What Every Behavior Analyst Should Know About the “MMR Causes Autism” Hypothesis

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ABSTRACT

In 1998, the English physician Andrew Wakefield suggested that the MMR vaccine insults the guts of children who then regress developmentally and become autistic. Although his research did not provide firm evidence for this hypothesis, many believe that (a) the MMR vaccine can cause autism; (b) children with autism typically have gastrointestinal problems; and, (c) a necessary component of treating autism is “treating the gut” through dietary restrictions. Research has subsequently shown that Wakefield’s hypothesis is unquestionably false, children with autism are not more likely to have gastrointestinal problems, and there is no sound evidence that diets are a valid treatment for autism. This paper will critically review these topics.

Keywords: Andrew Wakefield, autism, MMR vaccine, vaccines

The purpose of this article is to provide important information to behavior analysts about the relationship (or lack thereof) between autism and the measles-mumps-rubella (MMR) vaccine. Andrew Wakefield first suggested that the MMR vaccine could produce severe bowel problems and regression in development that manifests as autism (Wakefield et al., 1998). With his colleagues at the Royal Free Hospital, he studied 12 children with inflammation in their intestines. Eight of the children were reported to have autism and inflammation in their intestines following the MMR vaccine. Wakefield speculated that the measles virus in the MMR vaccine made its way to the child’s gut, “leaked” through the gut, entered the brain, and then caused autism.

Several implications follow from this “gut theory” of autism. The first is that the MMR vaccine can cause autism. If the vaccine causes autism, there is a good reason for concern about using the vaccine. Careful consideration should then be given to removing the current MMR vaccine, at least temporarily, although this is not without risk as it may lead to the return of preventable diseases. Next,

if there is an insult to the gastrointestinal (GI) system of some children with autism, further study of GI problems and related interventions is warranted for all children with autism spectrum disorders (ASDs).

Providers of services to children with autism should be aware of this situation and how it can impact the services delivered. Towards this end, I will review the MMR-causes-autism hypothesis and the evidence related to Wakefield’s original study that calls into question the validity of his research, and review the ramifications of belief in his hypothesis. Even though Wakefield’s research has been discredited, there still might be some validity to the notion that gut problems occur more often in children with ASDs. Therefore, I will also review the evidence suggesting that persons with ASDs are no more likely to have bowel disorders or severe GI problems. Also, due to the speculation that autism may be related to GI problems, dietary interventions are now commonly used with children with ASDs. I will briefly review some evidence about dietary intervention and suggest that the risks of imposing dietary restrictions on a child with an ASD are only warranted

if there are valid signs of the presence of a food allergy. Finally, in discussing effective treatments for ASDs, behavior analysts should be well informed of the evidence for alternative treatments and the potential impact of the alternative treatments on behavioral interventions. There is also a clear need to effectively communicate accurate information to consumers about these issues while promoting effective, empirically-validated treatments.

Does the MMR Vaccine Cause Autism?

In a study published in the British medical journal the *Lancet*, Andrew Wakefield and colleagues stated that regressive autism and severe bowel problems might be associated with the MMR vaccine (Wakefield et al., 1998). This study suggested that a component of the measles virus from the vaccine was found in the guts of their participants and was the cause of gastrointestinal problems that led to regression. In the article, the authors noted that their study did not prove a link between the MMR vaccine and autism but, after the study was published, Wakefield reported to the media that his work strongly

suggested a causal link between the vaccine and autism (Royal Free Hospital, 1998). He has held press conferences since then to present unpublished research to bolster his claims and to assert that the United Kingdom released the MMR vaccine without proper testing.

In July of 2007, Britain's General Medical Council (GMC) launched an investigation into the fitness of Andrew Wakefield and two of his collaborators to practice medicine, stemming from their autistic regression study (Wakefield et al., 1998). The GMC ultimately found Wakefield to have engaged in misconduct related to this research (Deer, 2010). The GMC described Wakefield as dishonest, irresponsible, unethical, and not acting in the best interests of the children studied. Among the dozens of charges the GMC leveled against Wakefield was that he provided a research proposal to a lawyer seeking to sue vaccine manufacturers for causing autism. This proposed study, if it found that the MMR vaccine caused autism in children, would greatly assist the lawyer in supporting his argument. As was revealed by investigative journalist Brian Deer (2004), Wakefield received a substantial sum of money from this group to conduct this research, a serious conflict of interest. Once this conflict of interest was revealed in *The Sunday Times*, 10 of his 12 co-authors requested that their names be withdrawn from the original publication. Following the findings of the GMC, the *Lancet* retracted the paper. Another paper Wakefield authored—on the effects of vaccines in monkeys—was accepted for publication in the journal *NeuroToxicology* and then retracted. More information on the Wakefield scandal can be found at <http://briandeer.com>, a website maintained by the investigative journalist.

