Vaccine Safety: Examine the Evidence

Vaccines are under constant study. For a vaccine to be recommended—as part of the childhood and adolescent immunization schedule (/English/safety-prevention/immunizations/Pages/Recommended-Immunization-Schedules.aspx)—it must be tested, found safe and closely monitored. Safety testing begins as soon as a new vaccine is made and clinical trials (/English/health-issues/conditions/treatments/Pages/Should-My-Child-Join-a-Clinical-Trial.aspx) begin, and evidence of safety is gathered for as long as it is in use.

When it is time for your child to receive recommended vaccines, you may want to know more about vaccines and vaccine-preventable diseases. Pediatricians get a lot of the questions from parents about vaccines. Many questions are sparked by misinformation (/English/safety-prevention/immunizations/Pages/Weighing-the-Risks-and-Benefits.aspx) found online and on social media. No question is too big or too small. It is important to talk with your pediatrician.

The truth about vaccines & autism

The U.S. Centers for Disease Control and Prevention (CDC) recently added misleading claims to its **autism (/English/health-issues/conditions/Autism/Pages/Autism-Spectrum-Disorder.aspx)** webpage. We want to be clear: decades of high-quality, large-scale studies show that vaccines do not cause autism. "Parents deserve peace of mind. Decades of rigorous research have shown vaccines do not cause autism," said **Dr. Susan Kressly (https://www.aap.org/en/news-room/news-releases/aap/2025/statement-by-aap-president-susan-j.-kressly-md-faap-on-changes-to-cdcs-website-on-autism)**, president of the American Academy of Pediatrics. "Vaccines are one of the safest and most effective ways to protect children's health and help them thrive."

What to know about vaccines

The child and adolescent immunization schedule (https://publications.aap.org/redbook/pages/Immunization-Schedules) is a policy that is recommended by the American Academy of Pediatrics (https://www.aap.org/) (AAP). Like all AAP policies, it is developed based on expert review of all available evidence.

As a parent, you can be reassured to know that there have been hundreds of large-scale studies around the world on vaccine safety during the past few decades. They demonstrate that:

- Recommended vaccines are safe for children and teens.
- Vaccines are not associated with conditions like diabetes or problems with fertility.
- Vaccines are not associated with autism or developmental delay.

  easles-containing vaccines are safe.
- Vaccine ingredients are safe.

Research continues to confirm that vaccines are safe and effective—and they protect children and teens from serious diseases.

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How we know that vaccines are safe & effective for children & teens

Here's a round-up of some of the studies published in science publications so parents to read the evidence for yourself.

Note: *This is not an exhaustive list—vaccine safety studies are constantly being conducted and published and may not be reflected here. Experts closely evaluated the methods and data analyses that produced the results described before accepting these studies for publication in scientific journals.*

Safety of Vaccines Used for Routine Immunization in the United States: An Update

Agency for Healthcare Research and Quality (AHRQ) Publication No. 21-EHC024 (2021) (https://effectivehealthcare.ahrq.gov/products/safety-vaccines/research)

This 2021 report is an update to a 2014 report (https://publications.aap.org/pediatrics/article/134/2/325/33005/Safety-of-Vaccines-Used-for-Routine-Immunization) from the Agency for Healthcare Research and Quality (AHRQ). The 2021 update found no new evidence of increased risk since the 2014 report for rare adverse events (severe allergy, seizures caused by fever and blood clotting issues) following administration of routine recommended childhood vaccinations. The AHRQ serves to produce evidence to make health care safer, higher quality, more accessible, equitable and affordable.

Association Between Estimated Cumulative Vaccine Antigen Exposure Through the First 23 Months of Life and Non–Vaccine-Targeted Infections From 24 Through 47 Months of Age

Glanz JM, et al. *JAMA*. 2018;319:906-913 (https://jamanetwork.com/journals/jama/fullarticle/2673970)

In a study of 994 children ages 24-47 months who had an emergency department (ED) or inpatient visit, 193 children were seen for an infectious disease for which there is no vaccine. Study authors counted how many antigens the children were exposed to through vaccines. They compared the group of 193 children with the remaining 801 children who were seen for a different reason. . There was no significant difference in the two groups of children related to their exposure to multiple vaccines through the first 23 months of life and their risk for infections not targeted by vaccines.

