

C5: Tick-borne pathogens detection in Caribbean ticks using high-throughput microfluidic real-time PCR (DOMOTICK Project)

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Among hematophagous arthropods, ticks transmit the greater variety of pathogens of public health and veterinary importance whose (re)-emergence is recognized worldwide. Whereas the main human and animal tick-borne pathogens are well characterised in the Northern hemisphere, very few is known concerning the diversity of tick species and tick-borne pathogens circulating within the Neotropical zone of the Americas, especially concerning the Caribbean area. Most of the epidemiological data on the topic are based on old records and focused on the main livestock pathogens such as Ehrlichia ruminantium, Babesia (bovis and bigemina) and Anaplasma marginale. These observations underline the need to develop high throughput diagnosis methods that will allow us to conduct large scale epidemiological surveys required to better anticipate the risk of (re)-emergence of tick-borne disease in such areas. In this context, the DOMOTICK project was designed to develop a new high-throughput real-time PCR method for a large scale screening of tick-borne pathogens potentially circulating in the Caribbean. This technology is based on high-throughput microfluidic real-time PCRs using Taqman probes (BioMark™ dynamic arrays, Fluidigm Corporation), allowing the simultaneous detection of up to 95 pathogens across 95 samples of ticks (Michelet *et al*, 2014). The choice of pathogens included in this new high-throughput technology was based on a comprehensive analysis of the literature, and on a without a priori detection of new or unsuspected pathogens by RNA-sequencing on nucleic acids extracted from ticks collected in Guadeloupe and Martinique. NGS analysis suggests that these ticks may harbour more pathogenic microorganisms than the currently monitored in the Caribbean, such as Rickettsia and Borrelia species of public health importance. Up to now, 40 bacterial species have been listed, including the genera Anaplasma, Ehrlichia, Bartonella, Borrelia, Rickettsia, Mycoplasma, Francisella, Coxiella, Aegyptianella ; 14 parasites species, belonging to the genera Babesia, Theileria, Hepatozoon, Leishmania, Rangelia vitalii, Cytauxzoon felis ; and 32 arboviruses mainly belonging to viral genus of Orthobunyavirus, Phlebovirus, Nairovirus, Asfivirus, Thogotovirus, Flavivirus, Coltivirus and Orbivirus. The high-throughput real-time PCR technology developed here have been validated on tick samples collected in Guadeloupe and Martinique. Finally, this new high throughput method will allow exploratory epidemiological studies on tick-borne pathogens circulating within Caribbean ticks collected on various vertebrate hosts through some Caribbean islands, such as Trinidad and Tobago, St Kitts, Barbados, St Lucia, and Cuba, thanks to the CaribVet network, and to local veterinarians.

References

Michelet L, Delannoy S, Devillers E et al. High-throughput screening of tick-borne pathogens in Europe. Front. Cell. Infect. Microbiol. 4, 103 (2014).