

Pests and Zoonotic Disease Vectors and Reservoirs

*What schools should know
Integrated Pest
Management*



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Zoonotic Disease Program
Fall School Workshop, 2016

Why do we want to manage pests?

- ▶ Food Safety
- ▶ Disease Vectors
- ▶ Bites and Stings
- ▶ Asthma triggers
 - Cockroaches, rodents & dust mites cause attacks
 - Approx. 1 in 10 children (2009) have asthma
 - 13 million school days/yr missed

Source: National Institute of Allergy and Infectious Disease



Integrated Pest Management

- ▶ IPM is a science-based approach to pest management that seeks to control pest problems proactively, avoiding the unnecessary use of and exposure to pesticides while achieving acceptable control of pests indoors and outdoors.
- ▶ EPA led voluntary effort to make Integrated Pest Management (IPM) practices the standard in all schools over the next three years.



Asthma and Allergy Foundation of America



Principals of Agreement

- ▶ We understand that children are uniquely vulnerable to environmental hazards due to their developing systems and greater exposures.
- ▶ We support and will promote and communicate making sound IPM practices the standard in all schools.
- ▶ We will encourage implementation of school IPM policies and practices and will encourage our members to routinely re-evaluate and improve their practices, as needed.

Recommendations

- ▶ Assess current pest management practices and recurring pest problems.
- ▶ Designate and train an appropriate staff person to coordinate IPM activities.
- ▶ Adopt and implement an IPM policy or plan to prevent and effectively address pest problems.
- ▶ Conduct regular inspections and monitoring for pests and pest conducive conditions.
- ▶ Adopt in-house IPM pest prevention and control practices indoors and outdoors and/or contract with pest management firms to perform IPM services.
- ▶ Provide IPM education corresponding to the roles of those in the school community.
- ▶ Free tools and information: www.epa.gov/managing-pests-schools

School IPM– What do we mean?

- ▶ *A sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks*

(Food Quality Protection Act (7 USC 136r-1) Sec. 303)

- ▶ ***School IPM***

- Uses common sense strategies to reduce sources of food, water, and shelter for pests in buildings and grounds
- Creates a safer and healthier learning environment by managing pests and reducing children's exposure to pesticides

What are all of the Components of an IPM Program?

- ▶ Designated IPM Coordinator
- ▶ Monitoring for pest activity and pest conducive conditions
- ▶ Sanitation, exclusion, and habitat modification activities
- ▶ Having action thresholds for pests – e.g. how many nuisance ants before we take action?
- ▶ Careful consideration of all the pest management options available, preference for low-risk options
- ▶ Education to all staff
- ▶ Keeping records and evaluating your program

Exclusion



©Take your own photo of uneven surface

Door sweeps

Image Source: EPA Region 8

What about pesticides? Children are not little adults

- ▶ Pound for pound, children eat more, drink more, and breathe more air than adults
- ▶ Organ systems are still developing
- ▶ Play close to ground, put things in mouth

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From the American Academy of Pediatrics →
Policy Statement
Pesticide Exposure in Children
COUNCIL ON ENVIRONMENTAL HEALTH

ABSTRACT

This statement presents the position of the American Academy of Pediatrics on pesticides. Pesticides are a collective term for chemicals intended to kill unwanted insects, plants, molds, and rodents. Children encounter pesticides daily and have unique susceptibilities to their potential toxicity. Acute poisoning risks are clear, and understanding of chronic health implications from both acute and chronic exposure are emerging. Epidemiologic evidence demonstrates associations between early life exposure to pesticides and pediatric cancers, decreased cognitive function, and behavioral problems. Related animal toxicology studies provide supportive biological plausibility for these findings. Recognizing and reducing problematic exposures will require attention to current inadequacies in medical training, public health tracking, and regulatory action on pesticides. Ongoing research describing toxicologic vulnerabilities and exposure factors across the life span are needed to inform regulatory needs and appropriate interventions. Policies that promote integrated pest management, comprehensive pesticide labeling, and marketing practices that incorporate child health considerations will enhance safe use.

KEY WORDS
• pesticides • toxicity • children • pest control • integrated pest management

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Using Pesticides

“When reasonable non-chemical approaches do not provide adequate control, products that pose the least risk to people and the environment will be selected, and then only used when and where pests are present, or expected to be present, as determined by monitoring and action thresholds and approved by the IPM coordinator.”

–EPA Model Pesticide Safety and IPM Guidance Policy for School Districts

- ▶ The Label is the Law
- ▶ WA state has posting, notification, and recordkeeping requirements



Recommendations:

- ▶ Pesticides only applied by certified pesticide applicators
- ▶ NO routinely scheduled pesticide applications
- ▶ Least-toxic pesticides and application methods with the least risk of exposure
- ▶ Pesticides applied when no one present, unoccupied for at least 8 hours or longer (label)
- ▶ School procedures should describe how pesticides are to be used, handled, stored, or removed

What is a Waste Pesticide?

- ▶ Any formulation that can't be used according to label directions -missing or deteriorated label
- ▶ A product whose federal or state registration was canceled or suspended
- ▶ A pesticide not stored in its original container
- ▶ A pesticide in a deteriorated container



From a high school greenhouse
Dave Zamora, WSDA

Resources

- ▶ [Integrated Pest Management for Schools, WSU](https://schoolipm.wsu.edu/)
<https://schoolipm.wsu.edu/>
- ▶ The Business Case for IPM in Schools
- ▶ School IPM policies, models, best practices
- ▶ Using Pesticides in Washington State Schools
- ▶ IPM for Microorganisms: Cleaning, Disinfecting, and Sanitizing
- ▶ Indoor Pests
- ▶ Outdoor Pests
- ▶ Pest Press
 - Bees, Wasps, Drain Flies, Cats, Mice, Birds, Spiders, Ants, Etc.

PNW
PEST PRESS

Pest-Proofing
Before School Break

ISSUE 6

IPM IN SCHOOLS

SUMMER



Pest conducive condition: desk hole that a mouse in a pest proof container.



Pest conducive condition: clutter in classroom closet and back of access to floor for regular cleaning.

What is "Pest-proofing"? Pest-proofing involves making your space less attractive to pests, if not outright inhospitable. All pests—be they insects, animals, or plants—are after one or more of the following:

- Food
- Water
- Shelter

Pest-proofing a space reduces the amount of food, water, and shelter available to pests, and therefore discourages them from setting up shop. Pest-proofing is a good practice for staff to be in the habit of year-round as part of an integrated pest management (IPM) program. Forgotten food, water, and shelter can attract pests.

WHY DO WE PEST-PROOF?

Most pests have the ability to chew through plastic bags containing snacks, and paper boxes holding cereals and crackers. Small ants can even find their way around a twist tie. Mice and cockroaches are adept at navigating cupboards where snacks are stored. When it comes to pests in schools, "open" foods are any foods that are not stored in a hard container with a snap-light or screw-top lid.

Pests also find food from unlikely sources. Ants, mice, and cockroaches dine on the greasy residue on floors underneath large kitchen equipment. Comugated cardboard is often used for long-term storage in kitchens and classrooms. German cockroaches can hide inside the comugations and eat the box glues...until the kitchen or classroom offers something tastier. Cardboard boxes are also highly accessible to ants, spiders, and mice, which use them for shelter.

PESTS NEED FOOD, WATER, AND SHELTER

FOOD can be a stale piece of cereal under the microwave, a week-old French fry, or a residue left on a desk after eating a sticky snack. Even bags of candy in a desk drawer are accessible to many pests.

WATER for a pest may be a leaky faucet or pipe underneath a sink. It might also be a leaky roof that moistens the wood and ceiling tiles, or areas of poor drainage around a building.

SHELTER sources include cluttered corners, cupboards, and closets—areas that are not often disturbed or cleaned. Well-organized spaces that are not cluttered, are accessible for cleaning, and use bins with lids will have far fewer pests.

Education – EPA Webinars

← → ↻ ☆

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School IPM Webinar Series

Are you a school facility manager, IPM Coordinator, building and grounds supervisor, nurse, administrator, or pest management professional? If so, you play a critical role in reducing the number of pests in your school and in minimizing the exposure of students and staff to pesticides. To help you be better prepared to fill your role, EPA's Center of Expertise for School IPM will host a series of webinars in the coming months on pest management topics of special interest to the school community. These monthly webinars, beginning on August 20, 2014, will include presentations from experts in the field.

