

Public Health Pests and Disease Vectors

Erin Hodgson

Extension Entomologist

Utah State University

Outline

- Definitions

- Spiders, scorpions

- Bees, wasps, ants

- Beetles, moths

} Public Health Pests

- Cockroaches, flies

- Lice, fleas, true bugs

- Ticks, mosquitoes

} Disease Vectors

- Summary

Important definitions *

- Arthropod – segmented body, exoskeleton, jointed appendages and mouthparts (90% animals)
- Parasite – organism living on or in a host
 - Ectoparasite lives outside the host
 - Endoparasite lives inside the host
- Host – organism where the parasite feeds
- Pathogen – organism that causes disease

** Defined by the Torre-Bueno Glossary of Entomology*

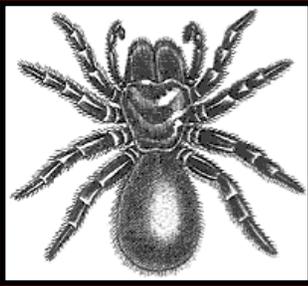
Important definitions *

- Vector – intermediate host carrying a pathogen
- Mechanical transmission – pathogen does not replicate in vector; accidental spread (i.e., legs)
- Biological transmission – pathogen replicates inside vector and transmitted to hosts by excretion (i.e., feeding, defecating)
- Reservoir host – organism that carries a pathogen but does not display disease symptoms



The insect blueprint

- 3 body segments:
 - Head = thinking, sensory
 - Thorax = locomotion
 - Abdomen = digestion and reproduction
- 1 pair of antennae
- 3 pairs of legs
- Usually 2 pair of wings as adults
- Ex. grasshopper, honey bee, butterfly, aphid



The arachnid blueprint

- 2 body segments:
 - Cephalothorax = thinking and locomotion
 - Abdomen = digestion and reproduction
- Antennae absent
- 4 pairs of legs
- Wingless
- Ex. spider, tick, mite, scorpion, harvestmen



Public Health Pests



1. Venomous bites or stings

- Painful swelling, itching, skin blistering,
 - Allergic reactions, trouble breathing
 - May require hospital visit, seldom fatal
- Ex. spiders, centipedes, scorpions, bees, wasps, ants



Hobo spider

- Funnel-web spider, swift running
- Live in building cracks, under debris
- Bites cause necrotic lesions
- Habitat elimination to reduce risk



Public Health Pests

2. Nuisance, sanitation problems

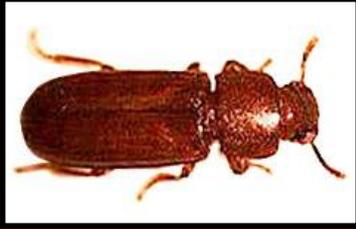
- Annoying, spoil food, damage structures
- Ex. beetles, earwigs, termites, ants

3. Urticating hairs, wing scales and cast molts

- Develop dermatitis, hives, lung problems
- Ex. Dust mites, moths, spiders







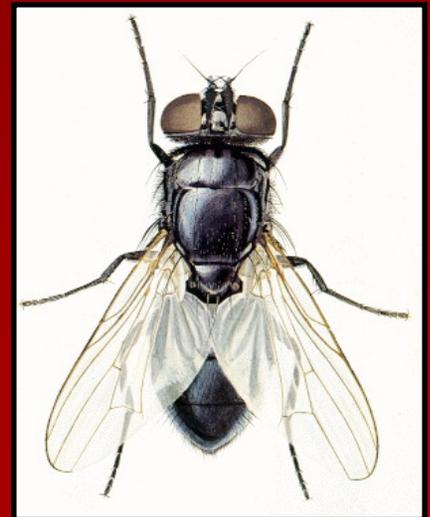
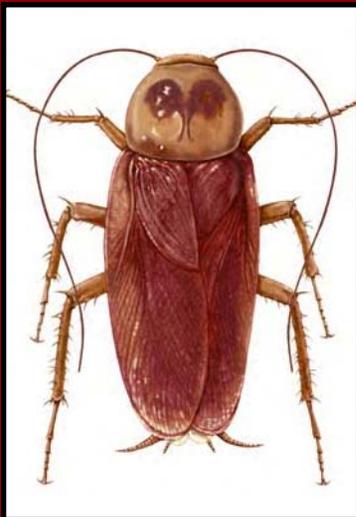
Red flour beetle

