights on One Health and Parasitology

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History of One Health

- 1762 First veterinary School, Lyon
- Rudolf Virc
- 1906
- 19
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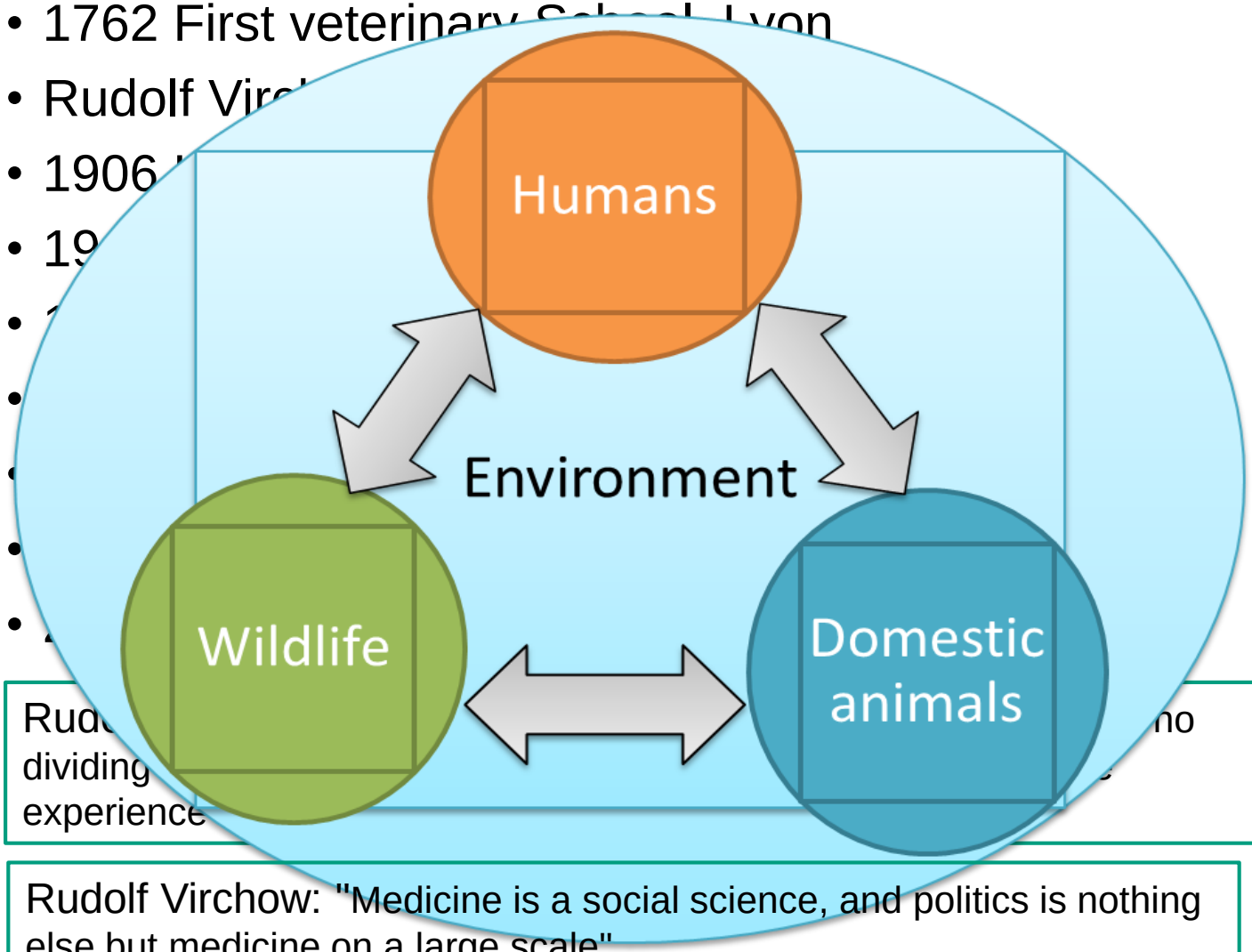


