

PROTECTION, PREVENTION TICK RESEARCH

STOP TICKS

STOP TICKBORNE DISEASE

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"What's the problem? Well it's the ticks of course!"

Ticks lay thousands of eggs



THE ISSUES

TICK POPULATION INCREASES AND SPREADS
TICKBORNE DISEASES INCREASE
TESTS/SEROLOGY
THREAT TO BLOOD SUPPLY
MEDICAL COST
COST TO SOCIETY
FUNDING VS NUMBERS
TICK RESEARCH REQUIRED

41 Years of Known Lyme Disease

Plight of patients not changed

No reliable test to determine who is actively infected

Tick - numbers dramatically increase

Tick - geographic spread

***Multitude of virulent pathogens discovered.**

Percentages of all pathogens increase in ticks.

**CDC Reported Tick-Borne disease numbers is more than a magnitude greater
Mosquito disease numbers.**

***Babesia, Anaplasma, Ehrlichia, Powassan /Deer Tick Virus, Borrelia miyamotoi,
Tularemia, Tick paralysis , Bartonella, Bourbon virus, Heartland virus and others.**

It's **NOT** just Lyme disease: One tick bite may cause multiple infections.

Some are currently **untreatable... and fatal.**

Source: cdc.gov

[CDC](#) > [Ticks Home](#)

Tickborne Diseases of the United States



In the United States, some ticks carry pathogens that can cause human disease, including:

- **Anaplasmosis** is transmitted to humans by tick bites primarily from the blacklegged tick (*Ixodes scapularis*) in the northeastern and upper midwestern U.S. and the western blacklegged tick (*Ixodes pacificus*) along the Pacific coast.
- **Babesiosis** is caused by microscopic parasites that infect red blood cells. Most human cases of babesiosis in the U.S. are caused by *Babesia microti*. *Babesia microti* is transmitted by the blacklegged tick (*Ixodes scapularis*) and is found primarily in the northeast and upper midwest.
- **Borrelia miyamotoi** infection has recently been described as a cause of illness in the U.S. It is transmitted by the blacklegged tick (*Ixodes scapularis*) and has a range similar to that of Lyme disease.
- **Colorado tick fever** is caused by a virus transmitted by the Rocky Mountain wood tick (*Dermacentor andersoni*). It occurs in the the Rocky Mountain states at elevations of 4,000 to 10,500 feet.
- **Ehrlichiosis** is transmitted to humans by the lone star tick (*Amblyomma americanum*), found primarily in the southcentral and eastern U.S.
- **Heartland virus** infection has been identified in eight patients in Missouri and Tennessee as of March 2014. Studies suggest that Lone Star ticks may transmit the virus. It is unknown if the virus may be found in other areas of the U.S.
- **Lyme disease** is transmitted by the blacklegged tick (*Ixodes scapularis*) in the northeastern U.S. and upper midwestern U.S. and the western blacklegged tick (*Ixodes pacificus*) along the Pacific coast.
- **Powassan disease** is transmitted by the blacklegged tick (*Ixodes scapularis*) and the groundhog tick (*Ixodes cookei*). Cases have been reported primarily from northeastern states and the Great Lakes region.
- **Rickettsia parkeririckettsiosis** is transmitted to humans by the Gulf Coast tick (*Amblyomma maculatum*).
- **Rocky Mountain spotted fever (RMSF)** is transmitted by the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), and the brown dog tick (*Rhipicephalus sanguineus*) in the U.S. The brown dog tick and other tick species are associated with RMSF in Central and South America.
- **STARI (Southern tick-associated rash illness)** is transmitted via bites from the lone star tick (*Amblyomma americanum*), found in the southeastern and eastern U.S.
- **Tickborne relapsing fever (TBRF)** is transmitted to humans through the bite of infected soft ticks. TBRF has been reported in 15 states: Arizona, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, Ohio, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming and is associated with sleeping in rustic cabins and vacation homes.
- **Tularemia** is transmitted to humans by the dog tick (*Dermacentor variabilis*), the wood tick (*Dermacentor andersoni*), and the lone star tick (*Amblyomma americanum*). Tularemia occurs throughout the U.S.
- **364D rickettsiosis** (*Rickettsia phillipi*, proposed) is transmitted to humans by the Pacific Coast tick (*Dermacentor occidentalis* ticks). This is a new disease that has been found in California.

