

Aluminum is present in several vaccines to improve the immune response. Some parents are concerned that aluminum in vaccines might be harmful to babies. However, healthy babies quickly eliminate aluminum from their bodies without harmful effects.

### Q. What is aluminum?

A. Aluminum is the most common metal found in nature. It is present in the water we drink, the air we breathe and the food we eat.

### Q. Is aluminum in vaccines?

A. Yes. Aluminum is present in vaccines that prevent hepatitis A, hepatitis B, diphtheria-tetanus-pertussis, *Haemophilus influenzae* type b, human papillomavirus and pneumococcus. Aluminum is not present in influenza vaccines, polio vaccines or live viral vaccines, such as those that prevent measles, mumps, rubella, chickenpox, shingles and rotavirus.

### Q. Why is aluminum in vaccines?

A. Aluminum is present in certain vaccines to improve the immune response. Substances used to improve immune responses are called *adjuvants*. Adjuvants often allow for lesser quantities of the vaccine and fewer doses. Aluminum salts such as aluminum hydroxide, aluminum phosphate and aluminum potassium sulfate have been used to improve the immune response to vaccines for more than 70 years.

### Q. How much aluminum is in vaccines?

A. During the first 6 months of life, infants could receive about 4 milligrams of aluminum from vaccines. That's not very much: a milligram is one-thousandth of a gram and a gram is the weight of one-fifth of a teaspoon of water. During the same period, babies will also receive about 10 milligrams of aluminum in breast milk, about 40 milligrams in infant formula, or about 120 milligrams in soy-based formula.

### Q. What happens to aluminum after it enters the body?

A. Most of the aluminum that enters the body is eliminated quickly. Though all of the aluminum present in vaccines enters the bloodstream, less than 1 percent of aluminum present in food is absorbed through the intestines into the blood.

However, once aluminum is in the bloodstream, it is processed similarly regardless of the source. Approximately 90 percent is processed by binding to a protein called transferrin, and about 10 percent is bound by citrate. Once bound, the majority of aluminum will be eliminated through the kidneys, a small amount through bile, and a small amount is retained in tissues of the body. About half of the aluminum in the bloodstream is eliminated in less than 24 hours and more than three-quarters is eliminated within two weeks. The ability of the body to rapidly eliminate aluminum accounts for its excellent record of safety.

### Q. What happens to the aluminum retained in the body?

A. The small quantity of aluminum retained in the body accumulates over time. Most of the aluminum that accumulates (50 to 60 percent) settles in the bones, some in the lungs (about 25 percent) and some in the brain (about 1 percent). The remaining quantities are distributed in serum, skin, gastrointestinal tract, lymph nodes and glands. In fact, low quantities of aluminum can be found in most organs.

By the time children become adults, they will have accumulated between 50 and 100 milligrams of aluminum. Almost all of that accumulated aluminum comes from food.



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# Aluminum in Vaccines: What you should know

## Q. Is the amount of aluminum in vaccines safe?

A. Yes. The best way to answer this question is to look at people who are harmed by aluminum. These people can be divided into two groups: severely premature infants who receive large quantities of aluminum in intravenous fluids, and people with longstanding kidney failure who receive large quantities of aluminum, primarily in antacids. (The average recommended dose of antacids contains about 1,000 times more aluminum than is found in a vaccine.) Both of these groups of patients can suffer brain dysfunction, bone abnormalities or anemia because of the high quantities of aluminum that have accumulated in their bodies.

For aluminum to be harmful, two criteria must be met: People must have kidneys that don't work well or don't work at all, and they must receive large quantities of aluminum for months or years. In these situations, a lot of aluminum enters the body and not enough leaves the body.

## Q. Isn't it possible that aluminum in vaccines could be harmful to some healthy babies?

A. No. The quantity of aluminum in vaccines is tiny compared with the quantity required to cause harm. Here's another way to think about this: All babies are either breast-fed or bottlefed. Because both breast milk and infant formula contain aluminum, all babies have small quantities of aluminum in their bloodstreams all the time. The amount is very small: about 5 nanograms (billionths of a gram) per milliliter of blood (about one-fifth of a teaspoon). Indeed, the quantity of aluminum in vaccines is so small that even after an injection of vaccines, the amount of aluminum in a baby's blood does not detectably change. In contrast, the amount of aluminum in the bloodstreams of people who suffer health problems from aluminum

is at least 100 times greater than the amount found in the bloodstreams of healthy people.



This information is provided by the Vaccine Education Center at The Children's Hospital of Philadelphia. The Center is an educational resource for parents and healthcare professionals and is composed of scientists, physicians, mothers and fathers who are devoted to the study and prevention of infectious diseases. The Vaccine Education Center is funded by endowed chairs from The Children's Hospital of Philadelphia. The Center does not receive support from pharmaceutical companies.

## Q. What is the harm in spacing out vaccines containing aluminum?

A. Delaying vaccines increases the time during which children are susceptible to catching vaccine-preventable diseases. Certain diseases, such as whooping cough and pneumococcus, still occur commonly in the United States. Given that aluminum is common in food and water, delaying vaccines will not significantly lessen a child's exposure to aluminum; it will only increase the child's chance of suffering a severe and potentially fatal infection.

## References

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