Creating Tick Safe Schools Using IPM

September 30, 2014 | 2 PM Eastern – [Register Now](#) EXIT EPA

Join us to learn about this increasingly important pest and what you can do to reduce the risk to students, faculty and staff in schools.

- Thomas Mather, University of the Rhode Island Center for Vector Borne Diseases, will discuss tick borne diseases and prevalence, the identification, inspection and removal of ticks, and the *Tick Encounter* web resource.
- Marcia Anderson, EPA's School IPM Center of Expertise, will review passive prevention using landscape design, sanitation, maintenance, the Agency's role in tick IPM, and on how to incorporate tick prevention into your school IPM plan.
- Kathy Murray, Maine Department of Agriculture, will discuss the importance of monitoring, repellents, active prevention using pesticidal tools, research, and information resources.
- Christine Dunathan, Friends Community School (College Park, MD), will discuss real world school tick issues and first-hand challenges with tick management.
- A Q&A session will conclude the webinar.

The Basics of Schools IPM



PESP's 200+ members across the United States are committed to environmental stewardship.

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PestWise programs invest over \$3 million annually in grant projects promoting environmental stewardship.

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We all need to manage pests in our homes and gardens. Whether you manage these pests on your own or hire a professional, pesticides are often used. [Learn More >>](#)

The National Pesticide Information Center

1-800-858-7378

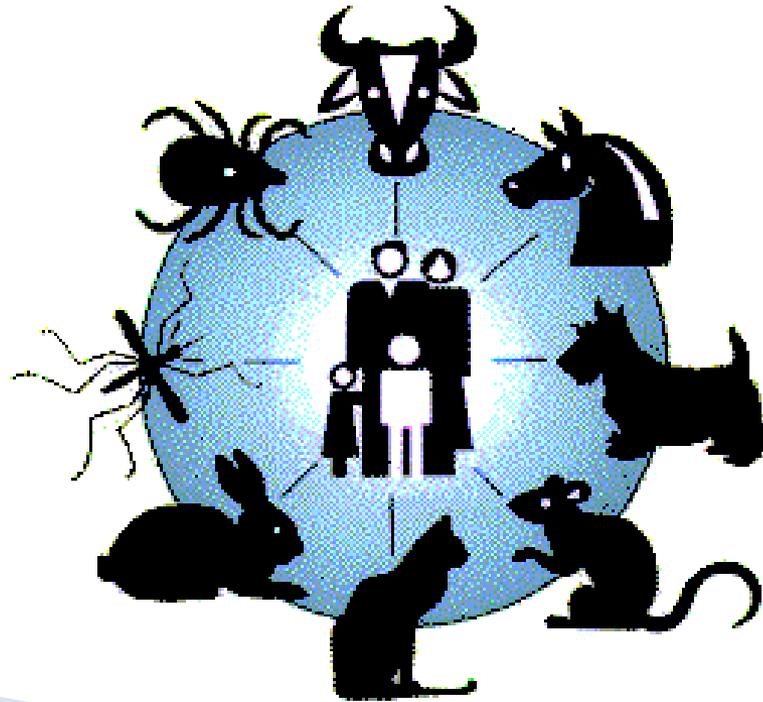
<http://www.npic.orst.edu/>

Risk = Toxicity X Exposure

npic

Zoonosis

Diseases that can be transmitted
from animals to humans



Zoonosis – how many are there?

Of approximately 1,415 known human disease causing agents

- 868 (61%) ARE ZOOONOTIC

Of 175 pathogens defined as “emerging infections”

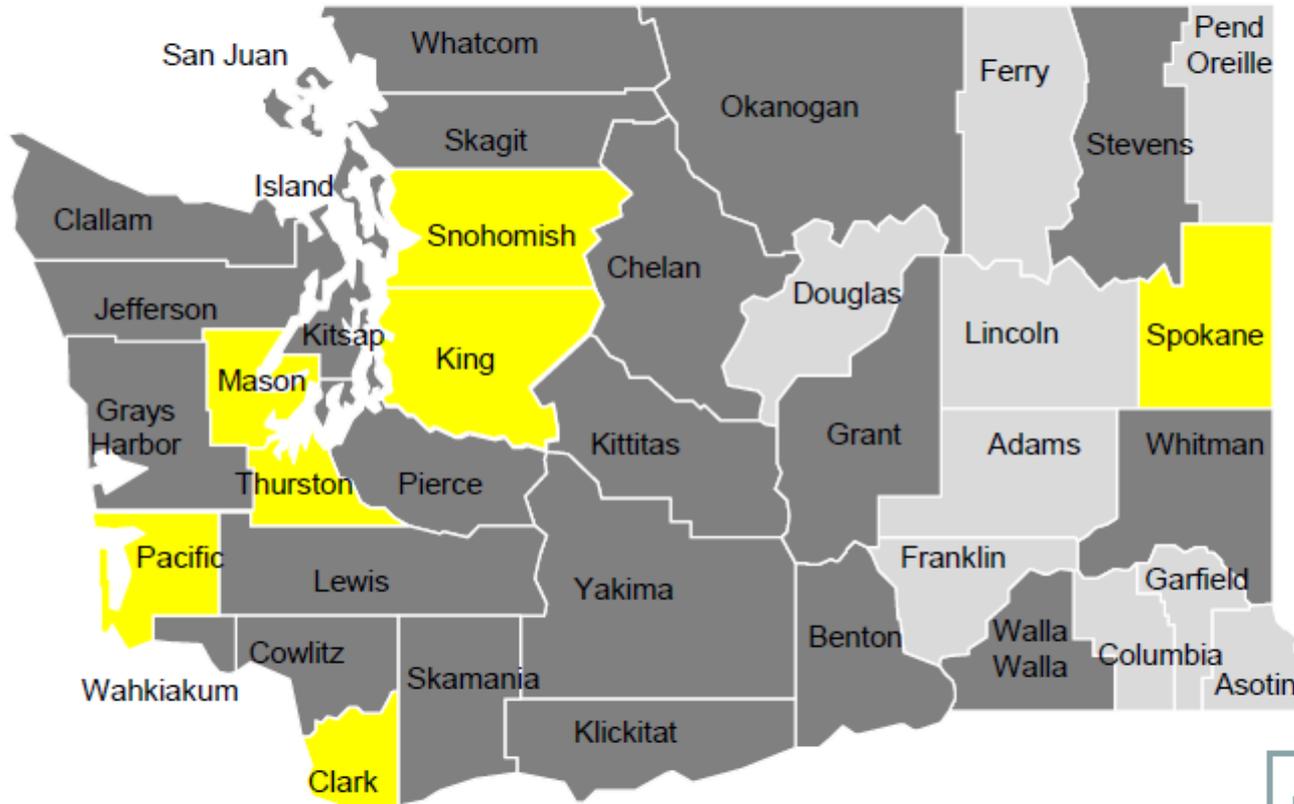
- 131 (75%) ARE ZOOONOTIC

Rabies in Washington State

Bats are the reservoir for rabies in WA



**Bats Tested for Rabies, Washington State,
January 1 – December 31, 2015 (N = 305 Tested Bats)**



Month	County	# Positive Bats
June	Thurston	1 bat
July	Spokane	1 bat
July	King	1 bat
August	Mason	1 bat
August	Clark	1 bat
September	Pacific	1 bat
September	King	1 bat
September	Mason	1 bat
September	Snohomish	1 bat

Nine rabid bats were identified during 2015.

