

Pet-Associated Infections, Shared Risk, and “One Health”

Peter M Rabinowitz MD MPH
Yale Occupational and Environmental Medicine
Program

Medicine Grand Rounds
Kalamazoo MI
January 14, 2009

Overview

- Pets and zoonotic infections
- Pets as 'sentinels' of shared environmental health risks
- "One Health" initiative

Case 1:

The Dog that Wouldn't Get Up

- May 7th: 9 year-old labrador retriever taken to veterinarian because of 2 days difficulty rising.
- Veterinarian notes ataxia and nystagmus.
- Amoxicillin prescribed



- May 8-11th: dog's condition worsens
- May 12th; admitted to veterinary hospital
- PE: Stuporous, temp 38.5 (nl 38.2), scrotal edema, ecchymoses, extensor rigidity
- CT scan: dilated ventricles, mass in brainstem
- CSF fluid: protein 250mg/dl (nl 25), nucleated cells $>50 \times 10^6$ (nl $<5 \times 10^6$), 50% neutrophils

- Provisional diagnosis: encephalitis, hydrocephalus 2° to CNS tumor.
- Dog euthanized May 12
- At necropsy, subarachnoid hemorrhage seen, also mononuclear infiltrates in small and medium sized capillaries, veins and arteries in scrotum, testes, eyes, brain with necrosis and hemorrhage consistent with vasculitis
- A diagnostic test was ordered

Case 1a: The Dog Owner with Fever and Malaise

- May 14th:
- Dog's owner, 69 year old woman, is seen by her doctor complaining of 3 days of nausea, vomiting, fatigue, and fever.
- Reports "my dog died of cancer 2 days ago, but had some of the same complaints"
- Patient diagnosed with gastroenteritis and sent home on clear liquid diet.

Questions

- Is there any connection between the dog's illness and the patient's complaints?
- What should a human health care provider do when a patient reports illness in a companion animal?

Case 1a (cont.)

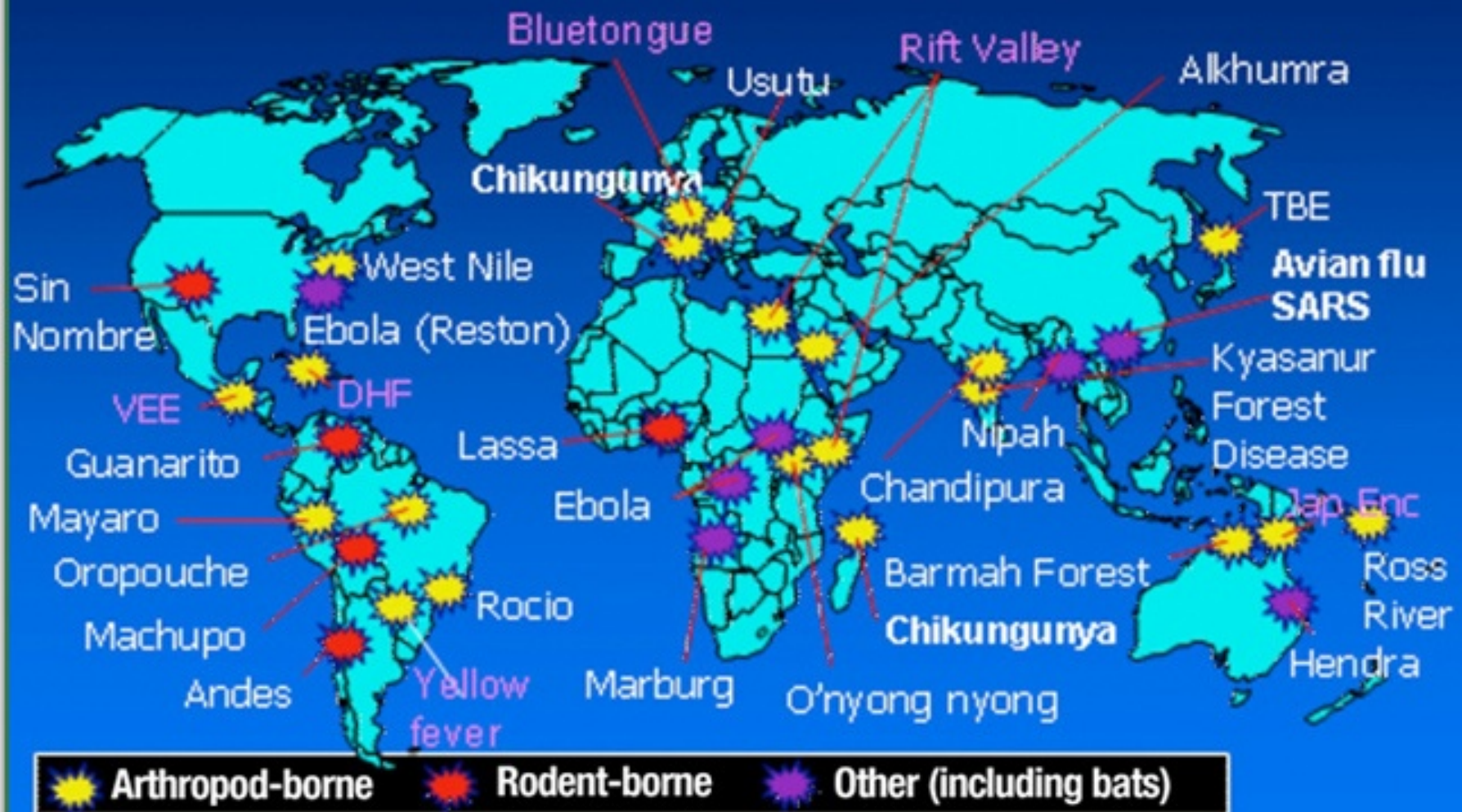
- May 15th (next day)
- Patient returns to doctor, feeling worse, with fever and altered mental status
- PE: Temp 38.0 , confused, lethargic. No focal neurological findings, no rash
- Admitted to hospital
- WBC $3.9 \times 10^9/\text{L}$, platelets $99 \times 10^9/\text{L}$, Na 133, Hb 12.7