- Flat, shiny and reddish-brown
- Feed on damaged kernels, moist grain (>12%), grain dust or flour
- Found in stored grain, food plants, homes
- Remove infested food source
- Use careful sanitation in homes
- Fumigation may be considered



Disease Vectors

- Organisms that transmit pathogens
 1. Mechanical transmission (i.e., legs)
 - Cockroaches spread food poisoning
 - House flies transmit bacillary dysentery



Disease Vectors

2. Biological transmission (i.e., replicates)

Arthropods capable of ingesting pathogens and vectoring disease to humans and other vertebrates

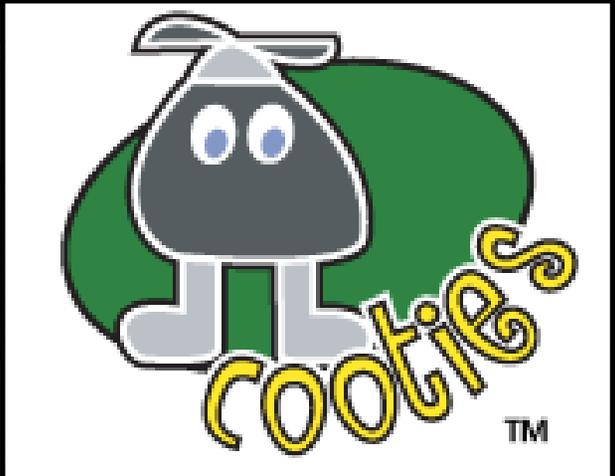
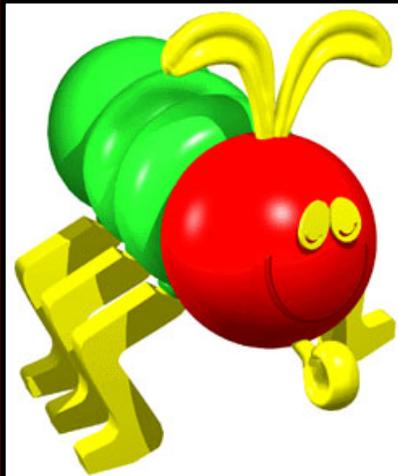
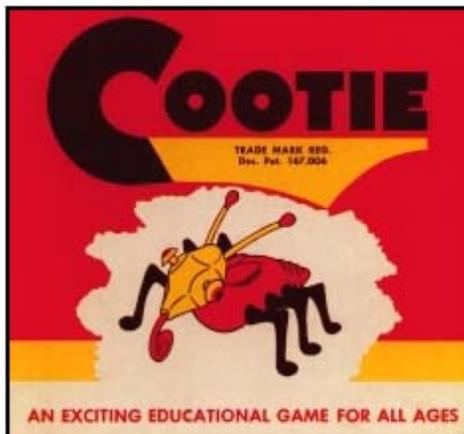
(AKA blood sucking pests passing disease to US!!)

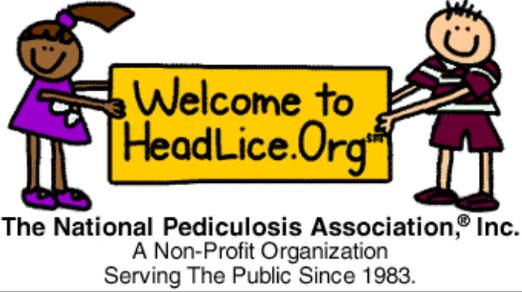
- Lice, fleas
- True bugs
- Ticks
- Mosquitoes