Prepared by H. Ahern MS, MT(ASCP), ahernh@sunyacc.edu; (518) 743-2287

If only Noah
hadn't saved
the ticks!



Current laboratory tests for Lyme disease are poor disease indicators; there are **NO diagnostic tests** available for the majority of other diseases caused by tick-borne microbes.

Deadly Heartland Virus Is Much More Common Than Scientists Thought



Heartland virus disease was first detected in 2009. There have been only 9 reported cases in the Midwest, including 2 deaths.

So, scientists thought the Heartland Virus was limited to a small region. - The assumption was wrong!

The Centers for Disease Control and Prevention has now found signs that Heartland virus is circulating in deer, raccoons, coyotes and moose in 13 states: From Texas to North Carolina, and Florida to Maine.

“It was not only in these states, but it was fairly common,” says biologist Nick Komar, who led the study. “It’s very possible there have been many other cases that have been overlooked.”



“The underlying message of this story is there are new pathogens out there. Our society is changing so quickly — and even the climate — that it allows for new things to develop. And we have to be on the lookout for those new things so we can protect the public health.”

Source: <http://www.npr.org/sections/health-shots/2015/09/16/440595392/deadly-heartland-virus-is-much-more-common-than-scientists-thought>

Tick-borne microbes (bacteria, protozoa, and viruses) are adapted to live in human blood. Some are now in the blood supply and transmitted by transfusion.

BUSINESS INSIDER

BRIEFING

The FDA is worried about a growing, parasitic threat to the US blood supply

DAVE MOSHER AUG 22 2015, 6:41 AM 2322

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Babesia parasites inside a red blood cell, as seen with a scanning electron microscope.

“ But the true scope of Babesia’s grasp on the country is unknown, and the government as well as blood centers are quick to admit it.

First, the CDC relies on states to compile and report cases to the government. But states aren’t required to participate — and not all of them do. (Lyme disease has a similar problem with vast underreporting; 10 times the reported cases likely exist.)

“So far 31 states have participated, and the disease has been reported from 36 states,” Sanjai Kumar, who studies pathogens for the FDA, said during the agency’s most recent blood safety committee meeting on May 13, 2015.”

Source: <http://www.businessinsider.com.au/babesia-parasite-increasing-threat-blood-donations-fda-test-2015-8>

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Health Care Costs, Utilization and Patterns of Care following Lyme Disease

Adrion ER, Aucott J, Lemke KW, Weiner JP.

PLoS One. 2015 Feb 4;10(2):e0116767. eCollection 2015port:

Lyme Disease Costs Up to \$1.3 Billion Per Year to Treat, Study Finds

Research suggests prolonged impact of the tick-borne illness in some patients is greater and more widespread than previously understood.

Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland

<http://www.jhsph.edu/news/news-releases/2015/lyme-disease-costs-more-than-one-billion-dollars-per-year-to-treat-study-finds.html> or <http://tinyurl.com/m5wyhfg>

* This report does not include the entire cost burden of Lyme disease and other TBDs

The **burden** of tick-borne illness, in terms of cost to both individuals and society, is astronomical and **only getting worse.**

Annual Cost of Lyme disease in the United States

Annual Cases of Lyme Disease The CDC raised case estimates based on national survey data by a factor of 10X in 2013

300,000

* **Lyme Disease Cost Per Case**

Direct Medical Costs, Indirect Medical Costs, Lost Income, Lost Taxes, and Related Lyme Disease Costs Per Case and adjusted for 2014 dollars