*Additionally, a rabid cat was identified in Jefferson County in November 2015

- Rabid bat identified
- Bats submitted for testing, no positives identified
- No bats submitted for testing

Rabies Transmission

- ▶ Rabies **IS** transmitted when the virus is introduced into bite wounds, open cuts in skin, or onto mucous membranes from saliva or other potentially infectious material such as neural tissue
- ▶ Rabies is **NOT** transmitted by contact with blood, urine, feces, petting or touching fur, or being sprayed by a skunk

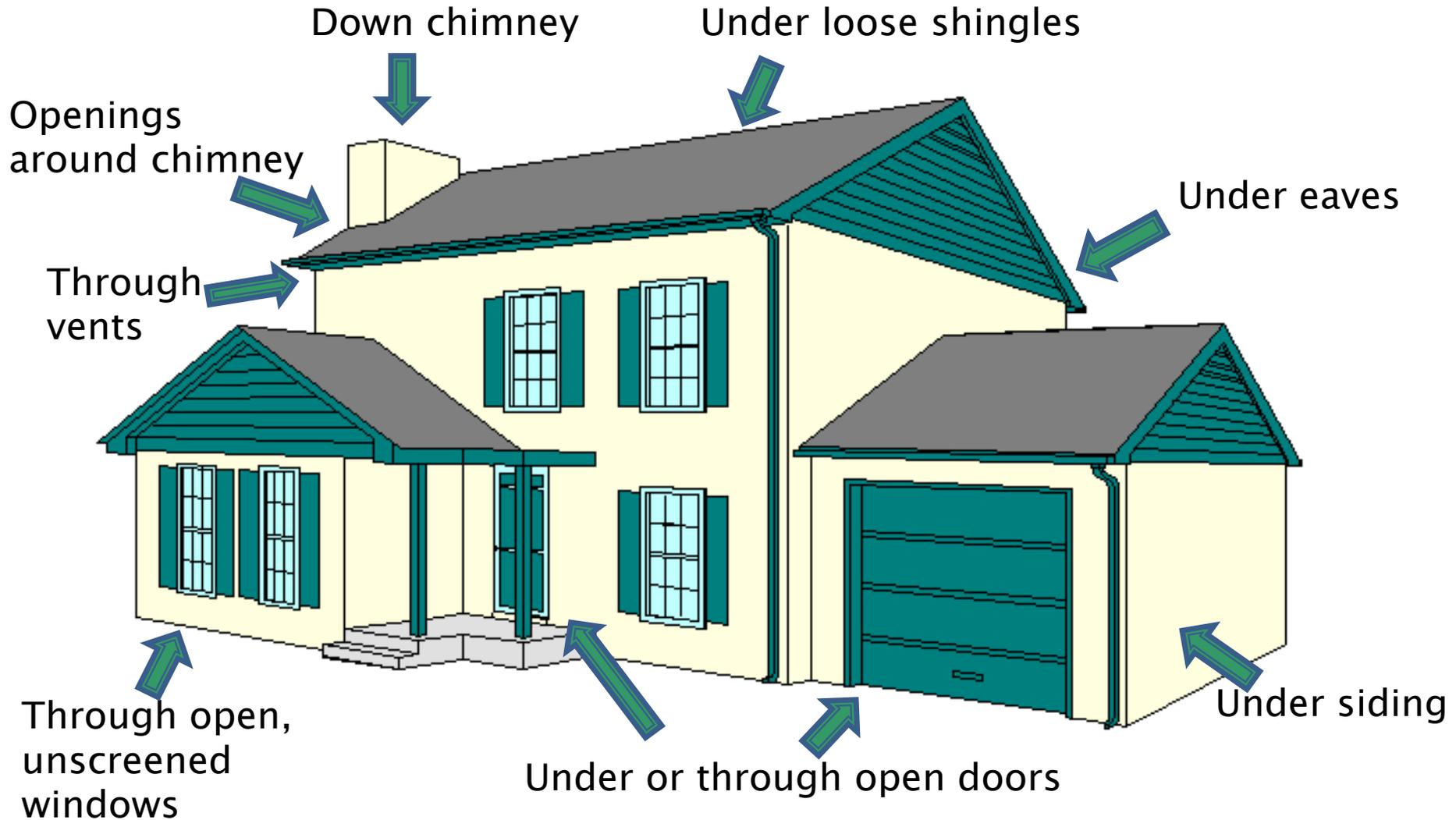


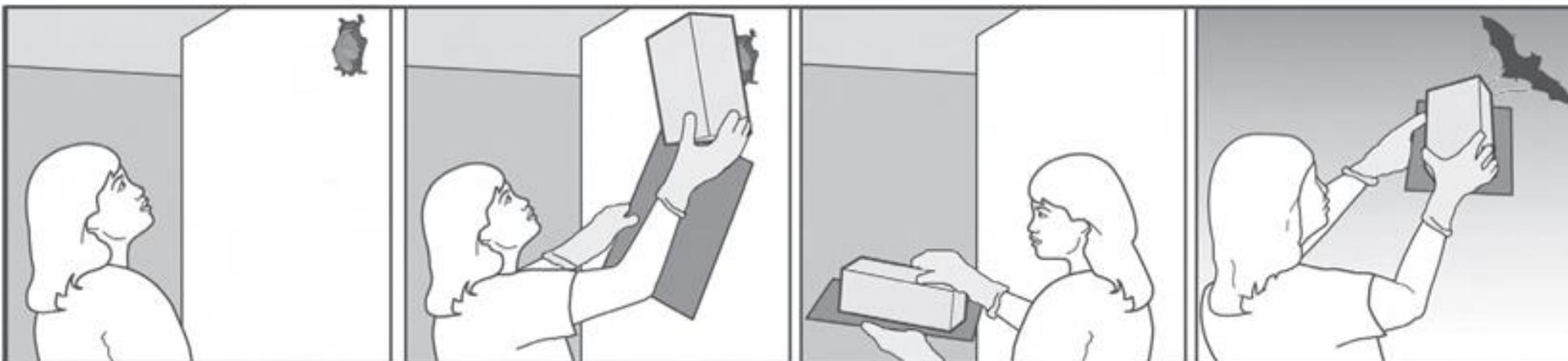
Bats with rabies

- ▶ May appear injured
- ▶ May be found flapping or dead on ground
- ▶ May fly during the day
- ▶ May be found in pets mouth
- ▶ Cats are the most commonly affected domestic animal.



Common Bat Entry Points





To Capture a Bat:

- When the bat lands, approach it slowly, **while wearing leather gloves**, and place the box or coffee can over it.
- Slide the cardboard under the container to trap the bat inside.

If no one exposed – release bat outside.

If person was exposed:

- Tape the cardboard to the container securely, and punch small holes in the cardboard, allowing the bat to breathe.
- ***Contact your Local Health Dept.*** to make arrangements for rabies testing.