Vaccines are not associated with conditions like infertility or diabetes.

A Prospective Cohort Study of COVID-19 Vaccination, SARS-CoV-2 Infection and Fertility

Wesselink AK, et al. *AJE. 2022*; doi.org/10.1093/aje/kwac011 (https://academic.oup.com/aje/article/191/8/1383/6511811)

Study authors found COVID-19 vaccination did not affect odds of achieving pregnancy within one menstrual cycle for males or females. In contrast, though, the study did find that being infected with the virus that causes COVID-19 may lead to a brief decline in fertility for males.

No Association between HPV [human papillomavirus] Vaccination and Infertility in U.S. Females 18–33 Years

Schmuhl NB et al. *Vaccine*. 2020. 19;38:4038–4043 (https://pubmed.ncbi.nlm.nih.gov/32253100/) Back to Top

Authors found that women who had never been pregnant or who were pregnant before they received human papillomavirus (HPV) vaccination were less likely to report infertility. No other associations between HPV and infertility were found.

Childhood vaccination schedule and type 1 diabetes

Glanz JM, et al. *Pediatrics*. 2021;148:e2021051910 (https://publications.aap.org/pediatrics/article/148/6/e2021051910/183391/)

Researchers studied medical records from 584,171 children to learn whether there was an association between receiving on-time vaccination (according to the recommended immunization schedule) and children developing type 1 diabetes (/English/health-issues/conditions/chronic/Pages/Diabetes-Mellitus-Type-1-Diabetes.aspx). The recommended schedule was not positively associated with T1DM in children. These results support the safety of the recommended childhood immunization schedule.

Vaccines are not associated with autism or developmental delays.

Vaccines Are Not Associated With Autism: An Evidence-Based Meta-Analysis of Case-Control and Cohort Studies

Taylor L, et al. *Vaccine*. 2014;32:3623-3629 (https://pubmed.ncbi.nlm.nih.gov/24814559/)

Authors of a meta-analysis review of 10 studies (5 cohort and 5 case-control involving over 1.25 million children looked at autism spectrum disorders (ASD), vaccines, the ingredient thimerosal (mercury) and the measles-mumps-rubella (MMR) vaccine. No causal association was found between vaccinations and ASD or between ASD and the MMR vaccine, specifically. In addition, no causal association was found between ASD and thimerosal (mercury).

Increasing Exposure to Antibody-Stimulating Proteins and Polysaccharides in Vaccines is Not Associated with Risk of Autism

DeStefano F, et al. *J Peds*. 2013;163:561-567 (https://www.jpeds.com/article/S0022-3476(13)00144-3/fulltext)

Researchers studied 321 children with diagnosis of autism spectrum disorder (ASD), autistic disorder (AD) or ASD with regression and 752 children not diagnosed with these conditions. They compared the number of components used in vaccines (antibody-stimulating proteins and polysaccharides) that each group of children had received through vaccines at these ages: birth to 3 months, birth to 7 months and birth to 2 years. The comparisons were to determine if children with a diagnosis of ASD, AD or ASD with regression had received more vaccine components. Having a diagnosis of ASD, AD, or ASD with regression was not associated with exposure to antibody-stimulating proteins and polysaccharides from vaccines in the first 2 years of life. An ASD, AD or ASD with regression diagnosis was not associated with exposure to these vaccine components at any of the studied time periods (birth to 3 months, birth to 7 months, birth to 2 years), or when comparing a how many vaccine components a child received in one day.

On-time Vaccine Receipt in the First Year Does Not Adversely Affect Neuropsychological Outcomes

Smith M, Woods C. *Pediatrics*. 2010;125:1134-1141 (https://publications.aap.org/pediatrics/article/125/6/1134/72509/) Back to top

Researchers looked for any association between vaccines in the first year of a child's life and neuropsychological outcomes 7-10 years later. The study involved more than 1,000 children born between 1993-1997. On-time vaccination in the first year was compared with delayed or incomplete vaccination in the first year. The researchers found no adverse effect on long-term neuropsychological outcomes in 42 tests related to speech and language, verbal memory, achievement, fine motor coordination, visuospatial ability, attention and executive-functioning tasks, behavior regulation, tics and general intellectual functioning. In fact, timely vaccination was associated with better performance on numerous outcomes.

Measles-containing vaccines are safe.

