NEGLECTED ZOONOTIC DISEASES

INSTITUTE OF MEDICINE
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Neglected Zoonotic Diseases

Outline

1. Discuss background – why these diseases are neglected and their importance
2. List and describe the group
3. Discuss the challenges to address and control
4. Present actions and approaches to consider for effective control
Neglected Tropical Diseases

Symptom of poverty and disadvantage

Low profile status or attention in public health

Over 1 billion people suffer from NTDs

Impoverished setting especially in heat and humidity

Most are parasitic with multiple vectors and hosts

Commonly found in urban slums, conflict zones and remote rural sites

Often overlap geographically and many have concurrent NTDs
An Important Truism

Diseases and poor health are both the result of poverty and the cause of poverty. This holds true for NZD.
A disproportionate burden is borne by the poor

- More at risk of acquiring a zoonosis
- More vulnerable to illness
- More reliance on health of a few family members
- Livestock incomes vital
- Livestock kept as part of coping strategy

- Evidence from a number of studies
- Living in isolated rural areas or urban slums
- Close contact with animals

- Difficulties in getting a diagnosis
- Expensive treatments
- Cost of seeking health care
- Parallel difficulties in getting animals treated

2nd International Conference on Neglected Zoonoses
Nairobi, 13 -15 November, 2007
Of the 27 infectious diseases tracked by DALYs (WHO Burden of Disease), 20 are classified as zoonotic and 7 others show that animal transmission cycles are important and veterinary intervention could affect the global burden of the diseases (e.g. Trypanosomiasis, schistosomiasis, Leishmaniasis, Chagas, Japanese B Encephalitis, Hookworms, and Hepatitis E)
Why Neglected?

Don’t cause explosive outbreaks
Compete with many visible diseases with higher mortality
Affect poor families without access to healthcare
Stigma associated with NTDs, reluctance to seek care
Don’t engender investment in diagnostics, drugs, and vaccines due to lack of perceived market
Poor diagnostics and surveillance
Attributes of NZD

There is a lack of:

* information and awareness of the problem
* Suitable diagnostic tests and surveillance
* Appropriate and sustainable prevention and control strategies

False perception that their burden and impact to society is low thus never attracting essential health resources nor the research to address them.
NZD affect mostly populations of the tropics and subtropics and the poorest and most vulnerable.

NZD largely affect livestock and animal owners and keepers and their families.

Prevention and control of NZD save lives and secure livelihoods thus can help alleviate poverty.

NZD are uniquely positioned at the interface between human and animal health and require collaboration between the two groups for effective control.
People and Animals Are Closely Interconnected

Livestock contribute to the livelihoods of 70% of the world’s poor. Thus, worldwide, approximately 800 million poor livestock keepers depend on their animals and animal agriculture supports farmers, consumers, traders and laborers in developing countries.
<table>
<thead>
<tr>
<th>Importance of Animals to the World’s Poor</th>
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<tr>
<td><strong>Food</strong></td>
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<td><strong>Fertilizer</strong></td>
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<td><strong>Transportation</strong></td>
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<td><strong>Clothing</strong></td>
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<td><strong>Income</strong></td>
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<td><strong>Draught Power</strong></td>
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<td><strong>Security</strong></td>
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<td><strong>Culture and Tradition</strong></td>
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Impact of Animal Diseases

Influence the vulnerability and assets of small livestock keepers

Reduce productivity of the animals

Constrain market access

Create zoonotic infections that disproportionately affect women/children

Put poor livestock and poultry keepers at economic and social risk
<table>
<thead>
<tr>
<th>The World’s Populations</th>
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<tbody>
<tr>
<td>1.3 billion cattle</td>
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<td>1.0 billion pigs</td>
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<tr>
<td>2.0 billion small ruminants</td>
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<tr>
<td>50 billion poultry reared annually</td>
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<td>500 million dogs and cats</td>
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<td>Unknown populations of wildlife and exotics</td>
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<tr>
<td>7 billion people</td>
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</table>

(Need a 50% increase in protein from animal sources in the next 10 years)
Neglected Zoonotic Diseases (NZD)

