Part 3: More About Vaccines

How Vaccines Work

Immunity from Disease

When disease germs enter your body, your immune system goes to work. It does three important things:

1. It recognizes the disease germs as not belonging in your body – as being "foreign invaders."

2. It responds by producing proteins called antibodies, which help destroy these germs. ***Unfortunately, these antibodies can't act quickly enough to stop you from getting sick.*** But by eliminating the germs, they help you get well.

3. It remembers the germs that made you sick, and if they ever try to infect you again – even after many years – your immune system will come to your defense again. But now they are able to stop the invading germs before they can make you sick. This is immunity. It is what keeps you from getting sick from diseases like measles or chickenpox a second time, no matter how often you are exposed to them.

In other words, the first time you are exposed to a disease, your immune system won't stop you from getting sick, but it will help you recover and make you immune to that disease if you are ever exposed to it again.

Immunity from Vaccines

With vaccination, killed or weakened disease germs are intentionally introduced into the body, usually by injection. Then your immune system goes to work, just as if you were exposed to a disease:

1. It recognizes the vaccine germs as not belonging in your body – as being "foreign invaders."

2. It responds by producing antibodies, the same as if you had been exposed to the disease. ***But there is a difference. The germs in the vaccine are weakened or killed, so they won't make you sick.***

3. However, you will still develop immunity, just as if you had gotten sick from the actual disease. So if germs from that disease ever do try to infect you, your immune system will come to your defense and stop them from making you sick.

In other words, getting a disease or getting a vaccine can both give you future protection from that disease. The difference is that with the disease you have to get sick to get that protection. With the vaccine you don't.

How Safe Are Vaccines?

This is a question that naturally worries any new parent. No matter how good vaccines are at preventing disease, no matter how much they have reduced diseases over the years, no matter how many lives they have saved, what if they can actually harm your baby?

Vaccine safety is a complex issue, and some specific questions will be addressed in Part 4 (Frequently Asked Questions) of this booklet. In the meantime, here are some basics:

Can vaccines harm my child? Any medicine can cause a reaction, even aspirin. Vaccines are no exception.

***Will* vaccines harm my child?** Probably not. Many children never have a reaction to a vaccine. For those who do, most reactions will be minor . . . a sore leg, a slight rash, or a mild fever that goes away in a day or two.

Some children have more serious reactions like a high fever, chills, fussiness, or muscle aches. One of the scariest of these reactions is called a *febrile seizure*. This is a seizure, or convulsion, caused by a high fever. During a febrile seizure a child might shake uncontrollably, become unresponsive, or even lose consciousness. About one child in 25 will

have at least one febrile seizure, usually between 6 months and 3 years of age. Any high fever, regardless of the cause, can trigger a febrile seizure, including a fever associated with a vaccination. Febrile seizures look serious, but fortunately they almost never are. Children recover with no lasting effects. You can learn more about febrile seizures at www.ninds.nih.gov/disorders/febrile_seizures/detail_febrile_seizures.htm.

Rarely, a child will have a truly serious reaction, like encephalopathy (brain infection) or a severe allergic reaction. These are the scary possibilities that make some parents think that it might actually be better not to vaccinate their children.

Would it?

First, serious reactions are extremely rare. One of the most serious – a life-threatening allergic reaction to a substance in a vaccine – occurs only about once in every million vaccine doses.

There are about a million words in the 7-volume series of Harry Potter books. If we let *each of those words* represent a dose of vaccine, then *one word*, somewhere within the 7 books' 4,224 pages, would represent the risk of a severe allergic reaction.

Second, sometimes it is hard to tell if a reaction was even caused by a vaccine. Any serious reaction that could be caused by a vaccine could also be caused by something else. There is no such thing as a serious health problem that is caused only by vaccines. For something that affects only one child in a hundred thousand or a million, it can be very hard to isolate the cause.

