Perspectives on Zoonotic Diseases

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Objectives

Why are zoonotic diseases of greatest consequence today?

Risk factors

Benefits of animals

Preventative measures

What roles can we play in educating the public?
What is a zoonotic disease?

A disease shared by humans and vertebrate animals
There are 1,407 known human disease pathogens of which 816 are zoonotic diseases.
75% of human emerging infectious diseases are caused by zoonotic pathogens

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Transmission of Zoonotic Disease
Who is at risk?

Veterinarians & veterinary technicians
Animal Emergency Responders
General Public When Visiting:
   Petting zoos
   Dog parks
   Animal Shelters
Pet owners
   New pet
   Outdoor cat
   Reptiles and birds
Animal shelter personnel
Animal control officers
Pet retail facility personnel
Livestock producers
4-H program participants
Salebarn personnel
Society has changed!

• More people have contact with animals today than they did a century ago!
• Early 19th century: 40% of the population were involved with agriculture
• Today <2% are involved with agriculture, but…
60% households have at least one kind of pet - 
An ever growing diversity of pets
A disease shared by humans and animals
Marshfield index case, 5/26/03
disseminated lesions
Wisconsin 2003
7 confirmed
34 suspect human cases
Monkeypox Virus

- Orthopox family
- Spread animal-to-human via blood or bite
- Human-to-human spread possible
- Clinical presentation similar to smallpox but milder
Smallpox
What are the risks for acquiring a zoonotic disease in Colorado?
Some Behaviors Are Clearly Risky
Those at greatest risk

- Children less than 5 years old.
- Elderly.
- Pregnant women.
- People undergoing treatments for cancer.
- People who have received organ transplants.
- People with HIV/AIDS.
Risk Recognition

Sick outdoor / hunter cat

High fever, depression
Lymph node enlargement or abscess
(+/-) respiratory signs
Plague

- *Yersinia pestis* gram(-), non-motile, non-spore forming bacillus

- Fleas living on infected rodents spread infection to humans, cats, deer, rabbits

- Recovery offers temporary immunity
Endemic Plague in the US

Counties with Plague-Positive Samples

1970 - 1994
Common reservoirs of *Yersinia pestis*
Aerosol
Bubonic or Septicemic Plague
Oropharyngeal & Secondary pneumonia
Pneumonia
Contact
Aerosol
Bubonic Plague

Photographs: Ken Gage, Ph.D., Centers for Disease Control and Prevention, Fort Collins, CO
Plague in cats

- Lymphadenopathy – ‘Bubonic’ 53%
  Mandibular area abscesses
- Septicemic
- Pneumonic
  Most dangerous to people
- Dogs frequently infected
  but are rarely clinical
Tularemia

- Gram Negative bacillus: *Francisella tularensis*
- One of the most infectious bacteria known
  - 10 or fewer bacteria will result in infection
Transmission

• **Direct contact**
  – Skinning infected animals

• **Ingestion**
  – Infected tissues
  – Water
  – Voles (*Microtus* spp)

• **Inhalation**

• **Vectors**
  – **HARD TICKS**
    • Human transmission
    • *Dermacentor variabilis*
  – **BITING FLIES**
    • *Chrysops*
    • *Tabanus*
    • Mechanical transmission
    • Infective for 14 days
Clinical presentations

Ulceroglandular (75-85%)
Ulcer and regional lymph node enlargement

Glandular (5-10%)

Oculoglandular
Conjunctivitis, cervical lymphadenopathy
Tularemia

Flu-like illness with fever, headache, generalized body aches and productive or non-productive cough

Pneumonia (85%)
pleural effusion (15%)

• Untreated case-fatality rate - 35-60%
• Culture diagnosis quite difficult
• Person-to-person spread not seen
Kosovo

- Nov 2001 – Feb 2002
  - 715 human cases
  - Ages 16-44
- Oropharyngeal form
  - Rodent contamination of food and water
CRYPTOSPORIDIOSIS. Incidence* — United States and U.S. territories, 2003

* Per 100,000 population.

MMWR 2:2005
Cryptosporidium parvum

- Most common causes of waterborne disease within humans in the United States.
- Serological surveys indicate that 80% of the population has had cryptosporidiosis.
- Incubation period 2-10 days
Cryptosporidiosis

**Etiology**
- *Cryptosporidium parvum*

**Transmission**
- Fecal-oral
- Human to human
- Animal to human
- Food borne
- Waterborne

**Most common outbreak source:**
- Failures in solid waste management

**Reservoirs**
- Human
- Livestock
- Birds
Cryptosporidial genotypes

GENOTYPE I

Human-human transmission only
*Not* infective for cattle
Isolated from major human outbreaks

GENOTYPE II

Animal-animal and animal-human transmission (zoonotic)
Associated with animal waste contact
Human Cryptosporidiosis

Incubation: 1-12 days
Self-limiting in immunocompetent
Nausea and abdominal pain
Watery diarrhea: 3-4 days duration
Immunosuppressed patients
  Persistent diarrhea
  Persistent shedding
  10-20% of AIDS patients affected
Human outbreaks

Solid Waste Failures

**Georgia, 1987**
- 13,000 people affected

**Milwaukee, WI, 1993**
- 403,000 people affected
- Dairy farms along 2 rivers upstream

**Austin, TX, 1998**
- 150 people affected
- 170,000 gallons of raw sewage into local creek
Human outbreaks

Public Water Parks & Swimming Pools
- Georgia, 1995
- Louisiana 1988
- Wisconsin 1993

Food Service Related
- Georgia Day Care, 1995
  - Food worker shedding oocysts
- Spokane WA Banquet, December 1997
  - Infected food service workers: Green onions
Control and prevention

Personal hygiene
Public education
Isolation of affected people from food handling or child care jobs
Proper fecal waste management
**Q Fever**

*Coxiella burnettii*

One organism may cause infection

Often symptomatic in animals

Rare cause of abortion in sheep & goats

**Inhalation** most common way to get infected

  Obstetrical assistance to sheep or goats

Unpasteurized milk, soft cheeses
Q Fever in Humans

In untreated patients, case fatality rate is 1%;
- death is rare in treated patients

Fever accompanied by chills, headache, weakness

About half of patients present with pneumonia

No person-to-person transmission

Chronic form (65% mortality)
(Valvular endocarditis)

Heart disease
Three step-process

1. Prevention
   • Vaccination, parasite control
   • Basic biosecurity
Three steps (continued)

2. Appropriate sanitation / hygiene practices
   - Cleaning and disinfecting animal areas as needed
   - Hand washing!
   - Don’t eat or drink in animal facilities

3. Early diagnosis and treatment
   - Both people and animals!
   Tell your doctor that you work with animals!
Animals are important part of our culture

- Agriculture
- Companions
- Service and working animals
- Wildlife

Benefits of contact with animals outweigh the risks!
Rocky Mountain Regional Center of Excellence
For Biodefense & Emerging Infectious Diseases