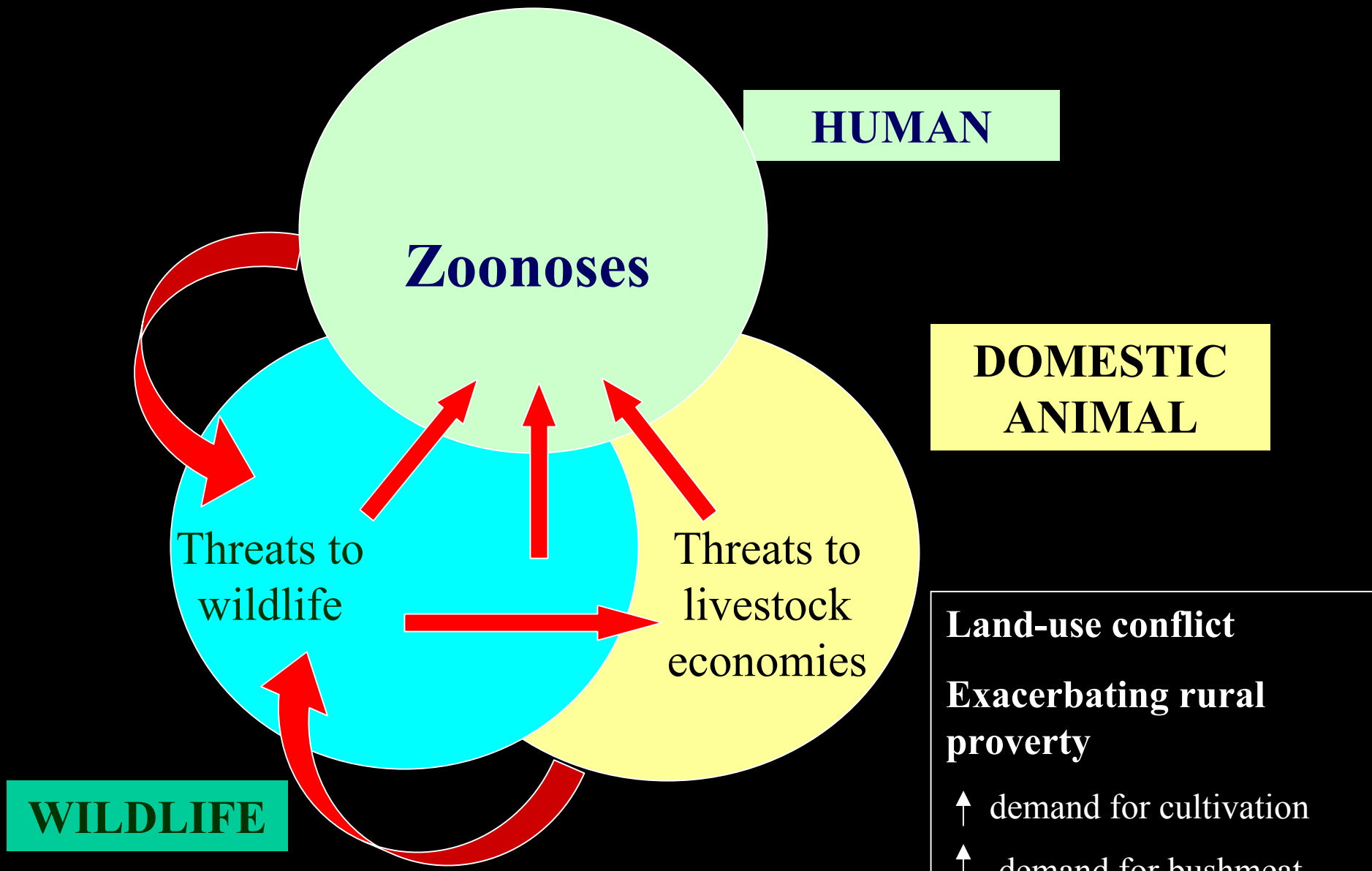
Impacts of Wildlife Infections on Livestock and Human Health: Implications for Protected Area Management

