



Q. How can parents sort out conflicting information about vaccines?

A. Decisions about vaccine safety must be based on well-controlled scientific studies.

Parents are often confronted with so-called scientific information found on television, on the Internet, in magazines and in books that conflicts with information provided by healthcare professionals. But few parents have the background in microbiology, immunology, epidemiology and statistics to separate good scientific studies from poor studies. Parents and physicians benefit from the expert guidance of specialists with experience and training in these disciplines.

Committees of these experts are composed of scientists, clinicians and other caregivers who are as passionately devoted to our children's health as they are to their own children's health. They serve the Centers for Disease Control and Prevention (www.cdc.gov/nip), the American Academy of Pediatrics (www.aap.org) and the Infectious Diseases Society of America (www.immunizationinfo.org), among other groups. These groups provide excellent information to parents and healthcare professionals through their Web sites. Their task is to determine whether scientific studies are carefully performed, published in reputable journals and, most importantly, reproducible. Information that fails to meet these standards is viewed as unreliable.

When it comes to issues of vaccine safety, these groups have served us well. They were the first to figure out that intestinal blockage was a rare consequence of the first rotavirus vaccine, and the vaccine was quickly discontinued. And they recommended a change from the oral polio vaccine (which was a rare cause of paralysis) to the polio shot when it was clear that the risks of the oral polio vaccine outweighed its benefits.

These groups have also investigated possible relationships between vaccines and asthma, diabetes, multiple sclerosis, AIDS and autism. No studies have reliably established a causal link between vaccines and these diseases — if they did, the questioned vaccines would be withdrawn from use.

Q. Do children get too many shots?



A. Newborns commonly manage many challenges to their immune system at the same time.

Because some children could receive as many as 25 shots by the time they are 2 years old and as many as five shots in a single visit, many parents wonder whether it is safe to give children so many vaccines.

Although the mother's womb is free from bacteria and viruses, newborns immediately face a host of different challenges to their immune systems. From the moment of birth, thousands of different bacteria start to live on the surface of the intestines. By quickly building immunity to these bacteria, babies keep them from invading the bloodstream and causing serious diseases.

In fact, babies are capable of responding to millions of different viruses and bacteria because they have billions of immunologic cells circulating in their bodies. Therefore, vaccines given in the first two years of life are a raindrop in the ocean of what an infant's immune system successfully encounters in this environment every day.

Offit PA, et al. Addressing parents' concerns: Do vaccines weaken or overwhelm the infant's immune system? *Pediatrics* 109:124-129, 2002.

Q. Are vaccines safe?



A. Because vaccines are given to people who are not sick, they are held to the highest standards of safety. As a result, they are among the safest things we put into our bodies.

How does one define the word safe? If safe is defined as "free from any negative effects" then vaccines aren't 100 percent safe. All vaccines have possible side effects. Most side effects are

mild, such as fever, or tenderness and swelling where the shot is given. But some side effects from vaccines can be severe. For example, the pertussis vaccine is a very rare cause of persistent inconsolable crying, high fever or seizures with fever. Although these reactions do not cause permanent harm to the child, they can be quite frightening.

If vaccines cause side effects, wouldn't it be safer just to avoid them? Unfortunately, choosing to avoid vaccines is not a risk-free choice — it is a choice to take a different and much more serious risk. Discontinuing the pertussis vaccine in countries like Japan and England led to a tenfold increase in hospitalizations and deaths from pertussis. Recently, a decline in the number of children receiving measles vaccine in the United Kingdom led to an increase in measles hospitalizations and deaths.

When you consider the risk of vaccines and the risk of diseases, vaccines are the safer choice.

Plotkin, S, et al. *Vaccines*. 4th Edition, W.B. Saunders and Co., 2003.

