



Tick-borne Relapsing Fever
Outbreak

Arizona Infectious Disease
Training and Exercise

July 22, 2015

Mare Schumacher and
Jennifer Corrigan



**PUBLIC HEALTH
SERVICES DISTRICT
COCONINO COUNTY**



Sunday, August 10, 2014

- Hospital calls Coconino County Public Health at 5:00 p.m.
 - “We’re sending four kids to Phoenix for care. We think they have hantavirus.”
 - They all stayed at a camp run by the schools a week ago.
 - One parent is “going to the media.”
- Calls fly around fast
 - Within CCPHSD
 - ADHS Infectious Disease
 - School District (Nurse, Camp Director)



Hantavirus Pulmonary Syndrome

- Early symptoms: fatigue, fever, muscle aches
- Incubation: 1-5 weeks
- Mortality rate: 36%
- No vax, no cure
- Transmission: inhalation of stirred up rodent feces or urine
- Parents: Students saw rodents, did cleaning

*The deer mouse.
Cute, yes, but can be cunning.*





PARENTS: CYBERCHONDRIA?

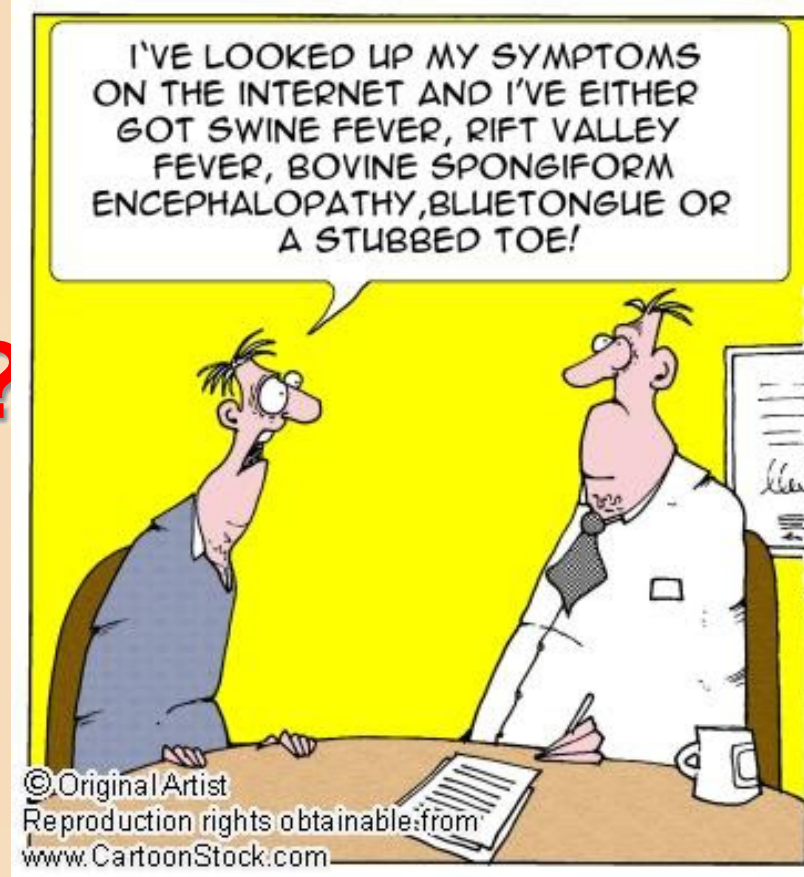
Google

Headache

It's a Brain Tumor!