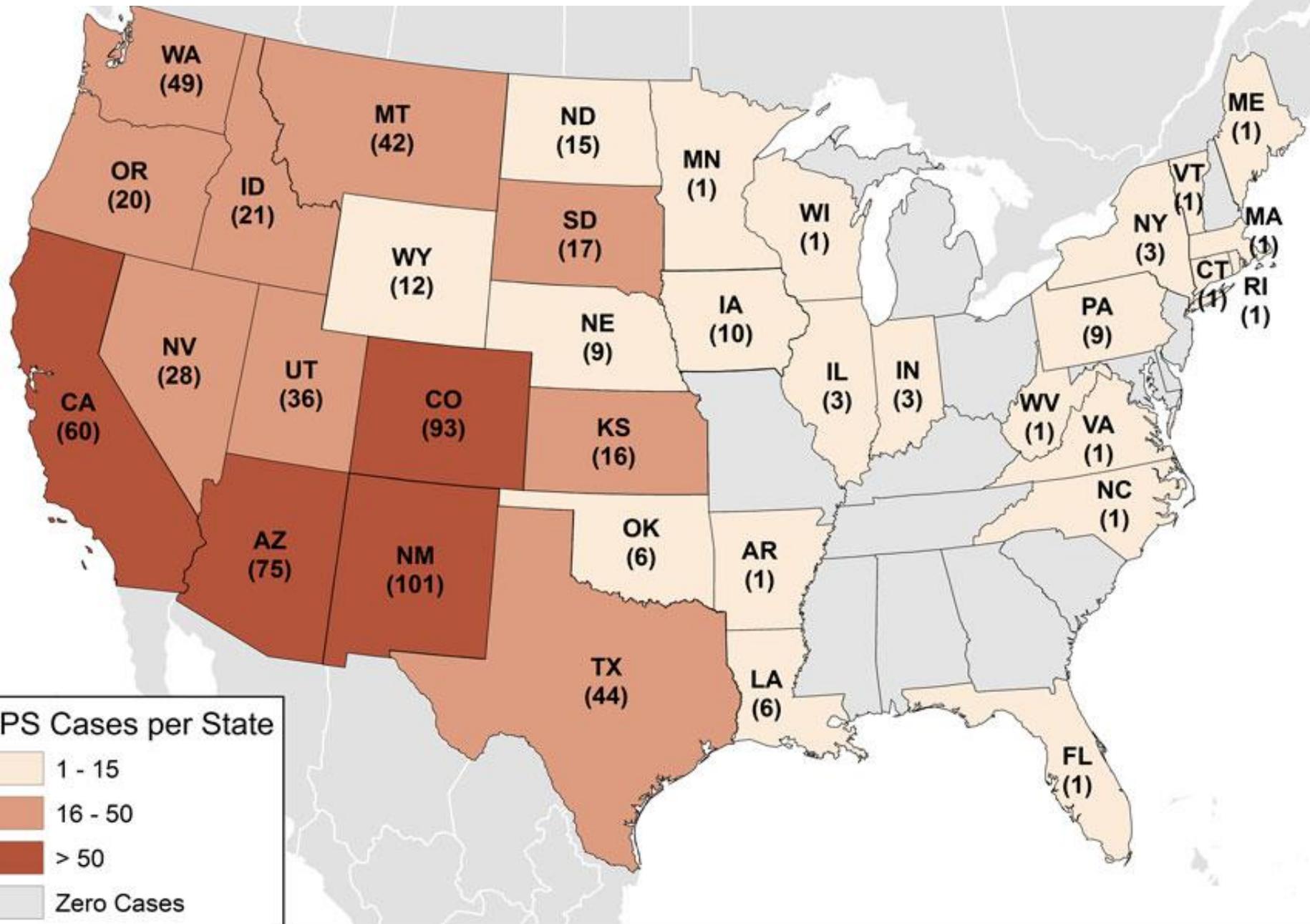
Hanta Virus Pulmonary Syndrome



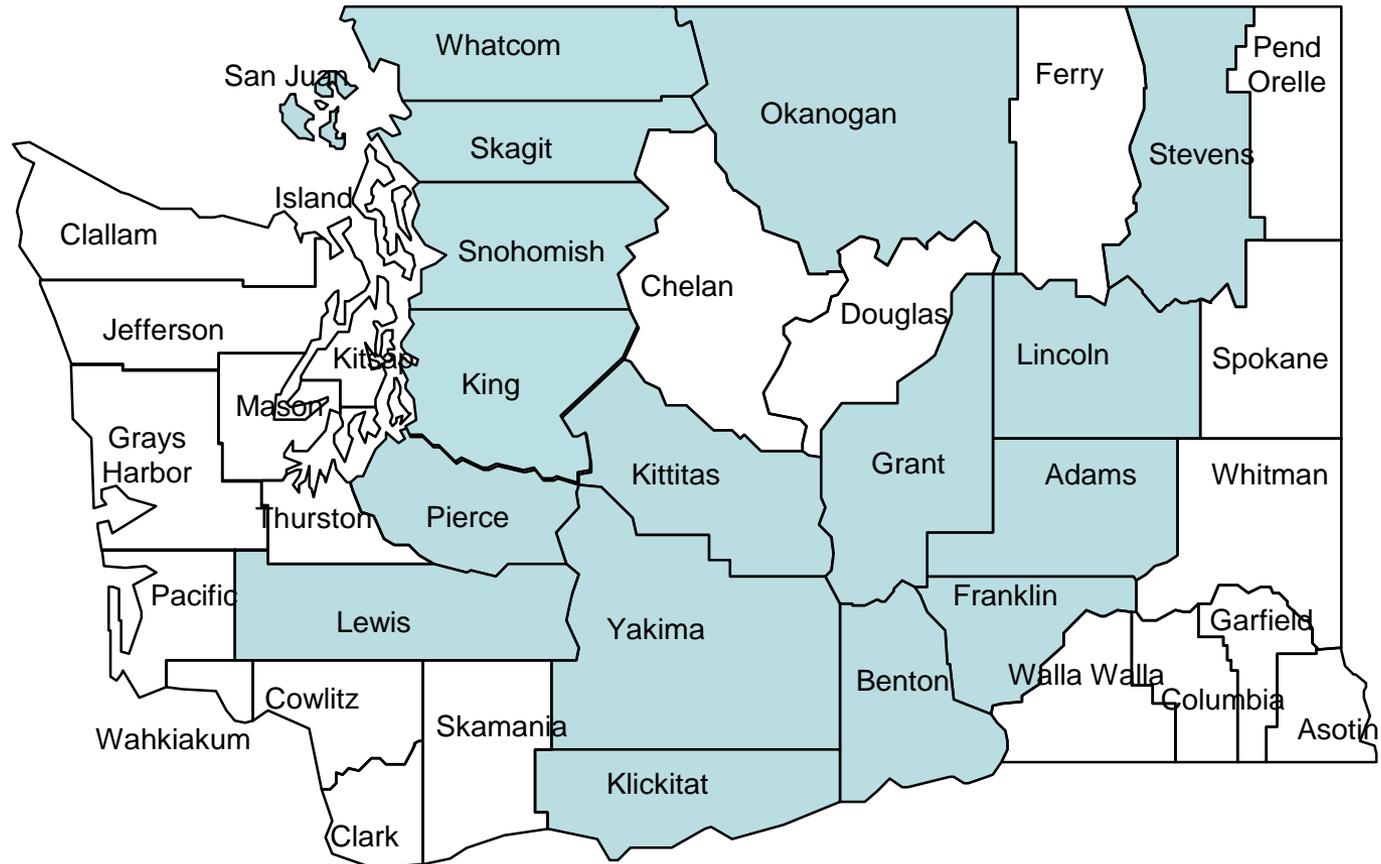
What is a Hantavirus?

- ▶ Hantaviruses are a group of viruses carried by rodents
- ▶ One of them, *Sin Nombre* virus, is found in deer mice in North America
- ▶ *Sin Nombre* virus is the cause of hantavirus pulmonary syndrome in people
- ▶ Hantaviruses are rare, but can cause serious life-threatening illness

Cumulative (since 1993) Case Count Per State as of January 8, 2016



Hantavirus Cases by County of Exposure, Washington State, 1985-2015



Based on 47 reported cases; 38 in-state exposures with county known; 3 out of state exposures; 6 exposure location unknown

Hantavirus – Transmission



- Virus inhaled in aerosolized dust
- Can happen when nests, rodents and excrement are disturbed in enclosed areas
- In US (and especially in Washington) the Deer Mouse is only known reservoir host of Sin Nombre virus
- Not all deer mice are infected – infected mice only shed virus periodically
- Best to assume all deer mice have it and are currently shedding the virus – **ALWAYS TAKE PRECAUTIONS!**

Deer Mouse

(Peromyscus maniculatus)

Top of
tail has
dark
strip of
hair



Large
bulging
eyes

White underbelly and throat

Hantavirus Viability

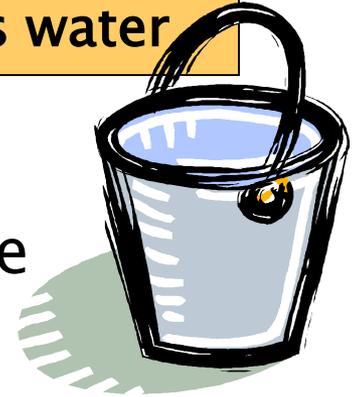


- ▶ Depends on environmental conditions
 - Temp, humidity, indoors/outdoors, exposure to sun, rodent's diet (affects urine chemistry)
- ▶ Normal room temperature: 2–3 days
 - Sunlight decreases viability
 - Freezing temps can increase virus viability
- ▶ Active rodent infestations, in often enclosed areas, are what leads to human infections

Clean Up

DO NOT SWEEP, DUST or VACUUM!