X \$10,769

Total Annual Cost Burden

\$3,230,700,000

*Source: Zhang, X., Meltzer, M.I., Pena, C.A., Hopkins, A.B., Wroth, L., and Fix, A.D. (2006) Economic Impact of Lyme Disease, Emerging Infectious Diseases, 12(4), 653 – 660. Adj. for inflation 2006 - 13)

Chronic Illness is a Huge Cost Burden to Society

Chronic illness consumes **84% healthcare costs.** **

LD survey *

- 79% productivity loss (work, school)
- 25% on disability
- most reported improvement with retreatment.

Two NIH Human Studies

47% Lyme research patients had a duration of illness **>10 yrs**

*Lorrane Johnson,JD, MBA "LD: Financial Burden of Illness

**"Chronic Care:Making the Case For Ongoing Care 2010 Robert Wood Johnson Foundation

www.rwjf.org/pr/product.jsp?id=50968

1990-2015

CDC USA 1990-2015 Total Lyme cases*: - 568,519
CDC underreporting factor of 10 (2013) - 5,685,190

CDC: **10 to 20%** treated patients have **lingering symptoms**. Other sources claim: **up to 50%**

Controversy over diagnosis and treatment protocols - simple vs complex

Cost to US is staggering: healthcare, loss of productivity at work, unemployment, public disability systems, cost of schooling sick children at home by taxpayers. As these sick people lose their ability to function physically, intellectually, and emotionally these additional stresses, even lead to breakups of families.

While case numbers went **UP**, NIH funding for Lyme research did not

Disease	New cases (annual)	NIH funding
Hepatitis C 2012	1,300	\$112 million
West Nile Virus 2012	5,700	\$29 million
HIV/AIDS 2012	56,000	\$3 billion (11% total NIH budget)
Influenza 2012	73,000	\$251 million
Lyme disease 2012	312,000	\$25 million
Lyme disease 2013	363,070	\$20 million

“ We won’t make progress until these dynamics change and without tests to diagnose and monitor Lyme and other tick-borne diseases. I have some trouble understanding how we could rapidly mobilize scientists to develop tests for MERS (Middle East Respiratory Syndrome), SARS (Severe acute respiratory syndrome), and Ebola, but have made little progress on Lyme over decades. ”

Judy Stone, “Ticked Off – What we Don’t Know about Lyme Disease,” Forbes Magazine, June 2015

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***Lyme disease 2004 198,040 \$34.4 million**

How Can The
US Center for
Disease
Control and
Prevention
(CDC)

Do Anything
for
PREVENTION
of TBDs?

Disease	New Cases 2015	CDC funding 2016
Lyme Disease	380,690 (10 x 38,069) 2016 numbers not yet available	\$10 million

This does NOT include other Tick-borne diseases

Lack of Funding Results In

Competition rather than Cooperation among Scientists

Retirement without Replacement by Graduate Scientists

Loss of Training, Knowledge and Skills

Reduction of Discovery in Technologies

Reduction of Innovative High Potential Research

Tick Borne Diseases a Global Threat to USA

Deadly pathogens can be brought into the US

US Ticks are capable of hosting these pathogens

Resulting in Devastating economic and public health consequences

Tick Research to Eliminate Disease

The cause of Lyme and Tick-Borne Diseases is the TICKS and their reservoir animals in the environment.

In the past 41 years, Lyme disease alone has spread from the area surrounding Lyme, CT to at least 49% of all US counties!

Without addressing the TICK cause, the escalating voracious diseases caused by tick pathogens will continue increasing, spreading and infecting us and other animals!

Tick research which is the one field of science that holds the most promise in reducing TBDs has received the least funding and recognition.

Tick Research is required to reduce tick populations and/or block tick ability to transmit disease pathogens to us!

Ticks should be Safer and Easier than Mosquitoes to Control

Safety: smaller area to implement control.

