

Preventing Tick-borne Diseases

("On A Shoestring")

April 2005

Prepared by:
Linn David Haramis, Ph.D.
Curt Colwell, Ph.D.
Illinois Dept. of Public Health
Environmental Health Division
525 W. Jefferson
Springfield, IL 62761

Public Health Significance of Ticks



- Nuisance / Recreational Impact / Agricultural
- Pathogen Transmission

2

Tick-borne Diseases: USA & Illinois

| | DISEASE | ORGANISM | Tick Vector |
|------|----------------|-----------|----------------|
| IL | Lyme | Bacterium | Blacklegged |
| | STARI* | Bacterium | Lone Star |
| | RMSF** | Bacterium | American Dog |
| IL | Tularemia | Bacterium | LS, AD |
| | Ehrlichiosis | Bacterium | LS, AD, BL |
| | CO Tick Fever | Virus | Rocky Mt. Wood |
| | Powassan En. | Virus | GH |
| | Babesiosis | Protozoan | Blacklegged |
| IL ? | Tick Paralysis | Toxin | LS, AD |

* Southern Tick-Associated Rash Illness ** Rocky Mountain Spotted Fever

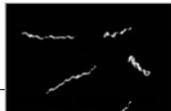
3

Lyme Disease

- ✦ Bacterial - spirochete
- ✦ Vector: blacklegged “deer” tick
- ✦ Most common arthropod-borne disease in U.S.
- ✦ Illinois: about 50 cases/year; the risk of Lyme Disease appears to be increasing in some areas of NW and central IL.

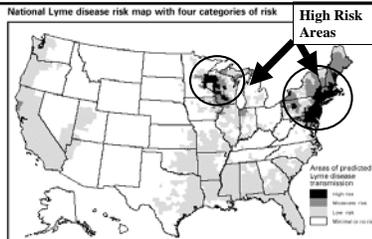


Ixodes scapularis



4

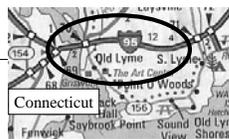
Lyme Disease



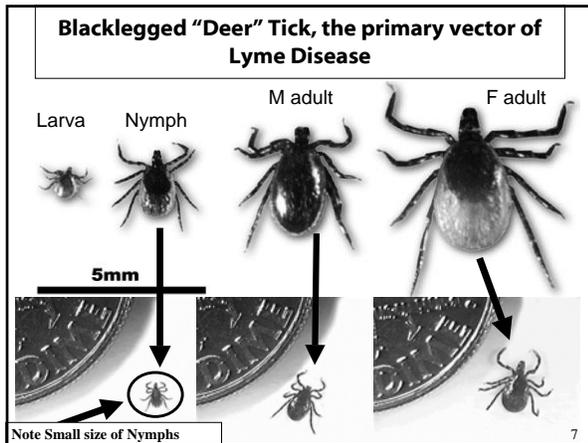
- ✦ Affects humans and dogs (not deer or rodents)
- ✦ Incubation: 3 - 32 days
- ✦ Non-specific and variable symptoms
- ✦ Most cases improve, some deteriorate
- ✦ If diagnosed early, treatment with antibiotics is generally successful