Google Search

I'm Feeling Lucky

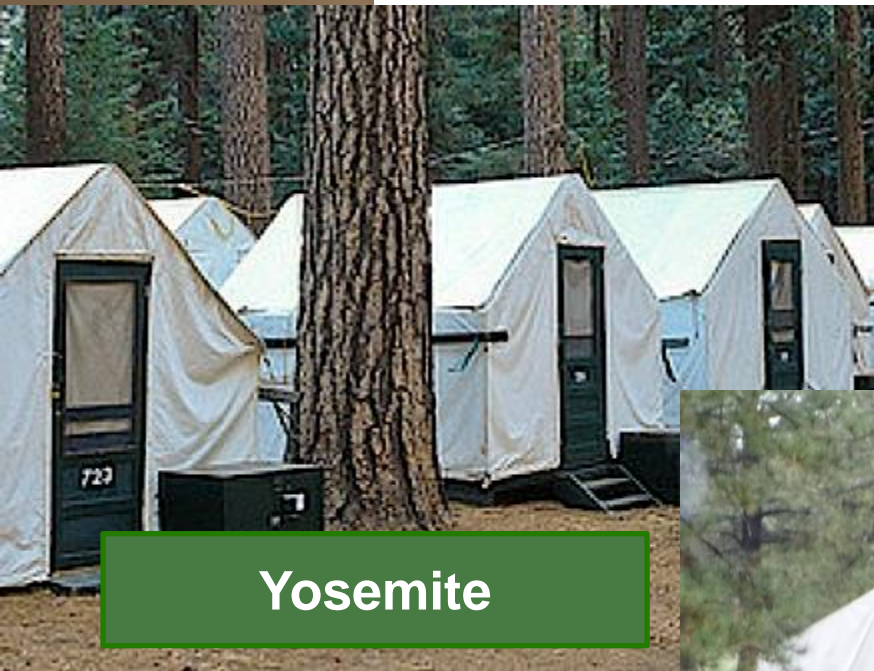


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Yosemite NP HPS Outbreak

- 10 confirmed cases in past two years (3 fatal)
- 9 of 10 stayed at Signature Tent Cabins (left) which had been colonized by rodents



Yosemite



Camp Colton



Timeline per Camp Manager

- Spring 2014 – All Flagstaff 6th graders
- Closed in July for:
 - Intensive cleaning
 - Rodent proofing
- First overnight guests – 45 high school students & chaperones Aug 1-3 at lodge only

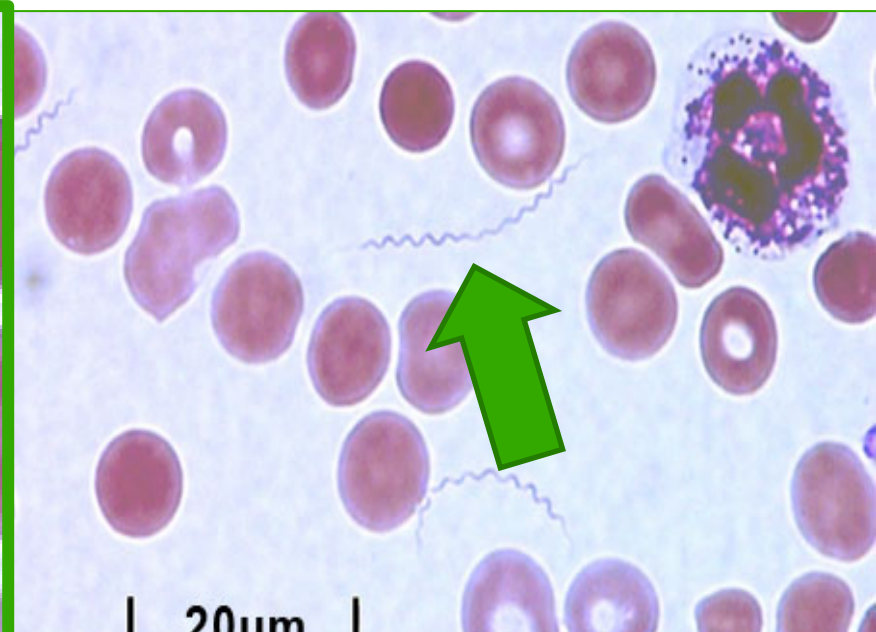
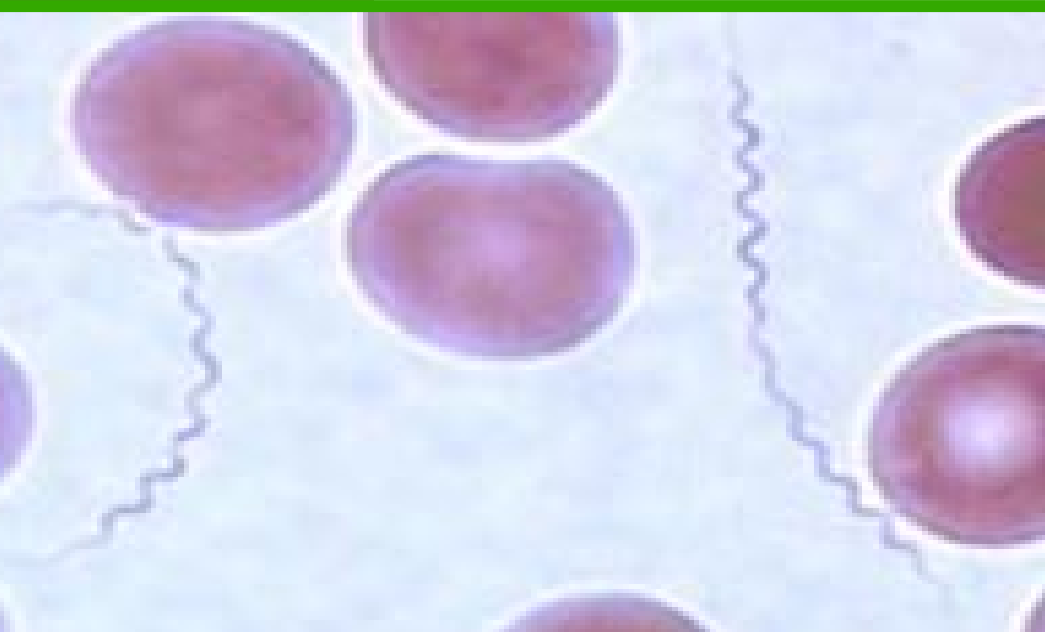






Sunday, August 10 – 10:00 p.m.