- Pt started on IV levofloxacin, defervesces
- Cultures of stool, urine, blood negative
- Serology negative for Lyme disease and ehrlichiosis
- Discharged with diagnosis of 'fever of unknown origin'
- Continues to have headache, malaise

Convergence of Human and Animal Medicine

- More than 50% of US households have a dog, cat, or both
- Millions of US households own exotic pets, birds, and/or reptiles
- 200 million animals imported into US each year
- Animals often receiving sophisticated veterinary care

Emerging and Reemerging infections - 70% vector-borne or zoonotic



Drivers of Disease Emergence

- Change in antibiotic resistance
- Change in agricultural practices
- Increasing population pressure
- Landscape change: deforestation, suburban sprawl
- Climate change
- Increased animal-human contact

What Are Implications for U.S. Medical Clinicians?

- Reexamine risk of zoonotic diseases related to companion animals
- Confront communication gaps between physicians and veterinarians

Pets and Zoonoses

- Pets and people sharing living spaces
- Higher risk persons
- Higher risk animals
- Extent of transmission poorly understood-
many zoonoses not reportable to state and
federal health agencies

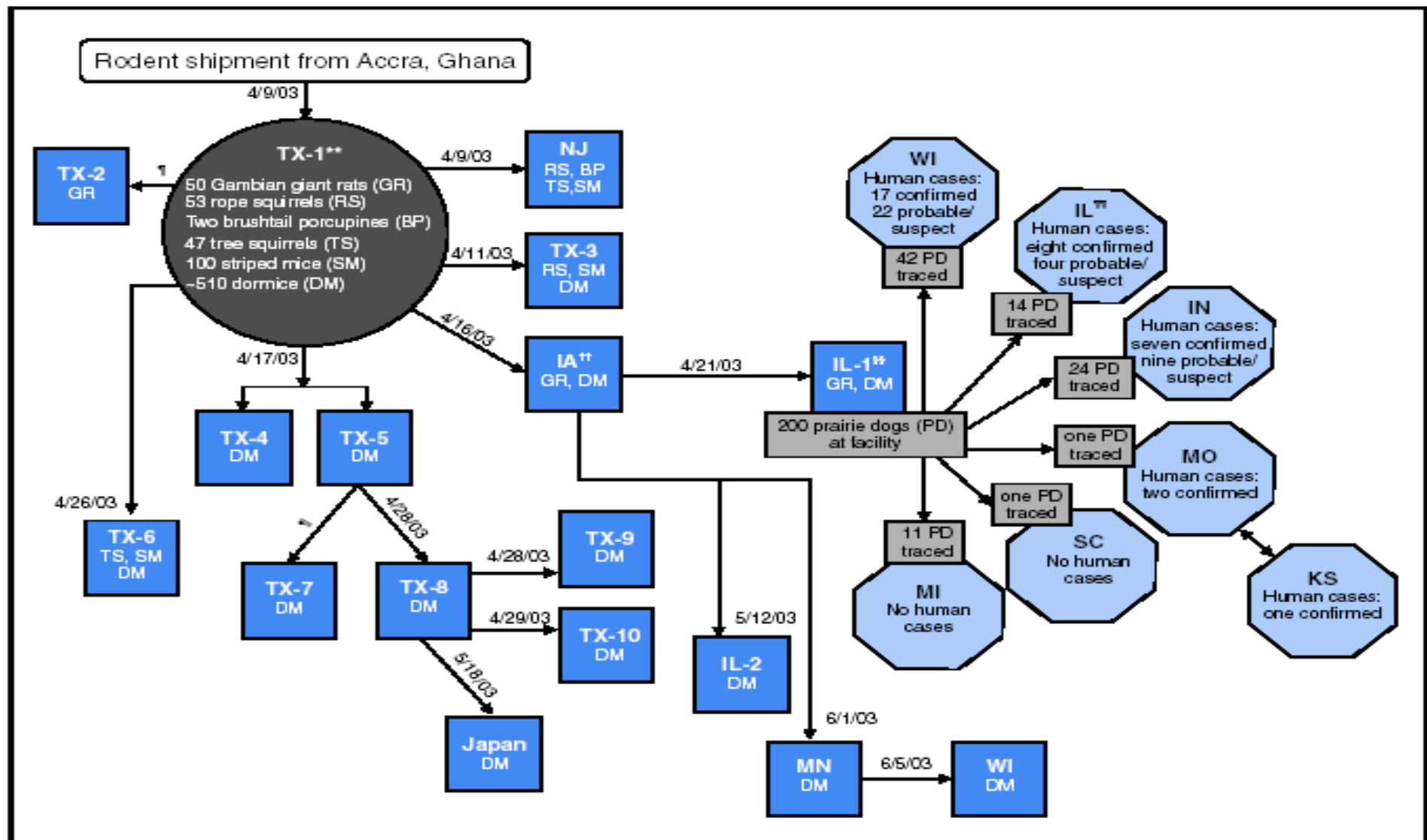
Individuals at Increased Risk for Zoonotic Disease

