

Evidence Shows Vaccines Unrelated to Autism

Erroneous claims that vaccines cause autism have led some parents to delay or refuse vaccines for their children. Some of the claims are that autism is caused by measles-mumps-rubella (MMR) vaccine, vaccines that contain thimerosal, or by too many vaccines. Many studies have been done to test these claims. None has shown that vaccines cause autism. The real causes of autism are not fully known, but the past

decade of research supports the role of genetics in an autism diagnosis. In fact, no scientific question into the causes of autism has been better researched, tested, and examined as the role of vaccines in autism. Volumes of evidence show no link between the two.

This sheet lays out the facts to help parents understand why experts do not think vaccines cause autism.

Medical and legal authorities agree that no evidence exists that vaccines cause autism.

The Institute of Medicine is an impartial group of the world's leading experts that advises Congress on science issues. After reviewing more than 200 studies in 2004 and more than 1,000 studies in 2011, their report strongly stated that the evidence did not show a link between vaccines and autism.

In 2014, researchers from the RAND Corporation published an update to the 2011 Institute of Medicine's report. In a systematic review of the evidence published on vaccine safety to date, they found the evidence was strong that MMR vaccine is not associated with autism.

In 2009, the U.S. federal court reviewed 939 medical articles in their hearings. The court found the evidence was "overwhelmingly contrary" to the theory that autism is linked to MMR vaccine, thimerosal, or a combination of the two. Since then, additional scientific evidence adds evidence to the conclusion that neither vaccines, nor the thimerosal in vaccines, was linked to autism.

Based on the research, the World Health Organization, the European Medicines Agency, Health Canada, and other national and international health groups have concluded that no link can be found between vaccines and autism.

REFERENCES

Institute of Medicine. *Adverse Effects of Vaccines: Evidence and Causality*. National Academies Press. 2011. www.ncbi.nlm.nih.gov/books/NBK190024/
Institute of Medicine. *Immunization Safety Review: Vaccines and Autism*. National Academies Press. 2004. www.ncbi.nlm.nih.gov/pubmed/20669467
Maglione MA, Das L, Raaen L, et al. Safety of Vaccines Used for Routine Immunization of U.S. Children: A Systematic Review. *Pediatrics*. 2014; 134(2):325–337. <https://pediatrics.aappublications.org/content/134/2/325>

The causes of autism are not fully understood, but the evidence does not point toward vaccines.

Parents often first notice the behaviors of autism when their child is 18–24 months old — the age by which most childhood vaccines have been given. Because of this, many parents incorrectly associate vaccination with the onset of autism. Developmental specialists, however, can identify early signs of autism in children when they are much younger. This research supports the scientific consensus that, in most cases, the precursors of autism are present before a child is born. Eric Courchesne and his colleagues at the University of California, San Diego, have confirmed that the brains of children with autism have distinct patches of architectural disorganization in their prefrontal and temporal cortical tissue. Because the organization of the cortex begins in the second trimester of pregnancy, the researchers conclude that the events leading to the malformation of the cortex must begin around this time or earlier, certainly well before a child is born or ever receives a vaccine.

The influence of vaccines on a child cannot explain the measurable differences in brain structure and brain function that exist between autistic and non-autistic children. Starting in the first six months of life, many autistic children experience unusually rapid growth in areas of the brain that are responsible for the skills typically impaired in autism. Researchers have used "functional" MRI scans to study the connections of nerve cells within the brains of autistic individuals. These scans show — in very young autistic infants and toddlers — abnormal connections in areas of the brain that control language, social, and emotional processes, suggesting that these abnormalities contribute to the development of autism. The results of these and other studies provide promising clues for future research on the causes of autism and emphasize that finding its causes will not be as simple as pointing to vaccines as the cause.

What is known with great certainty is that genetics play a major role in determining whether a child will be autistic. The study of twins bears this out. Identical twins have 100% of

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their genes in common; fraternal twins have 50% in common (like any other pair of siblings). In more than three out of four cases, when one identical twin has a form of autism, the other one does too. Among fraternal twins, though, this is true for one out of about seven pairs, at most. A child who has one or more older siblings with autism is between 20 and 50 times more likely to be diagnosed with a form of autism, compared with a child who has no autistic older siblings. The vaccination history of these infant siblings has been investigated (see below). In addition, in families affected by autism, many parents and non-autistic siblings display mild autistic-like traits. The inherited or spontaneous mutations that seem to be associated with autism are in genes that control the development of the brain – including how brain cells develop and make circuits that operate correctly. This finding agrees with the discovery of abnormalities in the way the brain operates even in very young infants and toddlers with autism.