Ticks exist mostly on the ground. climbing up to 3 ft height

Mosquitoes fly thus other beneficial flying insects such as bees may be affected

More opportunity over longer life cycle to implement control.

Ticks have 3 blood meals during a 2 year life cycle

Mosquito can bite multiple times during their short life cycle (5-40) days

Tick Research, like Mosquito Research should be a Governmental Priority because:

Lyme disease alone is the number one vector borne disease in the USA.

Some of the other Tickborne disease (TBD) are highly fatal.

Ticks and TBDs are increasing in number and spreading geographically.

REQUIREMENTS OF SUCCESSFUL TICK PREVENTION INTEGRATED PEST MANAGEMENT APPROACHES

Acceptance by Public

Low Cost

Ease of Maintenance

Safety

Self Propagating or Sustaining is Desirable

Use in Varied Environments

None of the currently available products have achieved these goals

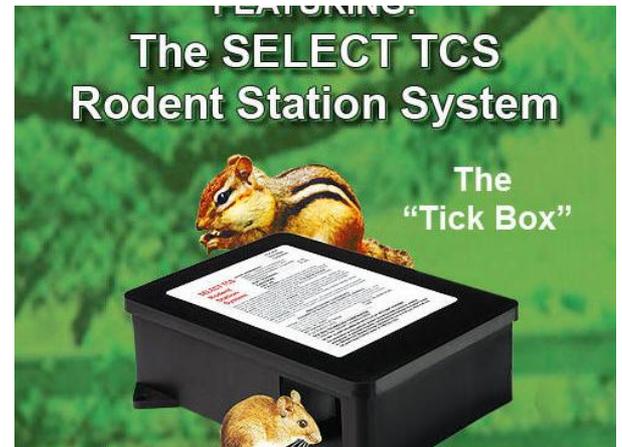
CURRENT TICK REDUCTION METHODS



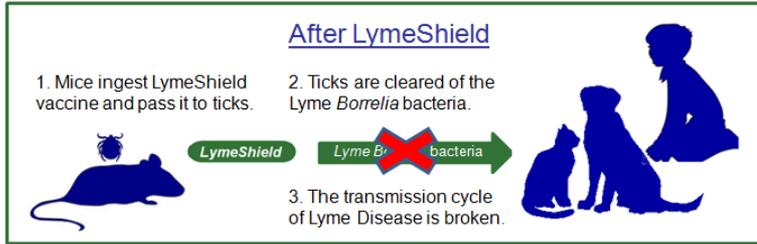
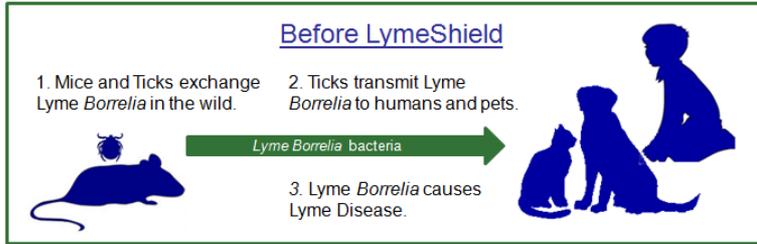
**Untreated vs Treated
reduce billions of ticks from hatching**



Low, controlled spray kills ticks

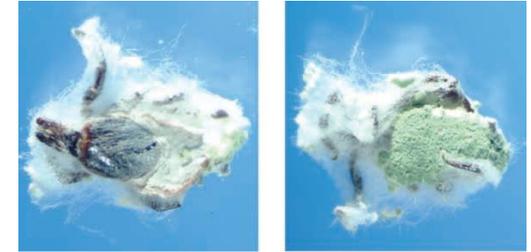


kills ticks on mice



Tick Bait Vaccine

A disease prevention platform that can address multiple diseases



Natural fungus kills ticks

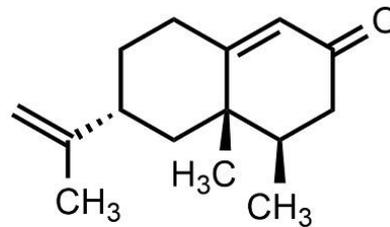


Cotton Balls to Nest Kills Ticks

CURRENT RESEARCH



Tick Bot



(+)-nootkatone

Grapefruit, Alaska Yellow Cedar



Cull Deer Herds

NOVEL APPROACHES

EXAMPLES:

Sex selection

Sterile eggs

Acaricide + pheromone => minuscule safe targeted acaricide

Vaccine to block pathogen transmission to reservoir animals and humans

Discover useful natural predators of ticks

????

BLOCK TRANSMISSION OF TICK BORNE DISEASES

The Most Promising Field of Science to Produce Solutions Ignored
Receives a Pittance in Funding – Time to Prioritize

Lack of Funding for Anti-tick vaccine

Ticks would not remain attached.

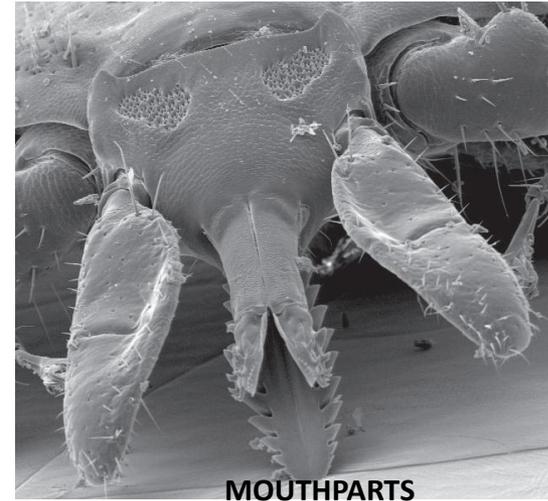
Prevent ticks ability to transmit all or almost all
disease organisms to humans and/or reservoir
animals.

Bio-warfare threat

Armed services also interested to protect
troops

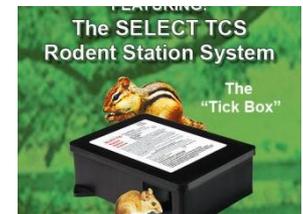
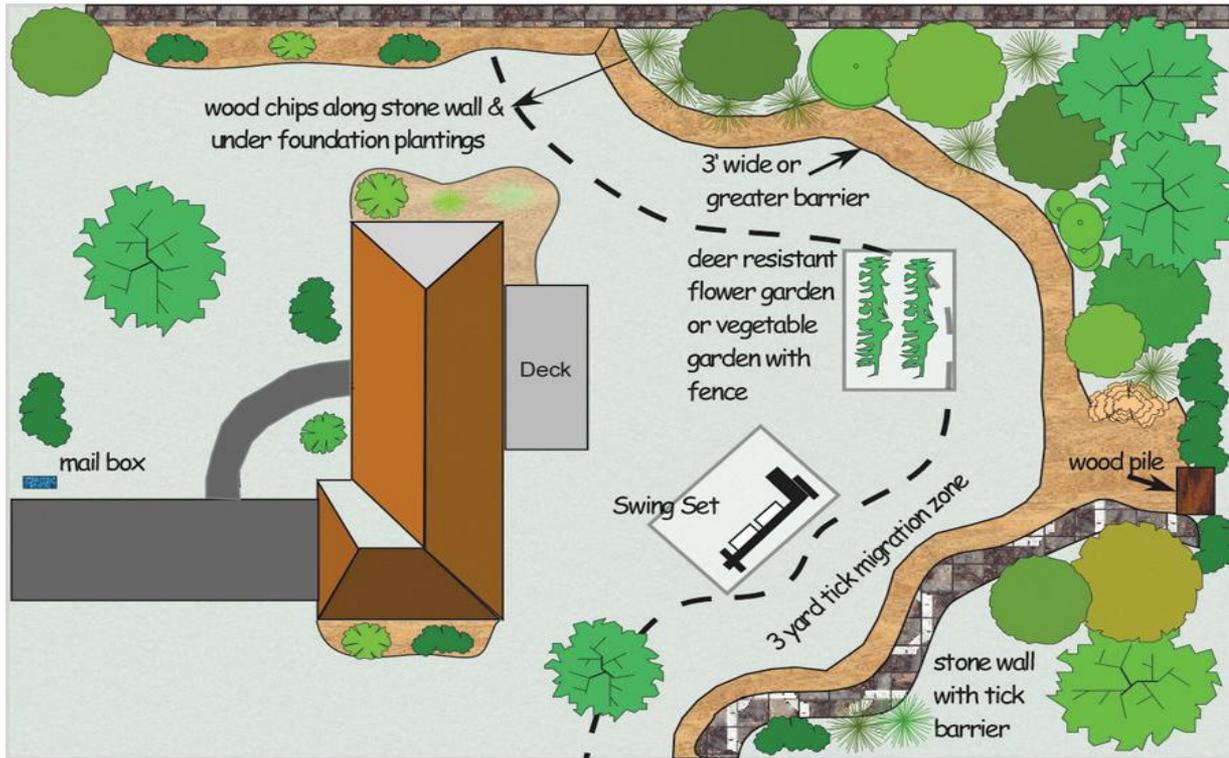
NIH discontinued funding, OUCH!

