



United States Department of Agriculture

# Veterinary Concerns for Biosafety in Field Research



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**U.S. Department of Agriculture  
Animal and Plant Health Inspection Service  
Veterinary Services**

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# Outline

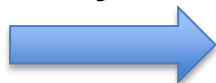
- First – Let's Define “The Field”
- One Health Connections and the Disease Triad
- Applying “Lab Safety” to “Field Safety”
- The AWA, the IACUC, and OS&H
- It's All About the Bas-ics!
- Plan for Risks and Hazards
- Prepare for Routes of Exposure
- Implement Risk Mitigation
- Resources



# Where is “The Field”?

*If you are not sitting in an office  
then you are in “The Field”*

Hopefully not this!



**We are all connected: humans, domestic animals, wildlife, and fish in our shared environment**

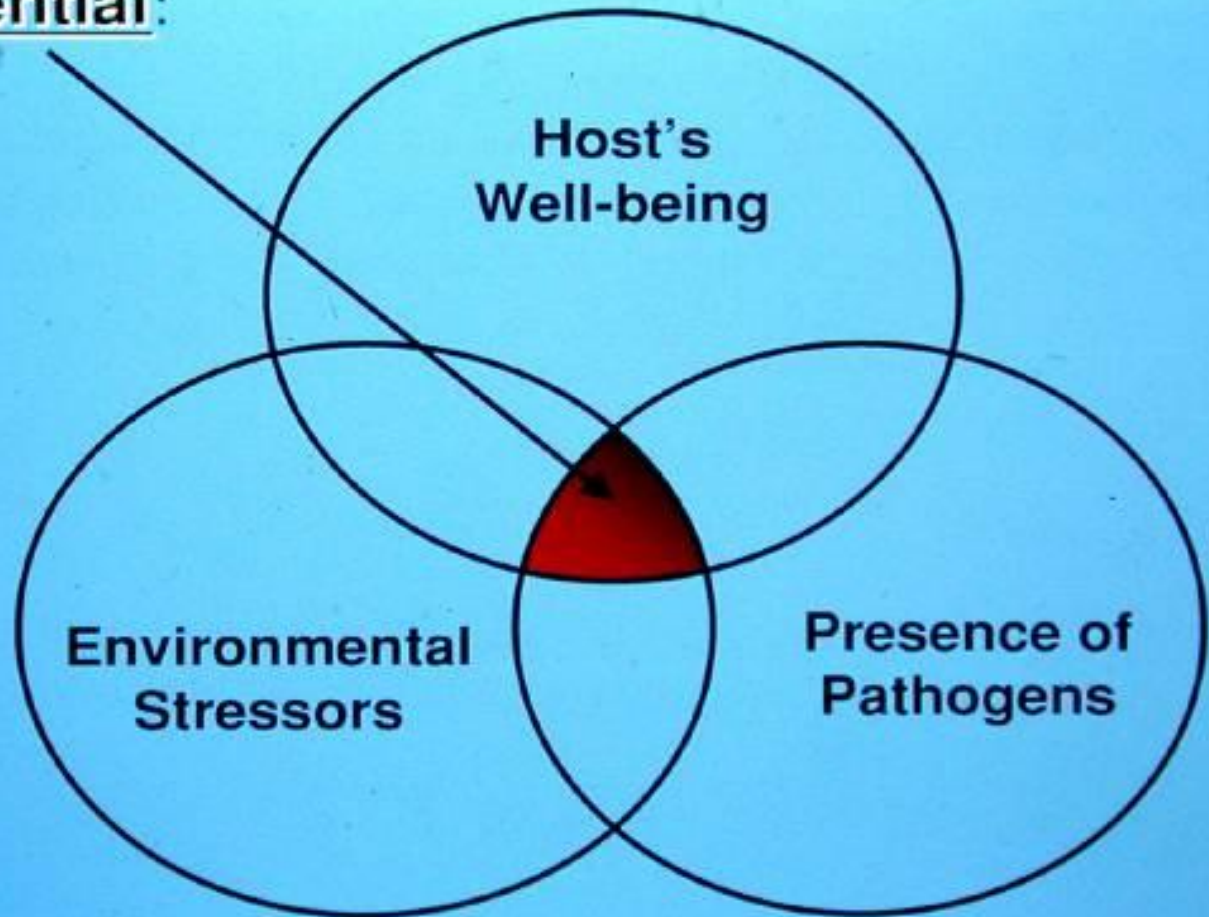


*Peaceable Kingdom and Leopard of Serenity, Edward Hicks*

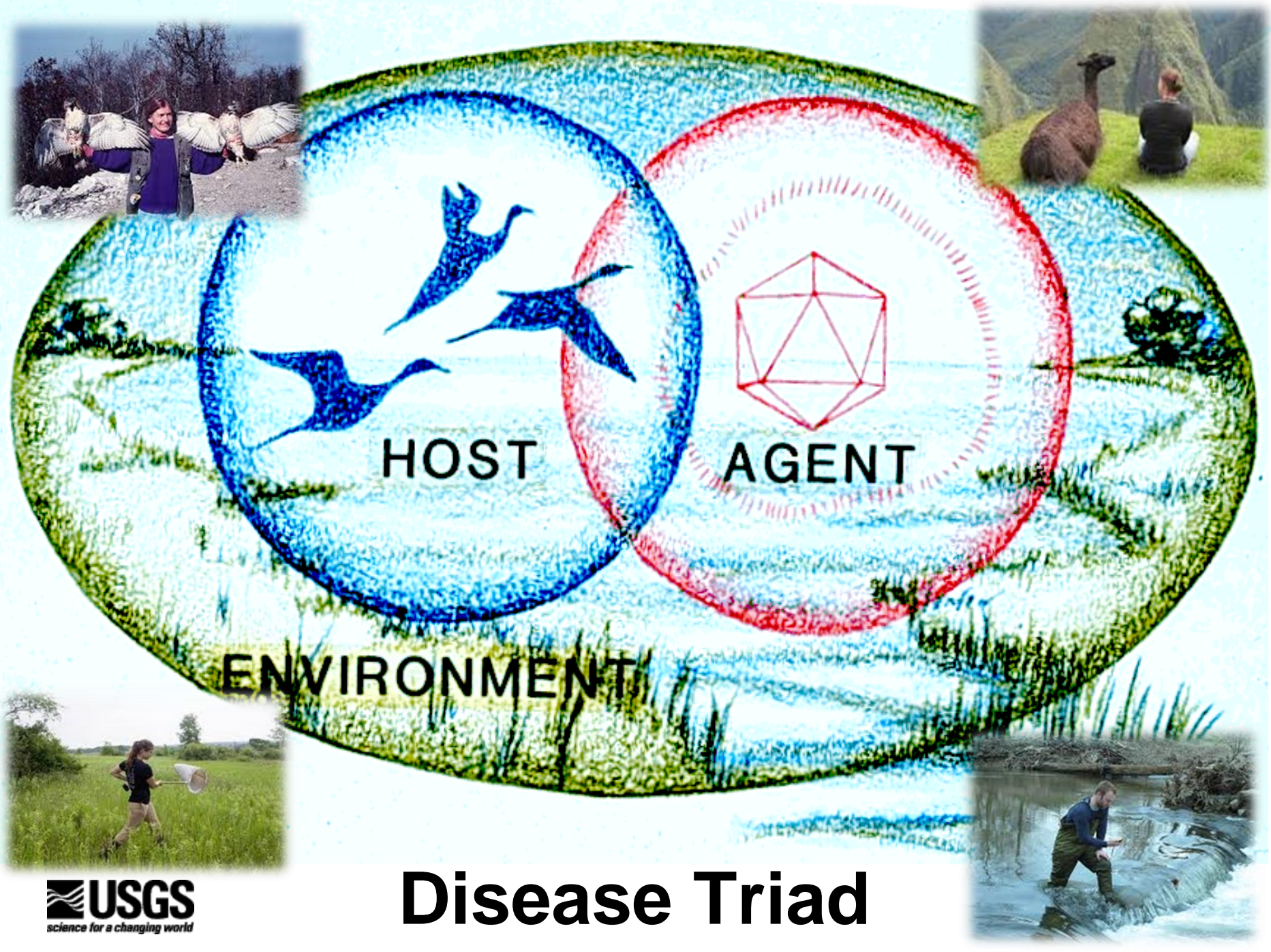
# Epidemiologic Triad

Disease potential:

infection  
 parasites  
 ulcers  
 morbidity  
 mortality



**The agent, the host, and the environment are always changing**



# Disease Triad

# Laboratory vs The Field

- Can we apply laboratory-based Occupational Safety and Health (OS&H) concepts in the field?
- Biomedical laboratory settings:
  - Planned facility design, species specific caging systems
  - Controlled environments (lighting, temperature, humidity, and ventilation)
  - Laboratory animals – domestic species & breeding
- Field settings
  - Facility is the natural environment
  - Free-ranging wildlife in their natural habitat
  - Animal's zoonotic disease potential often undefined

# AWA, IACUC, and Field Studies

- AWA 2005 amendment includes field studies conducted on free-living wild animals in their natural habitat.
- Field studies that are not invasive, do not harm, or materially alter the behavior of the animal under study are exempted from the AWA and IACUC oversight.
- Also pertains to captive wildlife and wild animals held in captivity for more than 12 hours.
- Reporting categories of pain and distress.
- Other federal laws, policies, and guidelines on animal care and use





# OS&H Issues in the Field

- Two components
  - Field workers (wildlife biologists, resource managers, law enforcement, researchers, veterinarians, etc)
  - Wild animals (and their habitats)
- Biosafety concept
  - Don't bring the animal's 'germs' to you
  - Don't bring your 'germs' to the animals and habitats
- Institutional OS&H Program and IACUC partners
- Job Safety Analysis should be completed for all field work / field research studies

# Job Safety Analysis

- Identify any safety risks & hazards in the ‘work place’
- Evaluate the relationship between the worker, the tasks, the tools, and the environment
- Goal is to discover ‘what can go wrong’
- Important to report and document work-related injury & illness (even tick bites) for OWCP claims!



# Basic Safety Principles

- Situational awareness is essential and required
- Plan before you act – identify risks and hazards
  - Physical, Chemical, and Biological
  - Use practical & systematic practices and habits
- Prepare for routes of bio/chem exposure
  - Contact (ingestion, absorption, bites)
  - Aerosol (inhalation)
  - Vectors
- Implement risk mitigation measures
  - PPE
  - Vaccination
  - Training, training, training!

# Job-Related Mortality of Wildlife Workers in the United States 1937 -2000

- Airplane accidents – 55%
- Drowning – 12%
- Vehicular accidents – 8%
- Fall – 3%
- Animal related injury or disease – 3%

*D.B.Sasse, Wildlife Society Bulletin (2003)*

# Risks and Hazards in the Field

## Physical

- Restraint, trap, capture injuries
- Animal kicks, bites, cuts, scratches
- Dart or needle sticks
- Hypothermia/Frostbite or Heat Stress
- Drowning, falls, heart attack/stroke
- Weather, terrain, remoteness
- Transportation accidents (airplane, boat, truck)
- Communication failure





# Aggressive Wildlife

S.Greiner, WS NWRC

# Risks and Hazards in the Field

## Chemical

- Chemical immobilization accidents
- Disinfection chemicals
- Pesticides and agro-chemicals



# Risks and Hazards in the Field

## Biological

- Poisonous plants
- Venomous animals
- Biotoxins (botulism, tetanus, HABs)
- Insects and vector-borne diseases
- Zoonotic diseases







# Zoonotic / Vector-borne Diseases

Anthrax

Avian Influenza

Bartonella

Baylisacariasis

Brucellosis

Ebola

Echinococcosis

Hantavirus

Leptospirosis

MERS

Mycobacteriosis

Plague

Psittacosis

Q-fever (Coxiella)