Measles-Containing Vaccines and Febrile Seizures in Children Age 4-6 Years

Klein N, et al, *Pediatrics*. 2012;129:809-814 (https://publications.aap.org/pediatrics/article/129/5/809/73854/Measles-Containing-Vaccines-and-Febrile-Seizures)

A cohort study included 715,484 children age 48-83 months. The children received one of these vaccine combinations:

- dose of measles-mumps-rubella-varicella (MMRV) vaccine,
- dose of measles-mumps-rubella (MMR) vaccine and dose of varicella vaccine on the same day,
- dose of MMR vaccine or
- dose of varicella vaccine on a single day.

Researchers set out to determine risk of post-vaccination seizure for each group. Results showed more fevers and seizures in children who received the MMRV vaccine compared with children in the other three groups, but the finding was not statistically significant. Four febrile seizures (/English/health-issues/conditions/fever/Pages/Febrile-Seizures.aspx) were seen in the 7-10 days post-vaccination for children receiving the MMRV vaccine. Only one febrile seizure could be confirmed. Authors concluded that the rate of febrile seizure after MMRV was 1 in 86,750 doses. There was no increased risk of febrile seizures in any of the study groups within 6 weeks of vaccination.

Autism Occurrence by MMR Vaccine Status Among U.S. Children With Older Siblings With and Without Autism

Jain A, et al. *JAMA*. 2015;313:1534-1540 (https://jamanetwork.com/journals/jama/fullarticle/2275444)

The study looked at MMR vaccine status in children with and without autism spectrum disorder (ASD) with older siblings with and without ASD. Relative risk was calculated for a child receiving an ASD diagnosis at ages 2 years, 3 years or 4 years based on 0 doses or 1 dose of MMR vaccine and whether the child had a sibling with ASD or a sibling without ASD. Relative risk also was calculated any child who got an ASD diagnosis at age 5 years based on 1) whether they'd received 0 doses, 1 dose or 2 doses of MMR vaccine, and 2) whether the child had a sibling with ASD or a sibling without ASD. No harmful association was found between MMR vaccination and ASD risk. In addition, no causal association was found between receipt of 1 or 2 doses of MMR vaccine and having a higher risk of ASD for children with an older sibling with ASD.

No Evidence for Measles, Mumps and Rubella Vaccine-Associated Inflammatory Bowel Disease or Autism in ear Prospective Study

Peltola H, et al., *Lancet*. 1998;351:1327-1328 (https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(98)24018-9/fulltext)

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This 14-year prospective study of 3 million adverse events tracked subjects who developed gastrointestinal symptoms or signs lasting 24 hours or more starting one hour after MMR vaccination. Researchers also checked hospital and health center records or interviewed local public health nurses. No evidence was found for MMR vaccine-associated inflammatory bowel disease or autism.

Autism and Measles, Mumps and Rubella Vaccine:
No Epidemiological Evidence for a Causal Association

Taylor B, et al. *Lancet*. 1999;353:2026-2029 (https://pubmed.ncbi.nlm.nih.gov/10376617/)

Researchers looked for any change in number or age of children diagnosed with autism associated with the MMR vaccine being introduced in the United Kingdom in 1988. The study identified 498 cases of autism (261 "core" autism; 166 "atypical" autism; 71 "Asperger syndrome") in children born in the UK since 1979. There was a steady increase in autism cases by year of birth with no sudden change after the MMR vaccine was introduced. There was no difference in age at diagnosis between the cases vaccinated before or after 18 months of age and those never vaccinated. There was no causal association between onset of autism within 1 or 2 years after vaccination with MMR. Developmental regression was not clustered in the months after vaccination.

Mumps, Measles and Rubella Vaccine and the Incidence of Autism Recorded by General Practitioners: A Time Trend Analysis

Kaye JA, et al. *BMJ*. 2001; 322:460-463 (https://www.bmj.com/content/322/7284/460.full)

A UK study compared MMR vaccination of children and rising prevalence of autism diagnoses in children. The study included 96 children with a pervasive developmental disorder born between 1992 and 1995 who received the MMR vaccine to those who did not receive the vaccine. No correlation was found between the prevalence of MMR vaccination and increase in risk of autism over time.