Just like any complex disorder, there are environmental factors that play a role. Scientists found that being sick during pregnancy triggers an immune response that contributes to an autism spectrum disorder (ASD) diagnosis. Multiple studies have linked high levels of air pollution during pregnancy to risk of an ASD diagnosis. Metabolic disorders, like gestational diabetes and obesity, also increase the risk. Certain medications, such as valproic acid (Depakote), taken during pregnancy also have been shown to increase the risk of autism. Scientists are working with families to explore every possible association.

REFERENCES

- Autism Science Foundation. www.autismsciencefoundation.org
- Centers for Disease Control and Prevention (CDC), National Center for Birth Defects and Developmental Disabilities. Autism Spectrum Disorders. www.cdc.gov/ncbddd/autism/facts.html
- National Institutes of Health. National Institute of Child Health and Development: Autism Spectrum Disorder (ASD): NICHD Research Information. www.nichd.nih.gov/health/topics/autism/researchinfo/Pages/default.aspx

A baby's immune system can easily handle the vaccines recommended for infants and toddlers.

Some people worry that receiving too many vaccines early in life can overwhelm a baby's immune system and that this might somehow lead to autism. This doesn't fit with what we know about the remarkable capacity of the immune system. From the moment of a baby's birth, the immune system begins coping with microorganisms in the form of bacteria, viruses, and fungi. Like vaccines, these microbes contain foreign antigens – proteins that stimulate the immune system. When you realize that a single bacterium contains a larger variety and number of antigens than are found in all the recommended early childhood vaccines combined, you can see that a baby's immune system, which copes with exposure to countless bacteria each day, can easily withstand exposure to the antigens in vaccines.

REFERENCES

- Offit PA, Quarles J, Gerber MA, et al. Addressing Parents' Concerns: Do Multiple Vaccines Overwhelm or Weaken the Infant's Immune System? *Pediatrics*. 2002;109(1):124–129. doi:10/1542/peds.109.1.124.PMID:11773551
- Vaccine Education Center, Children's Hospital of Philadelphia. Too Many Vaccines? What You Should Know. www.chop.edu/export/download/pdfs/articles/vaccine-education-center/too-many-vaccines.pdf

No links exist between autism and thimerosal.

A mercury-containing compound, thimerosal has been used since the 1930s as a vaccine preservative in vials that contain several doses of vaccine (called multi-dose vials). Before giving a vaccine, a healthcare professional inserts the needle of the syringe that will be used to administer the vaccine through the stopper of the multi-dose vial and draws out a single dose of vaccine. When the needle pierces the stopper, it is possible that contaminants from outside the vial might be introduced, even when good technique is used. Thimerosal keeps bacteria or other microorganisms that might have entered the vaccine vial from multiplying.

Studies to determine if a relationship exists between thimerosal-containing vaccines and autism have taken two different approaches: (1) some examined groups of children who had received childhood vaccines that contained varying amounts of thimerosal. Autism occurred at essentially the same rate, no matter how much or little thimerosal the children had received. (2) Other studies took the opposite approach, comparing autistic and non-autistic children to see if the autistic children had received more thimerosal-containing vaccines. No significant differences were found in the number of thimerosal-containing vaccines the two groups had received. Finally, researchers have utilized monkey models to mimic the administration of thimerosal in a number of vaccines and tracked outcomes. These studies were supported by anti-vaccine groups and found no effect of thimerosal on behavioral or neuropathological outcome in monkeys.

REFERENCES

- American Academy of Pediatrics. Vaccine Safety: Examine the Evidence. www.healthychildren.org/English/safety-prevention/immunizations/Pages/Vaccine-Studies-Examine-the-Evidence.aspx
- Gadad BS, Li W, Yazdani U, et al., *Proceedings of the National Academy of Sciences USA*, 2015; 112(40): 12498–12503. <https://www.pnas.org/content/112/40/12498>
- Pichichero ME, Gentile A, Giglio N, et al., Mercury Levels in Newborns and Infants After Receipt of Thimerosal-Containing Vaccines. *Pediatrics*. 2008;121(2):e208–214. <https://publications.aap.org/pediatrics/article-abstract/121/2/e208/68691/Mercury-Levels-in-Newborns-and-Infants-After?redirectedFrom=fulltext>
- Nelson KB, Bauman ML. Thimerosal and Autism? *Pediatrics*. 2003;111(3): 674–679. <https://publications.aap.org/pediatrics/article-abstract/111/3/674/79865/Thimerosal-and-Autism?redirectedFrom=fulltext>

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Why was thimerosal in childhood vaccines?

