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## ESA Position Statement on Tick-Borne Diseases

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The Entomological Society of America (ESA) strongly supports building a national strategy<sup>i</sup> using **Integrated Tick Management (ITM)** to better control tick populations and reduce the rapidly escalating impacts of tick-borne diseases (TBD) on human and animal health. This commitment is critical to ensuring the health, economic security, and biosecurity of society while protecting the environment; we believe that modern entomological sciences form the basis for developing new technologies, concepts, and ITM applications for scientific investigators and practitioners, all needed to “solve the tick problem.”

World-wide, ticks transmit over 20 pathogens capable of causing significant disease in humans, domestic animals or wildlife. In North America, with an estimated 300,000+ reported human cases every year, Lyme disease, and co-infections transmitted by deer ticks, cause serious disease consequences<sup>ii</sup>. Direct medical costs for Lyme disease alone are estimated at \$0.7 - \$1.3 billion annually, and along with associated overall indirect costs, the public health burden just for Lyme disease may be 3 times higher<sup>iii</sup>. Recent discovery of 2 new tick-borne viruses (Heartland virus, Deer Tick virus) that are responsible for human deaths in multiple states illustrates how dynamic the TBD landscape is, and highlights the need for continual surveillance, education and prevention.

TBDs also threaten livestock, pets and wildlife. Many ticks and the known diseases they transmit are not present in the United States but are potentially invaders. Some are even considered high-consequence bioterrorism agents threatening livestock enterprises and food security<sup>iv-v</sup>. Currently, the annual savings to the livestock industry from excluding these ticks from the U.S. mainland greatly exceeds \$3 billion annually, and one potential disease alone (Heartwater) could cause losses exceeding \$760 million annually<sup>vi</sup> if it were to become established in indigenous tick populations. Industry sources indicate that pet pharma distributed over 120 million doses of flea and tick products in the U.S. during 2014 costing consumers over \$1.6 billion for prevention; expenditures for TBD-related veterinary visits and treatments are unknown but likely substantial, considering that 56% of U.S. households own pets (70 million dogs/74 million cats)<sup>vii</sup>.

The recent confluence of environmental, ecological, sociological, and human demographic factors has created a near “perfect storm” leading to **more ticks in more places** throughout North America. Research and outreach efforts should be aimed at relieving the escalating health and economic burdens caused by tick parasitism and TBD in North America. Achieving this goal will require significant investment in training and research support for the existing and future generation of tick scientists.

The more recent explosive emergence of the blacklegged tick vectors of Lyme disease and co-infecting disease agents like those causing babesiosis and anaplasmosis has caught society and science in a severe “tick literacy deficit” allowing TBDs to explode, threaten the nation’s public health and economy, and accordingly, is the cause for significant new calls to action.

ESA actively supports policies and investments that (i) strengthen tick research and research capabilities; (ii) foster education and training of professional entomologists as well as increased engagement of citizen-scientists; and (iii) encourage dynamic partnerships between universities, industry, and government at all levels. Specifically, we advocate for:

- ***Broad Spectrum Approaches*** which hold great promise for improving ITM<sup>viii</sup> and preventing multiple TBDs. These include development of tick protective vaccines, more effective repellents, attractants, and novel host-targeted and pheromone-assisted acaricides.
- ***Increased Ecological Surveillance and Systems Assessment.*** Temporal-spatial assessment of tick-host-landscape systems should be a priority, and include evaluations of TBD risk and ITM strategies at the local level, followed by actions to suppress tick encounter rates and prevent disease. ESA supports a sustained investment in passive and crowd-sourced tick surveys that are readily translatable to both policy-makers and the general public; additionally, more public resources are needed to prevent introduction of exotic ticks at ports of entry and to build risk mapping and habitat assessment tools capable of providing accurate determinations of entomological risk at multiple geographic scales.
- ***Education & Citizen Engagement.*** While effective tick control and tick-bite prevention strategies exist, surveys consistently indicate inadequate use by people at risk. ESA believes that systems are needed to deliver tailored messages that engage individuals. Improved science translation is a critical skill set for both current and next-generation tick researchers, and greatly expanding the funding for local- to national-scale crowd-sourced and civic-based outreach and extension holds great promise for increasing citizen engagement and empowerment.
- ***Creating and Promoting Markets for Tick Research Innovation.*** Translating tick-control technologies and promising new inventions into consumer products requires collaboration across government, industry and research universities. Joint programs that foster dynamic partnerships between federal government, university researchers, and industry are needed to move patents off the shelf and into the field. An example may be expansion of the current Small Business Innovative Research (SBIR) program to move beyond Phase 3 research and development funding to include a Phase 4 government purchasing phase.

ESA strongly encourages development of a national strategy that minimizes the impact of tick parasitism and better manages current and future TBD. Key elements in this strategy should include a national commitment to investments that:

- 1) ***Broadly expand basic knowledge of tick biology***--exceptional recent advances in a broad range of scientific arenas now provides the opportunity for a much deeper understanding of ticks and tick/host relationships, the microbial agents they transmit, and expectations for discovery of novel approaches for tick suppression, ITM strategies, and diminished risk of tick-borne pathogen exposure;
- 2) ***Greatly enhance ecological surveillance***--knowing where ticks are at local and regional scales can serve to engage citizens leading to tick prevention actions as well

as enable policy makers to efficiently allocate scarce public resources for tick and disease mitigation including external threats;

- 3) **Promote citizen engagement and education**--with a focus especially on increasing the personal relevance of prevention messages leading to a broad-based health education strategy of minimizing tick encounters;
- 4) **Train the next generation scientists and specialists** at the undergraduate, M.S. and Ph.D. levels to increase capacity and ensure continuity of tick expertise for public protection from ticks in the future;
- 5) **Encourage commercializing and marketing of promising discoveries** from tick and TBD science. ESA strongly encourages development of government-industry-university partnerships structured to provide financial incentive for businesses to invest their capital in advanced product development, licensing and marketing of products that will be profitable for industry as well as protect public and animal health; and
- 6) **Seek greater investment in US-International partnerships** to deal with high priority accidental and intentional tick-disease introductions.

## References:

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<sup>i</sup> Wahlberg P, D Nyman. 2001. **Vector-borne Zoonotic Disease** 1:251-252.

<sup>ii</sup> Anonymous (2015) National Center for Disease Control and Prevention (NCDC). <http://www.cdc.gov/lyme/stats/humancases.html>.

<sup>iii</sup> Adrion ER, J Aucott, KW Lemke, JP Weiner. 2015. **PLoS One**. 10:e0116767. Epub 2015/02/05. doi: 10.1371/journal.pone.0116767.

<sup>iv</sup> Perez de Leon, A.A., P.D. Teel, A. Li, L. Ponnusamy, and M. Roe. 2014. **Outlooks on Pest Management**. DOI: 10.1564/v25\_dec\_00

<sup>v</sup> Estrada-Pena A, M Salman. 2013. **Agriculture** 3: 221-235.

<sup>vi</sup> S. Molia et al. **Veterinary Parasitology** 153 (2008) 338–346

<sup>vii</sup> American Veterinary Medical Assoc. 2012. **U.S. Pet Ownership & Demographics Sourcebook**. 186 pg.

<sup>viii</sup> Allen SA, DE Sonenshine, MJ Burrige. 2001. *Beauveria bassiana fungal biocontrol agent that kills ticks and a chemical from tick excreta which attract ticks*. **US Patent** 6331297 B1.