Rabies

Salmonellosis

Toxoplasmosis

Tularemia

Typhus

Tick-borne disease

– Lyme's disease

– Ehrlichiosis

– RMSF

Mosquito-borne disease

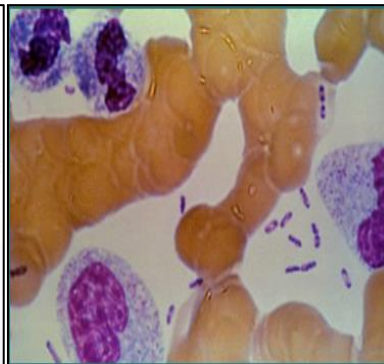
– WNV, arboviruses

– Malaria, Yellow fever




# Primary Pneumonic Plague Contracted from a Mountain Lion Carcass

- NPS wildlife biologist found deceased in his residence in Grand Canyon National Park – November 2007
- Field investigation on mountain lion mortality
- Transported carcass and conducted necropsy
- Acutely febrile with hemoptysis

*D Wong, et al, CID 2009*

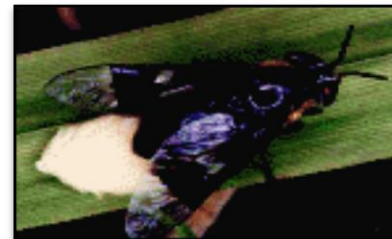


# Tickborne Diseases

Disease	Pathogen	Tick Vector
Babesiosis	<i>Babesia microti</i>	<p data-bbox="1340 439 1734 559"><i>Ixodes scapularis</i> (Black-legged tick)</p> 
Lyme disease	<i>Borrelia burgdorferi</i>	
Human granulocytotropic anaplasmosis (HGA)	<i>Anaplasma phagocytophilum</i>	
Human monocytotropic ehrlichiosis (HME)	<i>Ehrlichia chaffeensis</i> , <i>Ehrlichia ewingii</i>	 <p data-bbox="1561 901 1885 1062"><i>Amblyomma americanum</i> (Lone star tick)</p>
Rocky Mountain spotted fever (RMSF)	<i>Rickettsia rickettsii</i>	<p data-bbox="1193 1172 1479 1339"><i>Dermacentor variabilis</i> (Dog tick)</p> 
Tularemia	<i>Francisella tularensis</i>	

# Tularemia (Rabbit or Deer-fly Fever)

- Etiology: *Francisella tularensis*
  - *tularensis* (type A)- rabbits, squirrels, ticks
  - *holarctica* (type B)- aquatic animals
- Transmission – all routes
  - Highly infectious (10-50 organisms)
  - Inhalation, ingestion, arthropod bite
- Vector-borne transmission
  - ***Survives in mud, water, dead animals***
  - Ticks (Dermacentor, Amblyomma)
  - Flies (Deer fly)