- Infants
- Children (increased exposure)
- Elderly
- Immunocompromised
- Pregnant
- Splenectomy

Higher Risk Animals: Exotic and Wildlife Pets



FIGURE 2. Movement of imported African rodents to animal distributors and distribution of prairie dogs from an animal distributor associated with human cases of monkeypox — 11 states*, 2003†§



* Illinois (IL), Indiana (IN), Iowa (IA), Kansas (KS), Michigan (MI), Minnesota (MN), Missouri (MO), New Jersey (NJ), South Carolina (SC), Texas (TX), and Wisconsin (WI). Japan is included among sites having received shipment of rodents implicated in this outbreak.

† As of July 8, 2003.

§ Does not include one probable human case from Ohio; investigation is ongoing.

¶ Date of shipment unknown.

** Identified as distributor C in *MMWR* 2003;52:561-4.

†† Identified as distributor D in *MMWR* 2003;52:561-4.

§§ Identified as distributor B in *MMWR* 2003;52:561-4.

¶¶ Includes two persons who were employees at IL-1.

Other High Risk Animals

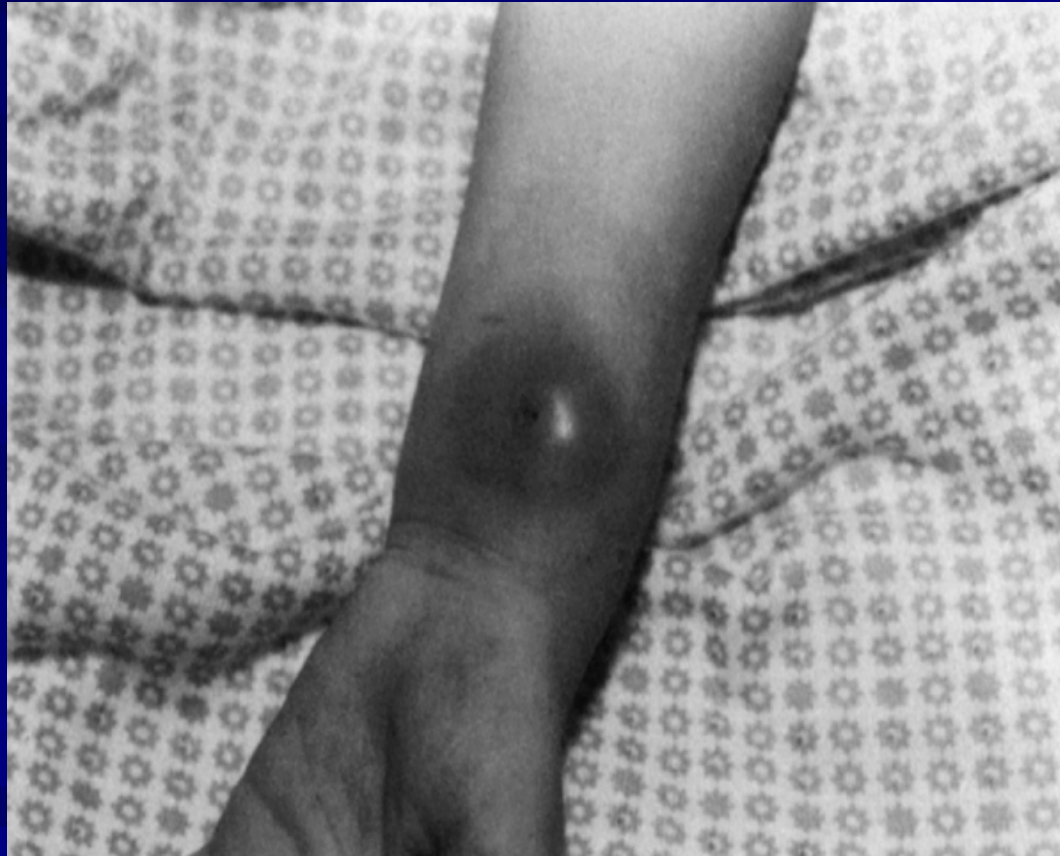
- Young animals
- Sick animals
- Reptiles
- Ducklings