- Lab tech at FMC sees spirochetes
- Tick-borne relapsing fever at the top of the differential – now ticks (not rodents) are key
- Caused by spirochete-type bacterium *Borrelia* (*B. hermsii*, *B. parkerii*, or *B. turicatae*)



Tick-borne fever victims traumatized

At least five students were taken to Phoenix Children's Hospital with what doctors feared was deadly hantavirus.

By SUZANNE ADAMS-OCKRASSA

Sun Staff Reporter

Flagstaff-area students who contracted a rare disease earlier this month at Camp Colton initially were feared to have contracted deadly hantavirus and were taken to Phoenix Children's Hospital for specialized care. "We were so relieved when we found out it was (borne) relapsing fever and they started the treatments," said one resident familiar with the situation.

Another resident close to the situation told the *Daily Sun* to withhold their names to protect the privacy of the students. "We said the students' experiences were very traumatic."

The students were attending a team-building event at Camp Colton the weekend of Aug. 2. The first resident said the student she knew reported feeling ill on Aug. 4. "The student was complaining of leg pain and night sweats," she said.

The student's symptoms grew progressively worse until the student was taken to Flagstaff Medical Center's Emergency Room on Aug. 9 with a 104-degree fever and leg pain so severe that he described

See **TICK**, A4

A R I Z O N A

Daily Sun

Serving Flagstaff and northern Arizona since 1883

Tuesday, Aug. 12, 2014

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Tick-borne disease closes Camp Colton

Five students who attended the FUSD camp on Hart Prairie are stricken with a rare relapsing fever.

By SUZANNE ADAMS-OCKRASSA
Sun Staff Reporter

Summer camp at Camp Colton is canceled this week after at least five students attending a team-building event at the camp

Flagstaff Unified School District are working to determine how the students contracted tick-borne relapsing fever, said Coconino County Chief Health Officer Marie Peoples. The department learned of the infected students Sunday night.

The illness is rare but easily treated with a week of antibiotics, she said. The disease cannot be transmitted by human-to-human contact.

then returns. Patients can also experience body aches, headache, nausea, vomiting, anorexia, dry cough, light sensitivity, rash, confusion and dizziness. It can take between seven and 10 days for symptoms to appear. Anyone with symptoms should see a doctor.

Officials from both the school district and the county health department said the students have been properly treated with anti-

restrictions on health and educational information that can be released.

FOUR ARIZONA CASES IN FIVE YEARS

Tick-borne relapsing fever is spread by "soft" ticks, which are different from the "hard" ticks found on a deer or a dog, Peoples said.

Soft ticks usually live in the burrows of rodents, such as mice and squirrels. The ticks are

“This is the first time in the 40 years the school district has operated the camp that there has been a problem with a tick-borne disease.”

KARIN EBERHARD FUSD spokesperson

Their favorite food source is ro-

ter's Emergency Room on Aug. 9 with a 104-degree fever and leg pain so severe that he described



Tick-borne Relapsing Fever

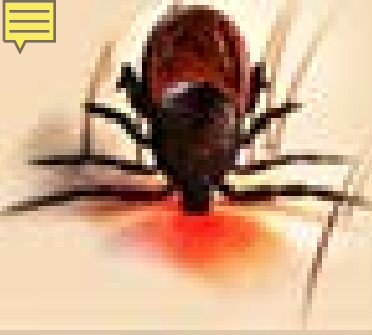
- Rare occurrence – 4 cases in AZ in past 10 years
- Incubation: 2 to 18 days, average 7
- Symptoms: fever, body aches, muscle pain, headache, nausea, vomiting, anorexia, dry cough, light sensitivity, rash, dizziness
- Symptoms often resolve, then reappear a week later
- Treatment successful with antibiotics
- Relapses 3-10 times if not treated
- Mortality is rare



TBRF History in Arizona (All Coconino)

- 2009 Wilderness Cabin – 4
- 1990 North Rim of Grand Canyon – 17
- 1973 North Rim – 62





Interviews with Parents/Students

- Started interviews next day
- UA SAFER students and CCPHSD
- Asked about:
 - Symptoms
 - Sought medical care
 - Risk factors