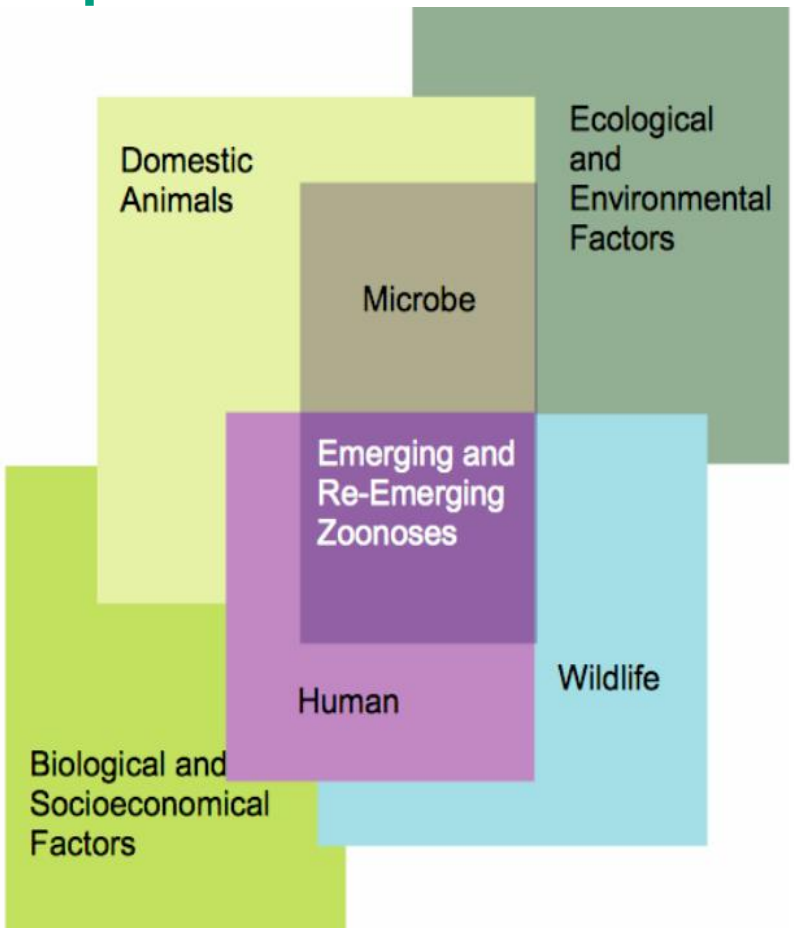
Rud no dividing experience

Rudolf Virchow: "Medicine is a social science, and politics is nothing else but medicine on a large scale".

One Health- the holistic approach

- FAO (2011): *The One Health vision is a unifying force to safeguard human and animal health, to reduce disease threats and to ensure a safe food supply through effective and responsible management of natural resources"*