Animal Bites

- More than 300,000 ED visits per year in US for dog bites alone.
- Many bites not reported
- Children more likely to be bitten
- Cat bites more likely than dog bites to become infected
- Pasteurella, polymicrobial
- Allergic reactions, envenomations, tissue damage can complicate

Pasteurellosis



Rat Bite Fever



Bartonella Infection

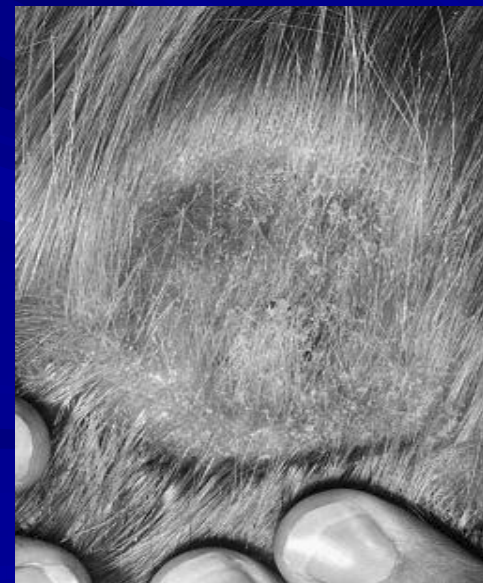


Management of Animal Bites

- Prevention
- Wound cleaning
- Decisions regarding closure and antibiotics
- Rabies exposure decisions

Dermatophytes

- Estimated 2 million zoonotic cases per year
- Animal may need treatment as well



Toxoplasmosis

- Cats are definitive host, but are infectious for short period (weeks).
- Many human cases due to other exposure such as soil and undercooked meat
- Usually, pregnant women and immunocompromised persons do not need to give up a cat.
- MDs found to often inappropriately advise giving up cat.

Toxocariasis

- Round worm infection
- Visceral and ocular larva migrans
- Eggs from infected dogs and cats found in soil
- In some areas of US, 5-30% of children may be infected, most asymptomatic
- Preventable with routine deworming of pets

Salmonellosis

- Estimated 200,000 animal associated cases each year
- Associated with high risk animals:
 - Young puppies and kittens
 - Ducklings
 - Chickens
 - Reptiles

Other Pet-associated Zoonoses:

■ Bacterial

- Leptospirosis
- Chlamydophila (psittacosis)
- MRSA
- Campylobacteriosis

■ Parasitic

- Cutaneous larva migrans
- Giardiasis
- Echinococcosis
- Cryptosporidiosis

■ Viral

- Rabies
- Lymphochoriomeningitis (LCMV)

Pet Zoonosis Prevention

- Wash hands after handling pets and avoid contact with pet feces.
- High-risk persons* should avoid contact with reptiles (i.e., turtles, lizards, and snakes), baby chicks and ducklings, puppies and kittens younger than six months, and pets with diarrhea.
- High-risk persons* should exercise caution at petting zoos and farms.
- Pregnant women should keep their cats indoors, should avoid handling cat litter, and should not feed cats uncooked meat.

– www.cdc.gov/healthypets

From “Us vs Them” to “Shared Risk” Approach to Zoonoses

■ “Us vs Them”:

- Example: hanta virus

■ “Shared Risk”:

- Both animals and humans susceptible to a hazard in the environment
- Animals may serve as “sentinels” for human risk

Sentinel Health Events

- “A Sentinel Health Event (SHE) is a preventable disease, disability, or untimely death whose occurrence serves as a warning signal that the quality of preventive and/or therapeutic medical care may need to be improved.”