Anthrax

*M. bovis*

Brucellosis

Cysticercosis

Echinococcosis

Rabies

Zoonotic Trypanosomiasis
Anthrax

Caused by the spore-forming *Bacillus anthracis*

Almost always fatal in animals

Three forms of disease in humans:

- **Inhalation anthrax**
  - Occupational disease, only in industrialized countries

- **Gastrointestinal anthrax**
  - Due to eating infected meat from an animal that died of anthrax

- **Cutaneous anthrax**
  - 95% of reported anthrax cases in developing countries
  - Acquired through skin lesions

Impact on the people and livestock of developing nations is often ignored
Bovine Tuberculosis

Due to Mycobacterium bovis
  Can cause extra-pulmonary infection
Rarely causes death in cattle
In humans, bovine TB may be clinically indistinguishable from M. tuberculosis infection
Patients often do not respond to common TB drugs
  Improper diagnosis and treatment may lead to death
  Need other, more expensive drugs
Bovine TB incidence seems to be increasing at a similar rate to total TB incidence
Brucellosis

Caused by Brucella species of bacteria
Affects cattle, sheep, pigs, goats, and others
  Leads to abortion, permanently reduced fertility, and chronically lowered milk yields
Transmitted to humans by direct contact or drinking unpasteurized milk from an infected animal
  Causes chronic debilitating disease
  Often mistaken for drug-resistant malaria in tropical areas
In endemic regions, brucellosis causes large losses to livestock producers
Cysticercosis

Caused by *Taenia solium*
(pork tapeworm)

Infection occurs when food contaminated with *T. solium* eggs is consumed

Larvae are freed in the digestive system, then migrate to the muscles, brain, and/or eyes and form cysts

If cysts form in the brain, they can induce seizures

Major cause of preventable epilepsy, especially in developing countries
Global Distribution

50 million people worldwide

Associated with improper sanitation, poor pig husbandry practices, lack of meat inspection and control

Traveling with humans and pigs

- International travel
- Immigration
- Transporting swine
Cysticercosis is becoming a public health issue in the US, particularly California and other states bordering Mexico. Due primarily to high traffic of immigrants from Latin America.
ECHINOCOCCOSIS

Hydatid disease

T ape worm – E. granulosus: dog to sheep to dog to people who ingest tapeworm eggs from water and/or food

Cysts grow slowly often in abdomen; need surgery

Control by deworming dogs and keeping them from ingesting sheep offal

Wide spread global distribution

May produce approximately 1 million DALYs
Rabies Around the World

Causes an estimated 55,000 - 60,000 deaths/year

PEP administered to approximately 10 million people/year

Domestic dog bites are responsible for >95% of human infections

Bats are also a major reservoir
Rabies Resurgence

Rabies burden falls heavily on developing countries

Little government support

  Competing health priorities, poor medical-veterinary collaboration, underestimation of rabies importance

Large unvaccinated and unconfined domestic dog population

Few sustainable control measures

Lack of rabies education among traditional healers

Political and/or economic instability
African Trypanosomiasis

Caused by Trypanosoma brucei
Insect vector is the tsetse fly; limits L/S rearing
Limited to African continent, where vector is found
Two human forms:
  Chronic gambiense form in West and Central Africa
  Acute rhodesiense form in Eastern and Southern Africa
Very high case fatality rate for untreated cases
Treatment is expensive and can be risky
  US$150-US$800 per person
  5% mortality due to treatment in later stages of disease
<table>
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<td>Dengue</td>
<td>Leptospirosis</td>
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<td>Toxoplasmosis</td>
<td>Toxocariasis</td>
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<td>Chagas</td>
<td>Food-borne Trematodes</td>
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<td>Bartonella</td>
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<td>Q Fever</td>
<td>Ehrlichia</td>
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<td>Leishmaniasis</td>
<td>Hepatitis E</td>
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Toxoplasmosis

Caused by the single-celled protozoan *Toxoplasma gondii*

Found throughout the world and infects multiple animal species

Main host is the domestic cat

They acquire disease from eating infected rodents or birds

3rd leading cause of death attributed to foodborne illness in the US
Chagas Disease

Trypanasoma cruzi

Vector: “Kissing bug”
Confirmed Chagas positive blood donors, United States 2007 – 2009*  n = 891

*Source: AABB Biovigilance program, as of June 4, 2009