



**Wildlife Health
Australia**

24 March 2016

The Senate Community Affairs References Committee for inquiry into the growing evidence of an emerging tick-borne disease that causes a Lyme-like illness for many Australian patients

Dear Senate Committee,

Please find attached a submission from Wildlife Health Australia (WHA) to the Senate Community Affairs References Committee inquiry into the growing evidence of an emerging tick-borne disease that causes a Lyme-like illness for many Australian patients.

Zoonotic diseases are of significant importance globally and many emerging infectious diseases have wildlife involved in their epidemiology. In order to protect human and animal health (including wildlife health) and to ensure positive outcomes for biodiversity, tourism and trade, ongoing efforts should be made to better understand wildlife disease in the Australian context and to improve our understanding of the complex interactions between wildlife, domestic animal and human health. Lyme-like disease in humans and *Borrelia* spp. in Australian wildlife are examples of such diseases.

As the peak body for wildlife health in Australia, WHA:

- supports the need for evidence-based information on vector-borne diseases in Australia causing Lyme-like illness in humans.
- strongly supports the need for ongoing targeted funding to advance our knowledge of tick (and other vector) ecology and potential vector-borne pathogens in Australia, including Lyme-like disease syndrome in humans.
- recommends that funding resources be made available to enable researchers in Australia to develop an understanding (using molecular, epidemiological, phylogenetic and evolutionary biology knowledge) of which groups of pathogens are likely to: a) be present in Australia and; b) are likely to result in the reported human disease syndromes.
- supports the statement that *“all research carried out in the search for evidence of organisms that may be associated with Lyme-like symptoms, must agree to (a) sharing of specimens that are believed to show a positive test result, whether the specimens are clinical material such as serum or whether they are ticks”*.

We suggest that a national agency or organisation be nominated to coordinate and collate this information, in as close to real-time as possible. Sustained direction and focus will be required.

Wildlife are likely to be involved in the epidemiology of any pathogens causing Lyme-like disease in Australia. WHA is willing to assist, as the need arises, in locating key wildlife health, ecology and conservation experts to assist with focused research and investigation.

We hope that this submission is of assistance. Wildlife Health Australia would be happy to discuss it further should you require additional information or clarification.

Yours sincerely,

Rupert Woods

Chief Executive Officer

Wildlife Health Australia

Wildlife Health Australia (WHA) submission

The Senate Community Affairs References Committee for inquiry into the growing evidence of an emerging tick-borne disease that causes a Lyme-like illness for many Australian patients

Background

- Globally, ticks are known to carry many microorganisms (referred to as their microbiome).
- Other regions of the world have developed, through focused research, a well-founded and detailed understanding of both the microbiome of their tick species and of the zoonotic tick-borne pathogens in their region.
- In these regions, specific diagnostic tests (e.g. a range of serological and molecular tests) have been developed and validated for the investigation and detection of zoonotic tick-borne diseases in humans.
- Australia is both geographically and ecologically isolated from other regions of the world and this is reflected in an evolutionary isolation (the extended period of time since the Australian continent and its endemic biota have been geographically separated from other continents). As a result, many of the flora and fauna found in Australia are not found in any other regions of the world (i.e. these species are endemic to Australia).
- All native Australian ticks are endemic and recent studies have shown that at least some of the bacteria found in Australian ticks are new to science and are probably also endemic, reflecting Australia's evolutionary isolation (Gofton *et al.* 2015b).
- Any (including those yet to be described by science) tick-borne pathogens within Australia (including those causing disease in either animals and/or humans), are also almost certainly endemic to Australia and are unlikely to be found in any other regions of the world.

The situation in Australia

- **Australian ticks appear to carry large numbers of microorganisms** and recent important research has revealed the presence of novel bacteria in Australian ticks, including bacteria in the same genus (*Borrelia*) as that causing Lyme disease (Gofton *et al.* 2015a; Gofton *et al.* 2015b).
- However, (and despite increased knowledge about bacteria in Australian ticks over the past few years), **there remains currently little knowledge on bacteria; very limited information on protozoa; and virtually no information at all about viruses in Australian ticks.**
- In Australia there is also **limited understanding** of Australian tick ecology; the natural vertebrate hosts of Australian ticks; the microbiome of Australian ticks; the potential

vertebrate hosts of any microbes found in Australian ticks and the **potential of these microbes to cause disease** in humans or animals in the Australian context.

