

MMR vaccine, inflammatory bowel disease and autism

MMR is a combination vaccine that protects against measles, mumps, and rubella (German measles). It is currently given to children at 12 months and again at 18 months of age. A link between the MMR vaccine and development of bowel inflammation and autism has been suggested by some researchers. However, numerous carefully performed studies and reviews have now been done that have found no relationship between MMR vaccine and autism or inflammatory bowel disease (IBD).

This fact sheet answers commonly asked questions. More general information on the MMR vaccine is also available by following the links in 'Further reading' below.

What is MMR vaccine?

Measles-mumps-rubella (MMR) vaccine is a live virus vaccine that contains measles, mumps and rubella viruses that have been modified (or attenuated) to produce an immune response that protects children against natural infection without causing the diseases themselves. Under the National Immunisation Program (NIP), two doses of MMR-containing vaccine are given at 12 months and 18 months of age.

Since the introduction of vaccination against these diseases, measles, mumps and rubella have become rare in Australia. However, it is extremely important that children continue to be immunised because these diseases remain very common in other parts of the world, and even slight decreases in the number of immunised children can result in major epidemics of measles, mumps or rubella (including the congenital rubella syndrome which seriously affects unborn children).

What is autism and what is inflammatory bowel disease (IBD)?

Autism is a disorder of normal development that is usually diagnosed between 18 months and 3 years of age. Children and adults with autism typically have difficulties in verbal and non-verbal communication, social interactions, and leisure or play activities. Autism is 4 times more common in boys than girls and occurs in all racial and social groups. Many children have some of the features of autism but do not have all the diagnostic criteria, in which case terms such as Pervasive

Developmental Disorder (PDD) and Autism Spectrum Disorder (ASD) are used. A single cause of autism has not been identified, but current research links it to developmental, genetic and environmental factors.

IBD is a group of chronic inflammatory disorders of the small and large bowel, the commonest being ulcerative colitis and Crohn's disease. IBD is relatively rare, and usually occurs between 15 and 30 years of age, but can also occur in children. Common symptoms include diarrhoea, fever, stomach pain and weight loss. The cause of IBD is not understood, but immune mechanisms and a genetic predisposition are likely involved.

Does the MMR vaccine cause autism or IBD, and why was this suggested?

Numerous studies and expert panel reviews have concluded that there is no link between MMR vaccine and autism or IBD.

The possibility of a link between the MMR vaccine and autism/IBD was suggested primarily by one group of researchers led by Dr Andrew Wakefield in the United Kingdom. Dr Wakefield's studies suggested that measles virus in the gut caused a new syndrome of IBD which resulted in decreased absorption of essential vitamins and nutrients through the intestinal tract. It was suggested that this in turn caused developmental disorders such as autism, or worsening of symptoms in children already diagnosed with autism, so-called 'regressive autism'. Although this theory generated a lot of media attention, the studies on which it is based have many significant weaknesses. Over 20 subsequent studies and many expert reviews have shown no association between MMR and these diseases (see below).

What about the studies that suggested a link between MMR and IBD/autism?

Medical and scientific experts who have reviewed the few studies suggesting a relationship between measles or MMR vaccine and autism/IBD have found them to have many significant weaknesses.

In 1993, the first of Dr Wakefield's studies suggested an association between both the natural and vaccine types of measles virus and IBD, based on a study of bowel

specimens from children with IBD. However, other groups of researchers using sensitive laboratory methods have shown that there is no evidence of measles virus in the blood or bowel of children with IBD. In 1998, Dr Wakefield and others reported 12 children with an apparently new syndrome of IBD in association with developmental disorders like autism. However, this study was conducted on highly selected patients, and there were too few patients and no control patients. These errors significantly affected the credibility of the study findings. If IBD causes autism, IBD would be expected to occur first; however, in at least 4 cases, autism preceded the bowel symptoms, and in most of the other cases, the date of onset of bowel symptoms was unknown.

In 2002, Uhlmann, Wakefield and others published a study showing a higher rate of measles virus in the bowel of autistic children with bowel symptoms, compared with a group of children without autism. However, key information on the characteristics and the method of selection of the cases and control patients, on vaccination status, and on laboratory methods were not given, and the control subjects were not matched for gender or age.

In 2004, 10 of the original 13 authors of Dr Wakefield's 1998 study published a statement retracting the paper's interpretation, stating that the data were insufficient to establish a causal link between MMR vaccine and autism.

What studies show that autism and IBD are not related to the MMR vaccine?

A large number of independent researchers from around the world, using many different techniques ranging from molecular biology studies to population-based epidemiology, have now shown that there is no evidence of a link between MMR vaccine and autism or IBD.

The following are summaries of some of the studies performed:

- In 1999, a large population-based study in England looked at the vaccination status of 498 children with autism and control subjects without autism and found no link between the timing of vaccination with MMR and the onset of autism.
- In 2004, another English study looked at the rates of autism in 5,500 children who attended GPs and were immunised with MMR, and found no evidence to suggest a link between the vaccine and autism.
- A study of more than 440,000 Danish children vaccinated in the 1990s compared with 96,000 unvaccinated children provided strong evidence against

the hypothesis that MMR causes autism or autistic spectrum disorder.