1 part bleach
+
9 parts water



1. **Wear protective equipment** (coveralls, rubber boots, gloves, goggles, appropriate respiratory protection)
2. Air out the contaminated area
3. Don't stir-up and breath dust
4. Spray droppings, dead mouse, nesting material with disinfectant or bleach-water mixture; let soak
5. Wipe up with paper towels or mop up
6. Dispose of waste & dead animals in plastic bag
7. Mop or sponge the area
8. Wash gloved hands before disposing
9. Decontaminate or dispose of protective coverings
10. Wash hands, shower

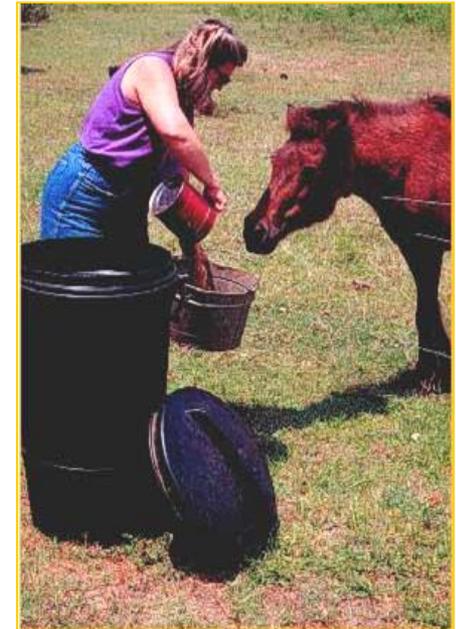
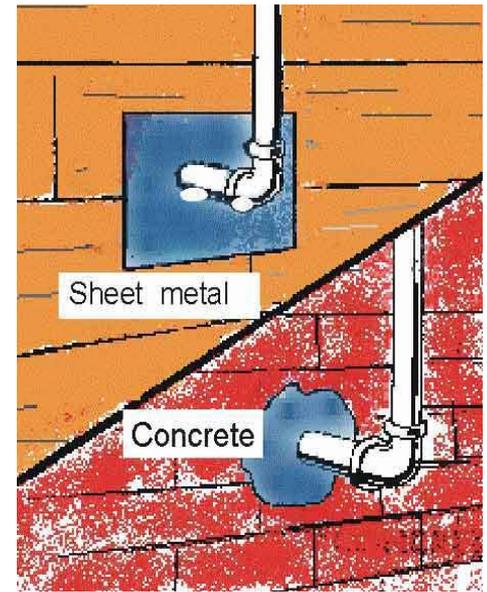
Harder to Clean Items

Follow basic procedures as discussed and for contaminated items:

- ▶ Carpets, rugs, upholstered furniture
 - *Steam clean with disinfectant, hot water*
- ▶ Clothes, bedding
 - *Wash in hot water and detergent, dryer heat high*
- ▶ Books, paper, and other things that can't get wet
 - *Expose to sunlight or isolate in non-infested areas to allow virus to "die out"*

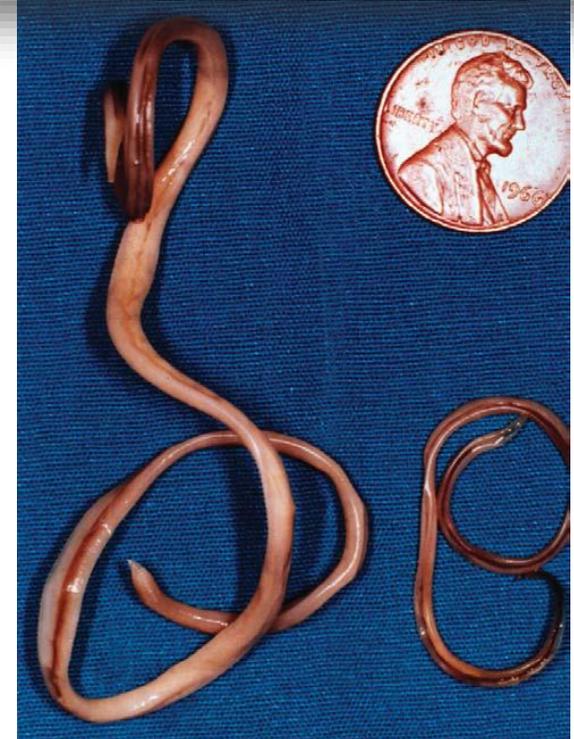


Prevention – Deterrence



Baylisascariasis

- *Baylisascaris procyonis*
(bay-liss-AS-kuh-ris pro-sigh-OH-nis)
- Raccoon roundworm
- Causes larva migrans in humans & animals
- Adult worms infest the intestines of raccoons and dogs



Raccoon Latrines



Raccoon Roundworm – Prevention



- ▶ Discourage contact with raccoons
- ▶ Do not leave food out for raccoons
- ▶ Keep food in coon-proof containers
- ▶ Cover sand boxes when not in use
- ▶ Clean up brush around property

Raccoon Roundworm – Clean Up

- ▶ Remove feces & contaminated material – burn, bury, or send to landfill
- ▶ Avoid getting feces on hands and clothes
- ▶ Use PPE
- ▶ Wash hands immediately afterward with soap & water.



Psittacosis

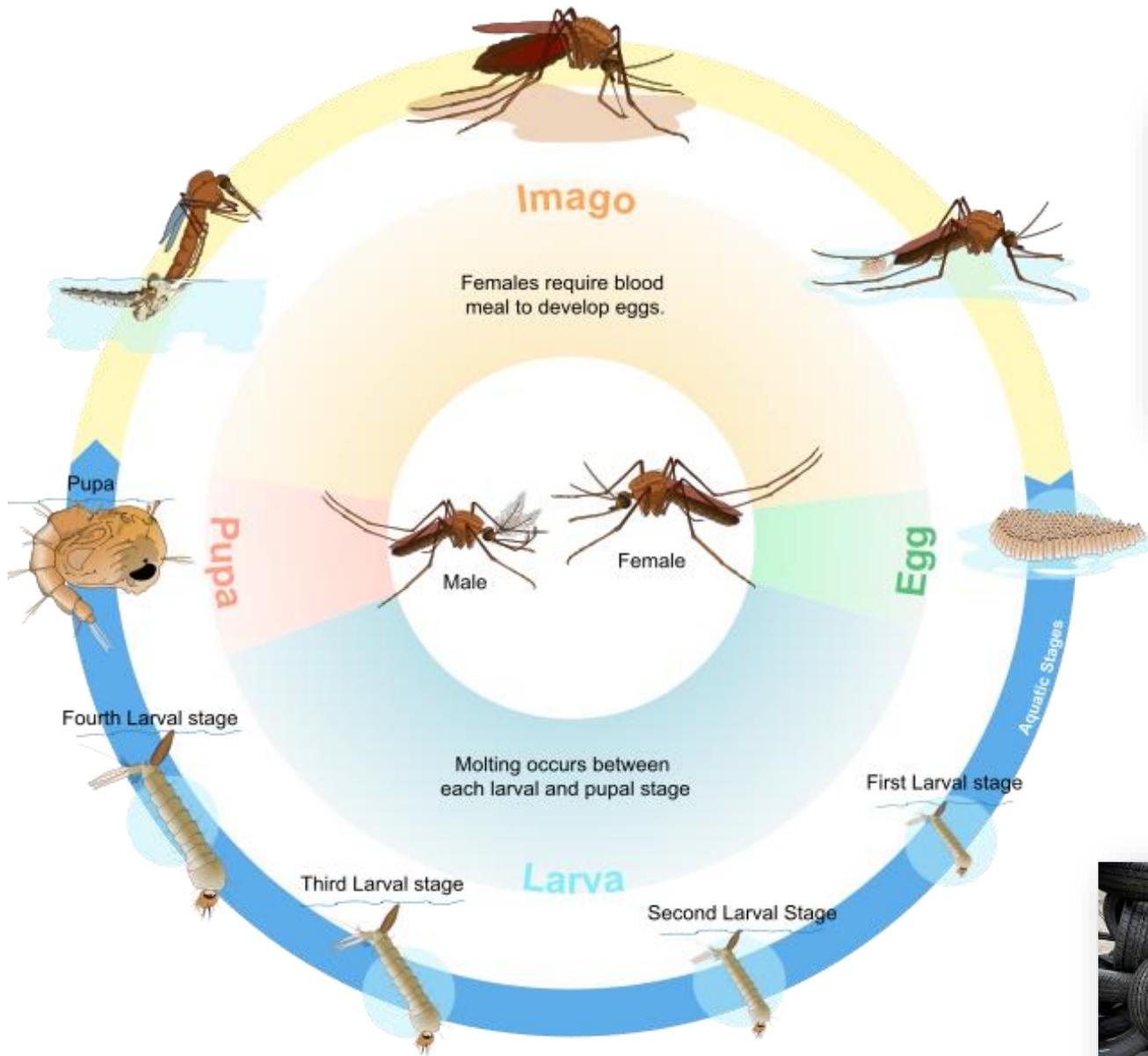
- ▶ Common in parrots, parakeets, pigeons, doves
- ▶ Humans infected from inhaling contaminated dust from feathers or bird droppings
- ▶ Incubation period: 1–4 weeks
- ▶ Disease varies from flu-like illness to more serious pneumonia-like illness