– Ruttstein et al Am JI Pub Health 1983

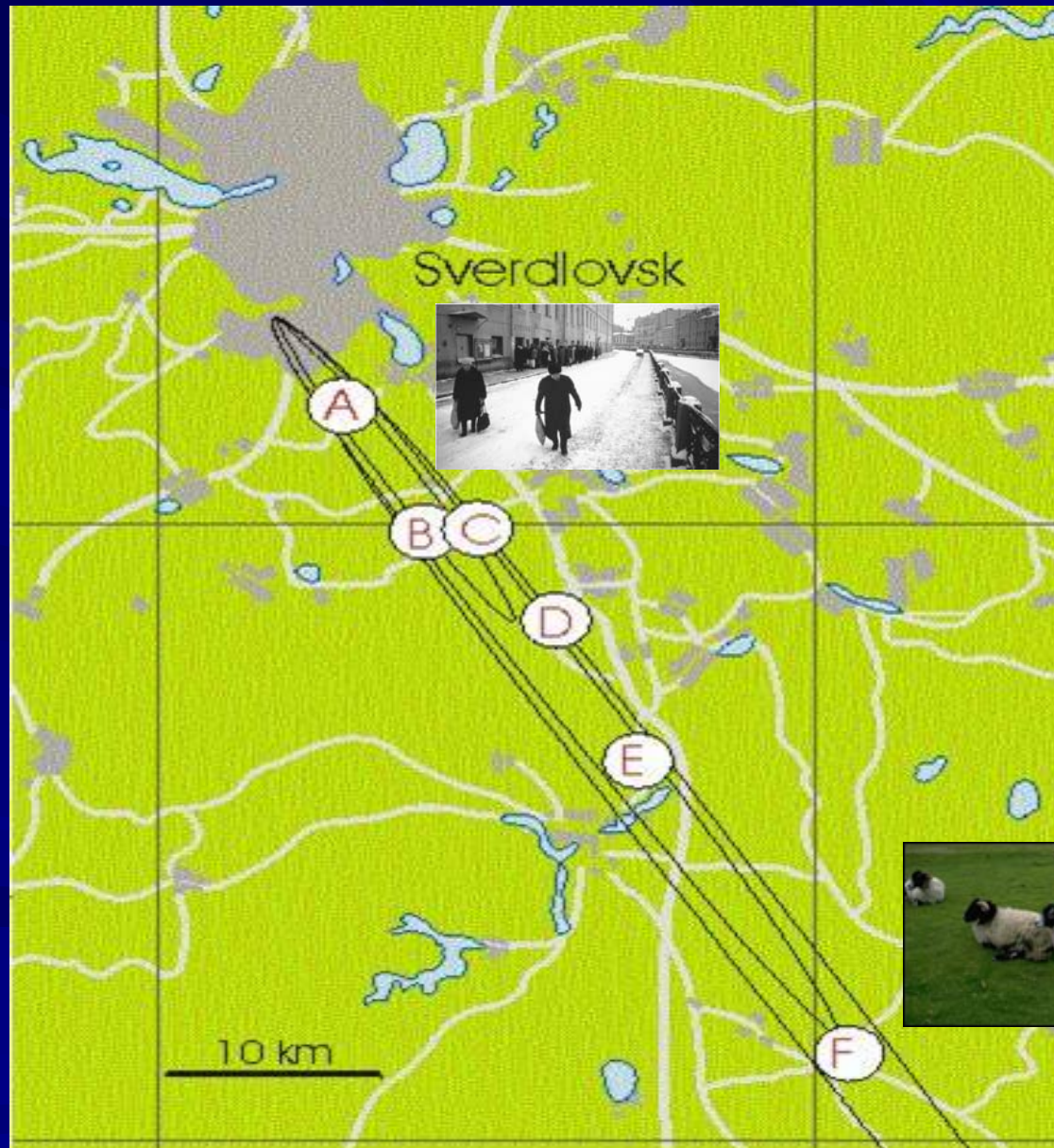
Animals as Sentinels for Humans

- Provide “early warning” about disease risks shared with humans due to some combination of:
 - Increased susceptibility
 - Increased exposure
 - shorter latency
 - Easily recognizable clinical signs