- A large study in Finland followed almost 600,000 children for 20 years after MMR vaccination and found no evidence for MMR vaccine-associated autism or other neurological disorders.
- A study of the rates of IBD and autism among 6,100 French school-aged children found no association between MMR and these diseases.
- A study in Sweden in 1998 looking at the prevalence of autism over 10 years found no change after the introduction of MMR vaccine.
- Two independent groups of researchers in the UK performed epidemiologic studies to determine if there was an association between bowel symptoms/autism, and MMR. Both studies found no evidence for gastrointestinal problems being linked to developmental regression or to MMR vaccination.
- Additional studies in the USA and UK found no correlation between trends in early childhood MMR immunisation rates and trends in autism diagnosis. For example, a study done in California showed that, although rates of autism have gone up by 373% over 15 years, the increase in the number of children immunised with MMR has only increased by 14% in that time.
- A study in the USA looked at patients with IBD born over a 32-year period and found that vaccination with MMR or other measles-containing vaccines, or the timing of vaccination early in life, did not increase the risk for IBD.
- At least three laboratory-based studies by different research groups, using technical methods similar to those in the Uhlmann study, found no evidence of measles virus in the bowel specimens of patients with IBD.

What have expert reviews concluded?

A review by the World Health Organization concluded that current scientific data do not permit a causal link to be drawn between the measles virus and autism or IBD. An extensive review published in 2004 by the Institute of Medicine, an independent expert body in the USA, has concluded that there is no association between the MMR vaccine and the development of autism.

Reviews by the American Academy of Pediatrics, the British Chief Medical Officer, the UK Medical Research Council, Canadian experts, and numerous other scientific

experts have stated that there is no link between autism or IBD and the measles vaccine.

Is there any benefit in giving each of the vaccine components separately?

No, there is no evidence that giving each vaccine component of MMR separately over time is of any benefit. In fact, giving each component separately may be harmful because children and their contacts would be exposed to serious diseases over a longer period of time. In addition, many extra needles and immunisation visits would be required. National and international expert bodies, including the NHMRC, the World Health Organization, the Institute of Medicine, the American Academy of Pediatrics, and the United Kingdom Department of Health all recommend that MMR should continue to be used. At present, only the rubella vaccine is available separately in Australia; it is given to women of child-bearing age who are susceptible to rubella, to prevent congenital rubella syndrome.

One of the serious consequences of a decrease in the number of children immunised with MMR vaccine is an increase in the number of children and susceptible adults who will get rubella (German measles). Rubella infection of susceptible women during pregnancy can cause congenital rubella syndrome in the developing fetus, which may result in miscarriage, brain damage, blindness, deafness and other serious problems, including autism spectrum disorder.

What about reports of a link between autism and thiomersal (a preservative in some vaccines)?

Thiomersal (also known as thimerosal) is a preservative used in some vaccines to prevent bacterial contamination of the vaccine vial. Since it is a mercury-based substance, theoretical concerns regarding its use in vaccines have been raised, and it has been removed from many vaccines as a precautionary measure. However, all the scientific evidence available to date suggests that thiomersal in vaccines has never caused any harm. Although a study published by Geier and Geier in 2003 suggested links between thiomersal in vaccines and the rates of autism and heart disease in the USA, these findings have been dismissed because of numerous errors in the study's methods. A review published in the journal *Pediatrics* in 2004 assessed all the published studies regarding thiomersal and autism and concluded that there was no link between thiomersal-containing vaccines and autism spectrum disorder. The Institute of Medicine also

published a wide ranging expert review in 2004 that concluded that there is no link between thiomersal in vaccines and autism.

MMR vaccine does not contain thiomersal, and has never contained thiomersal. For further information on vaccines and thiomersal, see the NCIRS [Thiomersal fact sheet](#).

Further reading

More general information regarding the MMR vaccine is available for immunisation providers in *The Australian Immunisation Handbook*, available online at <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook-home>. Parents can find general information about immunisation at the Immunise Australia website of the Australian Government Department of Health and Ageing (<http://www.immunise.health.gov.au/>).

This editorial (http://www.mja.com.au/public/issues/175_03_060801/macintyre/macintyre.html) in the *Medical Journal of Australia* also discusses MMR, autism and inflammatory bowel disease.

Additional web-based information

National Centre for Immunisation Research and Surveillance. MMR decision aid.

<http://ncirs.org.au/public/mmr-vaccine-decision-aid>

Immunisation Action Coalition. Does MMR vaccine cause autism? Examine the evidence.