Importance of zoonoses in One Health

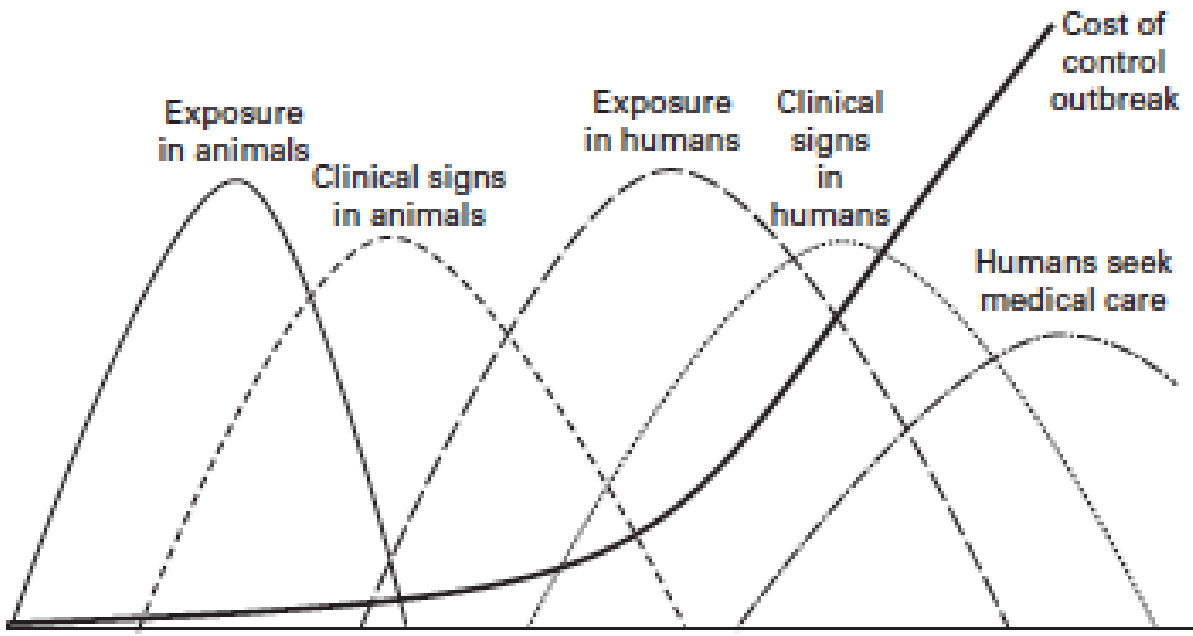


Convergence model illustrating factors at The animal-human-pathogen interface (King, 2004).

- 70 % of emerging pathogens of public health importance originate from animals
- Emerging pathogens are often viruses (rapid evolution)
- Both vet and med students focus on triple-paradigm - pathology, diagnosis, treatment
- Consider the new triple paradigm – occurrence, transmission, prevention
- Requires a One Health perspective

One World - One Health

FIGURE E.1: Early Control of Zoonotic Disease Is Both Cost-effective and Prevents Human Disease



Source: Adapted from IOM (2009).

From: People, Pathogens and Our Planet: The Economics of One Health. World Bank, 2012.

Zoonotic Pathogens – One Health

- All pathogen groups contain zoonotic agents – bacteria, viruses, fungal infections, and parasites
- Viruses most media-known and scary zoonoses – rabies, Ebola, SARS, MERS etc.
  - Rapidly emerging
  - Dramatic (often fatal) diseases
- What about parasites…..??

Zoonotic Pathogens – One Health