Measles-Mumps-Rubella and Other Measles-Containing Vaccines Do Not Increase the Risk for Inflammatory Bowel Disease: A Case-Control Study From the Vaccine Safety Datalink Project

Davis RL, et al. *Arch Pediatr Adolesc Med*. 2001;155:354-359 (https://jamanetwork.com/journals/jamapediatrics/fullarticle/190443)

The study looked at measles-containing vaccine (MCV) and risk of Crohn's disease, ulcerative colitis or irritable bowel disease (IBD). Neither past vaccination nor age at vaccination with MCV was associated with increased risk for Crohn's disease, ulcerative colitis, or IBD. Vaccination with MMR or other MCV, or the timing of vaccination early in life, did not increase the risk for IBD.

No Effect of MMR Withdrawal on the Incidence of Autism:
A Total Population Study

Honda H, et al. *J Child Psychol Psychiatry*. 2005;46:572-579 (https://pubmed.ncbi.nlm.nih.gov/15877763/)

In a study of all children born between 1988 and 1996 in Yokohama, Japan, the number of new cases of autism spectrum disorder (ASD) increased significantly even though MMR vaccination decreased and ended in 1993.. In addition, there was a steep increase in ASD that started with the 1993 birth cohort. Authors concluded that the withdrawal of MMR vaccine cannot be expected to lead to a reduction in the incidence of ASD and the vaccine t explain the rise over time in the incidence of ASD.

Measles, Mumps and Rubella Vaccination and Bowel Problems or Developmental Regression in Children With Autism: Population Study

Taylor B, et al. *BMJ.* 2002;324:393 (https://www.bmj.com/content/324/7334/393.long)

This study looked at a population of children born between 1979-1998, including 473 with autism. It found no evidence to link MMR vaccine and a "new variant form" of autism with bowel problems or developmental regression.

Neurologic Disorders After Measles-Mumps-Rubella Vaccination

Mäkelä A et al. *Pediatrics.* 2002;110:957–963 (https://publications.aap.org/pediatrics/article/110/5/957/64506/Neurologic-Disorders-After-Measles-Mumps-Rubella)

In a study of 535,544 children aged 1-7 years who were vaccinated between November 1982 and June 1986 in Finland, no association was found between MMR vaccination and encephalitis, aseptic meningitis or autism.

A Population-Based Study of Measles, Mumps and Rubella Vaccination and Autism

Madsen KM et al. *NEJM.* 2002;347:1477-1482 (https://www.nejm.org/doi/10.1056/NEJMoa021134)

No link was found between autism and age at receipt of MMR vaccination, time since MMR vaccination, or date of MMR vaccination in a population-based study of 537,303 children born between 1991 and 1998. This study was conducted in Denmark.

Age at First Measles-Mumps-Rubella Vaccination in Children With Autism and School-Matched Control Subjects: A Population-Based Study in Metropolitan Atlanta

DeStefano F et al. *Pediatrics.* 2004;113:259-266 (https://publications.aap.org/pediatrics/article/113/2/259/66877/Age-at-First-Measles-Mumps-Rubella-Vaccination-in)

There were similar proportions in case and control groups of children who received their first MMR vaccination by the recommended age or shortly after, and before age 24 months. That's the age when atypical development is recognized in children with autism.

Immunization Safety Review: Vaccines and Autism (2004)

Institute of Medicine, The National Academies Press: 2004 (https://nap.nationalacademies.org/catalog/10997/immunization-safety-review-vaccines-and-autism)

An independent review committee rejected a causal relationship between MMR vaccine and autism. The Institutes of Medicine Immunization Safety Review on vaccines and autism involved input from 15 committee members with expertise in pediatrics, internal medicine, immunology, neurology, infectious diseases, epidemiology, biostatistics, public health, risk perception, decision analysis, nursing, genetics, ethics and health communications. The committee analyzed more than 200 relevant studies. The group also rejected a causal relationship between thimerosal-containing vaccines and autism.

Relationship Between MMR Vaccine and Autism

Klein KC, Diehl EB. *Ann Pharmacother.* 2004;38:1297-1300 (https://pubmed.ncbi.nlm.nih.gov/15173555/)

ticles on autism and MMR vaccine were identified and evaluated. No causal relationship was found.

