DEVELOPMENT OF AN OspC VACCINE AGAINST LYME BORRELIOSIS

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ABSTRACT

Outer-surface protein C (OspC) is a plasmid-encoded lipoprotein and protective antigen produced by Lyme disease *Borrelia* species. OspC is potentially valuable as a vaccine component, but due to the high degree of antigenic heterogeneity of OspC, an OspC-based vaccine has to contain several antigenic forms of OspC. The production of a multivalent OspC vaccine using antigen expressed in *Borrelia burgdorferi* sensu lato is associated with many technical and economical disadvantages. Consequently, we have chosen to produce OspC in *Pichia pastoris* and to assess the ability of this recombinant OspC to induce antibody production and protective immunity. Mice were immunized with recombinant OspC combined with $Al(OH)_3$ and the antibody (IgG) response to OspC and the resistance of the immunized mice to infection with virulent *Borrelia afzelii* were evaluated. OspC produced in *Pichia pastoris* is highly immunogenic and protective when adsorbed to $Al(OH)_3$, an adjuvant that is acceptable for use in humans. Recombinant OspC derived from *Pichia pastoris* can be prepared in a form that is suitable for use in an OspC-based vaccine against Lyme Borreliosis.

KEY WORDS

Lyme Borreliosis, Borrelia, vaccine, OspC, Pichia pastoris

INTRODUCTION

A killed, whole-cell vaccine has been licensed for the prevention of Lyme Borreliosis (LB) in dogs (1). However, it is unlikely that a vaccine of this type will be developed for human use because of concerns about possible adverse reactions associated with certain antigens present in a whole-cell vaccine. To produce a safe and effective vaccine against LB for human use, the risk of potential side effects can be minimized by developing vaccines that contain only those components that are required for protection. Most attention has been focused on the development of sub-unit vaccines comprising purified *Borrelia* antigens produced using recombinant DNA technology. However, the expression of *Borrelia* antigens in the attenuated *Mycobacterium bovis* strain Bacille Calmette-Guerin (BCG) is another approach that is being pursued (2).

Two antigens of particular interest for use in candidate LB vaccines are the outer-surface proteins OspA and OspC. Both OspA (3,4) and OspC (5,6) are protective antigens in animal models of LB. In addition, both antigens are cell-surface exposed