

The application of immunodiagnostic methods in the detection of infection markers of selected tick-borne diseases in human with immunodeficiency virus type 1 (HIV-1) infection

Agnieszka Pawełczyk[1], Małgorzata Bednarska[2], Marek Radkowski[1], Justyna Kowalska[3], Renata Welc-Falęciak[2]

1 Department of Immunopathology of Infectious and Parasitic Diseases, Medical University of Warsaw, Pawińskiego 3c, 02-106 Warsaw, Poland; 2 Department of Parasitology Faculty of Biology University of Warsaw, Miecznikowa 1, 02-096 Warsaw, Poland; 3 Department for Adult's Infectious Diseases, Medical University of Warsaw, Wolska 37, 01-201 Warsaw, Poland

An increased number of ticks, their high activity observed in natural and urban areas increases the risk of tick-borne infections, including co-infections with different pathogen groups (viruses, bacteria, parasites) in people, especially in immunocompromised subjects (including HIV-infected). Dysfunctions of the immune system caused by the decreased T CD4+ lymphocyte count have a significant effect on the increased risk of infections caused by pathogens the multiplication and pathogenicity of which is normally controlled by the humoral and cellular immune response.

Serological testing is generally recommended for the detection of tick-borne diseases and frequently used in screening tests. Seronegative infections, lower positive predictive values of the tests in HIV-positive subjects, possible false negatives resulting from dysfunctions of the immune system and false positives which may be related to co-infection all hinder serological diagnostics.

The purpose of this paper is to determine the prevalence of serological and molecular markers of infections with tick-borne pathogens (*Borrelia burgdorferi*, *Babesia* sp., *Anaplasma phagocytophilum*, *Ehrlichia* sp., *Bartonella henselae*) in HIV-positive subjects.

The studied material consisted of blood serum samples collected from 227 HIV-positive subjects and from 199 blood donors (control group). ELISA (for *B. burgdorferi*) and indirect immunofluorescence assay (IFA) (for *Babesia* sp., *A. phagocytophilum*, *Ehrlichia* sp. and *B. henselae*) were used to detect IgM and IgG antibodies.

The prevalence of IgM and IgG antibodies in the blood serum of HIV-positive subjects was as follows: 29% (IgM) and 3.3% (IgG) for *B. burgdorferi*, 9% (IgM) and 0% (IgG – 0%) for *Babesia microti*, 3.3% (IgM) and 1.3% (IgG) for *Anaplasma phagocytophilum*, 2.6% (IgM) and 2% (IgG), and 6.6% (IgM) and 1.3% (IgG) for *Bartonella* sp. Anti-*B. burgdorferi* s. l. IgM antibodies were detected significantly more frequently ($p < 0.0001$) in the blood serum samples collected from HIV-positive subjects compared to the control group (9%). Similar correlations were observed for anti-*Babesia* sp. IgM antibodies with the antibody prevalence of 1% in the control group. There were no statistically significant differences between the two groups for the remaining pathogens. The

seroprevalence of tick-borne infections, including mixed infections, is significantly higher in HIV-positive subjects (3.1%) compared to the healthy population (1.5%). Coinfections with *B. microti* / *B. burgdorferi*, *B. henselae* / *A. phagocytophilum* and *B. henselae* / *E. chaffeensis* were detected more frequently in the studied group compared to the control group. False positive or uncertain results were found in 30% of HIV-positive subjects, in particular for *B. burgdorferi* IgM antibodies. Additionally, artefacts were observed more frequently in IFA (20% of samples collected from HIV-positive subjects and 11% for blood donors).

The study led to the conclusion that the diagnosis of infections with the respective species of pathogens causing tick-borne diseases should involve the detection of diverse infection markers. It appears reasonable for molecular techniques to assist immunodiagnostic techniques.