Lice (Phthiraptera)

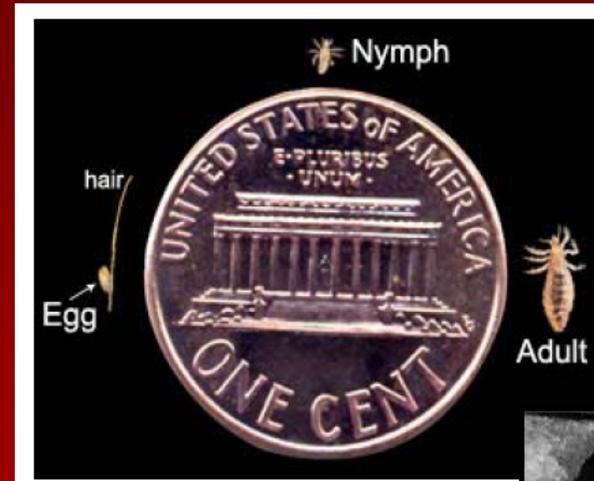
- Permanent ectoparasites of birds, mammals
- 3,000 species; wingless
 - Chewing lice attach to hair and feathers
 - Sucking lice are blood feeders
 - Specialized legs adapted for grasping
 - Host grooming causes mortality





Louse-borne disease

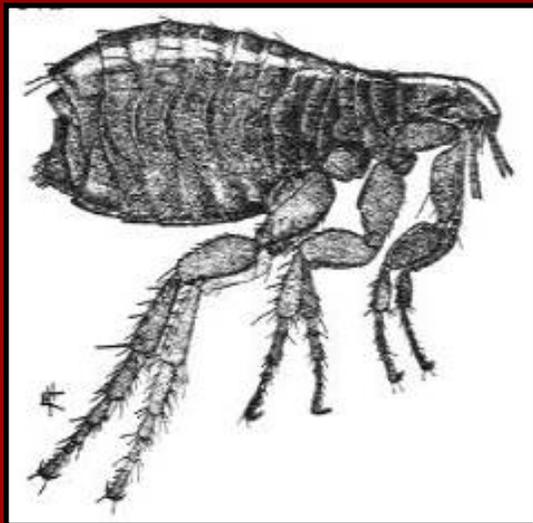
- Pediculosis in humans – head, body, pubic
 - Poor hygiene and sanitary conditions
 - Close personal contact
 - Severe itching
 - Scarred, hardened skin
 - Difficult to control
 - Reinfestation is likely
- Typhus, trench fever, relapsing fever



(1929-1945)

Fleas (Siphonaptera)

- Ectoparasite of birds, mammals
- 2,500 species; piercing sucking mouthparts
- Wingless, bilaterally flattened
- Excellent jumping hind legs



Flea-borne disease

- Attracted to CO₂, body heat
- Can be host specific
 - Range of host “neediness”
- Black Death: Bubonic Plague
 - Oriental flea carried by black rats
 - Killed 1/3 of Europeans (1347 – 1352)!
- Typhus, tapeworms



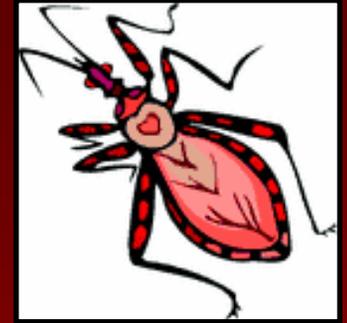
True bugs (Hemiptera)

- Soft bodied insects, 2 pair of wings
- >90,000 species, very diverse group
 - Aquatic, natural, agricultural, urban
- Piercing sucking mouthparts
 - Aphids, cicada, chinch bug, box elder bug
 - Water bug, leaf-footed bug, stink bug, pirate bug



Kissing bugs (Reduviidae)

- Temporary ectoparasite
- Typically feed on small mammals
- Bite around face and lips
- Can transmit Chagas disease
- 16-18 million people infected



