

# Thimerosal and Autism

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Dr. Offit is the Chief of Infectious Diseases, the Director of the Vaccine Education Center, and the Henle Professor of Immunologic and Infectious Diseases at the Children's Hospital of Philadelphia. In addition, Dr. Offit is a Professor of Pediatrics at the University of Pennsylvania School of Medicine. Dr. Offit has published over 130 papers in medical and scientific journals in the areas of virology and immunology and was recently a member of the Advisory Committee on Immunization Practices to the Centers for Disease Control and Prevention. He is also the co-author of two books, *Vaccines: What Every Parent Should Know* and *Breaking the Antibiotic Habit: A Parent's Guide to Coughs, Colds, Ear Infections, and Sore Throats*. In 2005, Dr. Offit also authored *The Cutter Incident: How America's First Polio Vaccine Led to the Growing Vaccine Crisis*, to give readers an understanding of the connection between a tragic manufacturing accident of fifty years ago and today's challenging vaccine development and manufacturing environment. This piece is reprinted with permission of the author. It was originally posted on the Vaccine Education Center's website at [www.chop.edu/consumer/jsp/division/generic.jsp?id=75751](http://www.chop.edu/consumer/jsp/division/generic.jsp?id=75751) in March 2006.



*Some parents are concerned that thimerosal, a mercury-containing preservative contained in the influenza vaccine, causes autism. However, during the past few years a series of biological and epidemiological studies have shown this concern to be unfounded. Here is a summary of the evidence showing that, while some things do cause autism, mercury in vaccines isn't one of them.*

## All mercury isn't the same: methylmercury vs. ethylmercury

Mercury is a naturally occurring element found in the earth's crust, air, soil and water. Since the earth's formation, volcanic eruptions, weathering of rocks and burning of coal have caused mercury to be released into the environment. Once released, certain types of bacteria in the environment can change mercury to methylmercury. Methylmercury makes its way through the food chain in fish, animals, and humans. At high levels, it can be toxic to people.

Thimerosal — a preservative still used in the influenza vaccine — contains a different form of mercury called ethylmercury. Studies comparing ethylmercury and methylmercury suggest that they are processed differently in the human body. Ethylmercury is broken down and excreted much more rapidly than methylmercury. Therefore, ethylmercury (the type of mercury in the influenza vaccine) is much less likely than methylmercury (the type of mercury in the environment) to accumulate in the body and cause harm.

## Evidence that mercury doesn't cause autism

- In 1971 Iraq imported grain that had been fumigated with methylmercury. Farmers ate bread made from this grain. The result was one of the worst, single-source, mercury poisonings in history. Methylmercury in the grain caused the hospitalization of 6,500 Iraqis and killed 450. Pregnant women also ate the bread and delivered babies with epilepsy and mental retardation. But they didn't deliver babies with an increased risk of autism.
- Four large studies have now compared the risk of autism in children who received vaccines containing thimerosal to those who received vaccines without thimerosal. The studies were consistent, clear and reproducible — the incidence of autism was the same in both groups. Denmark, a country that abandoned thimerosal as a preservative in

1991, actually saw an increase in the disease beginning several years later.

- Studies of the head size, speech patterns, vision, coordination and sensation of children poisoned by mercury show that the symptoms of mercury poisoning are clearly different from the symptoms of autism.
- Methylmercury is found in low levels in water, infant formula, and breast milk. Although it is clear that large quantities of mercury can damage the nervous system, there is no evidence that the small quantities contained in water, infant formula, and breast milk do. An infant who is exclusively breast-fed will ingest more than twice the quantity of mercury that was ever contained in vaccines and fifteen times the quantity of mercury contained in the influenza vaccine.

## What is known about the causes of autism?

- First, like cystic fibrosis or sickle-cell disease, autism clearly has a genetic basis. Researchers found that when one identical twin had autism, the chance that the other twin had autism was about 90 percent; for fraternal twins, the chance was less than 10 percent.
- Second, although autism clearly has a genetic basis, environmental factors can also cause the disease. For example, children whose mothers took thalidomide during pregnancy had birth defects, including malformed ears and shortened limbs. But they also had a significantly greater incidence of autism than babies born to mothers who never took thalidomide. Thalidomide clearly caused autism, but only if mothers took it early in pregnancy. If mothers took thalidomide in the second or third trimester of pregnancy, their babies weren't at increased risk of autism.
- The thalidomide experience showed that there was a vulnerable time early in pregnancy when a drug could possibly cause autism. Echoes of the thalidomide story are found in babies infected with rubella virus. Babies born to mothers who suffered rubella early in their pregnancies develop birth defects involving the eyes, ears, brain, and heart. They also are at greater risk of developing autism, but like thalidomide, only if the baby is exposed to rubella early during pregnancy. Babies don't develop autism if they are infected with the virus soon after birth. Taken together,