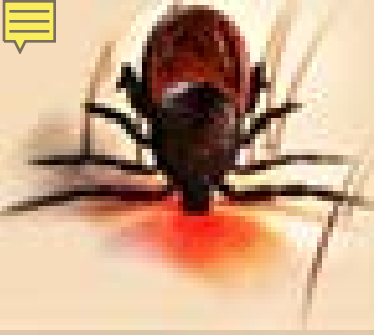




Interviews with Parents/Students

- Education and prevention:
 - What symptoms to look for
 - If in doubt, see provider (antibiotics)
 - Avoid ticks with insect repellent



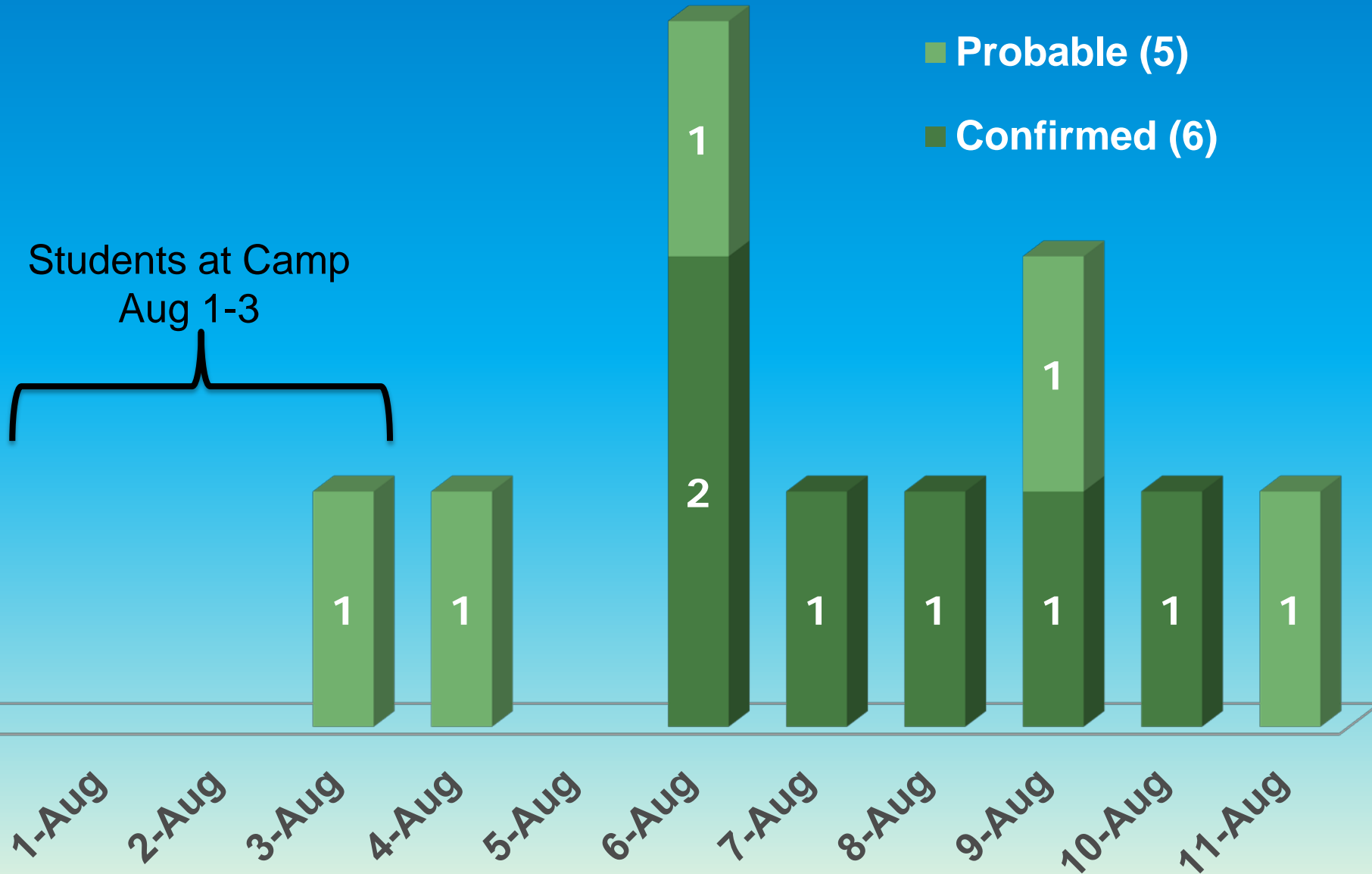


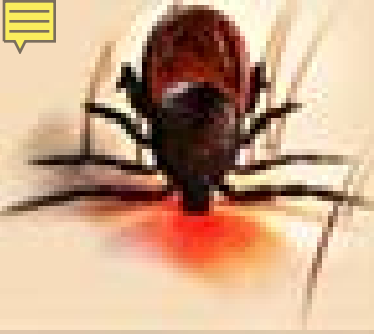
Interview Results

- Found 5 probable cases
 - 3 of 4 major sx (fever, chills, myalgia, and headache)
 - All treated
- Chimney loft may have been a tick hot spot (4 cases), but others slept elsewhere (4 cases)
- Other activities not associated with illness