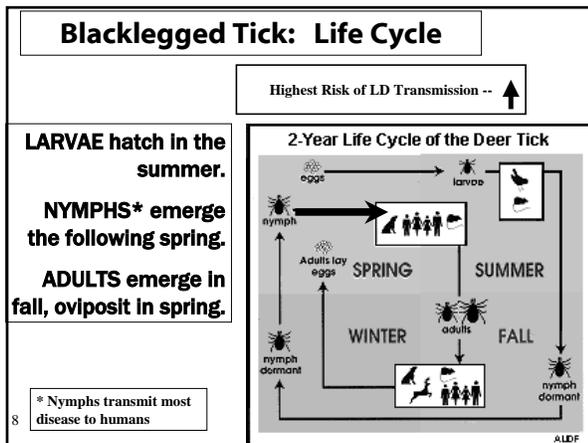
5

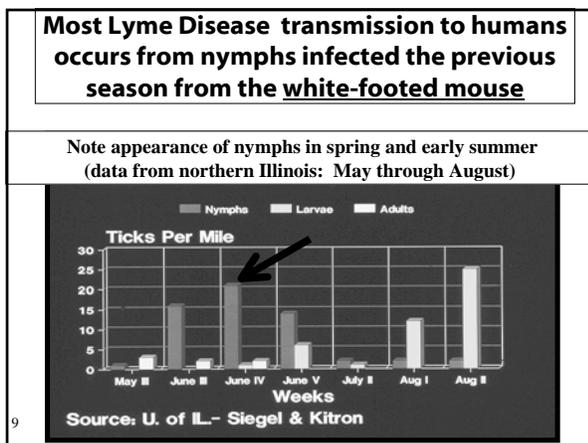
- 1975 - Several children were afflicted by illness with neurologic and arthritic symptoms, diagnosed as juvenile rheumatoid arthritis
- 1981: Pathogen identified: Spirochete bacterium *Borrelia burgdorferi*
- 1988-90: Blacklegged tick and Lyme disease become established along Rock River in northern Illinois



6







Blacklegged Tick: *HOSTS*

LARVA: Small rodents (white-footed mouse and deer mouse, chipmunks)

NYMPH: Small rodents → dogs, humans

ADULT: Deer, occasionally horses and humans



10 Sometimes found on birds, too



Some Suspected Causes for the "Emergence" of Lyme Disease

Suburbanization brings people, wildlife and ticks together



Massive increase in the deer population over the last 100 years

11 Dispersal of juvenile ticks by migratory birds



Increase in outdoor recreational activities

Lyme Disease: Clinical Stages

* Stage 1

* "bulls-eye rash" (Erythema migrans)
in about 75% of cases, flu-like illness without cough

■ Stage 2

■ affects skin, muscles, skeletal, nervous system, lymphadenopathy, heart, facial palsy and meningitis

■ Stage 3

■ chronic arthritis or encephalitis



12

How did this Issue Impact Illinois Department of Public Health ?

13

Specifically, Environmental Health, Communicable Diseases and Communications Staff

Genesis of Lyme Disease as an issue in the 1980's (Interesting, but this won't affect Illinois...will it ?)

1986 Smithsonian Magazine

LD identified in Old Lyme, Conn.

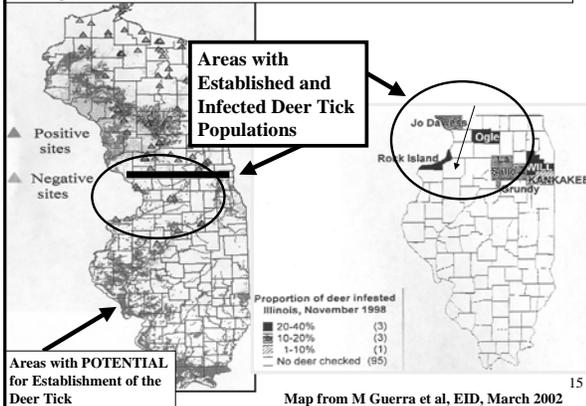
NY USA Today Supplement Cover

TICKBUSTERS

PREVENT LYME DISEASE

14

Geographic orientation for this presentation...



15

NOTE: Travel from Chicago area to Wis.; this is a Major Media Market

The Deer Tick is present at some locations throughout the region...

90 % of Lyme Disease *cases* are from these areas, but...

Public Health officials in Illinois had to deal with the impact of being on the edge of "hyperendemic" Lyme Disease areas

The Difficulties of Presenting a "Complex Message"

News Media Consultants tell you to present a "simple message" to the public, but...