Q. If the diseases that vaccines prevent are now rare, why should my child still get vaccines?

A. Although several of the diseases that vaccines prevent have been dramatically reduced or eliminated, vaccines are still necessary:

- To prevent common infections

Some diseases are so common in the United States that a choice not to get a vaccine is a choice to get infected. For example, choosing not to get the pertussis (whooping cough) or varicella (chickenpox) vaccine is a choice to risk serious and occasionally fatal infections.

- To prevent infections that could easily reemerge

Some diseases in this country continue to occur at very low levels [for example, measles, mumps, rubella (MMR) and Haemophilus influenzae type b (Hib)]. If immunization rates in our schools or communities are low, outbreaks of these diseases are likely to occur. This is exactly what happened in the late 1980s and early 1990s when thousands of children were hospitalized with measles and more than 120 died. Children were more likely to catch measles if they weren't vaccinated.

- To prevent infections that are common in other parts of the world

Although some diseases have been completely eliminated (polio) or virtually eliminated (diphtheria) from this country, they still occur commonly in other parts of the world. Children are commonly paralyzed by polio in India or killed by diphtheria in Russia. Because there is a high rate of international travel, outbreaks of these diseases are only a plane ride away.

Atkinson W, et al. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. 8th Edition. Centers for Disease Control and Prevention, U.S. Dept. of Health and Human Services, 2004.

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vaccine.chop.edu

Q. Does the MMR vaccine cause autism?

A. Carefully performed studies clearly show the MMR vaccine does not cause autism.

Because the signs of autism may appear in the second year of life, at around the same time children receive certain vaccines (such as MMR), and because the cause of autism is unknown, some parents wonder whether vaccines might be at fault.

The vast weight of medical and scientific evidence now strongly refutes the idea that MMR causes autism. Studies of hundreds of thousands of children in the United States, the United Kingdom and Denmark found children with autism were not more likely to have received the MMR vaccine, or to have received the MMR vaccine recently, than other children.

Four of the 14 studies that found that MMR vaccine did not cause autism are listed below:

Taylor, B, et al. Autism and measles, mumps, and rubella vaccine: no epidemiologic evidence for a causal association. *Lancet* 351:2026-2029, 1999.

Dales L, et al. Time trends in autism and in MMR immunization coverage in California. *JAMA* 285:1183-1185, 2001.

Kaye JA, et al. Measles, mumps, and rubella vaccine and incidence of autism recorded by general practitioners: a time-trend analysis. *Brit Med J* 322:460-463, 2001.

Madsen KM, et al. A population-based study of measles, mumps, and rubella vaccination and autism. *N Engl J Med* 347:1477-1482, 2002.

Q. Do vaccines cause chronic diseases like diabetes, multiple sclerosis, asthma or allergies?

A. A wealth of evidence confirms the fact that vaccines do not cause allergic or autoimmune diseases.

Most people get vaccines. Therefore, people with chronic diseases like diabetes, multiple sclerosis, asthma or allergies are likely to receive vaccines. Some of these people will receive a vaccine just before the first symptoms of their disease. The question is "How can you tell whether a vaccine caused a disease?"

The best way to answer this question is to perform a scientific study. For example, some people who smoke a lot of cigarettes get lung cancer. To determine whether cigarette smoking caused lung cancer, studies compared the incidence of lung cancer in people who smoked cigarettes to people who didn't smoke. The best studies matched these two groups of people with regard to age, general health, medications and so on. By matching these groups they made sure that the only difference between them was cigarette smoking. The result was clear — cigarette smoking caused lung cancer.

Similarly, some people who use cell phones get brain cancer. To determine whether cell phones caused brain cancer, the incidence of brain cancer in people who used cell phones was compared to people who didn't use cell phones. Again these groups were matched to make sure that the only difference between them was cell-phone use. The result was also clear: cell phones didn't cause brain cancer.