Epidemiologic Curve

Tick-borne Relapsing Fever Outbreak, August 2014

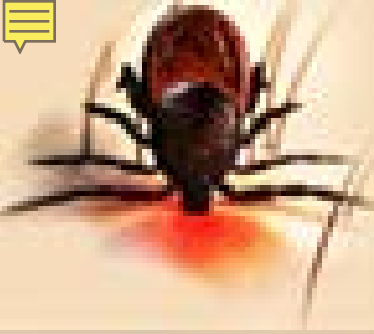




How is TBRF Transmitted?

- Transmitted by the bite of infected soft “body” ticks of the genus *Ornithodoros*
 - *Ornithodoros hermsi* tends to be found at higher altitudes (1500 to 8000 feet) where it is associated primarily with ground or tree squirrels and chipmunks.
 - *Ornithodoros parkeri* occurs at lower altitudes, where they inhabit caves and the burrows of ground squirrels and prairie dogs, as well as those of burrowing owls.
 - *Ornithodoros turicata* occurs in caves and ground squirrel or prairie dog burrows in the plains regions of the Southwest, feeding off these animals and occasionally burrowing owls or other burrow- or cave-dwelling animals.





Hard Ticks vs. Soft Ticks

Dog Tick



Soft ticks live in rodent nests, take brief blood meals at night, and do not stay on the host.

