

*Some parents are concerned about ingredients contained in vaccines, specifically aluminum, mercury, gelatin and antibiotics. However, parents can be reassured that ingredients in vaccines are minuscule and necessary.*

### Q. Why is aluminum in vaccines?

**A. Aluminum is used in vaccines as an adjuvant.**

Adjuvants enhance the immune response by allowing for lesser quantities of active ingredients and, in some cases, fewer doses. Adjuvants were first used in vaccines in the United States in the 1930s; specifically, aluminum salts. Some people wonder whether aluminum in vaccines is harmful — the facts are reassuring.

First, aluminum is present in our environment; the air we breathe, the water we drink and the food we eat all contain aluminum.



Second, the quantity of aluminum in vaccines is small. For example, in the first six months of life, babies receive about 4 milligrams\* of aluminum if they get all of the recommended vaccines. However, during this same period they will ingest about 10 milligrams of aluminum if they are breastfed, 40 milligrams if they are fed regular infant formula, and up to 120 milligrams if they are fed soy-based infant formula.

Some people wonder about the difference between aluminum injected in vaccines versus aluminum ingested in food. Typically, infants have between one and five nanograms (billionths of a gram) of aluminum in each milliliter of blood. Researchers have shown that after vaccines are injected, the quantity of aluminum detectable in an infant's blood does not change and that about half of the aluminum from vaccines is eliminated from the body within one day. In fact, aluminum causes harm only when kidneys are not functioning properly or at all (so aluminum cannot be effectively eliminated) AND large quantities of aluminum, such as those in antacids, are administered.

In 2009, a second adjuvant was approved for use in the United States. This adjuvant, known as monophosphoryl lipid A, was isolated from the surface of bacteria and detoxified, so that it cannot cause harm. This adjuvant has been tested for safety in tens of thousands of people and is currently used in one of the HPV vaccines (i.e., Cervarix).

\*A milligram is one-thousandth of a gram and a gram is the weight of one-fifth of a teaspoon of water.

### Q. Why is gelatin in vaccines?

**A. Gelatin is used in some vaccines as a stabilizer.**

Stabilizers are added to vaccines to protect the active ingredients from degrading during manufacture, transport and storage. Gelatin, which is made from the skin or hooves of pigs, is concerning because some people (about 1 of every 2 million) might have a severe allergic reaction to it.

Also, because religious groups, such as Jews, Muslims and Seventh Day Adventists follow dietary rules that prohibit pig products, some parents are concerned about using vaccines that contain gelatin. However, all religious groups have approved the use of gelatin-containing vaccines for their followers for several reasons: First, vaccines are injected, not ingested (except the rotavirus vaccine, which does not contain gelatin). Second, gelatin in vaccines has been highly purified and hydrolyzed (broken down by water), so that it is much smaller than that found in nature. Finally, leaders from these religious groups believe that the benefits of receiving vaccines outweigh adherence to religious dietary laws.

### Q. Why is formaldehyde in vaccines?

**A. Formaldehyde is used during the manufacture of some vaccines to inactivate viruses (like polio and hepatitis A viruses) or bacterial toxins (like diphtheria and tetanus toxins).** While most formaldehyde is purified away, small quantities remain.

Because formaldehyde is associated with the preservation of dead bodies, its presence in vaccines seems inappropriate. However, it is important to realize that formaldehyde is also a by-product of protein and DNA synthesis, so it is commonly found in the bloodstream. The quantity of formaldehyde found in blood is 10 times greater than that found in any vaccine.



# Vaccine Ingredients: What you should know

## Q. Why is mercury in vaccines?

**A. Mercury is contained in some multi-dose preparations of influenza vaccine as a preservative.**

Preservatives prevent contamination with bacteria. Early in the 20th century, most vaccines were packaged in vials that contained multiple doses. Doctors and nurses would draw up a single dose and place the vaccine back in the refrigerator. Unfortunately, sometimes bacteria would inadvertently enter the vial and cause abscesses at the site of injection or bloodstream infections that were occasionally fatal. Preservatives, originally added in the 1930s, solved this problem.

The most common preservative used was thimerosal, a mercury-containing compound. As more vaccines were given, children received greater quantities of thimerosal. By the late 1990s, the American Academy of Pediatrics and the Public Health Service requested that mercury be removed from vaccines to make “safe vaccines safer.” No evidence existed to suggest that thimerosal was causing harm, but they wanted to be cautious. Unfortunately, their caution worried parents who wondered whether mercury in vaccines was causing subtle signs of mercury poisoning or autism. Addressing these concerns, scientists performed several studies, all of which showed that thimerosal at the level contained in vaccines hadn’t caused harm.

Further, because mercury is a naturally occurring element found in the earth’s crust, air, soil and water, we are all exposed to it. In fact, infants who are exclusively breastfed ingest more than twice the quantity of mercury than was contained in vaccines. Today, breastfed infants ingest 15 times more mercury in breast milk than is contained in the influenza vaccine.

## Q. Are some vaccines made using fetal cells?

**A. Fetal cells are used to make four vaccines: rubella, chickenpox, hepatitis A and rabies.** Fetal cells used to grow the vaccine viruses were isolated from two elective abortions performed in Sweden and England in the early 1960s.

Some parents wonder why scientists would choose to use fetal cells at all. There are several reasons for this. First, viruses, unlike bacteria, require cells to grow. Second, human cells are often better than animal cells at supporting the growth of human viruses. Third, fetal cells are different from other types of cells in that they are virtually immortal, meaning they can reproduce many, many times before dying. Other cells reproduce only a limited number of times before they die.

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. Do ingredients in vaccines cause allergic reactions?

**A. In addition to gelatin, other ingredients in vaccines such as egg proteins, antibiotics and yeast proteins might cause an allergic reaction.**

Because the influenza and yellow fever vaccines are grown in eggs, the final products contain sufficient quantities of egg proteins to rarely cause an allergic reaction in people allergic to eggs. People with egg allergies can get these vaccines only under special protocols, usually administered by an allergist.

Antibiotics are used to prevent bacterial contamination during production of some vaccines. However, the types of antibiotics used in vaccines, such as neomycin, streptomycin, polymyxin B, chlortetracycline and amphotericin B, are not those to which people are usually allergic.

A couple of viral vaccines are made in yeast cells; these include hepatitis B vaccine and one of the human papillomavirus vaccines (i.e., Gardasil). Although the vaccine is purified away from the yeast cells, about 1 to 5 millionths of a gram remain in the final product. The good news is that people who are allergic to bread or bread products are not allergic to yeast, so the risk of allergy from yeast is theoretical.

## Selected References

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