Is There A 'Regressive Phenotype' of Autism Spectrum Disorder Associated With the Measles-Mumps-Rubella Vaccine? A CPEA Study

Richler J, et al., *J Autism Dev Disord*. 2006;36:299-316 (https://pubmed.ncbi.nlm.nih.gov/16729252/)

Authors found no evidence of an observable loss of skills (regressive phenotype (https://www.genome.gov/genetics-glossary/Phenotype)) of autism spectrum disorder (ASD) associated with the MMR vaccine . This multi-site study used caregiver interviews to describe loss of social-communication milestones. In addition, caregivers reported that the children with ASD had atypical development before the observable loss of skills.

Immunizations and Autism: A Review of the Literature

Doja A, Roberts W. *Can J Neurol Sci*. 2006;33:341-346 (https://pubmed.ncbi.nlm.nih.gov/17168158/)

In a review of literature on immunizations and autism, an overwhelming majority of studies concluded that there is no causal association between the MMR vaccine and autism. Also, no convincing evidence was found to support an association between the vaccine preservative thimerosal and autism. In addition, no evidence was found to support the use of chelation therapy in autism.

MMR-Vaccine and Regression in Autism Spectrum Disorders: Negative Results Presented from Japan

Uchiyama T, et al. *J Autism Dev Disord*. 2007;37:210-217 (https://pubmed.ncbi.nlm.nih.gov/16865547/)

MMR vaccine and regression in autism spectrum disorders (ASDs) were not linked in a study of 904 patients with ASD in Japan. No significant difference was found in the incidence of regression between MMR-vaccinated children and non-vaccinated children.

Measles Vaccination and Antibody Response in Autism Spectrum Disorders

Baird G, et al. *Arch Dis Child*. 2008;93:832-837 (https://pubmed.ncbi.nlm.nih.gov/18252754/)

Researchers studied 98 vaccinated children aged 10-12 years in the UK with ASD and two control groups of similar age: 52 children with special educational needs but no ASD and 90 children in the "typically developing" group. There was no dose-response relationship between autism symptoms and antibody concentrations.

Lack of Association between Measles Virus Vaccine and Autism with Enteropathy: A Case-Control Study

Hornig M, et al. *PLoS One*. 2008;3:e3140 (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0003140)

Autism was not associated with traces of measles virus in the gastrointestinal tract after recovery from infection or MMR vaccination. In this study, researchers looked for measles virus in the guts of 25 children with both autism and gastrointestinal disorders, and another 13 children with the same gastrointestinal disorders but no autism. The virus was detected in one child from each group.

Vaccine ingredients are safe.

Pervasive Developmental Disorders In Montreal, Quebec, Canada: Prevalence And Links With Immunizations

Fombonne E, et al. *Pediatrics*. 2006;118:e139-150 (https://pubmed.ncbi.nlm.nih.gov/16818529/) Back to Top

A study found that thimerosal and MMR vaccine were not linked to prevalence of pervasive developmental disorders in 28,000 children in Montreal, Quebec, Canada, born between 1987-1998 (including 180 identified with a pervasive developmental disorder). Data ruled out an association between pervasive developmental disorder and either high levels of ethyl mercury exposure or 1- or 2-dose MMR vaccinations.

Association Between Thimerosal-Containing Vaccine and Autism

Hviid A, et al. *JAMA*. 2003;290:1763-1766 (https://pubmed.ncbi.nlm.nih.gov/14519711/)

A study of 467,000 children born in Denmark between 1990 and 1996 compared children who were vaccinated with a thimerosal-containing vaccine to children who received a thimerosal-free formulation of the same vaccine. The risk of autism spectrum disorders did not differ significantly between children vaccinated with thimerosal-containing vaccine and children vaccinated with thimerosal-free vaccine. The results do not support a causal relationship between childhood vaccination with thimerosal-containing vaccines and development of autism spectrum disorders.

Thimerosal Exposure in Infants and Developmental Disorders: A Prospective Cohort Study in the United Kingdom Does Not Support a Causal Association

Heron J, et al. *Pediatrics*. 2004;114:577-583 (https://publications.aap.org/pediatrics/article/114/3/577/67138/Thimerosal-Exposure-in-Infants-and-Developmental)

Researchers monitored the thimerosal exposure of more than 14,000 children born in the United Kingdom between 1991 and 1992. The age at which doses of thimerosal-containing vaccines were administered was recorded, and measures of mercury exposure by 3, 4 and 6 months of age were calculated and compared with numerous measures of childhood cognitive and behavioral development between 6 and 91 months of age. No evidence was found that early exposure to thimerosal had a negative effect on neurologic or psychological outcomes.