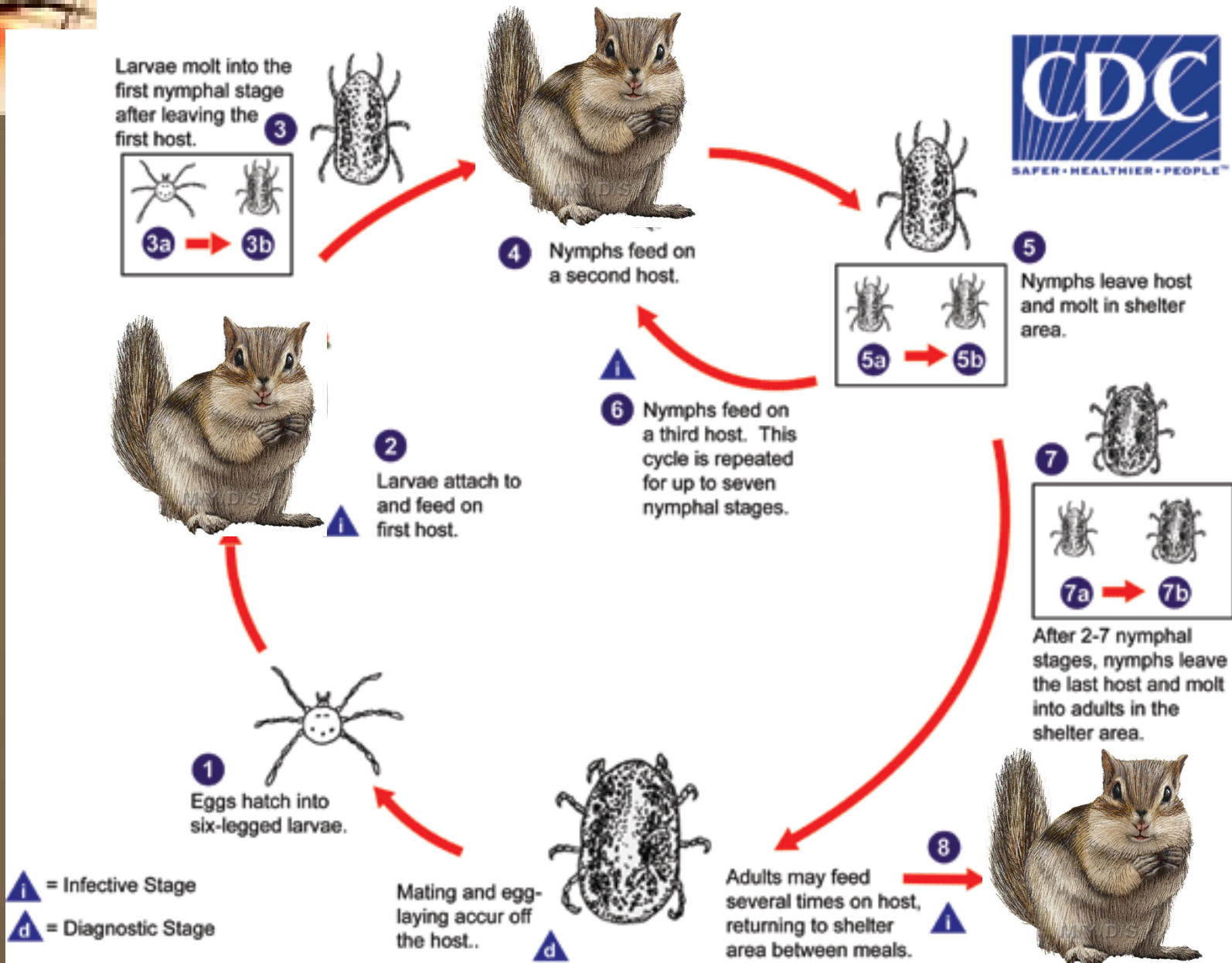


What Are The Differences Between Hard Ticks And Soft Ticks?

Feature	Hard Tick	Soft Tick
Scutum (dorsal shield)	present	not present
Capitulum (mouth parts)	anterior, visible from above	ventral, not visible from above
Nymphal stages	one	several
Adult feeding time	several days	30-60 min.
Female blood meals	one	several
Egg laying events	one	several
Total eggs laid	3,000-8,000	400-500



Soft Tick Life Cycle





The Amazing Soft Tick

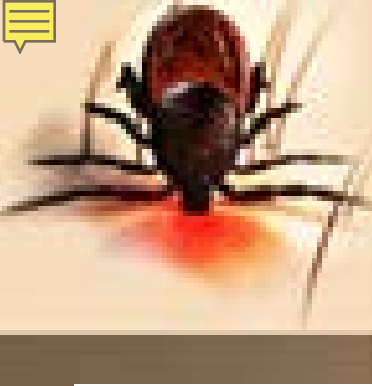
- Live 10 years + (one documented at 20 years in Russia)
- Many soft ticks have an uncanny resistance to starvation, and can survive for many years without a blood meal (Furman and Loomis 1984)
- Feed for 15-20 minutes only
- Feed at night (when rodent in nest)
- *Ornithodoros hermsi* likes chipmunks and squirrels



O. hermsi tick, before and after feeding. Photo taken by Gary Hottelick, DML, NIAID.

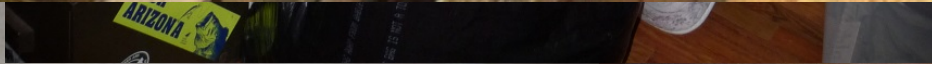
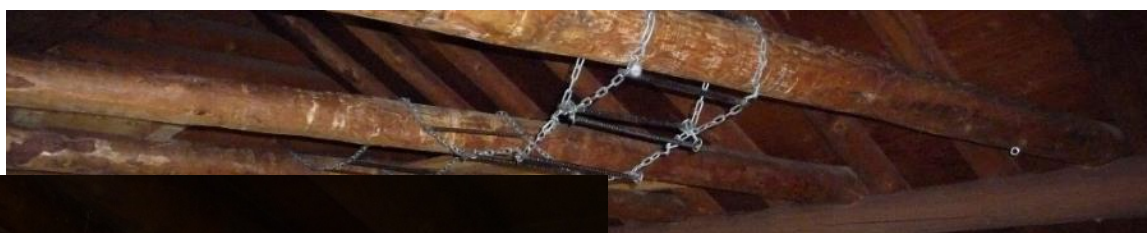
LET'S GO TO THE SITE





Camp Colton







August 12: Initial Environmental Health Assessment



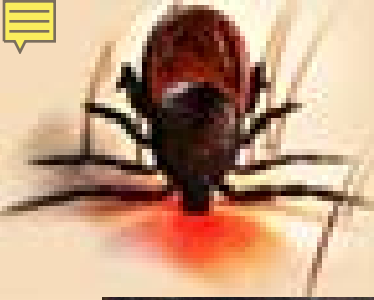
Keeping ourselves safe from Hantavirus with PPE's because of students reports of rodent droppings



Main Lodge

- Rodent droppings found in both loft areas, several in chimney crevasse, kitchen storage, first floor areas
- Dead rodent found in south loft and dead mouse in kitchen