No common sense; penny wise, pound foolish!



FEMALE LAYS EGGS, LARVAE, NYMPH ADULTS: FEMALE & MALE

Protect Your Property



Recommended web sites
www.tickcounter.org/prevention

The Tick Management Handbook
<http://www.ct.gov/caes/lib/caes/documents/publications/bulletins/b1010.pdf>

Source: "Tick Management Handbook" by Kirby C Stafford III, PhD CT Agricultural Station

HR 34(114th) 21st Century Cures Act

Section 2062 Tick-borne Diseases

2062.

Tick-borne diseases

(a)

In general

The Secretary of Health and Human Services (referred to in this section as the Secretary) shall continue to conduct or support epidemiological, basic, translational, and clinical research related to vector-borne diseases, including tick-borne diseases...

(3)

Membership

The members of the working group shall represent a diversity of scientific disciplines and views and shall be composed of the following members:...

(v)

Other individuals whose expertise is determined by the Secretary to be beneficial to the functioning of the Working Group.

* Link at <https://www.govtrack.us/congress/bills/114/hr34/text>

TICK RESEARCH to ELIMINATE DISEASE: Coalition of Scientists TRED

TRED is Coalition of scientists who wish to bring attention to the ever increasing need for 'tick' research to develop methods to prevent tick-borne diseases (TBDs).

The passage of the "21st Century Cures Act, Section 2062: Tick-borne Disease" created a Workgroup. Researchers focusing on the ticks and tick transmission should be assigned to contribute perspectives as essential partners in this process.

The goal is to represent the critical science that begins with the pathogens carried by ticks, and work to educate our national policy-makers about the desperate need to end tick-borne diseases **at the tick**, before transmission to humans and animals occurs. The intention is to rally the support of our Congressional Representatives and other decision makers to increase funding for tick prevention research.

The need for tick research is dire. The scientists invited to join the coalition are experts in their fields!

What Are We Doing

Federal 21st Century Cures Act: Section 2062 Tick-Borne Diseases – LAW

Meetings and Presentations with US Senators and US Representatives

Tick Research to Eliminate Disease: Coalition of Scientists

Request HHS Secretary to Assign “Tick” Research Scientists to the Federal Workgroup, as defined in Section 2062

Increase Tick Research Requirements by Federal Agencies

Appropriation Requests for Federal Agencies dedicated to TBD & Tick Research

PROTECT, PREVENT, CURE

and

**STOP TICKS AND DISEASES
DEAD IN THEIR TRACKS!**

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