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Serological evidence of *Midichloria mitochondrii* circulation in humans parasitized by *I. ricinus* in Germany and development of a marker for tick bite

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Abstract

The tick *Ixodes ricinus* transmits several microorganisms of medical and veterinary importance. *Midichloria mitochondrii* (order Rickettsiales; family Midichloriaceae) is an intracellular symbiont present in the ovaries and salivary glands of 100% of adult *I. ricinus* females (Sassera *et al*., 2008) and is transmitted to the vertebrate host during the tick bite (Mariconti *et al*., 2012; Bazzocchi *et al*., 2013) despite its infective role is not demonstrated.

In this experimental study, a total of 324 human from different areas of Germany were analysed in order to investigate the seropositivity against the flagellar FliD protein of *M. mitochondrii* using an ELISA approach. Fifty sera were collected from patients living in non-endemic areas and used as negative controls while 274 sera were obtained from subjects exposed to tick bite and suffering from several symptoms referred to tick borne diseases and collected at the BCA clinic in Augsburg.

Since the positivity for the spirochete *Borrelia burgdorferi* transmitted by *I. ricinus* is indicative for the tick bite, we considered also this additional information.

The obtained results showed that 82 out of 274 sera were positive to *M. mitochondrii* and 42 out of 175 sera of subjects negative to *B. burgdorferi* were positive to *M. mitochondrii* to confirm the good property of FliD protein as a tick bite marker. However, the high number (133 out of 274) of subjects parasitized by *I. ricinus* but negative to both bacteria prompted us to detect new more suitable *I. ricinus*/*M. mitochondrii* antigenic proteins to use as markers for tick bite.

The next step to this purpose will be the setting up of a new ELISA test for investigating the exposure of humans and animals to this tick species by using 12 synthetic peptides obtained from three *I. ricinus* proteins and one surface protein of *M. mitochondrii*.

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