ENCYCLOPEDIA
on Early Childhood
Development

The Myth of MMR and Autism Debunked

Michael J. Smith, MD, MSCE

University of Louisville, School of Medicine, USA

April 2013

Introduction

In 1998, Andrew Wakefield and colleagues published a brief report, entitled “Ileal-lymphoid nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children,” in the prestigious medical journal The Lancet.[1] This series of 12 children with developmental disorders and gastrointestinal (GI) problems included nine children with autism. According to their parents, eight of the 12 children had received the combined measles-mumps-rubella (MMR) vaccine prior to developing symptoms. Although the authors wrote “We did not prove an association between [MMR] vaccine and the syndrome described,” Dr. Wakefield suggested in a press release that parents separate the three components of the vaccine until further research could be performed. This study received significant media attention worldwide and many parents began to doubt the safety of the MMR vaccine.

Subject

Because of the concern about MMR and autism, an increasing number of parents have requested to delay or refused this vaccine.[2,3] These include first-time parents as well as those with older children who have been diagnosed with autism.

Problems

Measles is a highly contagious pathogen and vaccine refusal has been associated with disease outbreaks. During the 2008 outbreak in the United States, 91% of cases occurred in unvaccinated individuals, two-thirds of whom had no medical contraindication to vaccination.[4] A smaller outbreak in Indiana affected 34 people, 32 of whom were unvaccinated.[5] Similar outbreaks have occurred in other communities with high levels of susceptible individuals. In the United Kingdom measles was eliminated but with decreased vaccination rates post-Wakefield, is once again endemic, meaning there is sustained person-to-person spread over a 12-month period.[6]

Research Context

The original Wakefield paper was a small case series that included 12 children. Such studies cannot prove that one thing causes another. They may be used to generate hypotheses that may be tested in larger and more rigorous epidemiologic studies.

Key Research Questions

1. Have Wakefield's findings been replicated?
2. At the population level, is receipt of MMR vaccine associated with the development of autism?

Recent Research Results

1. Key Research Question 1: Wakefield postulated that the measles virus in the MMR vaccine traveled to the intestine where it caused inflammation, allowing proteins from the GI tract to enter the bloodstream, travel to the brain and cause autism. This theory has never been proven. In 2008, Hornig and colleagues[7] searched for the presence of measles virus in biopsy samples taken from children with GI disturbances undergoing colonoscopy procedures. Biopsy specimens were taken from the intestines of 25 children with autism and 12 without. The measles virus was not detected more often in the children with autism as compared to those with GI symptoms alone.
2. Key Research Question 2: To date, at least 13 epidemiologic studies have failed to support an association between MMR vaccine and autism.[8] Many of these were ecologic studies that demonstrated that national trends of MMR vaccination were not directly associated with national trends in the diagnosis of autism. For example, Japan suspended the use of MMR

vaccine in 1993, but rates of autism continued to increase.[9] Additional studies have compared the risk of autism in individual children who did and did not receive the MMR vaccine. The largest and most compelling of these assessed 537,303 Danish children born between 1991 and 1998.[10] This study took advantage of the Danish Civil Registration system, which captures information from all medical encounters for all citizens. These researchers found no difference in rates of autism or other autism-spectrum disorders between vaccinated and unvaccinated children. Other population-based studies from across the world have reached similar conclusions.

3. Other Relevant Information: In addition to these scientific questions there are significant ethical considerations surrounding the MMR-autism myth. In 2010, The Lancet formally retracted the original 1998 paper, citing issues of ethical misconduct on the part of Dr. Wakefield.[11] Specifically, he never obtained approval from the hospital ethics committee for his research and the children in the study were not “consecutively referred” as described in the paper, but were hand-selected. Even more worrisome is that Dr. Wakefield received compensation from attorneys who were representing several of the study subjects in a lawsuit against vaccine manufacturers and he held a patent for a new measles vaccine.[12] These financial conflicts of interest were not disclosed at the time of publication. Finally, recent allegations have been made that Dr. Wakefield may have falsified some of the data from this study.[13]

Research Gaps

As outlined above, there is no scientific evidence that the MMR vaccine causes autism. However, for many parents vaccine safety is not a scientific issue, but rather an emotional one. In this context, the key research question has shifted from “Does MMR cause autism?” to “What resources and communication strategies are most useful when discussing vaccine safety with parents who are concerned that vaccines may cause autism?” This line of questioning will require collaboration between medical and risk communication researchers. It is also important to better understand the role of the media in the dissemination of the MMR-autism myth, so future vaccine safety crises may be avoided.