- Parasites - the neglected partner among neglected diseases

World Health Organization

Neglected tropical diseases

- Buruli ulcer
- Chagas disease
- Dengue and Chikungunya
- Dracunculiasis (guinea-worm disease)
- Echinococcosis
- Foodborne trematodiases
- Human African trypanosomiasis (sleeping sickness)
- Leishmaniasis
- Leprosy (Hansen's disease)
- Lymphatic filariasis
- Onchocerciasis (river blindness)
- Rabies
- Schistosomiasis
- Soil-transmitted helminthiases
- Taeniasis/Cysticercosis
- Trachoma
- Yaws (Endemic treponematoses)

18 NTD

- 4 bacterial NTD
- 3 viral NTD
- **11 parasite NTD**

Zoonotic Pathogens – One Health

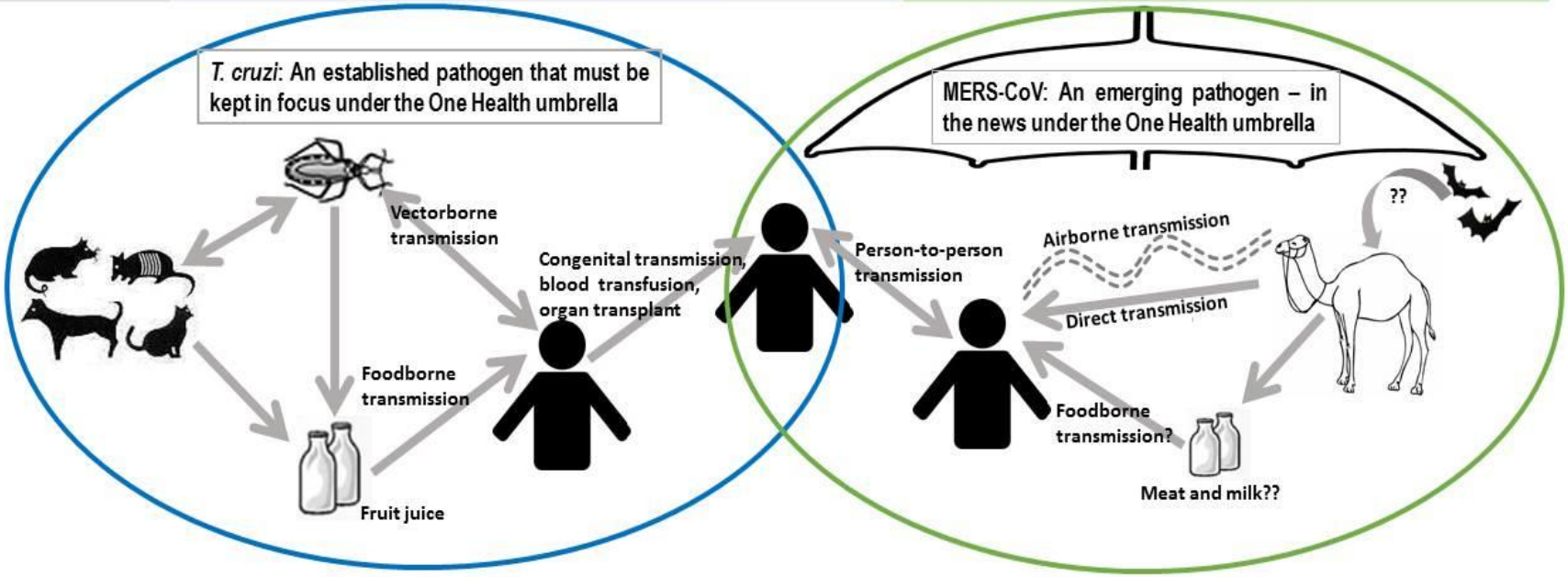
- Parasites the neglected partner of neglected diseases
- Often more chronic or insidious infections – but nevertheless, have a large human impact
- Many already well-established as zoonoses -transmitting between animals and humans
- Environmental factors also very important for transmission of many parasites – vectors, water, food, etc.
- Transmission affected by all the pressures – globalisation, climate change, altered farming practices, urbanisation etc.