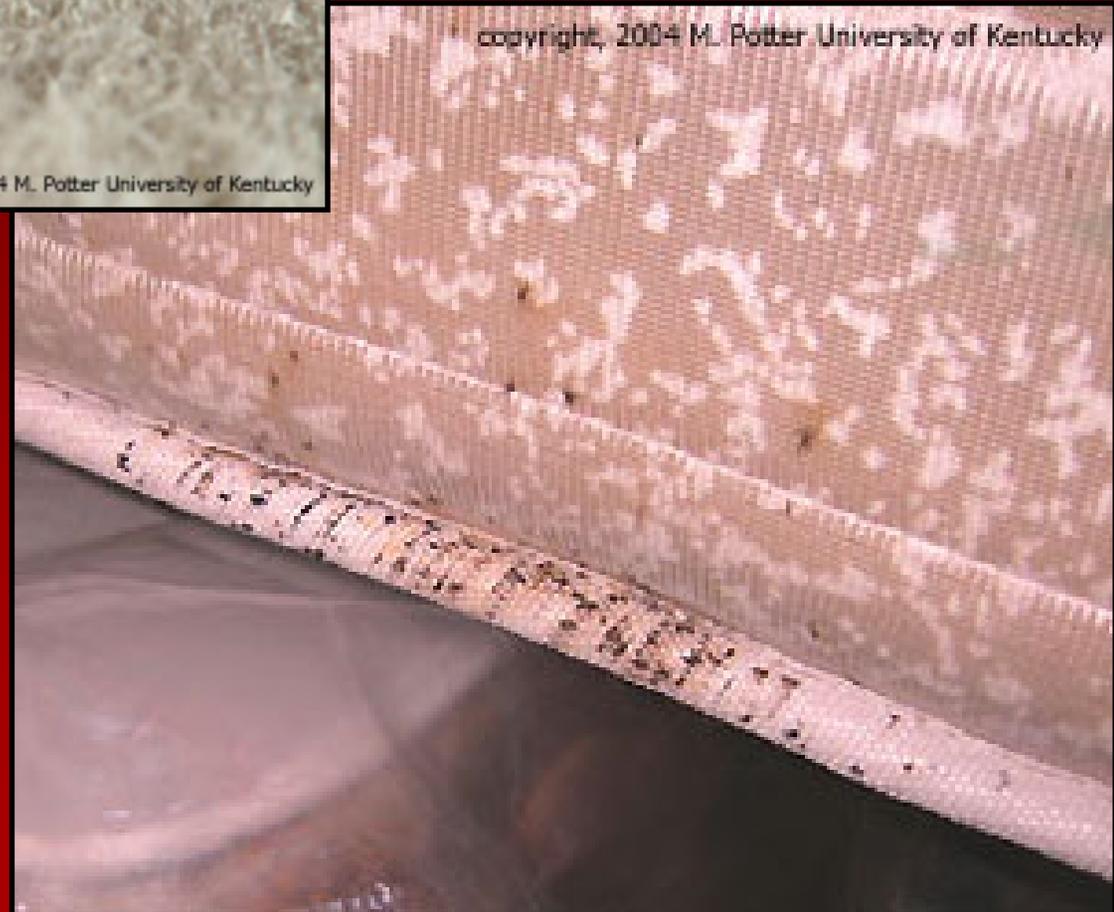
Bed bugs (Cimicidae)

- Temporary ectoparasite, wingless
- Feed on humans, birds, bats
- Eggs laid in furniture/wall cracks
- Can survive months without food
- Attracted to CO₂, body heat