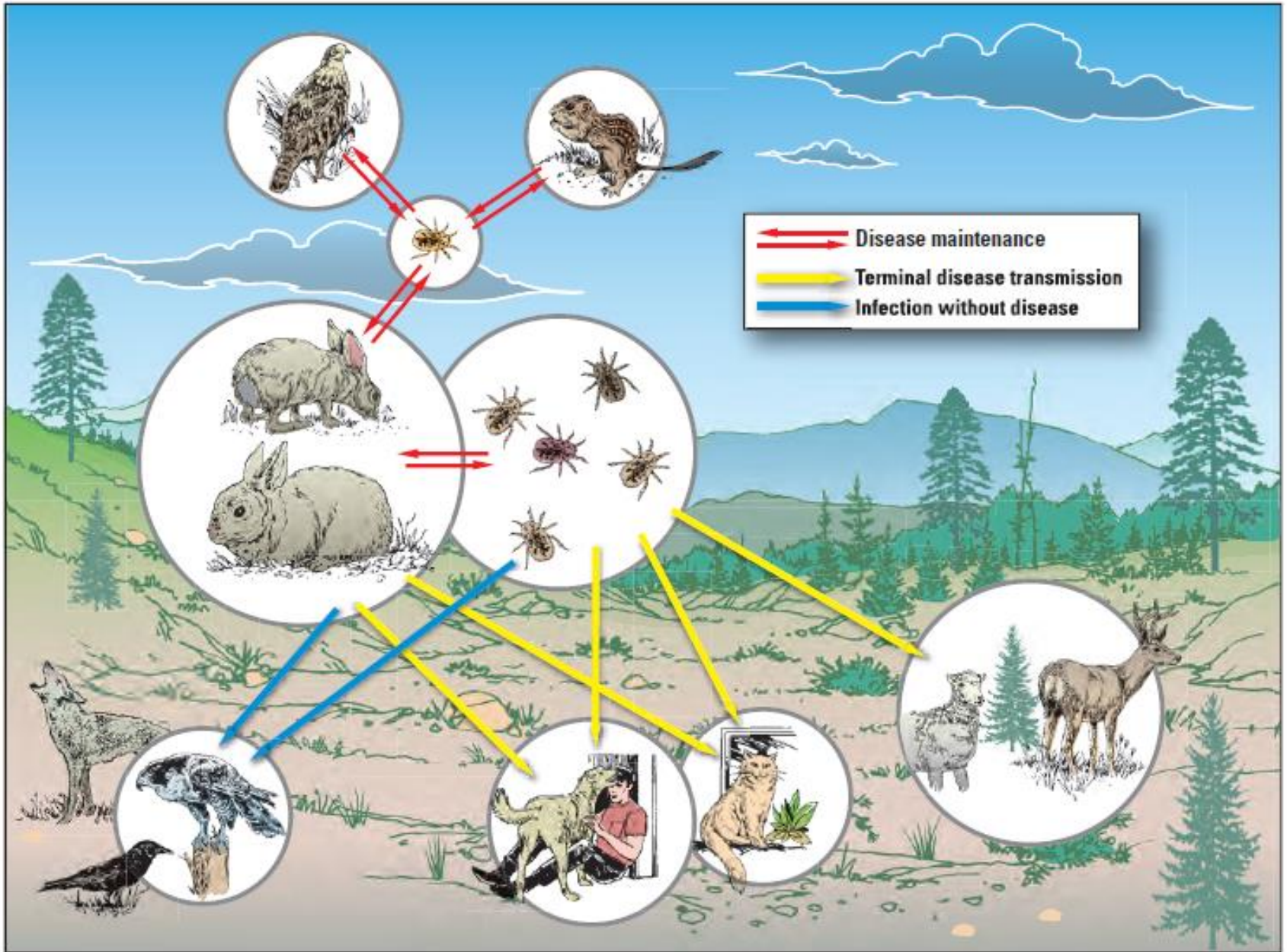


Illustration by John M. Evans

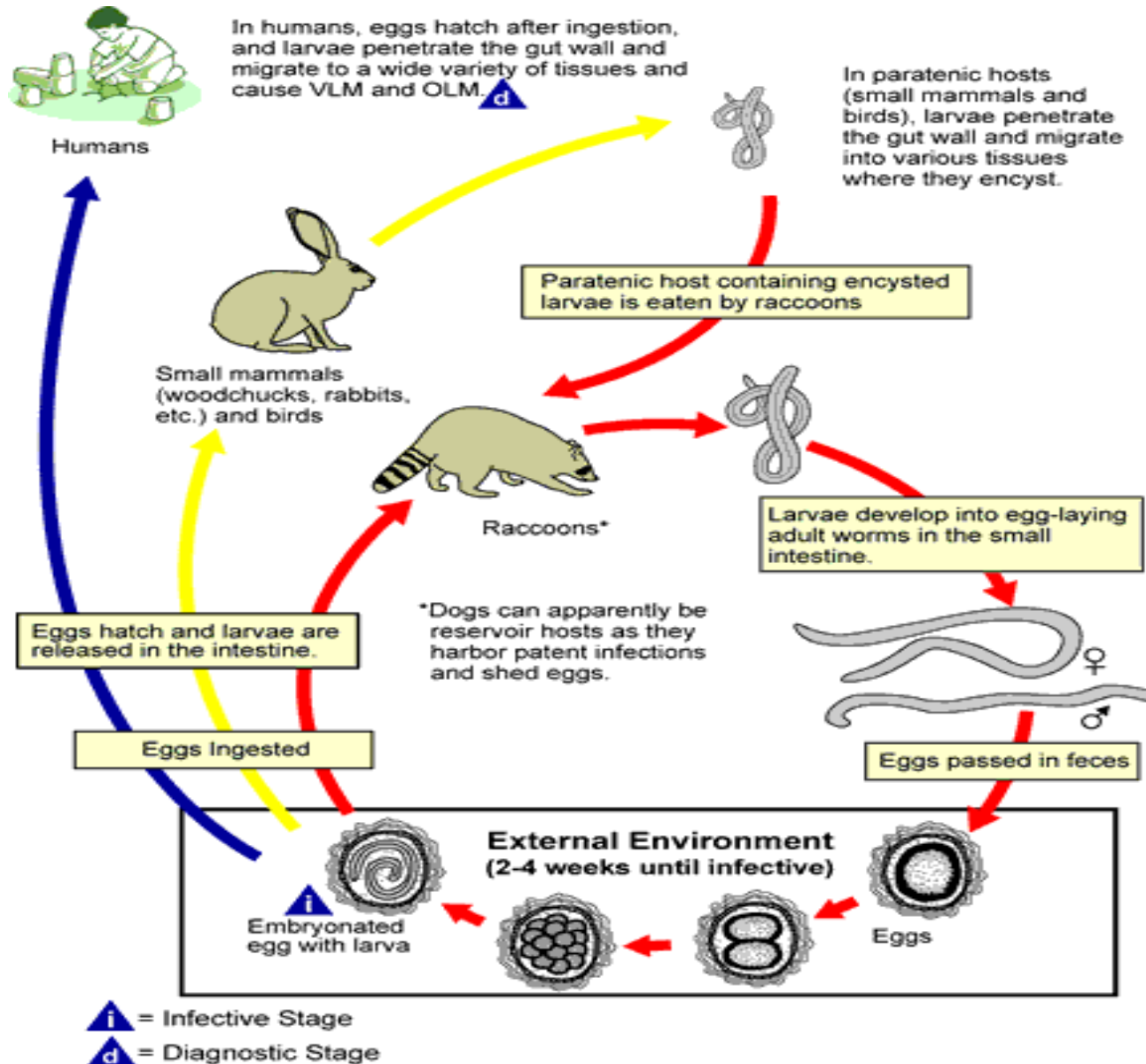
Figure 10. Pathways, hosts, and primary vector associations for lagomorphs and tularemia in North America.

# Larval migrans

- ***Baylisascaris procyonis***
  - “Raccoon roundworm”
  - Raccoons are definitive host
  - Widespread in raccoon populations in Eastern U.S.
- Other wildlife susceptible to larvae
  - Neurologic illness due to aberrant larval migration
  - Clinical signs mirror rabies suspects
- Human disease – severe
  - Palliative treatment, no cure
  - VLM, OLM



# Lifecycle of *Baylisascaris procyonis*



# Rabies



- *Rhabdoviridae* (Genus *Lyssavirus*)
  - 6 distinct rabies virus variants (Canine, Raccoon, Skunk, Coyote, Fox, Bat)
- All warm-blooded animals susceptible
- Reservoirs consist of
  - *Carnivora* (canids, skunks, raccoons, etc)
  - *Chiroptera* (bats)
- Reported in every continent except Australia
- **USA ‘canine rabies variant’ free (2008)**





# Risk Mitigation Measures

- Medical evaluation and preventive medicine
  - Health profile
  - Vaccines (tetanus, rabies, yellow fever, etc)
  - Training
    - First aid
    - Firearm and equipment safety
    - Hazmat
  - Emergency medical kits (include allergic reactions and venomous animal bites)
  - Field evacuation plan
  - Incident reporting and follow up

# Risk Mitigation Measures

- Use of PPE
- Use of insect repellents
- Personal hygiene
  - Vigilant hand washing
    - Before and after handling animals
    - Before handling food or eating
    - **Scrub hands for at least 20 sec.**  
**(Sing “Happy Birthday” twice!)**
  - No eating or smoking during field work
- Seek medical care if sick or injured
  - Carry medical alert card
  - Inform medics of work-related exposures