The issue in Illinois was NOT a simple situation, note the following:

We responded to News Media Issues and Public Inquiries of many types...

Cook County issues tick alert

TICKS AND LYME DISEASE

Life in The Age Of Lyme

As the disease spreads, many scared Americans have declared war on ticks. Summer may never be the same.

Health

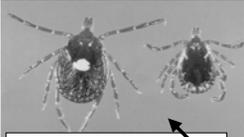
Life in The Age Of Lyme

As the disease spreads, many scared Americans have declared war on ticks. Summer may never be the same.

18

“STARI” also known as Lone Star Tick Rash

(Mimics Lyme rash)



Female & Male Lone Star Ticks

Another complicating factor was that in southern Illinois, Lyme disease cases might be *Southern Tick-Associated Rash Illness* or **STARI**. The infectious agent is tentatively named *Borrelia lonestarii* and is associated with Lone Star ticks (*Amblyomma americanum*). See <http://www.cdc.gov/ncidod/dvbid/stari/index.htm>

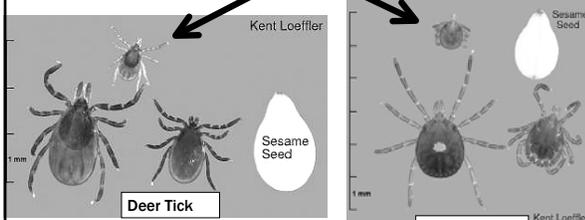
Early symptoms of STARI are similar to Lyme disease. The same antibiotic therapy for Lyme disease is prescribed to treat STARI.

22

(Mis)-Identification by local agencies and medical personnel:

The Lone Star Tick is MUCH more common in the southern 2/3 of the State

All stages very similar in size and appearance

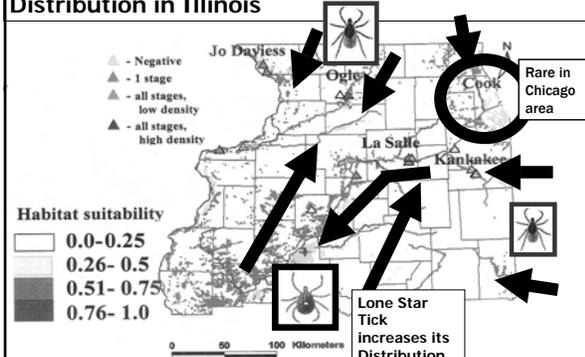


Deer Tick

Lone star tick

23

Creeping Along: slow increase of Deer Tick Distribution in Illinois



Legend:

- Negative
- ▲ - 1 stage
- ▲ - all stages, low density
- ▲ - all stages, high density

Habitat suitability

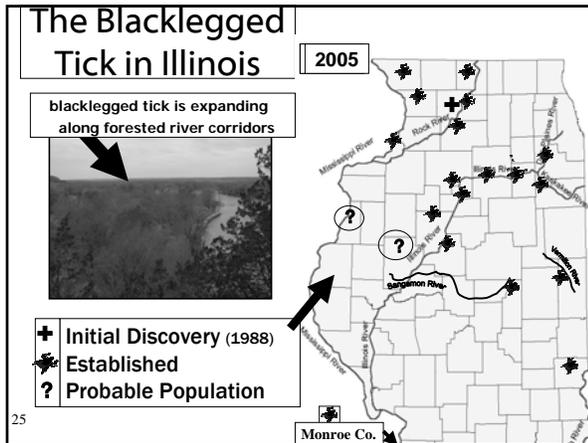
- 0.0-0.25
- 0.26-0.5
- 0.51-0.75
- 0.76-1.0

0 50 100 Kilometers

Lone Star Tick increases its Distribution

Rare in Chicago area

24



No Specific Funding for Lyme Disease, but...

“We Don’t Do ticks...”
is *not* an acceptable response !

