Evaluation of serum levels of nitric oxide and its biomarkers in patients with Lyme borreliosis

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ABSTRACT

Purpose: In response to penetration by the spirochete *Borrelia burgdorferi*, neutrophils trigger the mechanisms of intracellular killing, including the generation of reactive oxygen and nitrogen species, e.g. superoxide anion radical and nitric oxide (NO). Overproduction of these reactive molecules leads to oxidative stress which contributes to lipid peroxidation and protein nitration. The major products of these processes include malonyldialdehyde (MDA) and nitrotyrosine, the biomarkers of NO action in the *in vivo* conditions. The study objective was to assess the serum levels of total nitric oxide and its biomarkers in patients with Lyme borreliosis before treatment, and to elucidate the relationship between these parameters.

Materials and Methods: Clinical types of the disease were considered: early (Erythema migrans - EM) and late (Lyme arthritis - LA). The serum level of total NO was determined by using Griess' reaction, MDA was measured by spectrophometry according to Buege and Aust, whereas nitrotyrosine by the immunoenzymatic ELISA method.

Results: The study revealed significantly higher serum levels of NO, MDA and nitrotyrosine in the two study groups of patients as compared to healthy people. The analysis of the results with respect to various types of borreliosis showed significantly higher levels of malonyldialdehyde in patients with EM as compared to those with LA. Moreover, a correlation was noted between the serum levels of total NO and nitrotyrosine in the early and late type of borreliosis.

Conclusions: High serum levels of total NO, MDA and nitrotyrosine observed in patients with Lyme borreliosis indicate on enhancement of lipid peroxidation and protein nitration, which in consequence may enhance the inflammatory process in patients with Lyme borreliosis.

Key words: Nitric oxide (NO), malonyldialdehyde (MDA), nitrotyrosine, Lyme borreliosis