Center City Pediatrics

Why Vaccinate Your Child?

Vaccines are one of the greatest public health achievements of the 20th century. Infections that were once the most common causes of childhood death and disease in the U.S. – smallpox, diphtheria, polio, mumps, rubella, measles – have faded from memory. As the immune protection of the community strengthened through widespread immunizations, vaccine-preventable diseases began to disappear. Unfortunately, vaccines have now become victims of their own success. In the protected privilege of this present vaccine era, vaccine myths and misinformation have begun to spread as easily as the diseases they prevent. Some parents have even begun to fear vaccines more than the diseases themselves.

As pediatricians, our mission is to protect the wellbeing of our patients by providing and implementing sound, evidence-based recommendations. Having cared for thousands of children in Philadelphia, our group has seen first-hand the devastating consequences of pertussis (whooping cough) in young infants, pneumococcal and *Haemophilus influenzae* type b (Hib) bacterial meningitis and sepsis in young children, and severe pneumonia with respiratory failure from influenza in healthy school children. These vaccine-preventable diseases are not theoretical - nor forgotten - to us. We've felt the weight of grief and regret from parents who realized that their child's suffering was preventable and unnecessary. In pockets of the country where immunization rates have declined, the diseases of our grandparents are coming back. Whooping cough outbreaks have led to the highest rates the U.S. has seen since 1965 (~33,000 cases in 2014), and measles outbreaks continue to occur (> 600 cases in 2014). As parents ourselves, we would do anything to protect our own children from harm. So, let's talk about why you should vaccinate your child.

How do vaccines work?

An unimmunized child travels to a popular tourist attraction where she is unknowingly exposed to measles. The virus infects her body, and a few virus particles soon multiply into millions. Ten days later she develops high fever, runny nose, pink eyes, and cough. A rash begins to develop, covering her whole body. She soon develops difficulty breathing and is hospitalized with pneumonia. Fortunately, after two weeks the child's immune system begins to rally. She's developed immunity in the form of antibodies and white blood cells that now are trained to specifically and rapidly recognize and fight measles if she's exposed again. What was the cost of that natural immunity? Two weeks of missed work (for her parents) and school (for her), doctor visits, a hospitalization, and now her infant sister and other children in the doctor's waiting room have been exposed. But this cost was fairly light compared to other known complications of measles.

In contrast, vaccines provide the immune system with the chance to develop the antibodies and immune memory that provide long-term protection, without the cost of suffering the disease. How does it do this? Generally speaking, vaccines use the parts of a germ that stimulate a protective immune response, while leaving out the parts that make you sick. Different strategies are used depending on the germ, but the principle is the same. While we don't have vaccines for every infection, we do have vaccines against many of the germs causing the most serious and contagious infections.

So, do these vaccines work? A resounding "yes!" Polio was eradicated from the U.S. in 1972, endemic ("homegrown") rubella and congenital rubella syndrome was eliminated from the U.S. in 2004, and endemic measles was eliminated in 2000 (although imported cases from travelers outside the U.S. still cause outbreaks each year). For newer vaccines including hepatitis A, hepatitis B, varicella (chickenpox), rotavirus, pneumococcus, and Hib vaccines, rates of infections, hospitalizations, and deaths have all dramatically decreased. *Some vaccines can even lead to immune responses that are actually better than natural infection, including human papillomavirus, tetanus, Hib, and pneumococcal vaccines*. For example, young children (who are most at risk of serious Hib and pneumococcal diseases) are unable to make effective immune responses after natural infection with Hib or pneumococcus and can become infected again. However, young children develop excellent immune responses after receiving the Hib and pneumococcal conjugate vaccine series.

Is it too much of a good thing?

In 1980, there were only 7 diseases that children were routinely immunized against in the first year of life. In 2016, there are 14. It's easy to think that with this many vaccines today, it must be overwhelming to the immune system. Why isn't this the case? Consider that a baby – previously living in the relatively sterile environment of the womb – encounters billions of germs shortly after birth. This exposure continues as the baby feeds, breaths, and interacts with its environment. These germs will colonize the surfaces of their skin, nose, throat, and intestinal tract. In fact, 10 times more germs live on the surfaces of our body (100 trillion) than the number of cells we have (10 trillion)! All of these germs have the potential to cause infection, and each germ contains multiple components ("antigens") that trigger immune responses. But from the earliest days, babies are capable of an immune response that keeps these colonizing germs largely at bay.