Canaries and Coal Mines



Sverdlovsk: Anthrax and Livestock

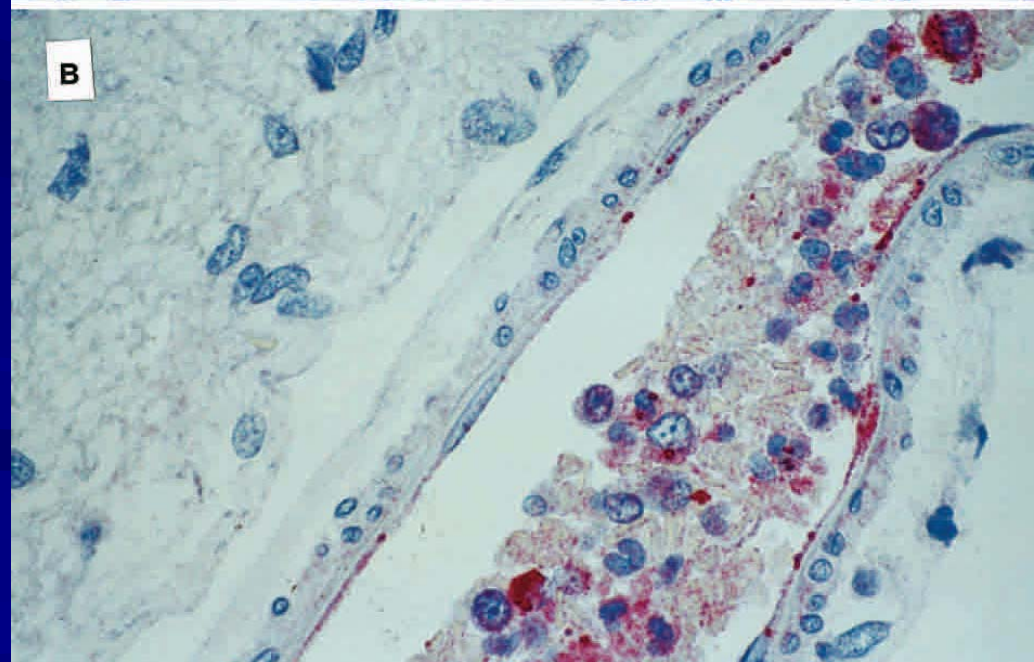
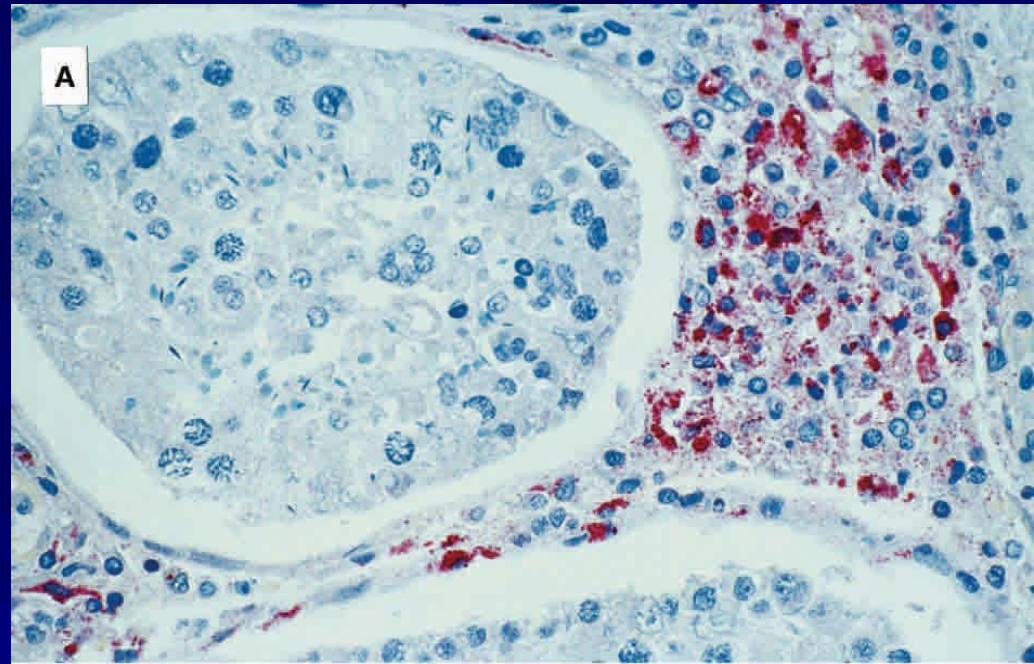


Pets as Sentinels of Hazards in the Environment

- Cats and dogs that roam outside are links between household and wildlife disease reservoirs, including peridomestic rodents and dead carcasses.
- Pets may be exposed to the same vectors (ticks, mosquitoes and flies) as humans
- May be exposed to common environmental source such as water, air, and soil that also could be human hazard.

Case of the Dog that Wouldn't Get Up (continued):

- Dog's tissue specimens sent to CDC, tested with immunohistochemistry for spotted fever rickettsial antigen