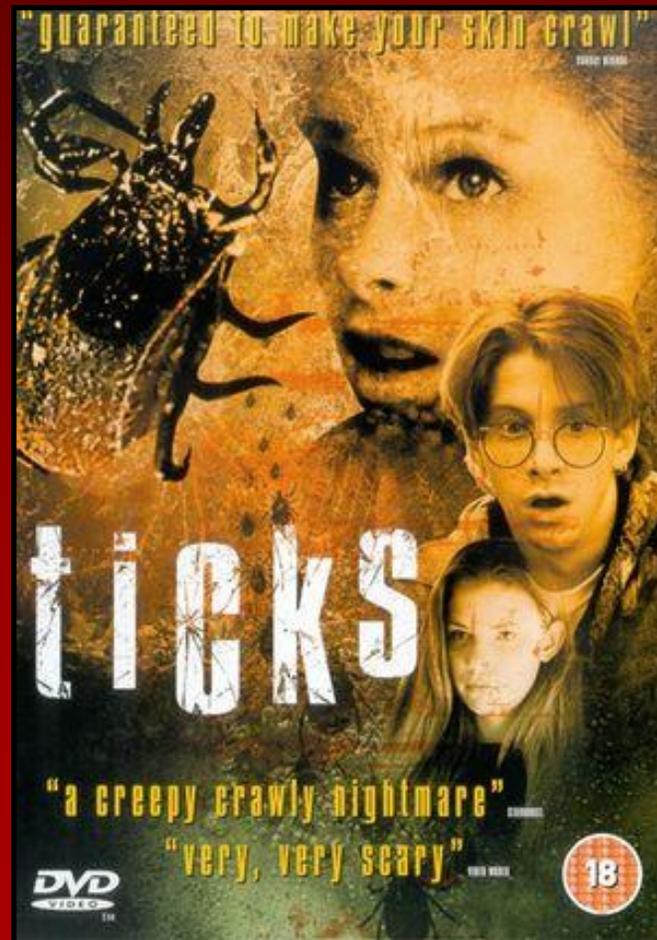
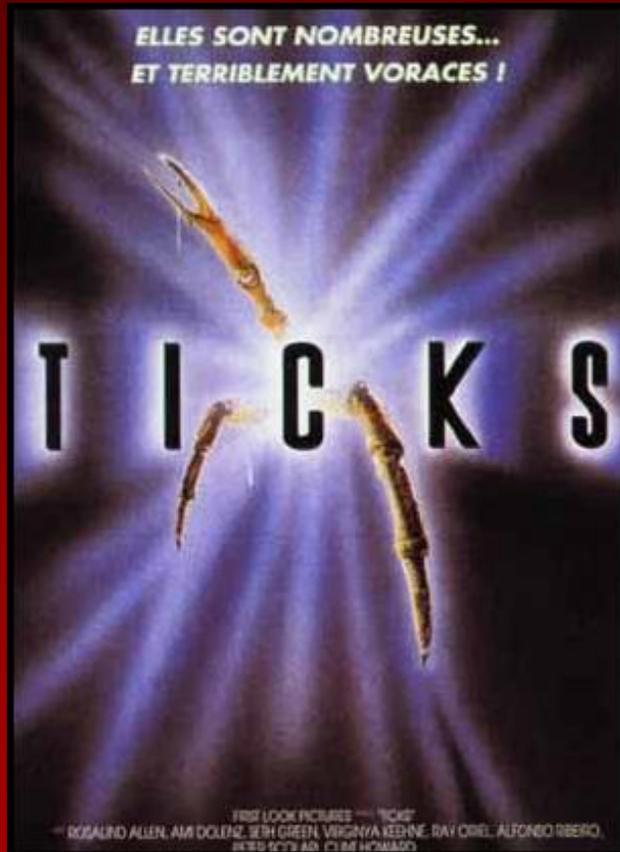


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“Sleep tight,
don’t let the
bed bugs bite!”