Neglected parasites & zoonoses

11 PARASITE NTD	Parasites	Zoonotic ?
Chagas disease	*Trypanosoma cruzi*	√
Dracunculiasis	*Dracunculus medinensis*	√
Echinococcosis	*Echinococcus granulosus, E. multilocularis*	√
Foodborne trematodiases	Fasciolidae (e.g. *Fasciola hepatica*), Opisthorchiidae (e.g. *Clonorchis sinensis*), Heterophyidae (e.g. *Heterophyes heterophyes*)	√
Sleeping sickness	*Trypanosoma brucei* (and sub-types)	√
Leishmaniasis	e.g. *L. donovani*, *L. infantum*, & *L. braziliensis*	√
Lymphatic filariasis	e.g. *Wuchereria bancrofti, Brugia malayi,*	
River blindness	*Onchocerca volvulus*	
Schistosomiasis	*S. mansoni, S. haematobium*	
STH	*A. lumbricoides, T. trichiuria,* hookworm	
Taeniasis / cysticercosis	*Taenia solium, T. saginata, T. asiatica*	√

Chagas vs MERS

	Chagas Disease	Middle East Respiratory Syndrome (MERS)
Aetiological agent	*Trypanosoma cruzi*	MERS coronavirus
Transmisssion	Vectorborne, foodborne, blood or organ transplant, congenital	Direct, airborne, person-to-person (but not in community setting), (foodborne?)
No. cases	Global prevalence estimate of 15 million; global incidence estimate of 200,000	> 600 (from 2012 until May 2014)
Estimated mortality	30-40 %	30-40 %
No. deaths	Estimate: 15,000 annually	Around 200 (from 2012 until May 2014)
Treatment options	No vaccine. Treatments options are limited and associated with side effects	No vaccine or effective antivirals
Global distribution	Endemic in most countries of Central and South America. Also cases in N. America and Spain	Middle East (particularly Saudi Arabia). Also imported cases in USA, UK, etc.
Reservoir hosts	All mammals considered susceptible; 150 species from 24 families of domestic and wild mammals naturally infected, including dogs, cats, armadillos, opossums	Camels, bats (?)



