The Changing Ecology of TICKS and their Public Health Impact

Human Health-Climate Change Conference

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Top 3 human-biting tick species in the eastern U.S.A

Blacklegged (deer) tick
Lone star tick
American dog tick
Each dot represents a reported case in the county of residence

Blacklegged tick

Borrelia burgdorferi

Erythema migrans (EM)
“Warm weather and more people moving into tick habitats may contribute to the high number.”
Powassan virus - a flavivirus transmitted by Deer Tick

- Notifiable Arboviral disease
- Neuro-invasive, encephalitis
- First detected in Canada,
- Annual cases in NE & Midwest
- Rare, but 10% fatality rate
- Long-term sequelae in 50% survivors
- Will it shift to Virginia?
Ticks can be infected by more than 1 pathogen!

Co-infection

Ixodes scapularis

Q: Prevalence of co-infection in wild ticks?
Q: How does infection with Pathogen A & B influence transmission of each?

Anaplasma phagocytophilum
Babesia microti

Powassan virus
Borrelia spp.

Drag-sweeping as a field collection method

Male & (engorged) female Nymphal ticks at a Tennessee deer check station
TICKS ARE MOVING
TICK-BORNE DISEASE IS ON THE INCREASE

The rise of the blacklegged tick population, a main culprit of the spread of Lyme disease, can be correlated with climate change among a number of other factors. Pennsylvania has one of the highest Lyme disease incidence rates in the country, according to the CDC. Warmer weather and milder winters mean that ticks become active earlier and survive longer, allowing more time for the disease to spread.

Two new disease-carrying tick types arrive in Connecticut:
- Asian long-horned ticks are a non-native invasive species that turned up in New Jersey in 2017.
- A warming climate could be speeding the lone star tick north from its habitat in the southeastern US.

Ticks used to have spring and autumn peaks (so-called "rises") but in recent years, due to the changing climate, they have become active all summer too.

As the climate warms, it pushes the timing of tick nymphs and larvae forward, potentially changing the interactions they have with their hosts. “October is a key month because the difference between a cold fall and a warmer fall can have a profound effect on when the ticks interact with their hosts.”

Oregon State University
New invasive ticks to the USA

ASIAN LONGHORNED TICK
*Haemaphysalis longicornis*

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**Origin:** China, Korea

**Habitat:** Can be found in open fields! Grassy areas and meadows, nr woods

**Hosts:** Broad

**First detected:** 2017 NJ

**Infests livestock** - to point of anemia!

**Vector for livestock pathogens** - *Theileria*

Abroad it transmits **Powassan, SFTS** (severe fever with thrombocytopenia syndrome), **Anaplasma, Ehrlichia, Babesia** spp.

As yet, we don’t know **human threat**
Amblyomma maculatum
(Gulf coast tick)
Range expanding into the mid-Atlantic region

Habitat: Open mowed grassy habitat.

Vector for Spotted Fever Rickettsiosis
(Rickettsia parkeri – bacteria)
Escar-associated febrile illness

Survival & duration in each life stage is dependent on environmental factors – habitat, temperature and humidity

Seasonal Activity in South Atlantic
Peaks in June
Most LD transmission is from bite of a nymphal blacklegged tick
(Larvae aren’t infected; adults are easier to see and remove)

Be Aware of SEASONALITY:
- Know the Peak seasons for different ticks
- Peak seasons to expect different diseases
- Determine what life stages the tick are at
- Region variation – even within VA (has the patient travelled?/exposed locally?)

ADVICE:
- Dress appropriately (Long pants, permethrin-coated clothing for outdoor activities)
- Avoid long grass areas
- Shower & tick checks
- Body checks – self & pets
- Remove any ticks promptly and carefully

Expect ticks all year round