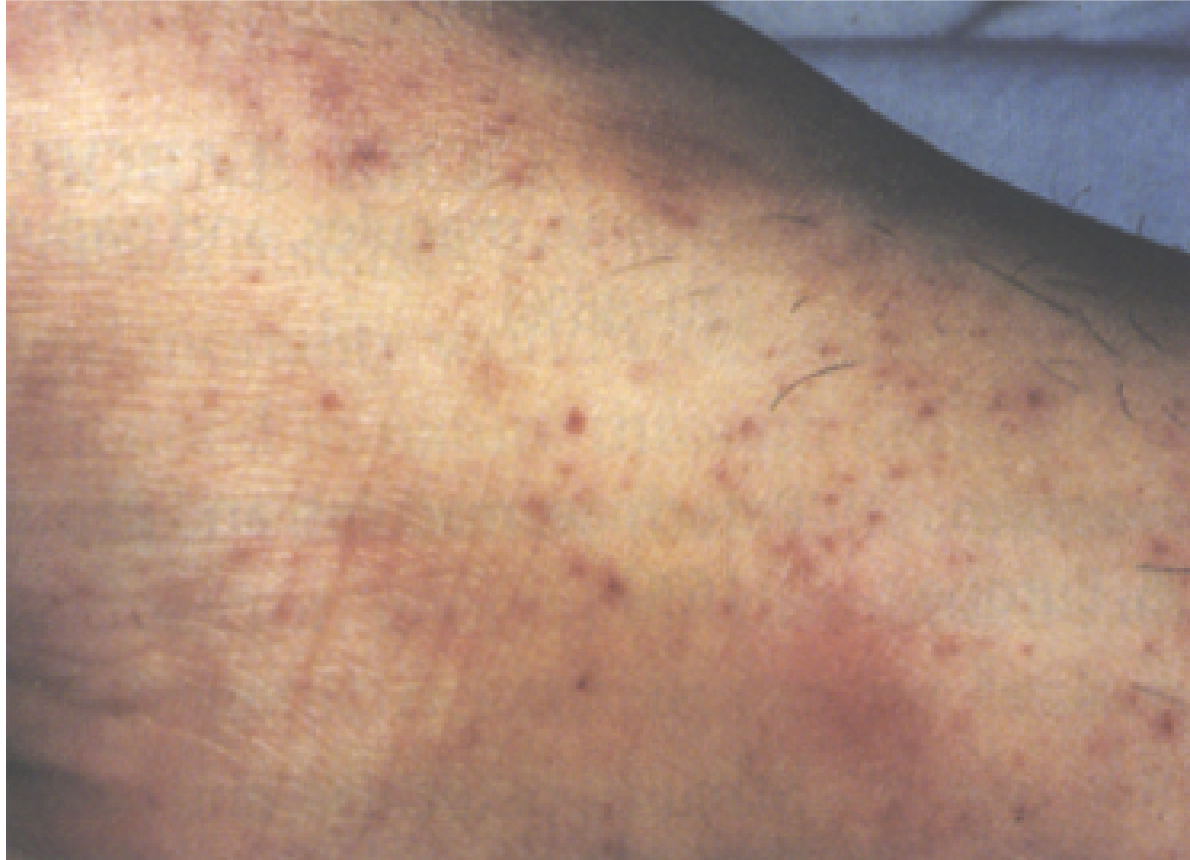
Veterinarian-Physician Communication

- Veterinarian contacts doctor with results of dog's test
- Doctor contacts patient: still complaining of headache and malaise
- Doxycycline started, patient's complaints resolve completely
- Acute and convalescent sera confirm diagnosis of Rocky Mountain Spotted Fever

(Paddock, Childs et al 2002 Am J Trop Med Hyg)

Rocky Mountain Spotted Fever

- Severe tickborne rickettsial infection
- Incidence increasing, vectors extending range- disease often localized
- Mortality without antibiotic treatment: 20%, with treatment (Doxycycline): 5%
- Long term sequelae: deafness, neurological damage, amputation
- Often underdiagnosed, at first visit only 3-18% present with triad of fever, rash, history of tickbite



A



B

RMSF in Dogs

- Causes severe disease
- Ecchymoses, edema, vasculitis, hemorrhage
- Dogs can be “sentinels” of RMSF risk in environment, since distribution very localized
- Humans can also become infected removing ticks from dogs without protection

Other Potential Pet Sentinels

- Plague
- West Nile Virus
- Lyme Disease
- Anthrax
- Avian influenza
- C. difficile?

Bottom Line for Clinicians

- A pet may both be a “vector” and a warning for infectious pathogens
- Counsel patients about general prevention (handwashing, types of contact)
- Communication between physicians and veterinarians may be useful:
 - Referral for counseling of immunocompromised patient re: zoonotic risks
 - Other consultation

The Animal Contact History

- Consider including screening questions about pets in patient histories:
 - Do you have pets or other contact with animals?
 - If so, what type of pets/contacts?
 - Are the animals experiencing health problems?

Case 2: The Cats That Became Canaries

- 28 year old woman, pregnant at 29 weeks of gestation (no complications to date) reports that her cats are not well
- 2 short hair cats (Midge and Pepsi: 3 year old siblings) sick for past 3 weeks; anorexia, gagging, retching
- Treated with ranitidine on previous visit 3 weeks ago

Evaluation of Cats

- Both cats vomiting, diarrhea, anorexia
- Pepsi had lost 0.7kg
- Both dehydrated, pale mucus membranes
- Midge: swaying gait, fine tremor
- Pepsi: Hypersalivation
- Both admitted to veterinary hospital

Evaluation of Cats (cont.)

- Lab tests: anemia, elevated alanine transaminase, alkaline phosphatase
- Started on IV fluids and IV ranitidine
- Other blood studies sent

Questions

- What is differential diagnosis of cat illness?
- What is possible relevance to the pregnancy of the owner?

Case of Cats (cont.)

- Results of venous lead level:
 - Midge 135mcg/dL (nl <25)
 - Pepsi 87 mcg/dL
- Both started on chelation therapy (EDTA) for lead poisoning
- Pepsi survived, Midge died
- Veterinarian advised owner to contact physician

Case of Cats (cont.)

