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

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Comments
Sarah Fulco participated in this study as a medical student in the Senior Scholars research program at the University of Massachusetts Medical School.

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

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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.

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