Our assessment:

- Because of its isolation, it is **unlikely that tick-borne pathogens and related disease syndromes found in other areas of the world will be replicated in Australia**. Therefore, **Australia cannot reliably extrapolate from the knowledge and understanding developed in other regions of the world** relating to tick-borne zoonotic diseases in general, and Lyme disease in particular.
- It is **highly likely that any tick-borne pathogens**, including those with the potential to cause disease in humans, or any pathogens causing a “Lyme-like” syndrome in humans in Australia, **will be unique to our continent**.
- It is also likely that **native wildlife species may prove to be the reservoir host for any zoonotic tick-borne Australian disease**. Tick-borne pathogens carried and transmitted by Australian ticks are highly likely to have one or more wildlife species as reservoir hosts.
- Although WHA does not hold expertise in the area of human health *per se*, it is reasonable to assume that **the potential exists within the Australian environment for one or more pathogens that may contribute to a “Lyme-like” syndrome in humans**. Arguably, Lyme-like syndrome in Australian humans may be caused by a variety of different infectious agents, only some of which may be transmitted by ticks.
- It is highly likely that **current diagnostic and investigative techniques will not detect potentially novel species or strains of pathogens present in Australia** that may be responsible for Lyme-like disease in humans.
- It is likely that these novel pathogens (perhaps in the *Borrelia* genus, but probably not within the *Borrelia burgdorferi* group) will also **have different vectors and reservoirs hosts to those identified for Lyme disease in the northern hemisphere**. For example, when a novel species of *Leishmania* was identified in northern Australia, it was subsequently confirmed that, in contrast to the transmission in all other parts of the world of *Leishmania* spp. by sandflies, in Australia the vector was found to be a midge (Dougall *et al.* 2011).

What needs to occur?

- It is of high importance and priority that further work is undertaken to greatly improve the scientific knowledge on Australian tick ecology, the natural hosts of Australian ticks, the potential microbial pathogens carried and transmitted by Australian ticks, the natural and opportunistic wildlife hosts of any potential microbial pathogens and the potential of any identified pathogens to cause disease in humans, domestic animals and wildlife.
- A detailed understanding of the role and specifics of how Australian wildlife are involved in pathogen transmission will be a vital component of any efforts to better understand Lyme-like disease syndromes in Australia.

- **It will be prudent to extend investigations to include other potential pathogens transmitted by non-tick vectors.**
- Any investigations undertaken into the causal factors of Lyme-like disease in Australia should draw on current and developing understanding (using molecular, epidemiological, phylogenetic and evolutionary biology knowledge) of which groups of pathogens are likely to: a) be present in Australia and b) likely to result in the reported human disease syndromes.
- It will be important to ensure appropriate consultation with Australian vector ecologists, conservation biologists and vertebrate ecologists as well as wildlife veterinarians in the continuing efforts to understand the aetiology of Lyme-like disease in humans in Australia.
- **Identifying novel or existing vector-borne microorganisms is only the first step** in gaining an understanding of which agents may be responsible for Lyme-like disease (or other syndromes) in the Australian context. A detailed understanding of the role of these pathogens in disease will require **extensive and detailed research and epidemiological studies**. Research efforts will need to be extended to include the potential role of these pathogens in disease syndromes in domestic animals and wildlife, and which factors may influence the maintenance, transmission and geographic spread of these agents in the Australian situation.
- We recognise the considerable amount of information that was previously collated to inform the Scoping Study undertaken by the Clinical Advisory Committee on Lyme disease in 2014, to develop research projects to investigate the presence or absence of Lyme disease in Australia. The Scoping Study clearly highlighted the complexity of this topic both within Australia and globally, hence the challenges which lie ahead for any research undertaken.
- **A solution will require sustained direction and focus over a prolonged period. A significant factor in determining success will be the coordination of effort, including a multidisciplinary and cross-sectorial approach and national leadership. Effective and proactive communication will be vital to untangling pre-conceptions and ensuring key stakeholders are kept informed as new information arises. The magnitude of the task should not be underestimated.**

How can WHA help?