The mercury compound in thimerosal — ethylmercury — is chemically different from methylmercury, which is widely recognized as an environmental pollutant. A key difference is that, unlike methylmercury, ethylmercury is excreted from the body quickly. The amount of ethylmercury in a thimerosal-preserved vaccine is tiny compared with the amount of mercury that is required to cause symptoms of mercury poisoning. Also, the signs and symptoms of mercury poisoning are very different from the characteristics of autism. The chemical difference between ethylmercury and methylmercury is similar to the difference between ethyl alcohol, found in wine and beer, and methyl alcohol (wood alcohol), a poison found in antifreeze.

As a precaution, by 2001, all routinely recommended childhood vaccines were changed to single-dose packaging so they wouldn't require thimerosal. At the time, this was thought prudent, but all the evidence that has emerged since then shows that there was never a danger of children being harmed by thimerosal in vaccines. Some influenza vaccine formulations come in multi-dose vials that are preserved with thimerosal. Today, influenza vaccine is the only childhood vaccine used in the U.S. that contains more than a trace of thimerosal, and we know that it is safe for children.

REFERENCES

CDC. Notice to Readers: Thimerosal in Vaccines: A joint statement of the American Academy of Pediatrics and the Public Health Service. *MMWR*. 1999; 48(26):563–565. www.cdc.gov/mmwr/preview/mmwrhtml/mm4826a3.htm

U.S. Food and Drug Administration. Thimerosal and Vaccines. www.fda.gov/BiologicsBloodVaccines/SafetyAvailability/VaccineSafety/UCM096228

Studies have found no link between autism and MMR vaccine.

Some studies compared groups of children who had received MMR vaccine against those who had not. These studies found that neither group was more likely to develop autism. Other studies looked at comparable groups of autistic and non-autistic children. These studies found that autistic children were no more likely to have received MMR vaccine.

Rumors about the safety of MMR vaccine first arose in 1998 after a British physician (a gastroenterologist, not a person trained in either vaccinology or in neurological

disorders) announced he had found virus from measles vaccines lingering in the intestines of 12 autistic children. He claimed this accounted for their autism. Other researchers, however, were never able to replicate these results, which implied the gastroenterologist's conclusions were erroneous. Later, a press investigation revealed that the doctor had falsified patient data and relied on laboratory reports that he had been warned were incorrect. The journal that originally published his study took the unusual step of retracting it from the scientific literature on the grounds that it was the product of dishonest and irresponsible research, and British authorities revoked the doctor's license to practice medicine.

Some concerned parents have suggested that there may be a genetically susceptible subgroup of babies that lead to an increased sensitivity to vaccine-caused regression. First, scientists are realizing that the sudden regression that has been reported is actually rare. Regression is part of a decline in function that, if monitored closely by a trained clinician, appears prior to when a vaccine is administered. Second, while siblings of those with a diagnosis called “infant sibs,” are less likely to be vaccinated, they are 15% more likely to receive a diagnosis of autism. Finally, using large healthcare databases, two independent research studies examined the probability of an autism diagnosis in these infant siblings with a genetic predisposition to ASD, and found no such increased risk.

The fear that vaccines might cause autism is a dangerous myth. Much scientific research has been devoted to this topic. The result has been an ever-increasing and uniformly reassuring body of evidence that childhood vaccination is, in fact, entirely unrelated to the development of autism. The readings below may be of interest to parents who wish to learn more.

REFERENCES

Immunize.org. MMR Vaccine Does Not Cause Autism. www.immunize.org/catg.d/p4026.pdf

Hviid A, Hansen JV, et al. Measles, Mumps, Rubella Vaccination and Autism – A Nationwide Cohort Study. *Ann Intern Med* 2019; 170(8):513–520. <https://annals.org/aim/fullarticle/2727726measles-mumps-rubella-vaccination-autism-nationwide-cohort-study>

Jain A, Marshall J, et al. Autism Occurrence by MMR Vaccine Status Among U.S. Children With Older Siblings With and Without Autism. *JAMA*, 2015; 312(15:1534-1540). <https://jamanetwork.com/journals/jama/fullarticle/2275444>

Offit PA. *Autism's False Prophets: Bad Science, Risky Medicine, and the Search for a Cure*. New York: Columbia University Press; 2008