# 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. 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. The real causes of autism spectrum disorder (ASD) are not fully known, but the past decade of research supports the role of genetics in an autism diagnosis.*

*Below is a summary of studies that investigated and found no association between vaccines and autism. More information is available at Autismsciencefoundation.org.*

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

The Institute of Medicine (now known as the National Academy 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 spectrum disorder (ASD). An updated review including data through 2021 supported the earlier findings.

In 2009, a 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 evidence has added to the conclusion that neither vaccines, nor the thimerosal in vaccines, are linked to autism.

Based on research published through 2025, the World Health Organization concluded that "the most methodologically rigorous studies do not support a causal association between vaccines, thimerosal-containing or otherwise, and Autism Spectrum Disorder (ASD). The totality of credible scientific evidence strongly supports the safety of current vaccines in relation to both ASD and other neurodevelopmental disorders (NDDs)."


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

For years, scientists have been studying the DNA of people with autism to find genes that confer an elevated probability of a diagnosis. So far, over 100 of these genes have been identified. These genes affect how brain cells are shaped, how they connect, and how they change with time and learning. Another way that researchers have worked to understand possible causes is through studying infant siblings of children with an autism diagnosis. These siblings have up to 6 times higher likelihood of autism diagnosis compared to children with no family history of autism. This and other research point to genetic risk factors as a main cause of ASD. Infants that go on to have a diagnosis of ASD start to show early developmental delays as young as 6 months of age. Past research has shown that siblings of children with ASD are less likely to be vaccinated but still are more likely to be diagnosed with autism. New technologies have allowed scientists to investigate brain development in infants with a higher likelihood of an ASD diagnosis. Their brain development shows differences from typical infants as early as 6 months of age. The developmental cascade that leads to an ASD diagnosis starts well before parents see noticeable symptoms.

This is only part of the evidence that demonstrates that genetic factors are largely responsible for autism. Autism runs in families. Genes that lead to an autism diagnosis are sometimes seen in parents or other family members, but sometimes genetic changes associated with ASD are found only in the child with ASD and not in other family members. The genes associated with ASD control the way brain cells communicate with each other and how brain cells interact in areas of the brain that are known to be associated with language, cognition, emotion and processing of information. The types of brain cells that are affected in autism start to grow during prenatal development, adding to evidence that autism starts before birth.

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Just like any complex disorder, genetics together with environmental factors play a role. For example, a large study in the United States found that women who had an infection during the second trimester of pregnancy accompanied by a fever were more likely to have a child with ASD. 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 other possible associations. Scientists believe that some environmental factors work together with genetics to influence the broad spectrum of symptoms that are collectively known as autism. However, there has been no environmental factor that has been studied more often, more rigorously, or using as many types of assessments, as vaccines. This comprehensive body of research shows no link between vaccines and autism.

While the prevalence of autism is increasing, studies have demonstrated that this is not due to changes in vaccination rates or schedules. While the interaction of genetic and environmental factors is an area of intense interest, the changes in prevalence are mostly due to changes in awareness, diagnostic practices, and increased access to diagnosis and support services. It is also important to consider environmental factors broadly rather than narrowly, to learn more about the effects of the environment on brain development.

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## 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.

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## 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 thereby preventing contamination of the remaining vaccine doses in the vial.

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 children with and without ASD 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 utilized monkey models to mimic the administration of thimerosal in a number of vaccines and tracked outcomes. These studies found no effect of thimerosal on behavioral or neuropathological outcome in monkeys.

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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.

Thimerosal was removed from all routinely recommended vaccines by the end of 2001 with the exception of multi-dose vials of influenza vaccine. Today, at least 95% of seasonal influenza vaccines sold in the United States contain no thimerosal. In 1999–2001, removing thimerosal was thought to be prudent, but all of the evidence that has emerged since 2001 has found no association between thimerosal and ASD. In addition, the rates of autism have continued to increase following removal of thimerosal from vaccines, so it is clear that thimerosal is unrelated to changes in prevalence.

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## 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 children with and without ASD. These studies found no difference in MMR vaccination in children with or without ASD.

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 though his claim was not based on any data presented in that paper. 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, relied on laboratory reports that he had been warned were incorrect, and identified babies that may have influenced the findings. 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 have suggested that there may be a genetically susceptible subgroup of babies that could 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. As described earlier, while siblings of children diagnosed with autism are less likely to be vaccinated, they are up to 6 times more likely to receive a diagnosis of autism. Finally, to examine a genetic interaction with vaccination, researchers looked at rates of diagnosis in siblings of those with autism who had been vaccinated, and found no difference in rates compared to those who had few vaccinations. The readings below may be of interest to parents who wish to learn more.

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