### ATTN: Medical Personnel

This person works with wildlife and may have been exposed to certain zoonotic diseases not routinely considered in the differential diagnoses of febrile illnesses. In case of sickness in this individual, please consider zoonotic diseases including, but not limited to the following:

Anthrax, Arbovirus encephallitis, Brucellosis, Giardiasis, Hantavirus, Hendra Virus, Highly Pathogenic Avian Influenza, Histoplasmosis, Leptospirosis, Lyme Disease, Monkeypox, Mycotoxicosis, Nipah Virus, Rift Valley Fever, Rabies, Rocky Mountain Spotted Fever, Salmonella, Sylvatic Plague, Tularemia, Typhus, & West Nile Virus.

(continued on back)

For more information on the occurrence of these diseases in humans,

please contact:  
The Centers for Disease Control and Prevention  
1600 Clifton Rd.  
Atlanta, GA 30333  
1-800-232-4636 (1-800-CDC-INFO)  
<http://www.cdc.gov/>



For more information on the occurrence of these diseases in wildlife,

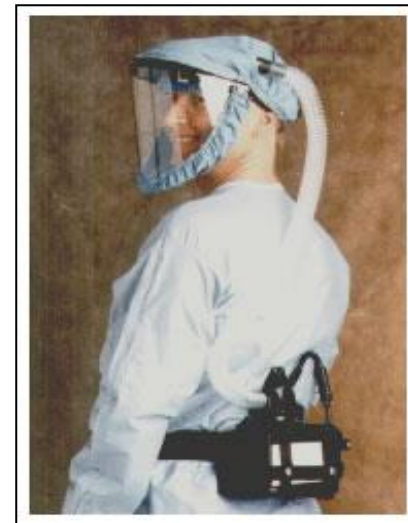
please contact:  
USGS National Wildlife Health Center  
4006 Schroeder Rd.  
Madison, WI 53711-6223  
(608) 270-2400  
<http://www.nwhc.usgs.gov/>



# Risk Mitigation Measures

## Personal Protective Equipment (PPE)

- Levels A, B, C
- Coveralls, Tyvek suits
- Boots, disposable boot covers
- Gloves
- Particle masks, face shields
- Respirators (fit-testing)



# How To Determine Level of PPE?

- Use situational awareness to inform decisions
  - Diseases and bio/chem hazards in the area?
  - Routes of transmission – airborne, ingestion, absorption
  - Zoonotic diseases carried by the animals?
  - Peak vector activity?
- Get advice from OS&H!
- When in doubt, put it on!
- Keep record of all people in contact with the animal in the event of disease confirmation and need for follow-up



# What's wrong with this picture?



# HOW DO I CHOOSE AN INSECT REPELLENT?



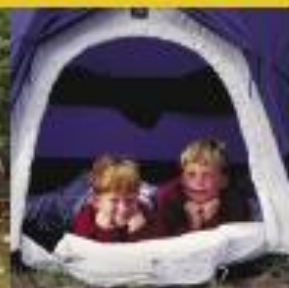
1-2 hours



2-4 hours



5 - 8 hours



## ON SKIN

### MOSQUITOES

Protection varies by species of mosquito.

Most mosquitoes that transmit diseases in the US bite from dusk-dawn.

### TICKS

Other factors affecting efficacy include: individual chemistry, sweat, numbers of bugs. Apply creams and lotions 15 to 20 minutes before going outdoors.

Choose the appropriate repellent for the length of time you'll be outdoors. Reapply according to product instructions

<10% DEET  
<10% picaridin

~15% DEET  
~15% picaridin/KBR 3023  
~30% oil of lemon eucalyptus/PMD

~20%-50% DEET

Generally, repellent with 20 - 50% DEET is recommended to protect against tick bites.

In areas where both mosquitoes and ticks are a concern, repellents with 20 - 50% DEET may offer best, well-rounded protection.

