

Southern Region Conference to Assess Needs in IPM to Reduce the Incidence of Tick-Borne Diseases

Pathogen Biology and Ecology Focus Area

**Kevin Macaluso, Chris Paddock, Michael Yabsley,
Ed Breitschwerdt, Kerry Clark, Greg Dasch,
Barbara Johnson, Susan Little, Doug Norris,
Al Richards, and Ellen Stromdahl**

100µm
└──────────┘

Resources to archive and provide fastidious organisms for research

- Difficulties with ATCC and needs to submit cultures to out of country collections for novel organisms
- Many organisms are difficult to grow in routine cell lines
- Need access to low passage cultures
- Isolation techniques – need for better techniques, maintenance in the lab, and ability to determine pathogenicity.

Elevate tick-borne diseases to appropriate level with existing resources

- Best research through collaboration to develop interdisciplinary projects involving entomologists, microbiologists, medical folks, pathologists, etc.
 - even scientists from other disciplines (virologists, malariologists, etc.) to broaden thought process
- Present at broad audiences –
 - Medical/pediatric conferences, veterinary groups, ecology, etc.

Elevate tick-borne diseases to appropriate level

- Recognition of large number of tick-borne infections compared with mosquito-borne
- Need more integrated medical entomology-pathogen-ecology training programs and opportunities
- Begin transition of the many mosquito-abatement programs to more holistic arthropod- or vector- control programs, modeling on western state control programs

Elevate tick-borne diseases to appropriate level

- Recognition that tick-borne disease research often now requires an ecologic approach
 - RECOMMENDATION: ensure a certain % of grants to more ecological-based, field-based, transmission-based studies
- Need to broaden review sections to “balance” the reviews
 - E.g., grants involving suites of pathogens that include *Borrelia*, *Babesia*, and *Anaplasma* don't fit anywhere “best”
 - RECOMMENDATION: ensure wide-range of experts including all disciplines on each review committee

Role of tick- (arthropod-) borne in chronic diseases

- Recognition that several diseases cause chronic diseases
 - *Rickettsia*, *Bartonella*, etc.?
- Partner with advocacy groups to elicit interest and funding?
- Difficulty – etiologic agent may be gone way before development of clinical disease

Access to well-characterized clinical samples

- Discussed realities of why this is difficult

Standard methods of detection/characterization/survey

- Difficult to compare surveys/studies across the board due to different techniques, etc.
 - Was recommended to validate methods used against a set of controls to ensure at least minimal sensitivity and specificity across field
 - Was recognized that adopting a standard protocol would hinder creativity/development and was not possible due to limitations of equipment, etc.

Standard methods of detection/characterization/survey

- Variable antigen use
- Multiple different gene targets with variable sensitivity and specificity used
- RECOMMENDATION: Need multiple lines of evidence
 - Culture (as gold standard when possible)
 - Share samples to independent labs to confirm
 - Use animal models to supplement DNA-based results
 - Serology
 - Immunohistochemistry/IHC
 - Sequencing of multiple gene targets

Understand and attempt to understand regional differences

- Just b/c we “know” what the ecology of organism X is in NC doesn't mean we understand the transmission/hosts/vectors, etc in FL
 - Differences in initial activity, peak activity, period of activity
 - Differences in endosymbionts that may alter ecology of organism X
 - Host effects, different potential reservoirs or dilution hosts in different regions
- **RECOMMENDATION:** Encourage research of the complex organisms in many regions to better understand general ecology

Regulation

- Need to have a more rational approach based to containment issues related to these organisms
 - Based on biological sense when working with some of these species
- Work with rickettsiologists and other experts with appropriate experience to change BMBL5 recommendations for some species that aren't pathogen or might be of low virulence
- Current regs (although only recommendations) have led to difficulties in working with agents that aren't necessarily BSL-3 (e.g., *Ehrlichia*) or not all *Rickettsia* should be considered BSL-3
- RECOMMENDATION: develop more rational guidelines for working with these agents

Research needs

- “clean” arthropods
- Understand role of coinfections (in arthropods and mammalian hosts)
 - In disease process
 - In exclusion of one over other
 - Also in general, better understanding of general flora of arthropods
- Determine why and effects of rapid LST expansion
 - Displacement?

Research Needs

- Bartonellosis: the hidden epidemic?
- Role of variable strains of *Rickettsia* and other organisms in causing clinical disease (or not)?
- Culture isolation of currently recognized zoonoses as well as suspected ones to enable better studies