26

When an issue is covered this intensely by the news media, the public and local health departments expect some response from the state public health agency...

Ok, so what can we do ?

27

What We Lacked: Specific \$\$\$\$ for significant field surveys for the deer tick or *Borrelia burgdorferi*

But, we had the following available resources

- Knowledgeable Staff
- Access to Training Seminars
- Cooperation with other State Agencies (U of IL, IL Natural History Survey)
- Cooperation of Local Health Departments
- Technical support from CDC

28

The result was many, many hours spent on:

- Talking to the public
- Identifying ticks (mostly lone star and American dog ticks)
- Talking to the news media about ticks and Lyme Disease
- Supporting researchers who were working in Illinois
- All without any specific \$\$\$ for Lyme Disease response...

29

Nevertheless, it was IDPH's responsibility* to inform the public about how to prevent tick-borne diseases...



30

*Assisted by local health departments

IDPH's Approach to Tick-borne Disease Prevention ("on a shoe-string")



31

Prevention through Public Information:

- 1) General news releases and
- 2) Regulatory newsletters

Warning
TICKS MAY BE FOUND IN THIS AREA
To avoid tick bites:
Wear light colored clothing and tuck pants up in waist.
Apply insect repellent to clothing before the week.
Examine clothing and skin frequently for ticks.
Consult a licensed physician for treatment.

Dear Campground Licensee:

CONTACT: 217-782-5750
TTY: 800-546-0466
FAX: 217-782-3987
WEB SITE: www.idph.state.il.us

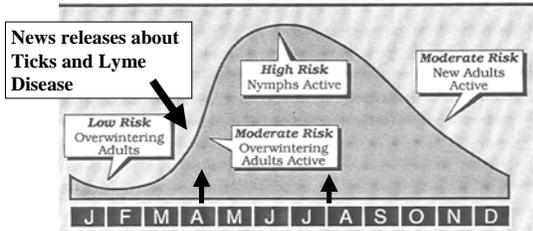
FOR IMMEDIATE RELEASE
June 23, 1999

SUMMER IS TIME TO CHECK FOR TICKS

32

Peak Tick Activity Occurs April through mid-July

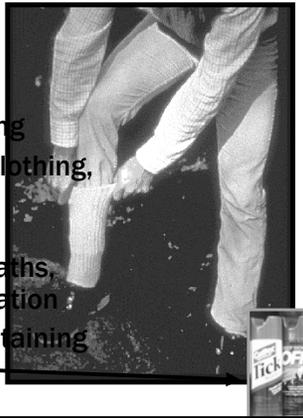
Lyme Disease: The Danger Months



33

Preventing Tick Bites

- ✦ Avoid woodlands, especially in spring
- ✦ Wear light colored clothing, tuck pant legs in socks or boots
- ✦ Walk in middle of paths, away from vegetation
- ✦ Wear repellents containing DEET (20 -30%)



34

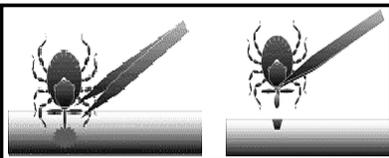
Tick Feeding & Pathogen Transmission

- ✦ **First 48 hours:**
tick penetrates and prepares bite site
- ✦ **After 48 hours:**
rapid uptake of blood (engorgement)

NOTE! Probability of Lyme disease transmission is very low during the first 48 hours of feeding, but rapidly increases after 48 hours.

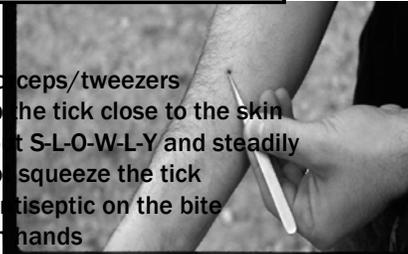
MORAL: Always check for and remove ticks ASAP after activities in areas where ticks live!