Mosquitoes

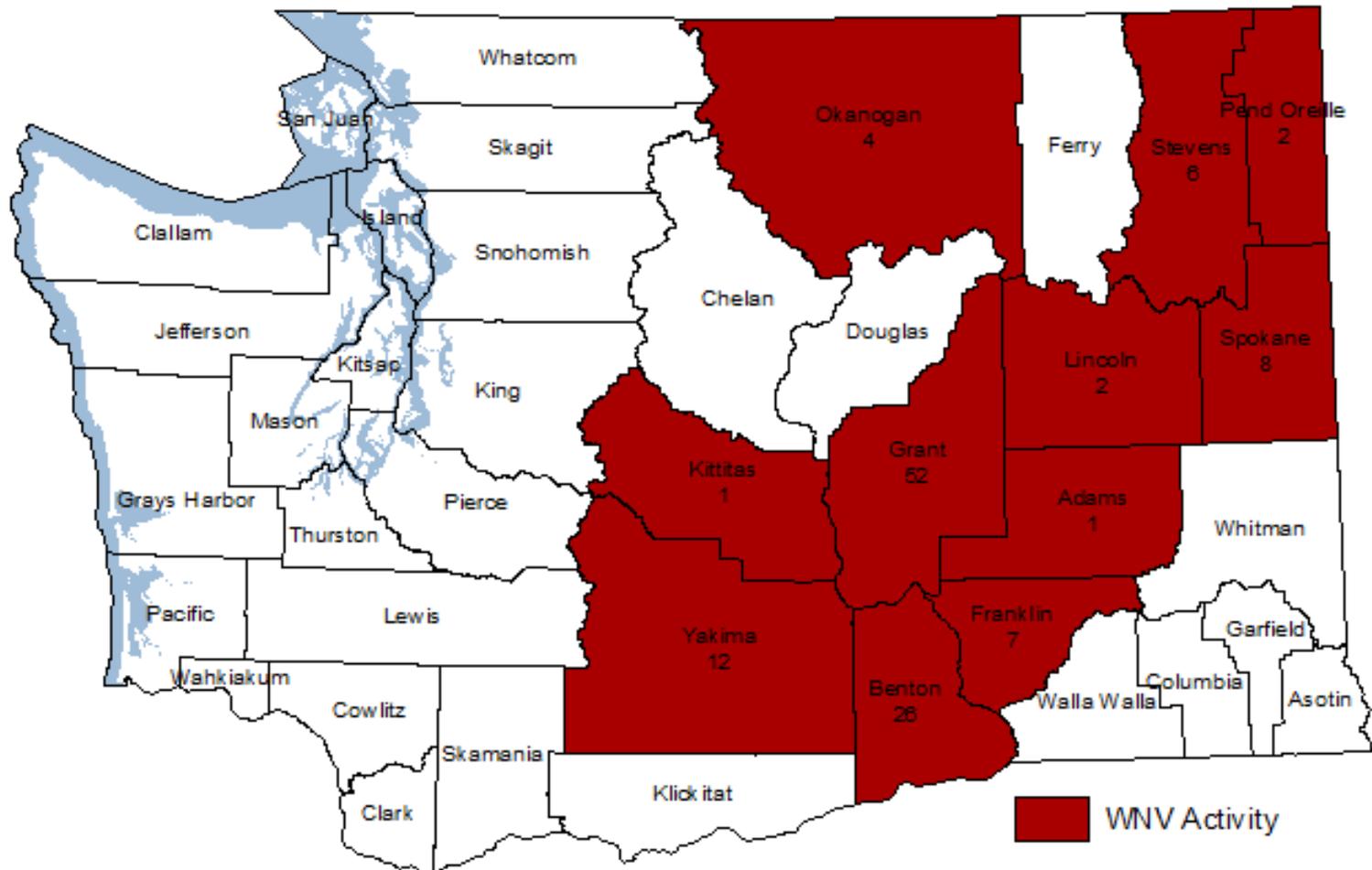
- ▶ Transmit diseases
 - West Nile virus
 - St. Louis Encephalitis
 - Western Equine Encephalitis
- ▶ Itchy bites
- ▶ Annoying





