Pre-exposure prophylaxis with OspA-specific human monoclonal antibodies protects mice against tick transmission of Lyme disease spirochetes

Yang Wang
University of Massachusetts Medical School

Let us know how access to this document benefits you.
Follow this and additional works at: https://escholarship.umassmed.edu/cts_retreat

Part of the Bacterial Infections and Mycoses Commons, Immunoprophylaxis and Therapy Commons, and the Public Health Commons

Repository Citation

Creative Commons License
This work is licensed under a Creative Commons Attribution-Noncommercial-Share Alike 3.0 License.

This material is brought to you by eScholarship@UMMS. It has been accepted for inclusion in UMass Center for Clinical and Translational Science Research Retreat by an authorized administrator of eScholarship@UMMS. For more information, please contact Lisa.Palmer@umassmed.edu.
Pre-exposure prophylaxis with OspA-specific human monoclonal antibodies protects mice against tick transmission of Lyme disease spirochetes

Yang Wang, MD PhD¹, Aurélie Kern, PhD², Naomi K. Boatright, BS¹, Zachary Schiller, BS¹, Andrew Sadowski, BS¹, Monir Ejemel, BS¹, Colby A. Souders, PhD¹, Keith A. Reimann, DVM¹, Linden Hu, MD², William D. Thomas, Jr., PhD¹, Mark S. Klempner, MD¹*

¹MassBiologics, University of Massachusetts Medical School, Boston, Massachusetts, USA
²Sackler School of Graduate Biomedical Sciences, Tufts University School of Medicine, Boston, Massachusetts, USA
*Corresponding Author: Mark.Klempner@umassmed.edu

**Background.** Tick transmission of *Borrelia* spirochetes to humans results in significant morbidity from Lyme disease worldwide. Serum concentrations of antibodies against outer surface protein A (OspA) were shown to correlate with protection from infection with *Borrelia burgdorferi*, the primary cause of Lyme disease in the United States.

**Methods.** Mice transgenic for human immunoglobulin genes were immunized with OspA protein of *B. burgdorferi* to generate human monoclonal antibodies (HuMabs) against OspA. HuMabs were generated and tested in *in vitro* borreliacidal assays and animal protection assays.

**Results.** Nearly 100 unique OspA specific HuMabs were generated and four HuMabs (221-7, 857-2, 319-44, and 212-55) were selected as lead candidates based on borreliacidal activity. HuMab 319-44, 857-2 and 212-55 were borreliacidal against one or two *Borrelia* genospecies, whereas 221-7 was borreliacidal (IC50 <1nM) against *B. burgdorferi, B. afzelii* and *B. garinii*, the three main genospecies endemic in the US, Europe and Asia. All four HuMabs completely protected mice from infection at 10 mg/kg in a murine model of tick-mediated transmission of *B. burgdorferi*.

**Conclusions.** Our study indicates that OspA-specific HuMabs can prevent the transmission of *Borrelia* and administration of these antibodies could be employed as pre-exposure prophylaxis for Lyme disease.

Yang Wang, M.D Ph.D
Senior Director, Product Discovery
Assistant Professor of Medicine
T  617-474-4091  MassBiologics
F  617-474-5354  460 Walk Hill Street
    Boston, MA 02126
yang.wang@umassmed.edu
www.umassmed.edu/massbiologics