35



Tick Removal

- Use forceps/tweezers
- Grasp the tick close to the skin
- Pull out S-L-O-W-L-Y and steadily
- Do not squeeze the tick
- Use antiseptic on the bite
- Wash hands



36

Tick Management

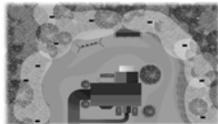
- Treat pets with flea & tick medications
- Eliminate, trim and/or treat vegetation along paths and forest borders
- Fence yards to keep out deer & other animals
- Several residual insecticides can be applied to “ecotones” along the edge of densely vegetated areas
- Use “Tick Management System”™* or something like it; such as cotton balls impregnated with insecticide. Mice will use cotton balls as nesting material, and the insecticide protects mice against ticks.

37

* Not known to be widely used in Illinois

Tick Management System™

- Stations placed every 10–20 ft. around residence.
- Food attractant lures mice to station
- Mouse contacts insecticide (fipronil)
- Insecticide protects mouse from ticks
- Less ticks (blacklegged tick nymphs) → fewer tick bites → reduced likelihood of Lyme



38

If the deer tick continues to become more common, could this be in our future ?

The Moral of the Story...

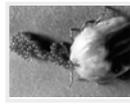
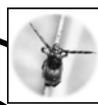
- Lyme Disease, like many pathogens, is not static over time – things can change....
- A state agency can draw on a variety of resources to provide some level of services to the public.
- In our humble opinion, local laboratory staff should become familiar with the most common species of ticks in their regions; unusual specimens can be sent to a specialist. Currently, there are MANY excellent on-line images that can be used to aid identification of adult ticks.

39

The End



Illinois Department of Public Health
Environmental Health
Rod R. Blagojevich, Governor • Eric E. Whitaker, M.D., M.P.H., Director






40 Appendices follow...

Appendices

...for those who are interested...

- Map of Current Known Distribution of the Deer Tick in Illinois, 2004
- Biology of Ticks for the Novice
- Basic Morphology of Ticks for the (Midwestern) Novice

41

Appendix I. Known Distribution of the Deer Tick in Illinois, 2004

- *Ixodes scapularis* is also known as the "deer tick" and the "blacklegged tick". *Amblyomma americanum*, the lone star tick, and *Dermacentor variabilis*, the American dog tick, should be presumed present throughout the state.



*CDC criteria for "established" ticks are at least 5 ticks or 2 different species, nymph, adult, or larvae.

42 www.idph.state.il.us/envhealth/tick_dist.htm

Appendix II. Basic Biology of Ticks

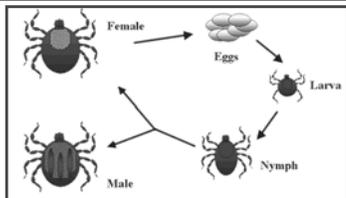
Blacklegged
Tick
(female)



- ✦ Arachnids (like mites, spiders)
- ✦ Abdomen (opisthosoma) unsegmented and broadly joined to prosoma
- ✦ 6 legs (larvae) or 8 legs (nymphs, adults)
- ✦ Blood-feeding parasites of mammals, birds, reptiles
- ✦ Vectors of diseases, mostly bacterial
- ✦ Include the “soft ticks” and “hard ticks”

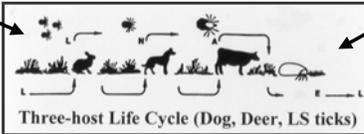
43

Tick Life Cycle



Infected as larvae; most Lyme Disease is transmitted by nymphs

Life cycle can be complex



44

For the deer tick, the complete life cycle may take as long as 3 years

Hard Ticks

Brown
Dog
Tick



- ✦ Mouthparts visible from above, scutum present
- ✦ Feed on mammals, birds, reptiles
- ✦ Some with lengthy life cycles involving several host species
- ✦ Typically found in wooded areas