The American Academy of Pediatrics has recommended that repellents containing up to 30% DEET can be used on children over 2 months of age.

The repellents shown here meet CDC's standard of having EPA registration and strong performance in peer-reviewed, scientific studies. They reflect products currently available in the U.S.

## ON CLOTHING AND GEAR

### Permethrin



Permethrin treatment of clothing and equipment can provide protection against mosquitoes and ticks through multiple washings. Follow label instructions.

# Risk Mitigation Measures

- Cleaning and disinfection of tools and equipment
- Decontamination of boots and vehicles
- Transport and store samples properly
- Trash removal and disposal
- Avoid being a mechanical vector!
  - Do not move disease agents between field sites
  - Do not introduce disease agents to other animal populations and habitats





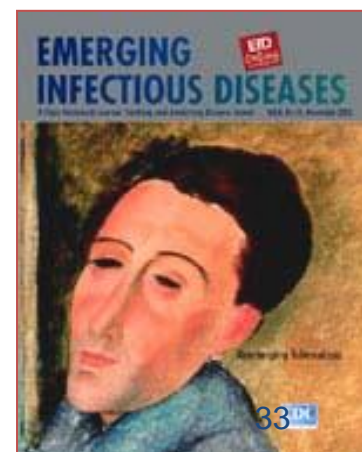
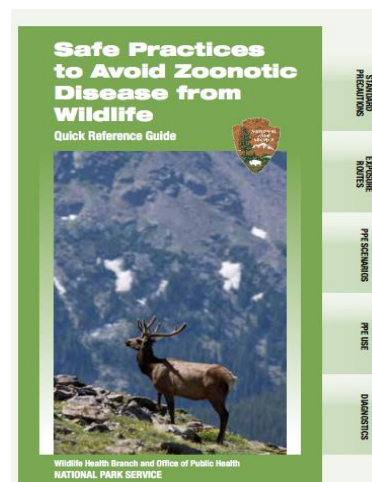
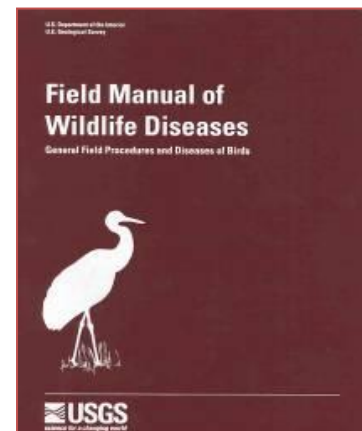
# Summary

- Remember “It’s all about the basics!”
- Identify, plan, and prepare for risks and hazards
- Implement risk mitigation measures
  - Most common injuries are physical (falls, bites, needle sticks)
  - Most common zoonotic infections prevented by good hygiene
  - PPE, vaccination, vector control, wash your hands!
- Training, training, training!
  - Increase situational awareness
  - Safety first!
- Promote a culture of prevention among wildlife professionals for safe work practices in the field



# Resources

- USGS National Wildlife Health Center
  - [www.nwhc.usgs.gov](http://www.nwhc.usgs.gov)
- NPS Wildlife Health Program and Office of Public Health
  - [www.nps.gov](http://www.nps.gov)
- USDA APHIS Wildlife Services - NWRC
  - [www.aphis.usda.gov/ws](http://www.aphis.usda.gov/ws)
- IAAAM - [www.iaaam.org](http://www.iaaam.org)
- American Assoc. of Zoo Veterinarians - [www.aazv.org](http://www.aazv.org)
- Wildlife Disease Association - [www.wildlifedisease.org](http://www.wildlifedisease.org)
- American Assoc. of Wildlife Veterinarians - [www.aawv.org](http://www.aawv.org)
- CDC - [www.cdc.gov](http://www.cdc.gov)
- CDC/NIOSH - <http://www.cdc.gov/niosh/topics/outdoor/>
- National Assoc. of State PH Veterinarians - [www.nasphv.org](http://www.nasphv.org)
- State Health Department websites
- Taxon specific professional associations
  - American Society of Mammalogists
  - Ornithological Council
  - American Fisheries Society



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# THE END



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