Thimerosal and the Occurrence of Autism: Negative Ecological Evidence From Danish Population-Based Data

Madsen KM, et al. *Pediatrics*. 2003;112:604-606 (https://publications.aap.org/pediatrics/article/112/3/604/28678/Thimerosal-and-the-Occurrence-of-Autism-Negative)

Data were analyzed from the Danish Psychiatric Central Research Register recording all psychiatric admissions since 1971, and all outpatient contacts in psychiatric departments in Denmark since 1995. There was no trend toward an increase in the incidence of autism during the period when thimerosal was used in Denmark through 1990. From 1991-2000, the incidence increased and continued to rise after thimerosal was removed from vaccines. There also were increases among children born after thimerosal was no longer used. Data do not support a correlation between thimerosal-containing vaccines and the incidence of autism.

Autism and Thimerosal-Containing Vaccines: Lack of Consistent Evidence for an Association

Stehr-Green P, et al. *Am J Prevent Med*. 2003;25:101-106 (https://pubmed.ncbi.nlm.nih.gov/12880876/) Back to Top

A study compared the prevalence and incidence of autism in California, Sweden and Denmark from the mid-1980s to the late 1990s with average exposures to thimerosal-containing vaccines. In all three locations, the incidence and prevalence of autism spectrum disorders began to rise in the 1985-1989 period, and the rate of increase accelerated in the early 1990s. In California, the average thimerosal dose from vaccines increased throughout the 1990s. In Sweden and Denmark, exposure to thimerosal from vaccines was low during the 1970s and 1980s, decreased in the late 1980s and was eliminated in the early 1990s. The data do not support the theory that increased exposure to thimerosal-containing vaccines is responsible for the apparent increase in the rates of autism in young children being observed worldwide.

Thimerosal Exposure in Infants and Developmental Disorders:
A Retrospective Cohort Study in the United Kingdom Does Not Support a Causal Association

Andrews N, et al. *Pediatrics*. 2004;114:584-591 (https://publications.aap.org/pediatrics/article/114/3/584/67149/Thimerosal-Exposure-in-Infants-and-Developmental)

A study analyzed thimerosal exposure and possible developmental delay in 109,863 children born in the UK from 1988 to 1997. Exposure was defined according to the number of diphtheria-tetanus-pertussis/diphtheria-tetanus (DTP/DT) doses received by 3 and 4 months of age, as well as the cumulative age-specific DTP/DT exposure by 6 months of age. With the possible exception of tics, there was no evidence that thimerosal exposure via DTP/DT vaccines causes neurodevelopmental disorders.

Early Thimerosal Exposure and Neuropsychological Outcomes at 7-10 Years

Thompson WW, et al. *NEJM*. 2007:357:1281-1292 (https://pubmed.ncbi.nlm.nih.gov/17898097/)

Researchers compared early exposure to mercury from thimerosal-containing vaccines and thimerosal-containing immune globulin to 42 neuropsychological outcomes in 1,047 children ranging in age from 7 to 10 years. Immune globulin is a substance used to boost the immune system in people with certain conditions. Exposure to mercury from thimerosal was determined from computerized immunization records, medical records, personal immunization records and parent interviews. The study did not support a causal association between early exposure to thimerosal used in vaccines and immune globulin and deficits in neuropsychological functioning at the age of 7 to 10 years.

Continuing Increases in Autism Reported to California's Developmental Services System: Mercury in Retrograde

Schechter R, et al. *Arch Gen Psychiatry*. 2008;65:19-24 (https://pubmed.ncbi.nlm.nih.gov/18180424/)

Autism client data from the California Department of Developmental Services were analyzed between 1995-2007. Thimerosal was removed from recommended childhood vaccines after 2002, but autism cases continued to increase each quarter. The data do not show a decrease in autism in California even after trace levels of thimerosal were removed from nearly all childhood vaccines. Data did not support the hypothesis that exposure to thimerosal during childhood is a primary cause of autism.