In 1980, the number of antigens in the vaccine series for the first year of life was > 3000. But in 2016, the number of antigens in the current infant vaccine series is about 160. How can this be? Vaccine science has advanced so much so

that we are now able to be more specific in identifying which antigens are necessary to create protection against disease. The immune challenge from the first year's vaccines is a drop in the bucket compared to what an infant faces simply from leaving the womb!

What about Alternative Schedules?

Various alternative vaccine schedules have been proposed for various reasons, none of which have been rigorously studied nor supported by evidence. So what are the downsides to an alternative vaccine schedule?

1. The current recommended vaccine schedule was strategically designed to balance the period that a child is at high risk for a particular disease, with the earliest time at which that child can develop an effective immune response towards that specific vaccine. *Spacing out vaccines increases the time during which a child remains at risk for preventable diseases*.
2. Despite the claim that spacing out vaccines reduces stress and pain from multiple shots, a study examining stress hormone (cortisol) levels in infants receiving a single vaccine versus multiple at a time found no difference in stress level. By spacing out vaccines (and increasing the number of vaccine visits), we may only be increasing the number of times a child experiences any stress from receiving shots.
3. Following a non-standard alternative vaccine schedule increases the risk of medical errors, due to the complexity of the vaccine catch-up schedule and the irregular nature of accommodating various alternative schedules.
4. The increased office visits required when spacing out vaccines increases the number of potential exposures to other sick children in the doctor's office.
5. All new vaccines must be studied to ensure there is no interference with the immune response or safety of existing vaccines typically given at that same time, and vice versa. The timing between doses is also studied to ensure the intervals between doses optimize the priming and boosting effect of the immune response. *All alternative vaccine schedules, on the other hand, are made-up.* No validated studies support these opinion-based and arbitrary schedules. The recommended schedule, on the other hand, is planned and approved by three committees representing the CDC, the American Academy of Pediatrics, and the American Academy of Family Physicians, which include experts in infectious diseases, epidemiology, immunology, vaccinology, public health, pediatrics, internal medicine, and family medicine.

Are vaccines safe?

When a patient with a medical condition (for example, diabetes) is prescribed a drug to treat the disease, that drug may have significant side effects. Given the risks of untreated diabetes, the benefits of using that drug outweigh the potential risks. Childhood vaccines, however, are different from drugs: they're given to healthy children in order to *prevent* disease. Any risk for serious adverse effects must be extremely low to justify their use in healthy people. Because of this, vaccines are tested more extensively than any drug before licensure, have higher regulatory standards than drugs, and have two separate safety monitoring systems to detect any new safety issues after licensure. Vaccines may cause mild and temporary side effects such as fever, pain, or swelling, but serious adverse effects are rare. Vaccines definitively *do not cause* autism, infertility, multiple sclerosis, leukemia, or diabetes. Vaccines *will* cause peace of mind, however, knowing that while there are many things we might worry about for our children, 14 significant childhood diseases are not going to be one of them! *Remember: The choice to not vaccinate is a choice to take a different risk*.

We know you may have more questions about vaccines. One of the biggest challenges for parents is identifying reliable, evidence-based information, beyond anecdote and hearsay. As trusted partners in your child's health, we are always here to help answer your questions. We also encourage you to explore these resources below:

Web-based Resources

****The Children's Hospital of Philadelphia Vaccine Education Center****
http://www.chop.edu/centers-programs/vaccine-education-center

Every Child By Two
http://www.ecbt.org

Centers for Disease Control and Prevention
http://www.cdc.gov/acip

Books

Vaccines & Your Child: Separating Fact from Fiction – by Paul Offit, MD & Charlotte Moser (2011)
Your Baby's Best Shot – by Stacy Mintzer Herlihy & E. Allison Hagood (2012)

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