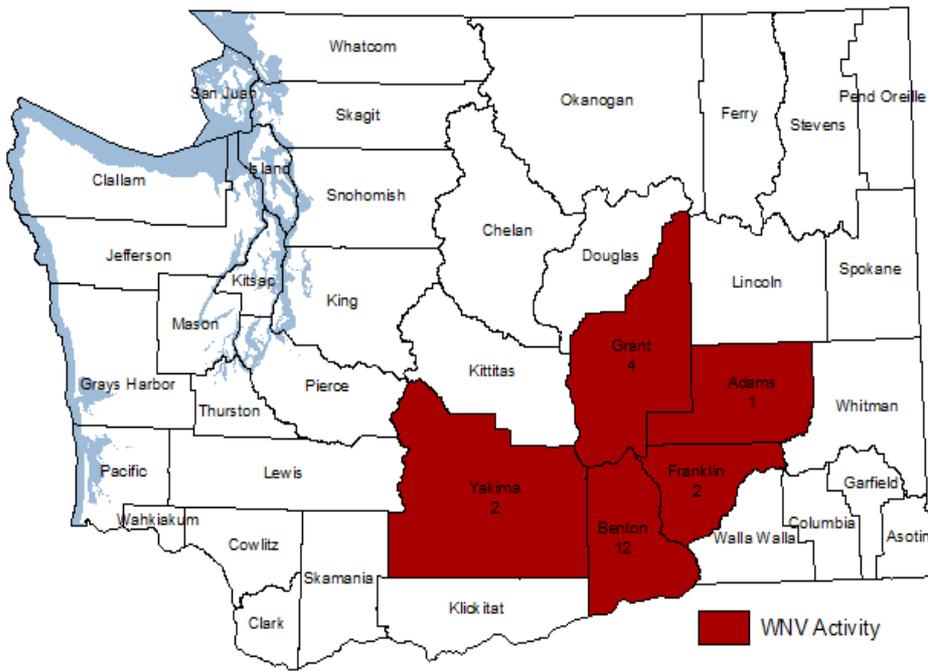
2016 WNV Activity

Horses/mammals, birds mosquitoes



WNV Human Cases by County of Likely Exposure

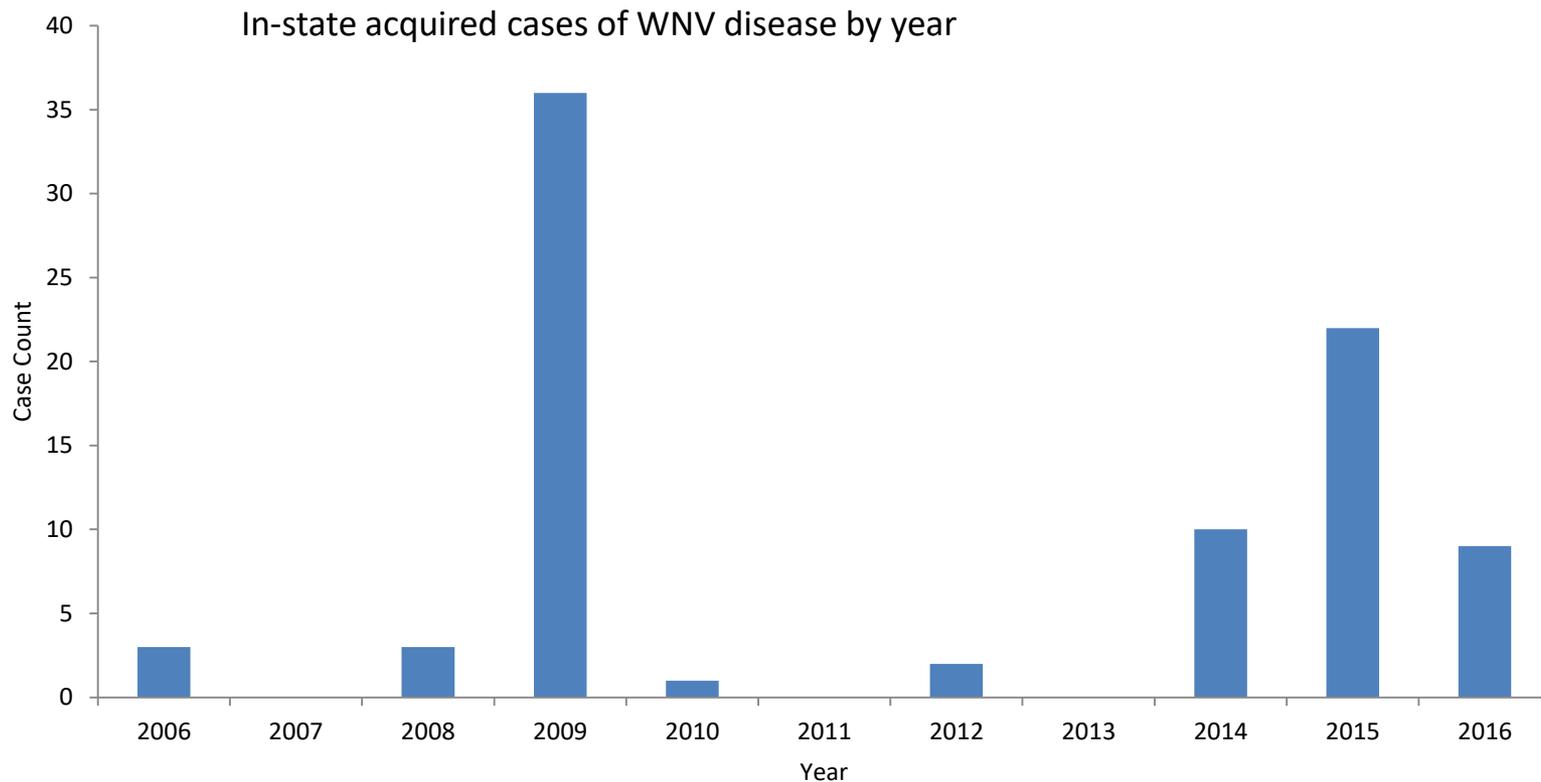
2015



2016



In-state Acquired WNV Cases by Year, Washington, 2006–2016*



* Preliminary and partial year data only as of September 19, 2016

Zika Virus



- ▶ Mosquitoes – *Aedes aegypti*, *A. albopictus* – not in WA
- ▶ Only 1 in 5 develop symptoms
- ▶ Fever, rash, joint pain, red eyes.
- ▶ Mild, few days – a week
- ▶ Body fluids
- ▶ Severe birth defects
- ▶ Chikungunya
 - Fever, joint pain
- ▶ Dengue
 - Fever, headache, pain, joints
 - Hemorrhagic fever



Aedes aegypti (Yellow Fever Mosquito)

What makes it such a good vector?

- Closely associated with humans
 - Eggs & larvae in containers
 - Adults rest inside houses
 - **Feed frequently and (almost) exclusively on human blood**
- Originally native to forests in West Africa
- Transported in water storage containers on slave ships around the world
- Now – in tropical and subtropical climates worldwide



Do you have potential mosquito habitat?



Retention ponds, storm drains, ditches, wetlands, clogged gutters, buckets, containers, tires, canals – basically, anything that holds standing water

Eliminate Standing Water



Take responsibility

For lined or contained water bodies:

- ▶ Remove or circulate the water (fountain)
- ▶ Add mosquito fish
- ▶ Treat using mosquito “dunks” or “bits” from home and garden stores that contain a larvicide (*Bacillus thuringiensis israelensis* (Bti)); follow the label directions



For uncontained water bodies that can reach other water bodies (retention pond with outlet, ditches, pond with stream, etc.):

- Licensed pesticide applicator needed to apply larvicides and you may need an NPDES permit

Mosquito Repellent – Know how to use it Safely



CHOOSE IT. USE IT.

- 15% DEET for children max
- 30% DEET for adults max
- Select a repellent that offers the best protection for the time you will be outdoors

Ticks



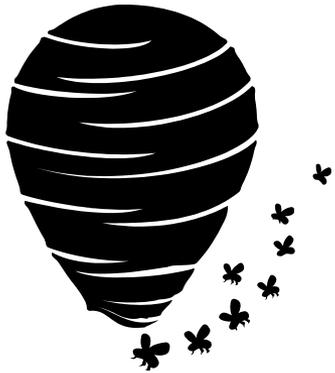
- ▶ Blood-feeding parasites.
- ▶ Most tick species wait on low-lying vegetation for an animal to brush against them
- ▶ Attach by burrowing their mouthparts into the skin for a blood meal.
- ▶ Feed anywhere from 2-10 days
- ▶ Transmit
 - Rocky Mountain Spotted Fever
 - Lyme Disease
 - Cause tick paralysis
 - Relapsing Fever (transmitted by soft ticks – feed only 30-90 minutes at night)

Ticks

Avoid getting bitten

- ▶ Wear long pants and a long-sleeved shirt. Tuck your pant legs into socks or boots and shirt into pants.
- ▶ Use tick repellent when necessary, and carefully follow instructions on the label.
- ▶ Buddy Checks – Check yourself, your children and pets thoroughly for ticks. Carefully inspect areas around the head, neck and ears. Look for what may appear like a new freckle or speck of dirt.

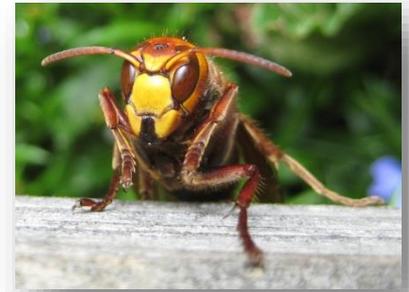
Stinging Insects – Bees, Wasps, Hornets



- ▶ Avoid fast movements if they're in the vicinity
- ▶ Don't wear strong smelling cologne or perfume to work
- ▶ Avoid wearing brightly colored clothing (esp. yellow, orange and red)
- ▶ Wear white, green or bright brown
- ▶ No teasing . . .



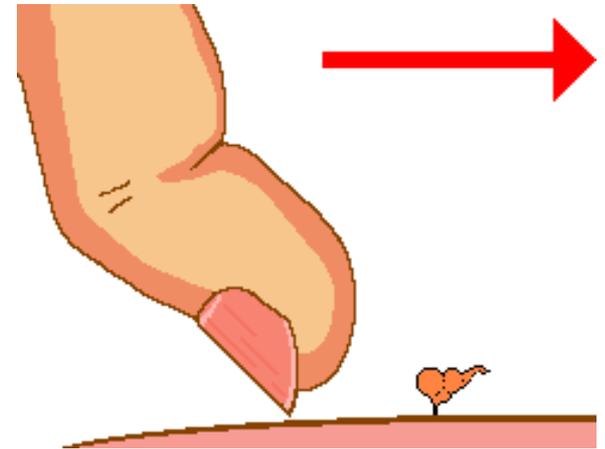
Wasps and Hornets



- ▶ Beneficial insects – eat insects that damage shade trees and crops and house flies
- ▶ Nests can be in trees, on buildings or underground, depending on species
- ▶ Attracted to food at picnics or in garbage cans

Bees

- ▶ Honey bees, Bumble bees, Orchard Mason bees
- ▶ Non-aggressive if left alone
 - *Critically* important pollinators for food crops
- ▶ Attracted to sweet liquids
 - e.g. regular Coke or Pepsi
- ▶ If stung by a honey bee, scrape stinger out of sting site.



Wasps and Hornets



- ▶ Aerial nests can be sprayed with aerosol
- ▶ Underground nests – use registered hornet & wasp spray; Direct spray into hole after dark
- ▶ In wall voids – call a professional

Wasps and Hornets

Safety Precautions

- ▶ Cover yourself with thick clothing
 - head, face, neck, hands
- ▶ Wear glasses to protect eyes
- ▶ Spray or remove aerial nests during the coolest part of evening; on a cool day if possible
- ▶ Carefully put pesticide into the entrance hole of ground nests after dark (they may be attracted to the light of your flashlight)



Head Lice

- ▶ Small parasitic insects adapted to living on the head hairs of humans.
- ▶ Presence does not mean a lack of hygiene or sanitation.
- ▶ Acquired by direct head-to-head contact with an infested person's hair.
- ▶ Infrequently transferred by shared combs, hats, and other hair accessories.
- ▶ Not a reason for exclusion from school.



Images to assist in the identification of head lice and their eggs.