45

Soft Ticks

Fowl Tick



- Mouthparts not visible from above
- Feed on domestic and wild birds, livestock, large and small mammals
- Live in and around host nests
- Typically found in rural areas
- Some soft ticks are vectors of relapsing fever (but not in Illinois)



Side view of soft tick

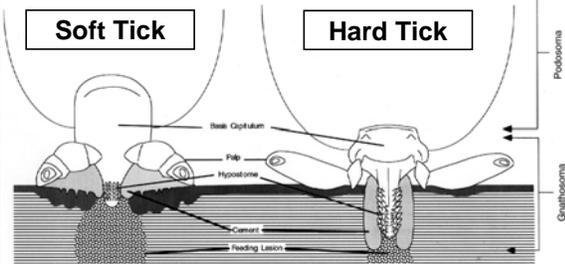
46

Tick Bites

After imbedding on the host, hard ticks feed for several days...

Soft Tick

Hard Tick

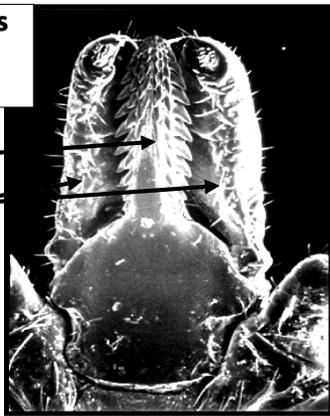
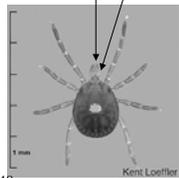


47

Tick Mouthparts (important for identification)

Hypostome

Palps



48

Lone star tick

Lone star tick

round shape

long mouthparts

white markings along festoons

"lone star" spot

| | | |
|----|------------------------|---|
| 52 | Identification: | Long mouthparts, round shape females with white spot, festoons |
| | Distribution: | Throughout Illinois, especially southern Illinois |
| | Vector of: | STARI, Ehrlichiosis, tick paralysis |

American Dog Tick

short mouthparts

white markings

festoons

| | | |
|----|------------------------|--|
| 53 | Identification: | Short mouthparts, festoons, white markings |
| | Distribution: | Throughout Illinois Most common tick submitted for ID |
| | Vector of: | RMSF, Tularemia, Ehrlichiosis, tick paralysis |

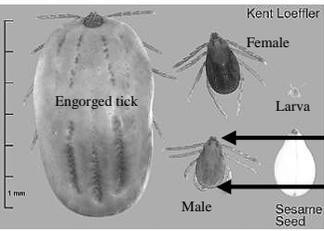
Blacklegged "deer" tick

long mouthparts

black legs

no festoons

| | | |
|----|------------------------|--|
| 54 | Identification: | Long mouthparts, black legs, red color, no festoons |
| | Distribution: | Known from 20 Illinois counties, especially northern Illinois river areas |
| | Vector of: | Lyme, Ehrlichiosis, Babesiosis |



Brown dog tick

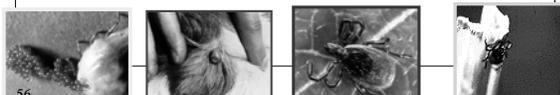
← short mouthparts

← festoons

| | |
|------------------------|---|
| Identification: | Short mouthparts, festoons no white markings |
| Distribution: | Throughout Illinois, can reproduce indoors |
| Vector of: | None known in Illinois |

Acknowledgements

➤ Thanks to the University of Illinois Department of Veterinary Pathobiology, Illinois Natural History Survey, the CDC, Mr. Kent Loeffler, Ms. Joan Bestudik of IDPH, the American Lyme Disease Foundation and others for their comments or use of their maps and/or images. Also, thanks to the sponsors of this teleconference for allowing us to address this group.



Registration/ Evaluation/ CEU Certificate

PHTN URL:
www.phppo.cdc.gov//phtnonline

Course verification code: TICK