Example: Sudden Infant Death Syndrome (SIDS) is the unexplained, sudden death of an infant, usually while sleeping. The causes of SIDS have always been uncertain, and for a time, some people blamed DTP* vaccine. As evidence, they pointed to the fact that SIDS deaths often seemed to occur within several days after a child received a dose of DTP vaccine.

But SIDS, by definition, occurs at the same ages when millions of babies were getting multiple doses of DTP – so it would have been remarkable if SIDS didn't occasionally strike right after the shot. Studies were conducted to test this theory, and it was found that babies who had been vaccinated with DTP were no more likely to get SIDS than babies who weren't vaccinated – in other words, there was no association. Since then, we have learned that precautions such as putting babies to sleep on their backs and not smoking around them can dramatically reduce the risk of SIDS. (For more information about SIDS, see the American SIDS Institute webpage at http://sids.org/.)

***DTP is an older version of DTaP.**

Third, it isn't just risks – it's also benefits. True, there is a risk that a dose of vaccine could cause discomfort and other side effects, and a very small risk that it could cause a serious problem.

What do you get for taking that small risk?

Most importantly, your baby will be protected from more than a dozen potentially serious diseases. (At this point you might be asking how likely your child is to actually be exposed to one of these diseases if she isn't vaccinated? For a discussion of this question, see Part 4 [Frequently Asked Questions].)

Meet Riley

In most ways, Riley is a typical 8-year-old girl. She takes piano and gymnastics lessons, plays soccer, likes to swim, and gets into fights with her brothers.

But Riley has something most 8-year olds don't – another child's heart. She was born with a serious heart defect and had to get a transplant within days of her birth.

Because Riley's new heart doesn't really belong to her, her body would reject it if she didn't take special drugs. These drugs suppress her immune system, and because of this she can't get live-virus vaccines like measles, mumps, rubella, or chickenpox.

Consequently, Riley is not immune to these diseases. She has to depend on the immunity of people around her for protection. If one of her schoolmates or playmates were to come down with a case of measles or chickenpox, Riley could easily catch it from them. And because her immune system can't fight off the infection, it could become very serious if not treated promptly.

Riley enjoys a normal life today, partly thanks to her friends who are protecting her from infections by getting all their shots.

Riley's self-portrait

However, the benefits of vaccinating your child also extend to other children. As mentioned earlier, a small percentage of children fail to develop immunity from vaccines. There are also children who can't get certain vaccines for medical or other reasons, and babies who are too young to be vaccinated. These children rely on the immunity of people around them to protect them from infectious diseases. The more children in a community who are vaccinated, the harder it is for a disease to spread.

And finally, getting vaccinated today will help protect future generations of children.

Smallpox was one of the deadliest diseases the world has ever known, killing 300 million people in the 20th century alone. But as millions of children and adults got vaccinated over the years, the disease began to disappear until finally, in October 1977, only one person on Earth had smallpox. When he recovered, smallpox was gone, and it will never kill another baby.

In the United States where disease rates are very low, your child's risk of getting one of these diseases may also be very low. Does that mean vaccination isn't important? What would happen if everyone stopped getting vaccinated? We know what would happen because it has happened in other countries.

Example: In the mid-1970s, about 80% of Japanese children were vaccinated against pertussis. In 1974, there were only 393 cases of whooping cough in the entire country, and no one died from it. But then, because of fear about the vaccine's safety, the immunization rate dropped to only about 10%. Within 5 years, the country was in the grip of a whooping cough epidemic that infected more than 13,000 people and left 41 dead in 1979 alone. When routine vaccination was resumed, the disease numbers dropped again.

Even a few cases of a contagious disease in a vulnerable population could touch off a major outbreak. This is why we still vaccinate against polio, even though we haven't seen it in this country for more than 10 years. One infected traveler from another country could set us back 50 years if our own population wasn't protected.

When you get your child vaccinated, you are not just protecting her. You are also protecting her friends and schoolmates and their families, and her children, grandchildren, and future generations.