

The Problem with Pertussis

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The number of Pertussis cases in the United States and associated deaths is climbing. In 2012, over 48,000 cases were reported and 20 children died, most of whom were unimmunized infants.

While this number seems large compared with the few hundred cases seen annually in the early 1990's, the actual number of pertussis infections may be much higher due to under diagnosis and under reporting. Credible estimates of actual cases range as high as 1,000,000 annually.

Several factors clearly play a role in the increase in reported pertussis disease including vaccine refusal, increased clinical awareness, new and better diagnostic tests, a growing disease reservoir among adolescents and adults, and pathogen mutation. But evidence points to the switch from the whole cell vaccine to the acellular version as having an effect on the resurgence of the disease.

In the late 1990's, increasing public concern about vaccine safety, especially antigenic load and the reactogenicity of the DPT vaccine, led to increasing vaccine hesitancy and decreasing immunization rates. Efforts to improve the vaccine resulted in the licensing of an acellular vaccine (DTaP) in 1997. The adult formulation (Tdap) was licensed in 2005.

Results

Over the past five years, the CDC has noted increasing Pertussis susceptibility in children aged 7-10 years, who exclusively received **DTaP**, and adolescents aged 13-14 years, who received a **Tdap booster**. These results are troubling and suggest *waning immunity* to the newer (acellular) **Pertussis (aP)** component of the vaccines.

The original whole-cell Pertussis vaccine elicited a robust Th1 immune response with long-lasting immunity, but caused an appreciable rate of adverse reactions in infants.

The newer acellular vaccine was much less reactogenic. It elicited a robust Th2 immune response, but provided a much shorter period of immune protection. This robust but short-lasting Th2 immune response also blocked subsequent long-lasting boosting by all varieties of Pertussis vaccine at all ages. The acellular vaccine is 75% effective in preventing pertussis disease in recipients for the first year, but decreases to below 40% after year four. Although a fair amount of research is ongoing, no solution to this problem has yet emerged.

Meanwhile, it is important to remember that **unvaccinated** children have at least an eight-fold greater risk for Pertussis and its serious complications than do vaccinated children. Children who are vaccinated and develop pertussis disease are less infectious, have milder symptoms and shorter illness duration, and are at reduced risk of serious pertussis-associated complications and hospitalization than those who are unvaccinated.

Moreover, adolescent siblings, parents, and older family members and friends can be the source of life-threatening infant pertussis disease. It therefore remains important to boost all who may come in contact with infants to receive one “lifetime” dose of Tdap prior to their coming in contact with newborn infants. Healthcare professionals who care for young infants and other immune compromised individuals must receive one dose of Tdap regardless of the time since their last dose of other Tetanus containing vaccines. Pregnant women should receive one dose of Tdap during each pregnancy, optimally between 27 and 36 weeks gestation. If not administered during pregnancy, Tdap should be given immediately postpartum.

References

1. Meade BA, et al. Possible Options for New Pertussis Vaccines. J of Infectious Diseases. 2014;209:S24-s27.
2. Ausiello CM and Cassone A. Acellular Pertussis Vaccines and Pertussis Resurgence: Revise or Replace? mBio 5(3):e01339-14.