- We maintain a fact sheet “Lyme-like disease and *Borrelia* species in Australia” (available electronically via our website www.wildlifehealthaustralia.com.au/FactSheets.aspx), which summarises current knowledge, with a focus on the potential role of Australian wildlife. We would be happy to keep this updated as new information arises.
- Because wildlife is likely to be involved in the epidemiology of tick-borne diseases in the Australian context, WHA is willing to assist, as the need arises, in locating key wildlife health, ecology and conservation experts.
- WHA also works with a network of more than 600 wildlife health professionals and others from around Australia and the rest of the world who have an interest in diseases with wildlife as part of their ecology, which will allow WHA to effectively assist with

location and engagement of experts both nationally and globally (please see our website www.wildlifehealthaustralia.com.au/AboutUs.aspx)

References

Dougall, AM, Alexander, B, Holt, DC, Harris, T, Sultan, AH, Bates, PA, Rose, K, Walton, SF (2011) Evidence incriminating midges (Diptera: Ceratopogonidae) as potential vectors of Leishmania in Australia. *International Journal for Parasitology* **41**, 571-579.

Gofton, AW, Doggett, S, Ratchford, A, Oskam, CL, Paparini, A, Ryan, U, Irwin, P (2015a) Bacterial profiling reveals novel "Ca. Neoehrlichia", Ehrlichia, and Anaplasma species in Australian human-biting ticks. *PloS ONE* **10**, e0145449.

Gofton, AW, Oskam, CL, Lo, N, Beninati, T, Wei, H, McCarl, V, Murray, DC, Paparini, A, Greay, TL, Holmes, AJ, Bunce, M, Ryan, U, Irwin, PJ (2015b) Inhibition of the endosymbiont "Candidatus Midichloria mitochondrii" during 16S rRNA gene profiling reveals potential pathogens in Ixodes ticks from Australia. *Parasites and Vectors* **8**, 1-11.

ABOUT WILDLIFE HEALTH AUSTRALIA

Wildlife Health Australia (WHA) is the peak body for wildlife health in Australia and operates nationally. The head office is located in Sydney, NSW. WHA activities focus on the increasing risk of emergency and emerging diseases that can spill over from wild animals and impact on Australia's biodiversity, trade, human health and tourism. We provide a framework that allows Australia to better identify, assess, articulate and manage these risks. As part of this process we also provide the framework for Australia's general wildlife health surveillance system.

WHA's vision is for "One Health", a concept that means different things to different people. For us, it is the recognition that human, domestic animal and wildlife biosecurity are strongly interlinked with each other and the environment. It also recognises that the best biosecurity outcomes will result from strong collaboration and communication between workers in these fields. WHA activities are underpinned by this principle and we actively foster interdisciplinary work on wild animal health.

Our mission is to develop strong partnerships in order to better manage the adverse effects of wildlife diseases on Australia's animal health industries, biodiversity, human health, trade and tourism.

WHA directly supports the Animal Health Committee (AHC), Animal Health Australia (AHA), the Animal Health Policy Branch and the Office of the Chief Veterinary Officer (OCVO) within the Australian Government Department of Agriculture and Water Resources (DAWR), and state and territory governments in their efforts to better prepare and protect Australia against the adverse effects of wildlife diseases. We provide priorities in wildlife disease work and administer Australia's general wildlife disease surveillance system as well as facilitating and coordinating targeted projects. Wildlife health intelligence collected through the National Wildlife Health Information System (eWHIS: www.wildlifehealthaustralia.com.au) and administered by WHA is provided to members of AHC and DAWR, and the Departments of Health (DoH) and Environment (DoE), on issues of potential national interest, potential emerging issues and significant disease outbreaks in wildlife. The information is provided in line with the agreed policy for data security.

WHA is administered under corporate governance principles. A management group, chaired by an appointment from DAWR provides strategic direction and advice to a small team, which oversees the running of WHA. It is important to note that WHA involves almost every agency or organisation (both government and NGO) that has a stake or interest in animal and wildlife health issues in Australia. In addition, WHA also comprises more than 600 wildlife health professionals and others from around Australia and the rest of the world who have an interest in diseases with feral animals or wildlife as part of their ecology that may impact on Australia's biodiversity, trade, animal and human health and tourism.



Find out more at www.wildlifehealthaustralia.com.au
email admin@wildlifehealthaustralia.com.au
or call +61 2 9960 6333