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these findings suggest that a virus or a drug can cause autism, and that there is a vulnerable time early during pregnancy when the baby is at risk. However, during the second or third trimester of pregnancy, or after the child is born, the window for environmental factors causing autism has apparently closed.

- Women in the United States also occasionally received mercury when they were pregnant. It happened when doctors found that the mother's

blood type was not compatible with their baby's blood type. To prevent this blood mismatch from hurting the baby, mothers were given RhoGam, a product that contained thimerosal as a preservative. However, consistent with the observation in Iraq, babies exposed to thimerosal in RhoGam did not have a greater risk for autism than babies whose mothers never received RhoGam. Although thalidomide and rubella virus can cause autism in pregnancy, scientific evidence clearly indicates that mercury doesn't.

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#### Selected References

- Chess S, Fernandez P, Korn S. "Behavioral consequences of congenital rubella," *J Pediatr*, 1978;93:699-703.
- Deykin EY, MacMahon B. "Viral exposure and autism," *Am J Epidemiol* 1979;109:628-638.
- Rodier PM. "The early origins of autism," *Scientific American* February 2000, pp.56-63.
- Stomland K, Nordin V, Miller M, et. al., "Autism in thalidomide embryopathy: a population study," *Developmental Med Child Neurol* 1994;36:351-356.
- A. Hviid, et al., "Association between thimerosal-containing vaccine and autism," *Journal of the American Medical Association* 2003;290:1763-1766.
- T. Verstraeten, et al., "Safety of thimerosal-containing vaccines: a two-phased study of computerized health maintenance organization databases," *Pediatrics* 2003;112:1039-1048.
- J. Heron, J. Golding, and ALSPAC Study Team. "Thimerosal exposure in infants and developmental disorders: a prospective cohort study in the United Kingdom does not show a causal association," *Pediatrics*. 2004;114:577-583.
- N. Andrews, et al., "Thimerosal exposure in infants and developmental disorders: a retrospective cohort study in the United Kingdom does not show a causal association," *Pediatrics*, 2004;114:584-591.
- Nelson KB, Bauman ML. "Thimerosal and autism?" *Pediatrics* 2003;111:674-679.
- Gundacker C, Pietschnig B, Wittmann KJ, et al. "Lead and mercury in breast milk," *Pediatrics* 2002;110:873-878.

#### **Websites with additional information on vaccines and thimerosal**

- American Academy of Pediatrics: "Vaccine Safety: at [http://www.cispimmunize.org/ill/ill\\_main.html](http://www.cispimmunize.org/ill/ill_main.html)
- Centers for Disease Control and Prevention: "Vaccine Safety Issues" at <http://www.cdc.gov/nip/vacsafe/concerns/gen/of-interest.htm>
- Every Child by Two: "Vaccine Safety" at <http://72.32.4.217/ecbt/vaccinesafety.htm>
- Immunization Action Coalition: "Thimerosal Information" at <http://www.immunize.org/safety/thimerosal.htm>
- Institute for Vaccine Safety, Johns Hopkins Bloomberg School of Public Health: "Thimerosal in Vaccines" at <http://www.vaccinesafety.edu/cc-thim.htm>
- Institute of Medicine: "Immunization Safety Review: Vaccines and Autism" at <http://darwin.nap.edu/books/030909237X/html/>
- National Network for Immunization Information: "Thimerosal/Mercury" at [http://www.immunizationinfo.org/thimerosal\\_mercury\\_issues.cfm](http://www.immunizationinfo.org/thimerosal_mercury_issues.cfm)
- U.S. Food and Drug Administration: "Thimerosal in Vaccines" at <http://www.fda.gov/cber/vaccine/thimerosal.htm>
- World Health Organization: "Vaccine Safety" at [http://www.who.int/immunization\\_safety/en/](http://www.who.int/immunization_safety/en/)