<http://www.immunize.org/catg.d/p4026.pdf> (accessed Dec 2009)

UK National Health Service. Immunisation information: MMR. <http://www.immunisation.nhs.uk/Vaccines/MMR> (accessed Dec 2009)

Centers for Disease Control and Prevention. Concerns about autism: CDC statement on autism and thimerosal. <http://www.cdc.gov/vaccinesafety/Concerns/Autism/Index.html> (accessed Dec 2009)

World Health Organization. MMR and autism. http://www.who.int/vaccine_safety/topics/mmr/mmr_auism/en/ (accessed Dec 2009)

Australian Government Department of Health and Ageing. Immunisation myths and realities: responding to arguments against immunisation. A guide for providers. 4th ed. 2008. <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/uci-myths-guideprov> (accessed Dec 2009)

The Children's Hospital of Philadelphia. Vaccine Education Center. Hot topics: Autism. A look at what causes, and doesn't cause, autism.

<http://www.chop.edu/service/vaccine-education-center/hot-topics/autism.html> (accessed Dec 2009)

Scientific papers

Institute of Medicine of the National Academies.

Immunization safety review: vaccines and autism. May 2004.

<http://www.iom.edu/en/Reports/2004/Immunization-Safety-Review-Vaccines-and-Autism.aspx> (accessed Dec 2009)

Smeeth L, Cook C, Fombonne E, et al. MMR vaccination and pervasive developmental disorders: a case-control study. *Lancet* 2004;364:963-969.

Chen W, Landau S, Sham P, Fombonne E. No evidence for links between autism, MMR and measles virus. *Psychological Medicine* 2004;34:543-553.

Parker SK, Schwartz B, Todd J, Pickering LK. Thimerosal-containing vaccines and autistic spectrum disorder: a critical review of published original data. *Pediatrics* 2004;114:793-804.

Offit PA, Coffin SE. Communicating science to the public: MMR vaccine and autism. *Vaccine* 2003;22:1-6.

Wilson K, Mills E, Ross C, et al. Association of autistic spectrum disorder and the measles, mumps and rubella vaccine: a systematic review of current epidemiological evidence. *Archives of Pediatrics and Adolescent Medicine* 2003;157:628-634.

Madsen KM, Hviid A, Vestergaard M, et al. A population-based study of measles, mumps, and rubella vaccination and autism. *New England Journal of Medicine* 2002;347:1477-1482.

Taylor B, Miller E, Lingam R, et al. Measles, mumps, and rubella vaccination and bowel problems or developmental regression in children with autism: population study. *BMJ* 2002;324:393-396.

Andrews N, Miller E, Taylor B, et al. Recall bias, MMR, and autism. *Archives of Disease in Childhood* 2002;87:493-494.

Mäkelä A, Nuorti P, Peltola H. Neurologic disorders after measles-mumps-rubella vaccination. *Pediatrics* 2002;110:957-963.

Uhlmann V, Martin CM, Sheils O, et al. Potential viral pathogenic mechanism for new variant inflammatory bowel disease. *Molecular Pathology* 2002;55:84-90.

Kaye JA, del Mar Melero-Montes M, Jick H. Mumps, measles, and rubella vaccine and the incidence of autism recorded by general practitioners: a time trend analysis. *BMJ* 2001;322:460-463.

Fombonne E, Chakrabarti S. No evidence for a new variant of measles- mumps-rubella-induced autism. *Pediatrics* 2001;108:58-59.

Dales L, Hammer SJ, Smith NJ. Time trends in autism and in MMR immunization coverage in California. *JAMA* 2001;285:1183-1185.

Iizuka M, Chiba M, Yukawa M, et al. Immunohistochemical analysis of the distribution of measles related antigen in the intestinal mucosa in inflammatory bowel disease. *Gut* 2000;46:163-169.

Patja A, Davidkin I, Kurki T, Kallio MJ, Valle M, Peltola H. Serious adverse events after measles-mumps-rubella vaccination during a fourteen-year prospective follow-up. *Pediatric Infectious Disease Journal* 2000;19:1127-1134.

DeStefano F, Chen RT. Autism and measles, mumps, and rubella vaccine: no epidemiological evidence for a causal association. *Journal of Pediatrics* 2000;136:125-126.

Taylor B, Miller E, Farrington CP, et al. Autism and measles, mumps, and rubella vaccine: no epidemiological evidence for a causal association. *Lancet* 1999;353:2026-2029.

Peltola H, Patja A, Leinikki P, Valle M, Davidkin I, Paunio M. No evidence for measles, mumps, and rubella vaccine-associated inflammatory bowel disease or autism in a 14-year prospective study. *Lancet* 1998;351:1327-1328.

Wakefield AJ, Murch SH, Anthony A, et al. Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *Lancet* 1998;351:637-641.

Feeney M, Ciegg A, Winwood P, Snook J. A case-control study of measles vaccination and inflammatory bowel disease. *Lancet* 1997;350:764-766.

Fombonne E, Du Mazauabrun C, Cans C, Grandjean H. Autism and associated medical disorders in a French epidemiological survey. *Journal of the American Academy of Child & Adolescent Psychiatry* 1997;36:1561-1569.

Haga Y, Funakoshi O, Kuroe K, et al. Absence of measles viral genomic sequence in intestinal tissues from Crohn's disease by nested polymerase chain reaction. *Gut* 1996;38:211-215.