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

Parents are often confronted with “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/vaccines), the American Academy of Pediatrics (www.aap.org) and the Infectious Diseases Society of America (www.idsociety.org), among other groups. These organizations provide excellent information to parents and healthcare professionals through their websites. 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, SIDS 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reliably established a causal link between vaccines and these diseases — if they did, the questioned vaccines would be withdrawn from use.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. How can parents sort out conflicting information about 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 this country that a choice not to get a vaccine is a choice to get infected. For example, choosing not to get the pertussis (whooping cough) vaccine is a choice to risk a serious and occasionally fatal infection.

• to prevent infections that could easily re-emerge
Some diseases in this country continue to occur at very low levels (for example, measles, mumps and Haemophilus influenzae type b, or 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 much more likely to catch measles if they weren’t vaccinated. Recent measles and mumps outbreaks in the United States also provide evidence of how quickly a disease can re-emerge.

• 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 paralyzed by polio in Pakistan, Afghanistan and Nigeria and sickened by diphtheria in India and other countries in the southeastern region of Asia. Because there is a high rate of international travel, outbreaks of these diseases are only a plane ride away.

Q. Are vaccines still necessary?

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 commonly given to children. Therefore, children with allergies to antibiotics such as penicillin, amoxicillin, sulfis 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.

Q. Do vaccines contain additives?

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 permanent inmobilizing coughing, 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” to just 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 and the United States led to an increase in cases of measles.

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

Q. Are vaccines safe?

A. Newborns commonly manage many challenges to their immune systems 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 to the doctor, many parents wonder whether it is safe to give children so many vaccines.

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Q. Do children get too many shots?
A. Yes. Of all of us have aluminum in our bodies and most of us are able to process it effectively. The two main groups of people who cannot process aluminum effectively are severely premature infants who receive large quantities of aluminum in intravenous fluids and people who have long-term kidney failure and receive large quantities of aluminum, primarily in anadicals. In both cases, the kidneys are not working properly at all and the people are exposed to large quantities of aluminum over a long period of time.

The amount of aluminum in vaccines given during the first six months of life is about 4 milligrams, or four-thousandths of a gram. A gram is about one-fifth of a teaspoon of water. In comparison, breast milk ingested during this period will contain about 10 milligrams of aluminum and infant formulas will contain about 40 milligrams. Soy-based formulas contain about 120 milligrams of aluminum.

When studies were performed to look at the amount of aluminum injected in vaccines, the levels of aluminum in blood did not detectably change. This indicates that the quantity of aluminum in vaccines is minimal as compared with the quantities already found in the blood.


Pennington JA. Aluminum content of food and diets. Food Additives and Contam. 1987;5:164-252.


Q. Does vaccine cause autism?

A. Carefully performed studies clearly disprove the notion that vaccines cause autism.

Because the signs of autism may appear in the second year of life, at around the same time children receive certain vaccines, and because the cause of autism is unknown, some parents have wondered whether vaccines might be at fault. These concerns focused on three hypotheses — autism was caused by the measles-mumps-rubella (MMR) vaccine, thimerosal, an ethylmercury-containing preservative used in vaccines, or receipt of too many vaccines too soon.

A large body of medical and scientific evidence now strongly refutes these notions. Multiple studies have found that vaccines do not cause autism. Some studies included hundreds of thousands of children, occurred in multiple countries, were conducted by multiple investigators and were well controlled.


Finally, changing the vaccine schedule requires additional doctor’s visits. Research measuring cortisol, a hormone associated with stress, has determined that children do not experience more stress when receiving two shots as compared with one shot. Therefore, an increased number of visits for individual shots will mean an increase in the number of stressful situations for the child without benefit. In addition, there is an increased potential for administration errors, more time and travel needed for appointments, potentially increased costs and the possibility that the child will never get some vaccines.


Q. What is the harm of separating, spacing out or withholding some vaccines?

A. Although the vaccine schedule can look intimidating, it is based upon the most scientific information available and is better tested for safety than any alternative schedules.

Experts review studies designed to determine whether the changes are safe in the context of the existing schedule. These are called concomitant-use studies.

Separating, spacing out or withholding vaccines causes concern because infants will be susceptible to diseases for longer periods of time. When a child should receive a vaccine is determined by balancing when the recipient is at highest risk of contracting the disease and when the vaccine will generate the best immune response.

Q. How can a “one-size-fits-all” approach to vaccines be OK for all children?

A. The recommended immunization schedule is not the same for all children.

In fact, recommendations for individual vaccines often vary based upon individual differences in current and long-term health status, allergies and age. Each vaccine recommendation, often characterized by a single line on the immunization schedule, is supported by about 25 to 40 additional pages of specific instructions for healthcare providers who administer vaccines. In addition, an approximate 60-page document titled “General Recommendations on Immunization” serves as the basis for all vaccine administration. The recommendations are updated as needed by the CDC and a comprehensive update is published every few years.