- Pregnant owner's venous blood lead level:
 - 40 mcg/dL (adverse fetal outcomes reported with levels >10mcg/dL)
- Had been stripping old paint with blowtorch while renovating house with husband in preparation for baby
 - (Dourmousthis SK et al . “Veterinary diagnosis” of lead poisoning in pregnancy.BMJ 2006)

Lead Poisoning

- Anemia, encephalopathy, learning problems
- Children at increased risk due to developing CNS
- In pregnancy: premature labor, intrauterine growth retardation
- Crosses placenta
- Cats at risk through grooming behavior
- Dogs can also be sentinels

Animals as Sentinels of Toxic Hazards

- Dancing Cats: Minamata Bay: methylmercury
- Pet food poisonings and melamine
- Cases of cancer in dogs linked to exposure to household carcinogens, providing clues to human cancer risks
 - Bukowski JA, et al. Environmental causes for sinonasal cancers in pet dogs. J Toxicol Environ Health A 1998;54:579-91

Case 3: Home Alone

- 76 year old woman is admitted to the hospital for a urinary tract infection.
- The first hospital day, she becomes agitated and anxious, and is insisting on leaving the hospital AMA.
- A psychiatry consultation is called

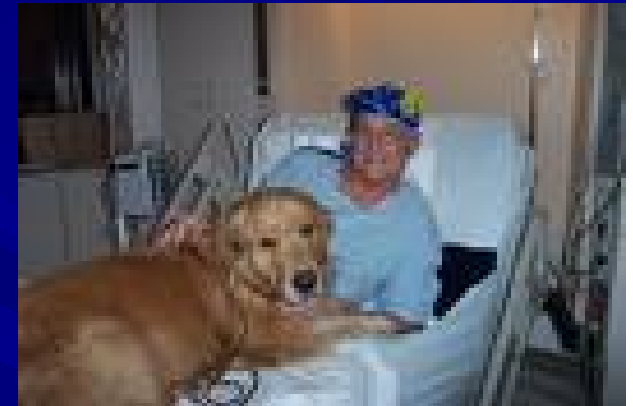
Case 3 (Cont.)

- The consult finds that she is experiencing an acute anxiety reaction due to her cat being left home alone.



Human-Animal Bond

- Pet ownership associated with lower rates of depression and chronic disease
- Animal Assisted Therapy
- During Katrina evacuation, other disasters, some people refused to leave to avoid abandoning pets
- Cases of abused women staying in home to protect pet



Human Animal Bond

- Benefits of pet ownership felt to outweigh zoonotic risks in most cases.

The Future of Human-Animal Medicine

- Increasing sophistication of veterinary diagnosis
- Increasing animal surveillance
- Increasing recognition of sentinel relationships
- Growth in a “one health” approach to human-animal medicine issues

Collaboration between Human and Animal Health



See website <http://www.onehealthinitiative.com>

Resolutions passed by AMA and AVMA 2007

One Health Task Force created

Implications for Clinicians

- Take an animal contact history
- Inquire about the health of pets
- Consult with veterinarian
- Consider shared environmental health risks: both infectious and toxic
- Remember that the benefits of human animal bond appear to outweigh risks of pet ownership

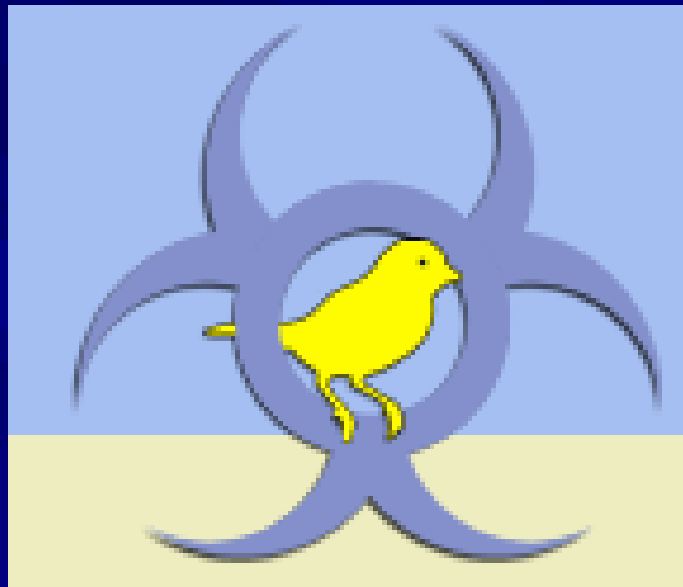
Barriers to “One Health” in Practice

- Physicians and Veterinarians have limited to no professional interaction during training and in practice
- Scope of practice restrictions
- Patient confidentiality concerns to sharing information across disciplines
- Economic reimbursement for referrals to veterinarians

Overcoming Barriers

- Develop evidence base for:
 - physician-veterinarian interaction
 - clinical use of animal sentinels
- Develop standardized protocols and reimbursement mechanisms
- Interdisciplinary training
- Clinician awareness

Thank you!



www.canarydatabase.org