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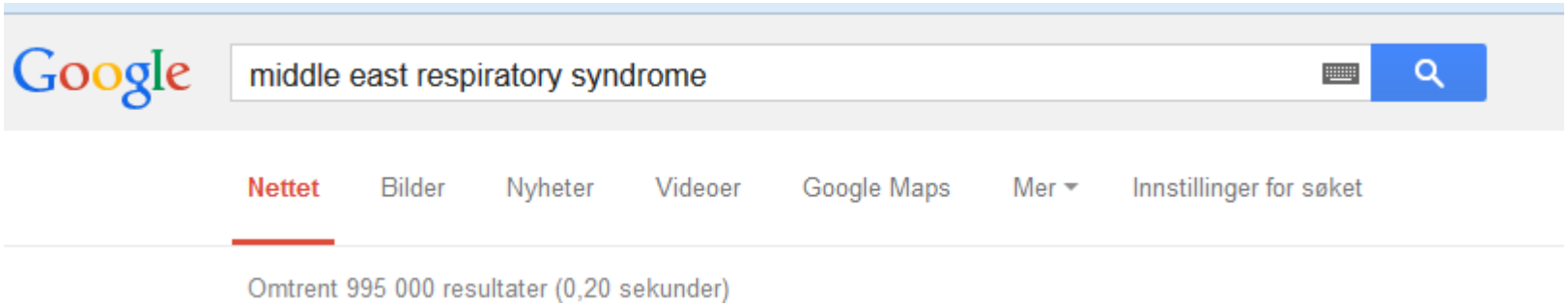
Keeping parasitology under the One Health umbrella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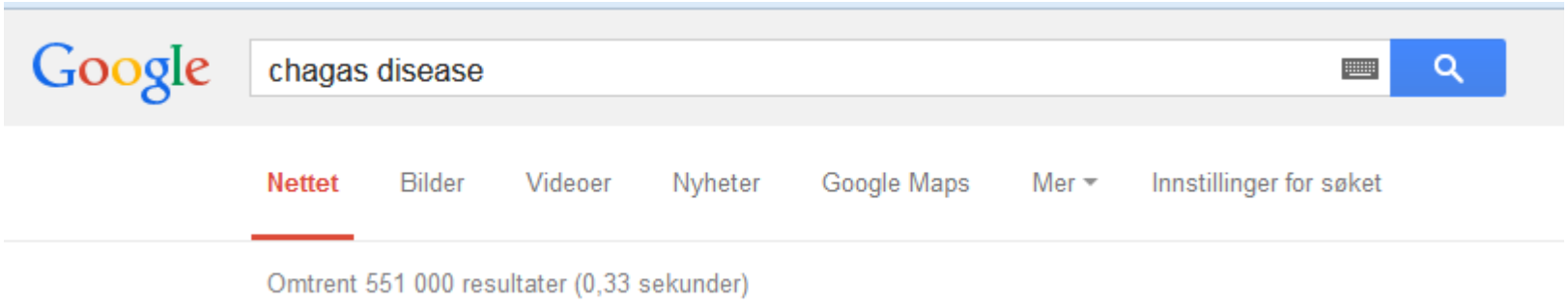
Nettet
Bilder
Nyheter
Videoer
Google Maps
Mer
Innstillinger for søket
Omtrent 995 000 resultater (0,20 sekunder)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chagas disease
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Videoer
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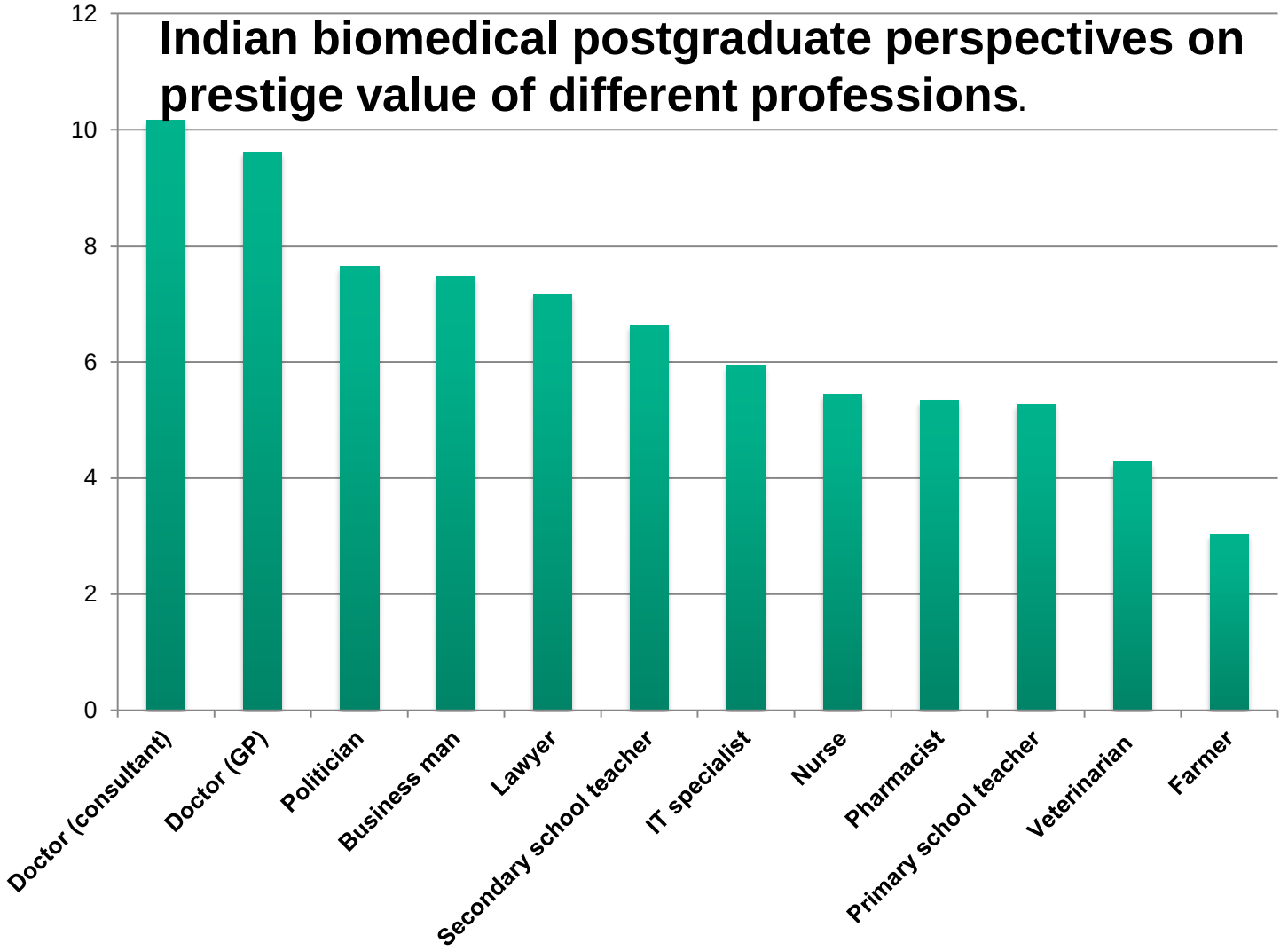
Mer
Innstillinger for søket
Omtrent 551 000 resultater (0,33 sekunder)

