

Q&A ALUMINUM IN VACCINES: WHAT YOU SHOULD KNOW

Volume 6
Winter 2023

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 (most versions), diphtheria-tetanus-pertussis (DTaP, Td, Tdap), *Haemophilus influenzae* type b (Hib; one version), human papillomavirus (HPV), Japanese encephalitis (JE), anthrax, meningococcal B, tick-borne encephalitis (TBE) and pneumococcus (conjugate versions). It is also present in combination vaccines that contain any of these individual vaccines.

Aluminum is not present in live, weakened viral vaccines, like those that prevent measles, mumps, rubella, chickenpox, mpox/smallpox, yellow fever and rotavirus, because the viral reproduction that occurs during processing generates strong immune responses. Aluminum is also not present in the following (non-live) vaccines: influenza, meningococcal ACWY, cholera, dengue, Ebola, rabies, pneumococcal (polysaccharide version), typhoid, shingles and polio vaccines.

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 six 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% 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% is processed by binding to a protein called transferrin, and about 10% 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 will be 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%) settles in the bones, some in the lungs (about 25%) and some in the brain (about 1%). The remaining quantities are distributed in serum, skin, lymph nodes, glands, and the gastrointestinal tract. 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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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 long-standing 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 breastfed or bottle-fed. 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.

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 pertussis (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.

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This information is provided by the Vaccine Education Center at Children's Hospital of Philadelphia. The Center is an educational resource for parents, the public and healthcare professionals and is composed of scientists, physicians, mothers and fathers devoted to the study and prevention of infectious diseases. The Vaccine Education Center is funded by endowed chairs from Children's Hospital of Philadelphia. The Center does not receive support from pharmaceutical companies. ©2023 Children's Hospital of Philadelphia. All Rights Reserved. 22201-01-2023.