Bathhouses

- Rodent droppings in restrooms and crawl spaces





Tents





Crawl Space

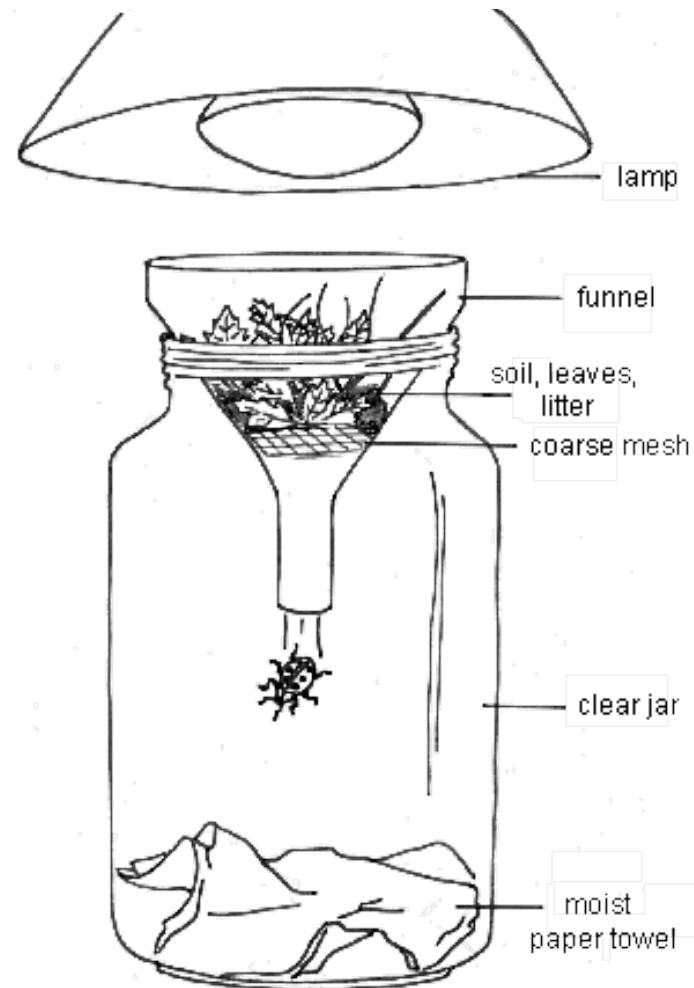


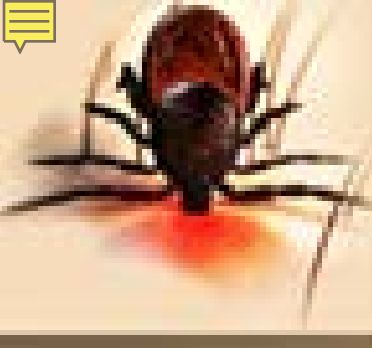


Rodent nesting found in wood pile in crawl space



Berlese Funnel





August 13: Rodent Processing

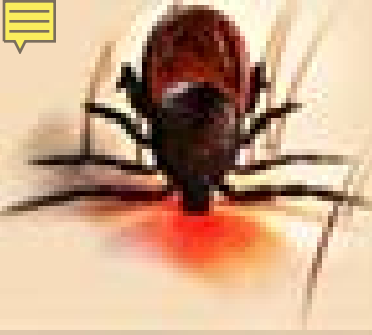




Dr. Nathan “Nate” Nieto

- Catches 4 chipmunks, 2 mice
- Retro-orbital blood collection
- Two chipmunks test positive for *Borrelia hermsii* quantitative polymerase chain reaction



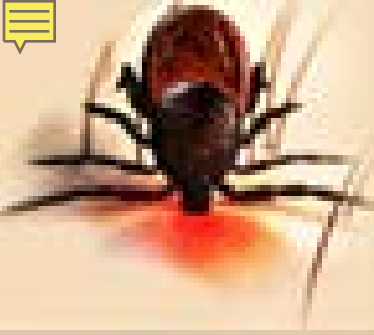


Tick Hunt

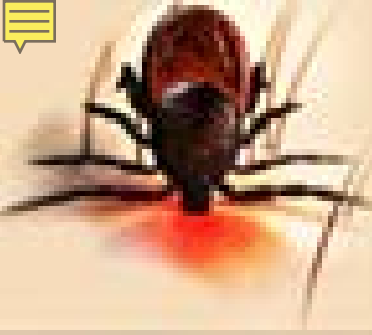
- Traps and tape worthless



Former AZ Epidemiologist, Dave Engelthaler, tries to build a better tick trap next to his Wile E. Coyote coffee mug.



Some scenes in this presentation have been reenacted.