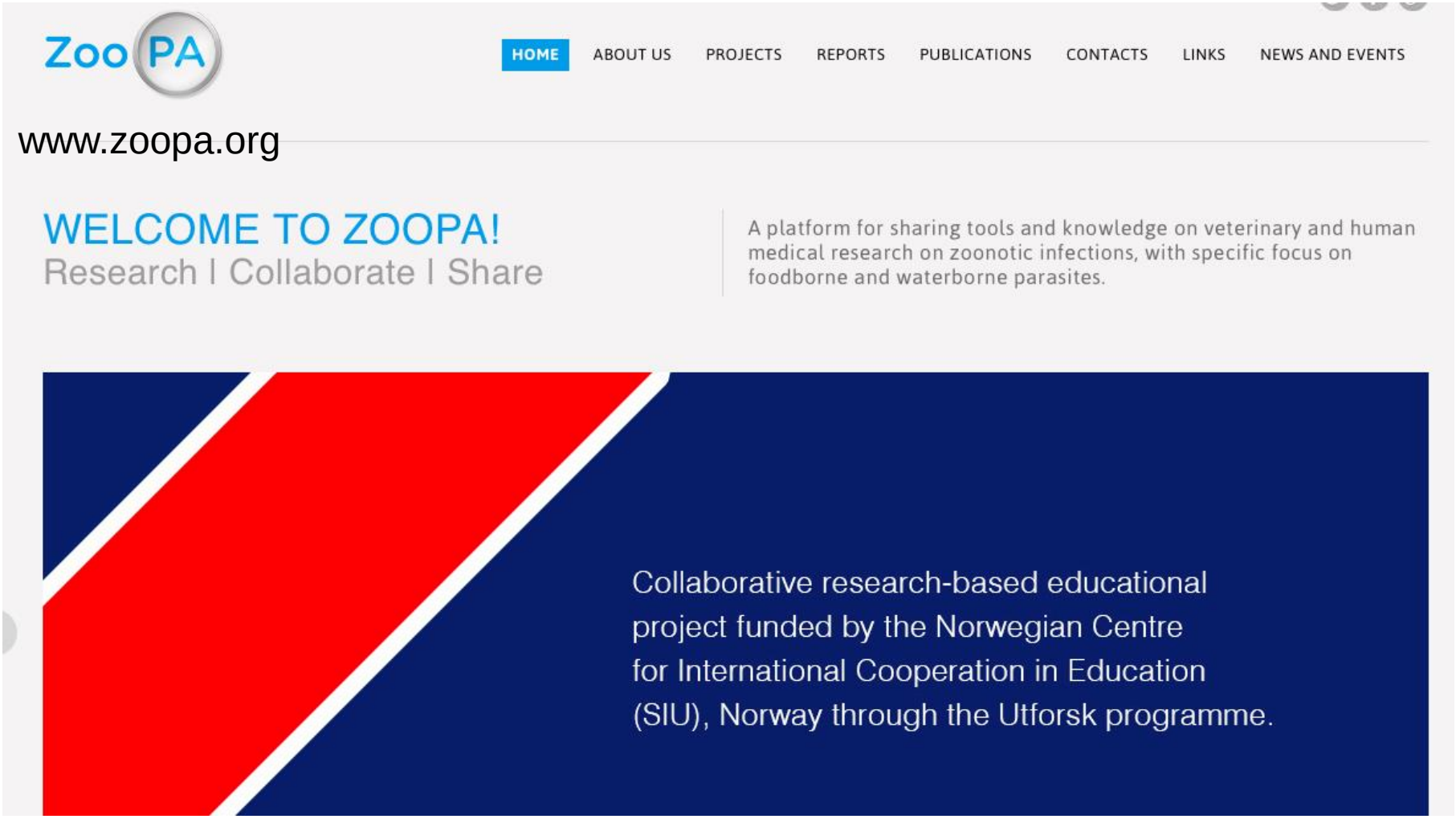
Challenges in One Health Parasitology

- Different parasite groups
  - worms: nematodes, cestodes, trematodes
  - protozoa: very diverse
- Very differing lifecycles and transmission routes
  - Some zoonotic, some not
  - Waterborne or foodborne
  - Vectorborne
  - Multiple transmission routes
- Very differing symptoms/pathology
  - Can be severe (possibly fatal)
  - Often chronic, long-term sequelae - burden hidden
- Very differing diagnostic methods

- One Health approach not always considered – in some places veterinarians and environmental specialists not considered by medical professionals