By doing matched studies of people who did or did not receive vaccines, we now know that vaccines don't cause diabetes, multiple sclerosis, allergies or asthma. A publication that reviewed 93 studies examining the relationship between vaccines and chronic diseases is listed below:

Offit, PA and Hackett, CJ. 2003. Addressing parents' concerns: Do vaccines cause allergic or autoimmune diseases? *Pediatrics* 111:653-659.

Q. Is the chickenpox vaccine really necessary?

A. The chickenpox (varicella) vaccine prevents the hospitalization and death occasionally caused by chickenpox.

Many people think of chickenpox as a benign infection, a sort of rite of passage through childhood. But chickenpox isn't always benign. Before the chickenpox vaccine was made available in the United

States in 1995, every year about 7,200 children were hospitalized and 50 children died from chickenpox. Most of the hospitalizations and deaths from chickenpox occurred in previously healthy, well-nourished, young children.

The harm caused by chickenpox infection can now be safely prevented by the chickenpox vaccine.

Q. Do vaccines contain preservatives?



A. Thimerosal, an ethylmercury-containing preservative, has now been removed from most routinely recommended vaccines.

Preservatives like thimerosal prevented vaccines from becoming contaminated with bacteria or fungi. Preservatives are especially important when the vial of vaccine contains more than one dose (multidose vials). Studies showed that multidose

vials of vaccines could become contaminated with bacteria. Bacteria in the vial could then be injected inadvertently into the child and cause serious and occasionally fatal infections.

Single-dose vials have largely replaced multidose vials in the United States. Because the risk of contamination is now much lower, thimerosal has been safely removed from most vaccines.

Thimerosal contains *ethylmercury*, not *methylmercury*. Although exposure of the developing fetus to high levels of environmental mercury (methylmercury) can be harmful, the levels of mercury contained in thimerosal in vaccines were within guidelines established for safety by the Food and Drug Administration. Also, the ethylmercury in thimerosal is excreted from the body far more rapidly than the methylmercury in the environment.

Five studies performed in the United States, the United Kingdom and Denmark clearly found that thimerosal contained in vaccines did not cause autism.

Hviid A, et al. 2003. Association between thimerosal-containing vaccine and autism. *JAMA* 290:1763-1766.

Andrews N, et al. 2004. Thimerosal exposure in infants and developmental disorders: a retrospective cohort study in the United Kingdom does not support a causal association. *Pediatrics* 114:584-591.

Herron J. 2004. Thimerosal exposure in infants and developmental disorders: a prospective cohort study in the United Kingdom does not support a causal association. *Pediatrics* 114:577-583.

Verstraeten T, et al. 2003. Safety of thimerosal-containing vaccines: a two-phased study of computerized health maintenance organization databases. *Pediatrics* 112:1039-1048.

Barbarese WJ, et al. 2005. The incidence of autism in Olmsted County, Minnesota, 1976-1997. *Arch Pediatr Adolesc Med* 159:37-44.

Q. Do vaccines contain additives?

A. Many vaccines contain trace quantities of antibiotics or stabilizers.

Antibiotics are used during the manufacture of vaccines to prevent inadvertent contamination with bacteria or fungi. Trace quantities of antibiotics are present in some vaccines. However, the antibiotics contained in vaccines (neomycin, streptomycin or polymyxin B) are not those given commonly to children. Therefore, children with allergies to antibiotics such as penicillin, amoxicillin, sulfa or cephalosporins can still get vaccines.

Gelatin is used to stabilize live viral vaccines and is also contained in many food products. People with known allergies to gelatin contained in foods may have severe allergic reactions to the gelatin contained in vaccines. However, this reaction is extremely rare.

Offit, PA, Jew RK. 2003. Addressing parents' concerns: Do vaccines contain harmful preservatives, adjuvants, additives, or residuals? *Pediatrics* 112:1394-1401.

American Academy of Pediatrics. In Pickering LK, ed. *Red Book: 2003 Report of the Committee on Infectious Diseases*. 26th ed. Elk Grove Village, IL

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