Tick Hunt

- No luck while 'flagging' for ticks





SCHWARZENEGGER

In the Year of Darkness, 2029,
the rulers of this planet
devised the ultimate plan.
They would reshape the
Future by changing the Past.
The plan required something
that felt no pity. No pain.
No fear.
Something unstoppable. They created

THE TERMINATOR

Hemdale Presents a Pacific Western Production of a James Cameron Film
Arnold Schwarzenegger "The Terminator" Michael Biehn, Linda Hamilton and Paul Winfield
Make-Up Effects By Stan Winston - Executive Producers John Daly and Derek Gibson
Written by James Cameron with Gale Anne Hurd - Produced by Gale Anne Hurd
An **ORION** PICTURES Release Directed by James Cameron - Prints by DeLuxe®
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R RESTRICTED
UNDER 17 REQUIRES ACCOMPANYING
PARENT OR ADULT GUARDIAN

The Tick Hunt Is
On!!



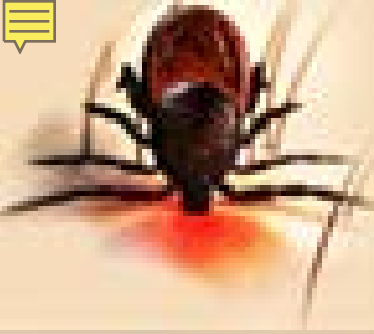
Ticks found!

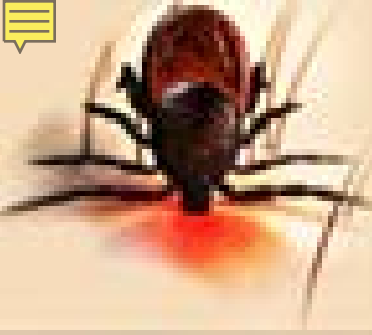
One live *Ornithodoros hermsii* found behind picture in loft.

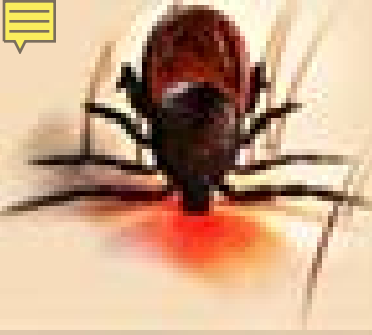
Tick tested negative for *B. hermsii*



One desiccated *Ornithodoros hermsii* found behind picture on first floor







Evidence





Aug 28-29: Follow-up Inspection





Sealed Spaces





Before the Re-Opening

- Continued rodent proofing
- Intensive cleaning
- Cracks and crevices insecticide treatment
- No overnights in main lodge





Prevention

- Prevent human contact with ticks:
 - Avoid sleeping in rodent infested buildings;
 - Rodent-proof buildings and conduct follow up treatment for ticks;
 - Use permethrin to treat boots, clothing and camping gear
 - Use tick repellents containing N,N-diethyl-m-toulamide (DEET) for skin;

<http://www.cdc.gov/features/stopticks/>





September 3, 2014

Wednesday, Sept. 3, 2014

azdailysun.com

Camp Colton reopens

A county health official says the risk of a recurrence of tick-borne relapsing fever is 'greatly diminished' after a three-week cleanup.

By DAILY SUN STAFF

An outdoor education camp that closed last month after five student attendees contracted a rare tick-borne disease found in rodents has reopened.

The Flagstaff Unified School District said Camp Colton on Hart Prairie reopened Tuesday after receiving the go-ahead from county health department officials.

Camp Colton Coordinator Mary Giannola said the OK came after camp staff completed a mitigation list compiled by health officials.

In scouring the camp's buildings, including a main cabin, bathrooms and shower facilities, the county health investigation team initially found rodent nesting material under the cabin and caught six rodents, two of which tested positive for tick-borne relapsing fever.

Staff worked for three weeks to remove wood piles near the cabin, cleaning out the cabin's crawl spaces, sealing any cracks or other openings in the walls, and contracting with a pest

control company to spray the cabin, bathrooms and shower areas on two different occasions.

The Coconino County Public Health Services District inspected the buildings at Camp Colton last week and determined the risk of tick-borne relapsing fever was "greatly diminished," said Marlene Gaither, environmental health program manager with the health services district.

The district did an "amazing job" in cleaning the camp's buildings and implementing the county's recommendations, Gaither added.

See **COLTON**. A7



Valiant Follow-up Effort

- ADHS staff tried to reach the un-interviewed
- And to get blood specimens from the probables
- Some interviewed, no blood
- Lesson learned...



Strike while the outbreak is hot!

**The Team (from left to right):
Mary Giannola, Tracy Anderson, Matt Maurer, Marlene Gaither,
Nathan Nieto, Mare Schumacher, Jennifer Corrigan**



**Not pictured:
CCPHSD
Linus Nienstadt
Mary Ellen Ormsby
Hugh Murray
Crystal Cordova
CDC
Jefferson Jones
CDC Lab
ADHS
Joli Weiss
Ken Komatsu
Hayley Yaglom
Lydia Plante
PH Lab
FUSD
Sally McMillian**