Sarah Cleaveland[1], Karen Laurenson[1,2], Louise Taylor[1], Titus Mlengeya[3]

1. Centre for Tropical Veterinary Medicine, University of Edinburgh, UK
2. Frankfurt Zoological Society, P.O. Box 14935, Arusha, Tanzania
3. Tanzania National Parks, P.O. Box 3134, Arusha, Tanzania

Disease transmission between populations



Direct and indirect impacts of MCF

↑ cattle mortality

↓ cattle fecundity

Increase in the human population

Reduced herd size

"POVERTY SPIRAL"

↓ livestock : human ratio

↑ need to sell animal to raise / earn cash income

Inability to meet food and subsistence needs

=>Increased demand for cultivation

=> Land-use practices incompatible with traditional livestock-keeping and wildlife conservation

Wildlife and Public Health

- Most (62%) human pathogens are zoonoses
- Almost half (44%) of all human pathogens can infect wildlife
- If a pathogen can infect wildlife it is more than twice as likely to cause an emerging human disease than infections that do not affect wildlife

Factors in Disease Emergence

- Ecological factors
  - Human demography and activities
  - Industrialization, deforestation, agriculture
  - Global human and animal movements
  - Climate change
- Individual host factors
  - E.g. immunosuppression, co-infections (HIV)
- Pathogen factors (e.g. mutation, recombination, genetic drift)
  - Evolution of new virulent strains
  - Evolution of drug resistance

Why are wildlife hosts important?

- Wildlife species represent an important ‘zoonotic pool’ for emergence
  - => New appearance in human population e.g. HIV-1, HIV-2, SARS
    - Strain mutations combined with increased human-to-human transmission
  - => Increasing incidence of older diseases e.g. West Nile Virus, Ebola, Lyme Disease, Hantavirus infections
  - Increasing incidence as a result of changing contact/transmission patterns

Nipah virus

- Paramyxovirus
  - Cause of fatal disease in pigs and humans
- Destruction of natural habitat for fruit bats?
  - Deforestation
  - Intensification of pig industry
- Fruit bat (Flying fox - *Pteropus spp*) reservoirs
  - also Hendra, Menangle, ABL virus
- Pathogens infecting bats a group of particular concern in emerging human diseases

Ebola virus

- Filovirus, haemorrhagic disease
  - Concern for both human health and wildlife conservation
- Increasing human-wildlife contact
  - Bushmeat hunting
  - Deforestation, encroachment?
- Identity of animal reservoir?

Monkey pox

- Central and west Africa, recent cases in north America
- Contact with infected animals
  - Bushmeat consumption, handling prairie dogs
  - Also human-to-human transmission
- Emergence factors: decline in smallpox vaccination coverage, pet trade

SARS

- Factors – genetic changes, human movement/contact patterns
- Emergence from wildlife host?

Implications for Wildlife Management

- Options for disease control limited
  - Many involve harm to wildlife populations e.g. culling, separation
  - Little known about dynamics of wildlife infections => decisions about control with incomplete knowledge

- Investigation of diseases
  - Identification of reservoirs often very difficult
  - Invasive or lethal sampling, disruption to populations
    - E.g. Search for reservoirs of Ebola, monkey pox

Indirect Impacts

- Perception of wildlife as health risk for humans
  - Potential impact on tourism vs need for dissemination of data of public health value
    - How much do we need to know?
  - Human health implications for sustainable/consumptive use programmes

Summary

- Need for interaction between wildlife managers/ecologists, veterinarians and public health sector
- Development of wildlife policies to address issues relating to public health
- Epidemiological questions
  - Identification of reservoir hosts/sources of infection
  - Design of optimum control strategies
  - Interpretation of increasingly sensitive diagnostic tests