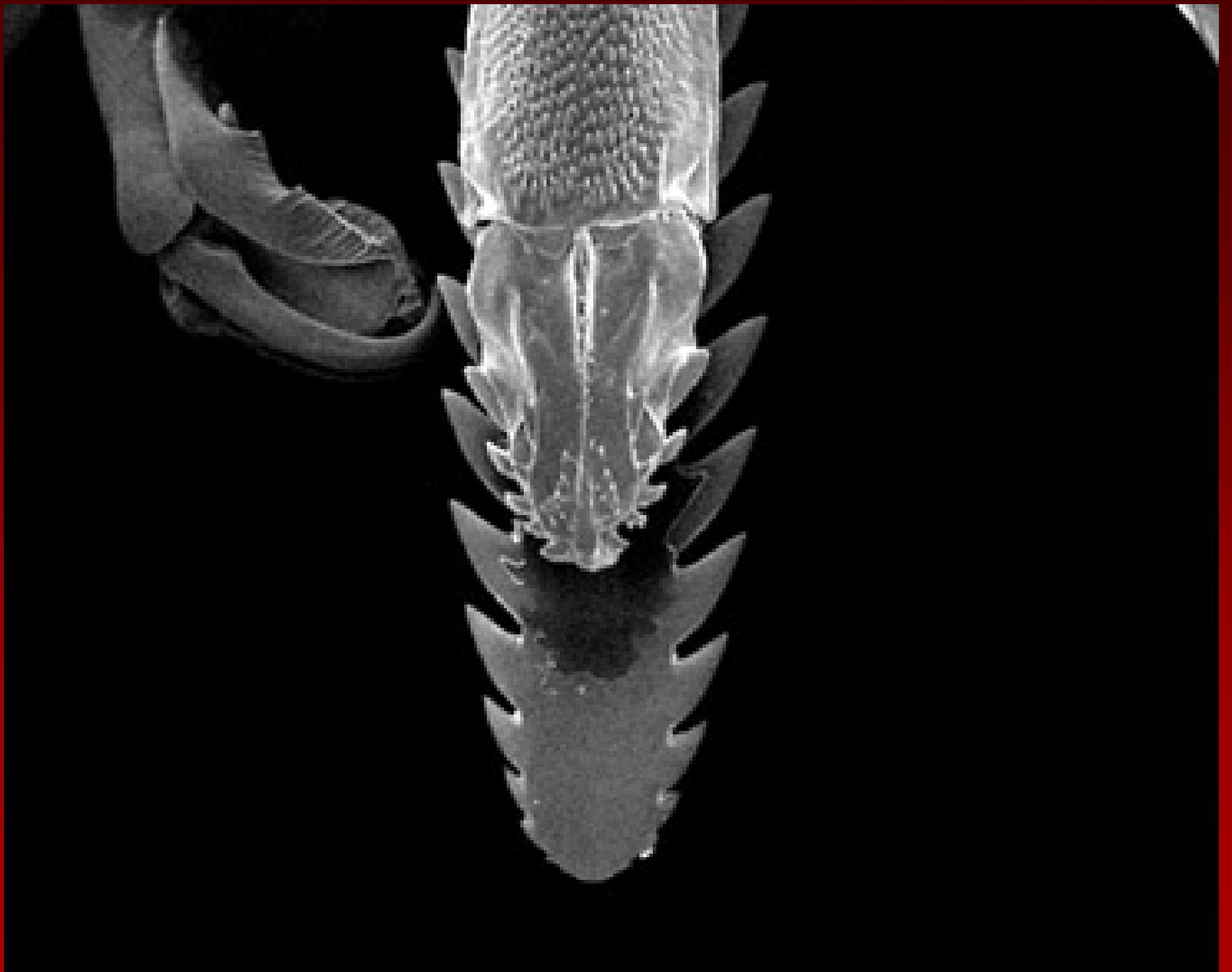
Ticks (Arachnida: Araneae)



Ticks (Arachnida: Araneae)

- Ectoparasites on vertebrates
- Barb-like mouthparts imbed into skin
- 800 species
- All stages, both sexes need blood





Tick-borne disease

- #1 vector for human illness in the U.S.
- #2 vector for human illness worldwide
- Prevention is emphasized
 - Lyme disease* is most common in U.S.
 - Rocky Mountain spotted fever*, Texas fever, Colorado tick fever*, Ehrlichiosis*, Tularemia, Tick paralysis, Relapsing fever