Challenges in One Health Parasitology

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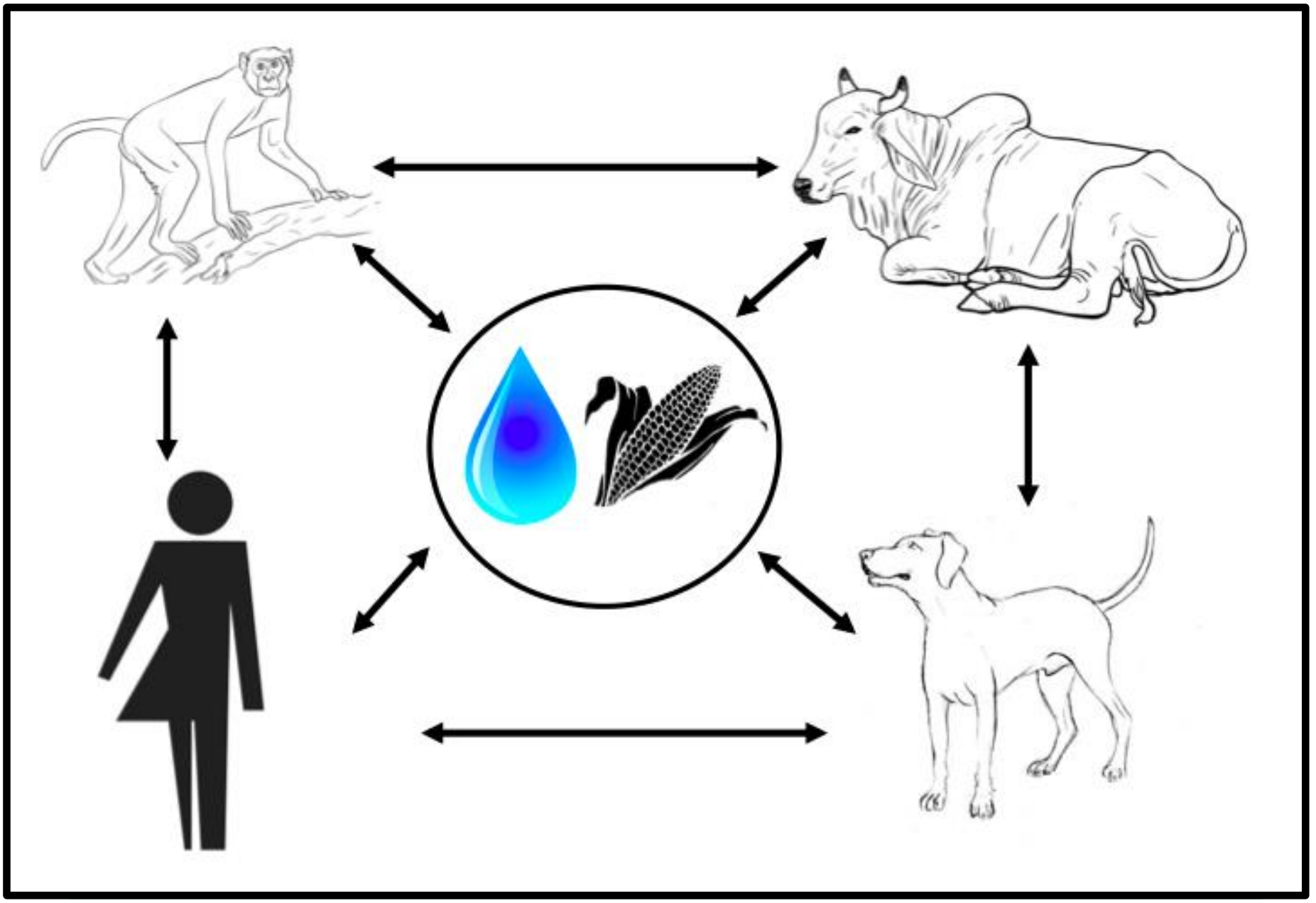
A platform for sharing tools and knowledge on veterinary and human medical research on zoonotic infections, with specific focus on foodborne and waterborne parasites.
Collaborative research-based educational project funded by the Norwegian Centre for International Cooperation in Education (SIU), Norway through the Utforsk programme.

ZooPa activities

- Workshops in India and Norway
  - Risk ranking of foodborne parasites
  - Scenarios and problem solving for zoonotic parasites
- Hands-on training courses
  - Detection of parasites as contaminants of food
  - Parasitology diagnostics
- Student exchanges and small-scale One Health research projects



Giardia in Macaques in Northern India

4 Troops:
Troop 1 – ca. 200 animals, university campus in Chandigarh
Troop 2 – ca. 200 animals, around hilltop temple near Shimla
Troop 3 – ca. 100 animals, around small temple with cattle breeding facility
Troop 4 – ca. 200 animals, outskirts of town; co-exists with ca 30 Tarai grey langurs

Giardia in Macaques in Northern India

TROOP	*GIARDIA* OCCURRENCE
1	45 %
2	20 %
3	33 %
4	17 %
TOTAL	53/170 (31 %)

- Macaques 550 to 5750 cysts per gramme faeces
- Calves at Troop 3, around 64 % positive for *Giardia*
- Genotyping of cattle samples, Assemblage A and E.
- Genotyping on 17 macaque samples – all Assemblage B (potentially zoonotic)

Project funded by ZooPa – work conducted as a collaboration between Norway-based veterinarian John Debenham and medical colleagues at Postgraduate Institute for Medical Education and Research in Chandigarh

One Health and Parasitology

- Although rarely major news, parasitic diseases can impact
  - Human health and animal health
  - Food safety
  - Ecology
  - Economy
- Parasites are often zoonotic
- Human activities are drivers for spread and emergence of zoonotic diseases
- Prevention and control is challenging
- Awareness that animal infections and environmental conditions can impact human disease is key
- Collaboration across sectors should be encouraged and supported

One Health and Parasitology

- Collaboration across sectors should be encouraged and supported
  - Parasitologists
  - Medical doctors
  - Veterinarians
  - Public health specialists
  - Environmental scientists
  - Wildlife zoologists
  - Sanitation engineers
  - Etc……

Thank you for your attention!