Immune features that afford protection from clinical disease versus sterilizing immunity to *Bordetella pertussis* infection in a nonhuman primate model of whooping cough

Keith A. Reimann  
*University of Massachusetts Medical School*

*Et al.*

---

**Let us know how access to this document benefits you.**

Follow this and additional works at: [https://escholarship.umassmed.edu/cts_retreat](https://escholarship.umassmed.edu/cts_retreat)

Part of the Bacterial Infections and Mycoses Commons, Immunoprophylaxis and Therapy Commons, and the Respiratory Tract Diseases Commons

---


---

Creative Commons License

This work is licensed under a [Creative Commons Attribution-Noncommercial-Share Alike 3.0 License](https://creativecommons.org/licenses/by-nc-sa/3.0/). 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.
Immune features that afford protection from clinical disease versus sterilizing immunity to *Bordetella pertussis* infection in a nonhuman primate model of whooping cough

Keith A. Reimann, DVM¹, Aaron J. Belli, BS¹, Sarah Fulco, BS¹, Jason M. Warfel, PhD², Rijian Wang, MD, PhD¹, Lisa A. Cavacini, PhD¹, James F. Papin, PhD³ Tod J. Merkel, PhD², Mark S. Klempner, MD¹

¹MassBiologics, University of Massachusetts Medical School, Boston, MA; ²Division of Bacterial, Parasitic, and Allergenic Products, Center for Biologics Evaluation and Research, Food and Drug Administration, Bethesda, MD; ³University of Oklahoma Health Sciences Center, Oklahoma City, OK

The respiratory bacterial infection caused by *Bordetella pertussis* (whooping cough) is the only vaccine-preventable disease whose incidence has been increasing over the last 3 decades. To better understand the resurgence of this infection, a baboon animal model of pertussis infection has been developed. Naïve baboons that recover from experimental pertussis infection are resistant both to clinical disease and to airway colonization when re-challenged. In contrast, animals vaccinated with acellular pertussis vaccine and experimentally challenged do not develop disease, but airways remain colonized for 4-6 weeks. We explored the possibility that the IgG antibody response to pertussis infection is qualitatively different from antibodies induced by acellular pertussis vaccination.

IgG was purified from pertussis-convalescent baboons shown to be resistant to pertussis disease and airway colonization. Purified IgG contained high titers to pertussis toxin, pertactin, and filamentous hemagglutinin. This pertussis-immune IgG or control IgG was passively transferred to naïve, juvenile baboons before experimental airway pertussis inoculation. The control animal that received normal IgG developed a typical symptomatic infection including leukocytosis, cough and airway colonization for 4 weeks. In contrast, baboons that received convalescent IgG maintained normal WBC counts and were asymptomatic. However, despite remaining asymptomatic, their airways were colonized for 4-6 weeks with *B. pertussis*. All animals developed IgG and IgA anti-pertussis antibody responses. Interestingly, the clearance of *B. pertussis* from airways coincided with the emergence of a serum anti-pertussis IgA response.

These studies demonstrate that passive administration of pertussis-specific IgG from previously infected animals can prevent clinical disease but does not affect prolonged airway colonization with *B. pertussis*. This outcome is similar to that observed following acellular pertussis vaccination. Understanding immune mechanisms—other than IgG—that are capable of preventing airway colonization with *B. pertussis* will be critical for developing more effective vaccines to prevent whooping cough.

Keith A. Reimann, DVM
MassBiologics
University of Massachusetts Medical School
617-474-3260
keith.reimann@umassmed.edu