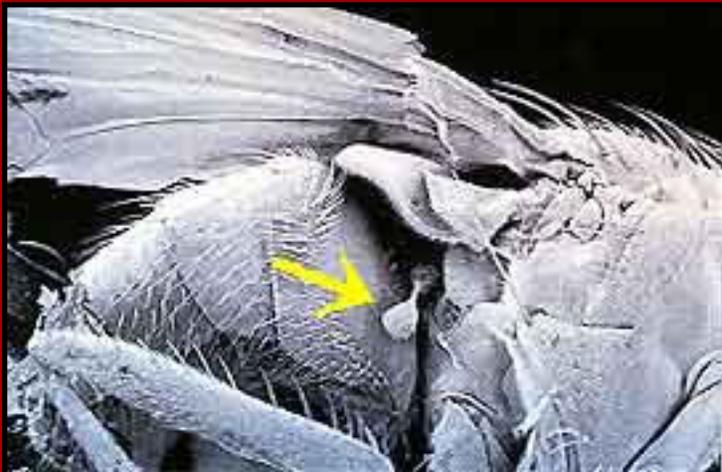
Symptoms of tick-borne disease

- Initially flu-like
 - Fever, headache, nausea, jaw pain, light sensitivity, muscle stiffness, neck pain
- Can be more serious
 - Rash, double vision, numbness, insomnia, depression, weight loss/gain, paralysis



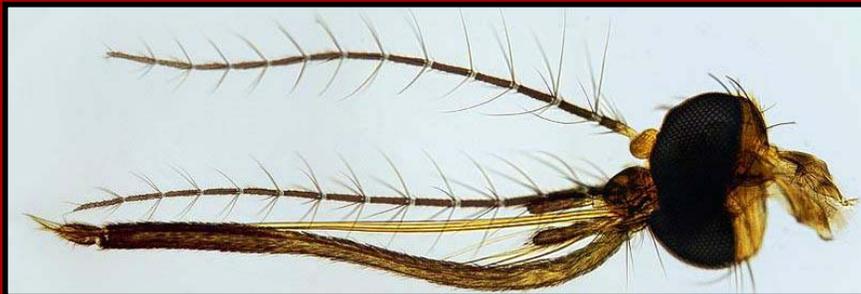
Mosquitoes (Diptera: Culicidae)

- 4,000 species; slender body, 1 pair of wings
- Excellent vectors of disease (#1 worldwide)
 - Malaria, filariasis, yellow fever, dengue fever, rift valley fever, dog heartworm
 - WNV, SLE, EEE, WEE, JE

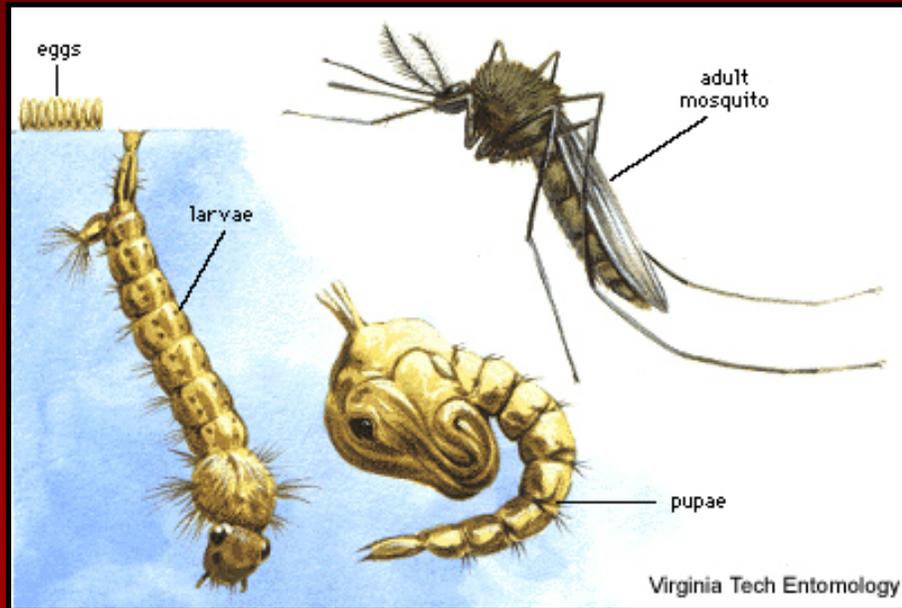


Mosquito biology

- Piercing sucking mouthparts
- Feed on nectar, but females require blood
- Persistent biters, attracted to CO_2 and heat