<http://www.hsph.harvard.edu/headlice.html>



c 2000 President and Fellows of Harvard College



Head Lice – Control & Prevention

Once a head lice infestation is confirmed:

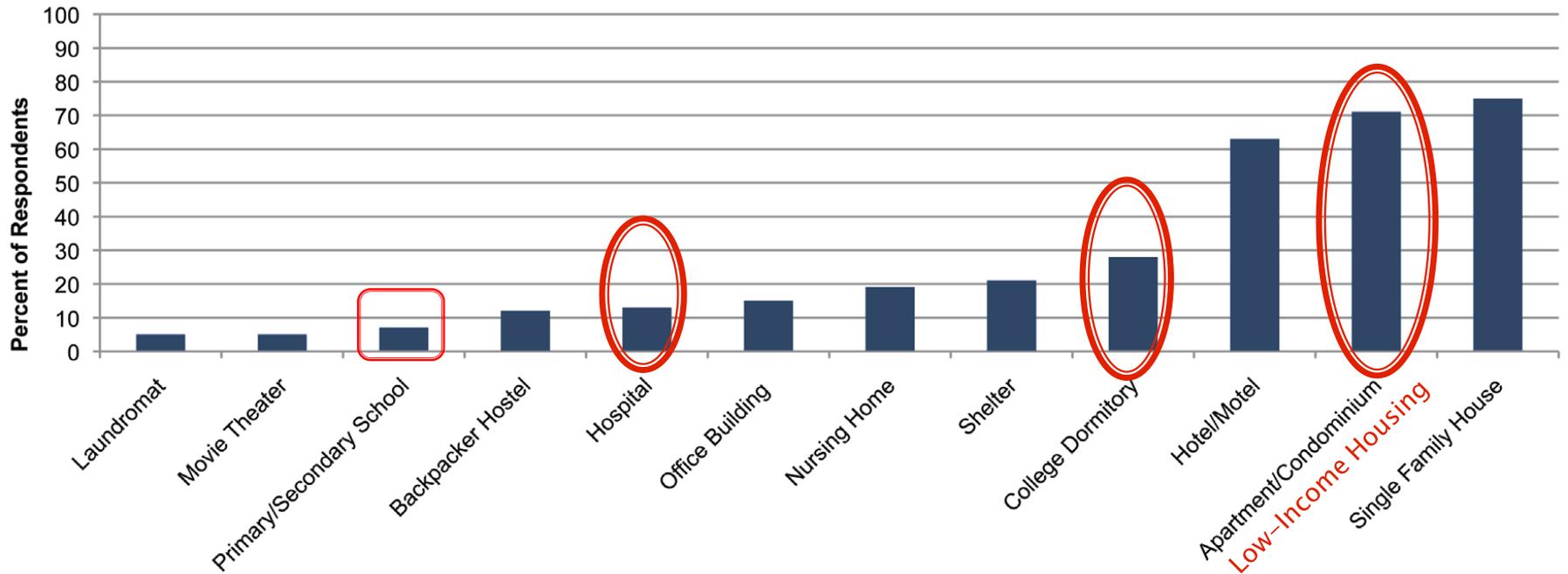
1. Treat with an approved lice control treatment, carefully following treatment directions
2. After treatment, comb the hair with an effective, metal, lice removal comb to remove the nits.
3. Get rid of eggs in the sink, toilet, or garbage. Vacuum around the area where you were combing out eggs. Both people should change their clothes afterwards.
4. Comb, using the lice comb daily for seven days, and until you no longer find any lice or eggs.
5. Most products recommend retreating after 7–10 days. Repeat above steps.



Bed Bugs



Most Vulnerable Industries (global)



NPMA Bed Bug Survey Results

**Jack Marlowe
Eden Advanced Pest Technologies

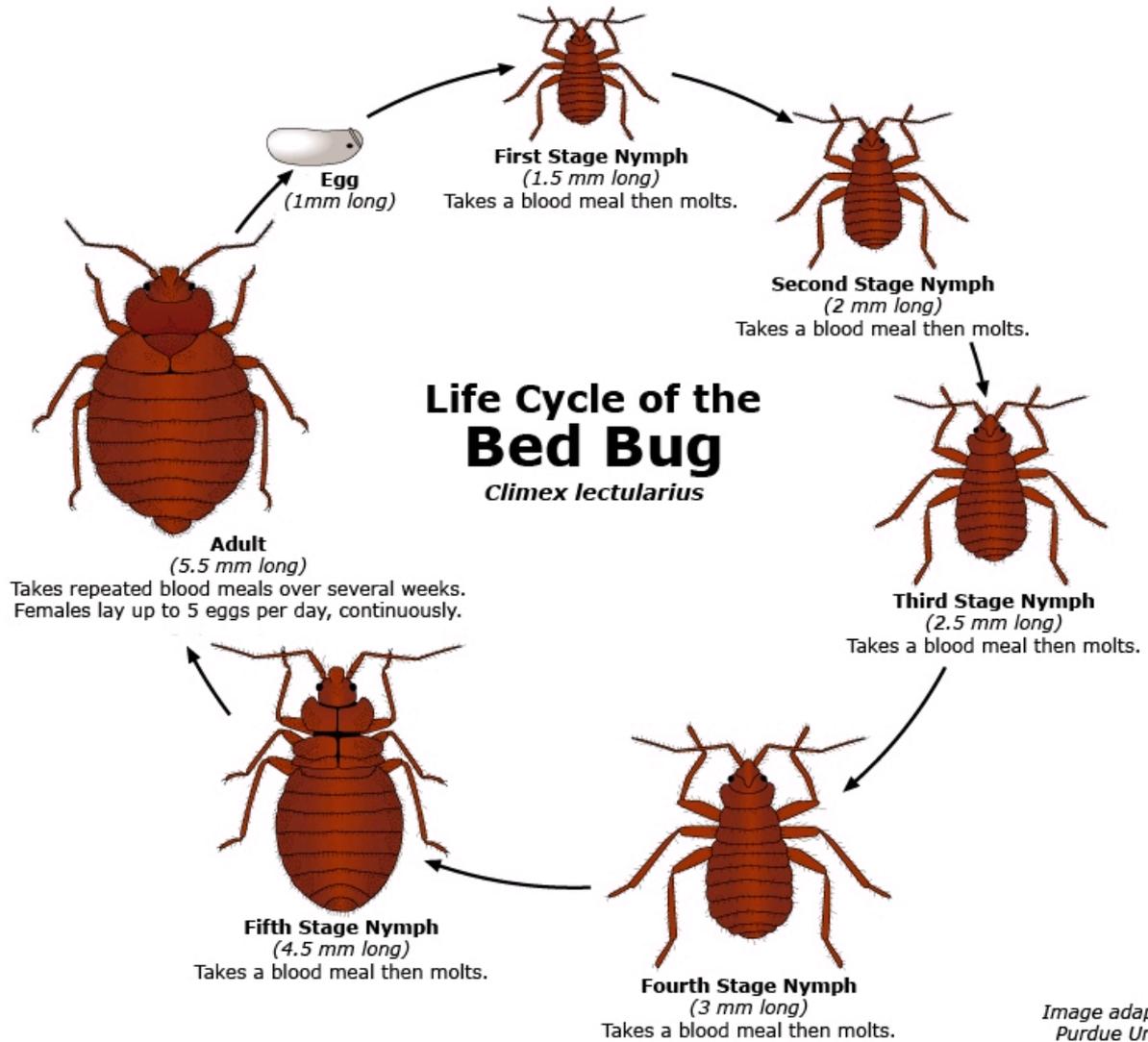


Image adapted from
Purdue University

Why are bed bugs making a comeback?



Travel



Insecticide Resistance



Used Furniture (infested with bed bugs)



Hitch-hiking

Are Bed Bugs A Public Health Issue?

- ▶ Found naturally infected w/ ≥ 28 human pathogens
 - ▶ Never proven to transmit any human disease
- ▶ Allergic reaction to bites (mild to severe)
- ▶ Secondary skin infections from scratching bites
- ▶ Mental Health issues
 - ▶ Anxiety, insomnia, systemic reactions
 - ▶ Serious social stigma to “having” an infestation

8 days post-bite

Following first-time exposure to 20-30 bed bugs held in rearing container

14 days post-bite



1 month post-bite



Bed Bugs

- ▶ Work with a pest control company committed to using IPM
- ▶ Cleaning/sanitation/clutter control
- ▶ Resources
 - [DOH Bed Bugs](#)
 - [Pest Press: Bed Bugs](#)
 - [Bed Bug Information](#) EPA
 - [Bed Bug Action Plan for Schools](#) Virginia Tech





Thank You!

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More Information at:

www.doh.wa.gov/zoonoses