Conclusions

The theory that MMR vaccine causes autism was based on a small case series that included only 12 children. Such a study may be used to generate a hypothesis, but does not establish

causation. Because autism is diagnosed around the same time the MMR vaccine is administered, it is not surprising that parents would suspect an association between the two events. However, multiple microbiologic and epidemiologic studies over the past 14 years have failed to support this theory. We can now conclusively say that the science does not support an association between MMR vaccine and autism. Furthermore, it is clear that there were significant ethical concerns surrounding the initial study, resulting in the retraction of the paper and the revocation of Dr. Wakefield's medical license in 2010. Parents who are concerned about the putative connection between MMR and autism may be reassured by these facts.

Implications for Parents, Services and Policy

The implication for parents is clear; MMR vaccine does not cause autism. Although measles is still not as common as it was in the pre-vaccine era, it is only a plane flight away. As there are negative consequences of remaining unvaccinated, healthcare providers should reinforce this message with parents. From the perspective of policy and services it is time to put the putative connection between MMR and autism to rest. Future research funding and energy should be invested into other etiologies and potential treatments for autism.

References

1. Wakefield AJ, Murch SH, Anthony A, Linnell J, Casson DM, Malik M, Walker-Smith JA. Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *The Lancet* 1998;351(9103):637-641.
2. Dempsey AF, Schaffer S, Singer D, Butchart A, Davis M, Freed GL. Alternative vaccination schedule preferences among parents of young children. *Pediatrics* 2011;128(5):848-856.
3. Smith MJ, Ellenberg SS, Bell LM, Rubin DM. Media coverage of the measles-mumps-rubella vaccine and autism controversy and its relationship to MMR immunization rates in the United States. *Pediatrics* 2008;121(4):E836-E843.
4. Centers for Disease Control and Prevention. Update: Measles - United States, January-July 2008. *Morbidity and Mortality Weekly Report* 2008;57:893-896.
5. Parker AA. Implications of a 2005 measles outbreak in Indiana for sustained elimination of measles in the United States. *New England Journal of Medicine* 2006;355(5):447-55.
6. Editorial team. Measles once again endemic in the United Kingdom. *Eurosurveillance* 2008;13(27).
7. Hornig M, Briese T, Buie T, Bauman ML, Lauwers G, Siemetzki U, Lipkin WI. Lack of association between measles virus vaccine and autism with enteropathy: A case-control study. *Plos One* 2008;3(9).
8. Gerber JS, Offit PA. Vaccines and autism: A tale of shifting hypotheses. *Clinical Infectious Diseases* 2009;48(4):456-461.
9. Honda H, Shimizu Y, Rutter M. No effect of MMR withdrawal on the incidence of autism: a total population study. *Journal of Child Psychology and Psychiatry* 2005;46(6) :572-579.
10. Madsen KM, Hviid A, Vestergaard M, Schendel D, Wohlfahrt J, Thorsen P, Melbye M A population-based study of measles, mumps, and rubella vaccination and autism. *New England Journal of Medicine* 2002;347(19):1477-1482.

11. Editors of The Lancet. Retraction—Ileal-lymphoid-nodular hyperplasia, nonspecific colitis, and pervasive developmental disorder in children. *The Lancet* 2011;375:445.

12. Offit PA. Autism's false prophets: Bad science, risky medicine, and the search for a cure. New York: Columbia University Press; 2008.

13. Deer B. How the case against the MMR vaccine was fixed. *British Medical Journal* 2011;342:77-82.