Prenatal and Infant Exposure to Thimerosal From Vaccines and Immunoglobulins and Risk of Autism

Price C, et al. *Pediatrics*. 2010;126:656-664 (https://publications.aap.org/pediatrics/article/126/4/656/65433/Prenatal-and-Infant-Exposure-to-Thimerosal-From)

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Researchers reviewed managed care organization records and conducted interviews with the parents of 256 children with autism spectrum disorder (ASD). Another 752 children without autism, matched to the ASD children by birth year, gender and managed care organization, were also studied. Prenatal and early-life exposure to mercury from thimerosal-containing vaccines and immune globulin (a substance used to boost the immune system in people with certain conditions) was not related to increased risk of ASDs.

Lack of Association Between Measles-Mumps-Rubella Vaccination and Autism in Children: A Case-Control Study

Budzyn D, et al. *Pediatr Infect Dis J*. 2010;29:397-400 (https://pubmed.ncbi.nlm.nih.gov/19952979/)

Researchers in Poland compared vaccination history and autism diagnosis in 96 children age 2 to 15 years with autism and 192 children in a control group. For those vaccinated before a diagnosis of autism, the autism risk was lower for individuals who received the MMR vaccine than for those who were not vaccinated. The result was similar for children who received a single-antigen measles vaccine.

Association vs. causation

What do ice cream cone and air conditioner sales teach about vaccine studies?

In a study, if two things happen at the same time or one after another, researchers look closely for any way that one could affect the other. Two things can happen at the same time, but one does not always cause the other. For example, a store sells ice cream cones and air conditioners. The shopkeeper notices that when the store sells more ice cream cones, it also sells more air conditioners. There is an association between ice cream sales and air conditioning sales. However, one of these does not cause or lead to the other. When a person experiences a health problem after a vaccine, they can report it to the U.S. Vaccine Adverse Events Reporting System (https://vaers.hhs.gov/) (VAERS)—even if the health problem was not caused by the vaccine. Read more about how VAERS is used as part of a larger safety monitoring system here (https://vaers.hhs.gov/).

Investigating vaccine safety: uncovering the truth

In 2011, British journalist Brian Deer investigated Dr. Andrew Wakefield (the man who initially claimed a link between autism and the MMR vaccine). A 2011 *BMJ* feature article Secrets of the MMR Scare: How the Case Against the MMR Vaccine Was Fixed (http://www.bmj.com/content/342/bmj.c5347.full) explores Wakefield's practices during the study that was published on the alleged connection between MMR vaccine and autism. The article also uncovers truths that lead to the decision to take away Dr. Wakefield's medical license and the retraction (https://www.thelancet.com/journals/lancet/article/PIIS0140673697110960/fulltext) of the study published on the subject. The 1998 study was cited more than (https://retractionwatch.com/the-retraction-watch-leaderboard/top-10-most-highly-cited-retracted-papers/)600 times *before* it was retracted in 2010. The retracted study serves as an example of how easily misinformation could spread about vaccines and how difficult it has been to disprove the misinformation. After the study was published, vast resources were used to respond to these theories that could have been put toward new research.

More evidence on the Wakefield study is presented in a 2021 *PLoS One* study, Quantifying the effect of Wakefield et al. (1998) on skepticism about MMR vaccine safety in the U.S. (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0256395), and 2019 *JAMA* original investigation, "Assessment of Citations of the Retracted Article by Wakefield et al With Fraudulent Claims of an Association Between Vaccination and Autism (https://jamanetwork.com/journals/jamanetworkopen/article-abstract/2755486)."

. 12, 2009, the U.S. Court of Federal Claims (also called the "vaccine court") ruled in three test cases, finding the *ii*ic evidence to be overwhelmingly contrary to the theory that MMR vaccine and the vaccine preservative thimerosal are linked to autism.

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If you have any questions about vaccines and your child, don't hesitate to talk with your pediatrician.

More Information

- Vaccine Safety: The Facts (/English/safety-prevention/immunizations/Pages/Vaccine-Safety-The-Facts.aspx)
- Recommended Immunization Schedules (/English/safety-prevention/immunizations/Pages/Recommended-Immunization-Schedules.aspx)
- Medicine in the Media: Reliable Health Information v. Fake News (/English/family-life/Media/Pages/Medicine-Ads.aspx)
- Retraction Watch: Top 10 Most Highly Cited Retracted Papers (https://retractionwatch.com/the-retraction-watch-leaderboard/top-10-most-highly-cited-retracted-papers/)

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