Life cycle of the vector



Culex tarsalis is #1 vector of WNV in UT

- Very efficient vector
- Are most active July - September
- Mostly feeding at dawn and dusk
- Birds are preferred hosts
- Will feed on small and large mammals



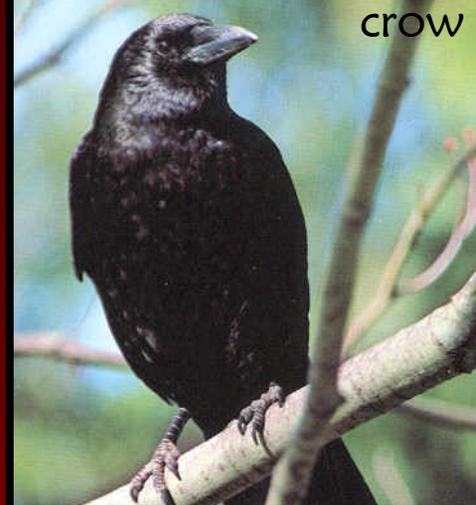
Culex life cycle

-  lay 100-300 eggs every 7-10 days
-  lay eggs on water surface
- Egg --> Adult takes 14 days (70°)
- Polluted, standing water is preferred
- Water standing for >4 days is ideal



← “Good” reservoir for WNV

“Bad” reservoir for WNV →



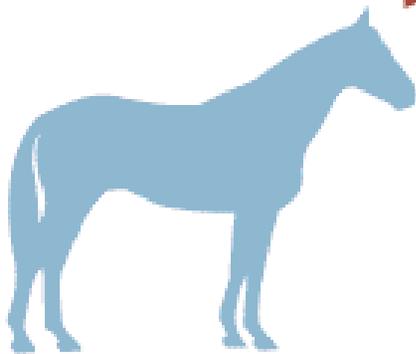
Life cycle of WNV



Bird



Mosquito



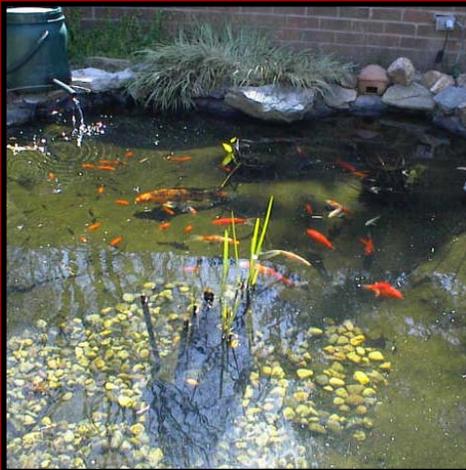
Horse



Human

How can you reduce the risk?

- Eliminate standing water around the house
- Change water frequently
- Mosquito-proof homes
- Avoid peak feeding times
- Use repellent sufficient for activity



Summary

- Public Health Pests
 - Annoying, nuisance, allergies
 - Cause painful bites/stings
 - Not vectors of disease
- Disease Vectors
 - Relatively painless biters
 - Vector many different pathogens
 - Range of illness possible
 - Public health programs (UMAA!)



Thank you!!

Please fill out the evaluation,
your comments are appreciated.

Erin Hodgson, Entomologist

Department of Biology

Utah State University

Logan, UT 84322

erin@biology.usu.edu

435.797.5689

435.797.1575 (fax)

<http://extension.usu.edu/cooperative/ipm>