Artificial-infection protocols allow immunodetection of novel Borrelia burgdorferi antigens suitable as vaccine candidates against Lyme disease.

Abstract:
Vaccination with recombinant outer surface protein A (OspA) from Borrelia burgdorferi provides excellent antibody-mediated protection against challenge with the pathogen in animal models and in humans. However, the bactericidal antibodies are ineffective in the reservoir host, since OspA is expressed by spirochetes only in the vector, but rarely, if at all, in mammals. Using an artificially generated immune serum (anti-10(8) spirochetes) with high protective potential for prophylactic and therapeutic treatment, we have now isolated from an expression library of B. burgdorferi (strain ZS7) three novel genes, zs7.a36, zs7.a66 and zs7.a68. All three genes are located, together with ospA/B, on the linear plasmid lp54, and are expressed in vitro and in ticks. At least temporarily two of them, ZS7.A36 and ZS7.A66, are also expressed during infection. The respective natural antigens are poorly immunogenic in infected normal mice but elicited antibodies in Lyme disease patients. We show that recombinant preparations of ZS7.A36, ZS7.A66 and ZS7.A68 induce functional antibodies in rabbits capable of protecting immunodeficient mice against subsequent experimental infection. These findings suggest that all three recombinant antigens represent potential candidates for a "second generation" vaccine to prevent and/or cure Lyme disease.