Wakefield continues to endorse these beliefs despite overwhelming evidence to the contrary. Another research group headed by Brent Taylor at The Royal Free Hospital—where Wakefield and colleagues conducted their work—published a study contradicting the assertion made by Wakefield that the MMR vaccine was associated with a higher probability of gastrointestinal problems (Taylor et al., 2002). They reviewed the medical records of over 400 persons with autism and found that there was no increased prevalence of GI problems or regression following the introduction of the MMR vaccine in London in 1979. This record review is only one study, but there is additional evidence that refutes Wakefield's hypothesis.

A study published in *Pediatrics* assessed whether the measles virus was more likely to be in the bodies of children with ASDs than in typically developing children (D'Souza Fombonne, & Ward, 2006). Essentially this was an attempt to replicate Wakefield's findings using the same procedures. D'Souza et al. studied 54 children with ASDs and 34 typically developing children using the same technique, polymerase chain reaction assays (PCR; a technique to identify the presence of substances in bodily tissue and fluid), that had purportedly detected measles in eight children with ASDs in Wakefield's work. They found that none of their results contained the components of the measles virus found in the vaccine. That is, neither the children with ASDs nor the typical children showed any evidence

of measles virus in their bodies. Furthermore, there were no differences found in measles antibodies across the groups of children. Another study, conducted by Afzal et al. (2006), produced similar findings.

Testimony in the Autism Omnibus¹ proceeding by the world's foremost authority on PCR, Stephen Bustin, described how the Wakefield results were the product of contamination (Seidel, 2010). There should have been measles RNA in the samples but there was only DNA. So, the Wakefield results were, in fact, not positive for measles from the MMR vaccine, they were positive for measles introduced into the lab by the investigators. This was corroborated in the Omnibus Autism Proceeding by the testimony of Nicholas Chadwick, who had worked in Wakefield's lab. He stated they found no positive results for the measles virus present in the MMR vaccine during the study and that he informed Wakefield of this result. This, in combination with numerous other studies showing no relation between the MMR vaccine and ASDs (e.g., Dales, Hammer, & Smith, 2001; Fombonne & Chakrabarti, 2001; Honda, Shimzu, & Rutter, 2005; Kaye, del Mare Melero-Montes, & Jick, 2001; Mrozek-Budzyn, Kieltyka, & Majewska, 2009), provides strong evidence against the "MMR causes autism" hypothesis.

The Evidence of Harm

What are the repercussions of Wakefield's false hypothesis? Perhaps most important is that we have seen a drop in the rates of the MMR vaccine in a number of places, no more so than in the UK. Two boys have died of the disease, and the number of cases of measles has skyrocketed from just 56 cases in 1998 to nearly 1,400 in 2008 (Health Protection Agency, 2009). These rates are even more alarming given that measles had been nearly eradicated through vaccination. The Bulletin of the World Health Organization (Wise, 2001) reported the British government spent over \$4.4 million to combat the decreased usage of the MMR vaccine. The rate of MMR usage has dropped below 75% in certain areas in England and 95% coverage rates are necessary to prevent measles outbreaks. Of course, these data are only correlational, but the picture they paint is disturbing given the potential ramifications. For example, Japan, the only country that uses the single measles and rubella vaccines "suffers from endemic and epidemic measles. Between 1992 and 1997 there were 79 measles deaths in Japan" (Wise, 2001, p. 272).

Although the data concerning the increased incidence of measles in the UK following Wakefield's article are only correlational, Brent Taylor and colleagues have reported an interesting and unsettling finding that lends credence to the suspected link between the two. Taylor et al. (2002) obtained multiple parental interviews for many children diagnosed with an ASD about when they noticed the onset of autistic symptoms. A review of each individual case was made. Several parents reported

¹ The Omnibus Autism Proceeding was formed in July 2002 by The National Vaccine Injury Compensation Program, housed in the U.S. Court of Federal Claims.

different times of the onset of autistic symptoms in different interviews. Taylor et al. state:

“A review of each record showed that in 13 children the history given by the parents had changed after the extensive publicity about MMR vaccine and autism. Before the publicity the parents often reported concerns early in their child’s life, usually before their first birthday; the current history for the same children recorded symptoms as developing only after MMR vaccination, in some cases shortly after. This bias associated with changes in the history given by the parents necessitates particular care when interpreting [parental report]” (p. 395).

In a related study, Andrews et al. (2002) found that parents of children with autism diagnosed after the MMR controversy was publicized in the media were more likely to report the onset of autism as just after MMR vaccination than were parents of children with autism diagnosed before the controversy. The impact of the media’s coverage of this issue seems to have had a significant and detrimental influence. Specifically, the media coverage has fostered steadfast beliefs that the MMR vaccine causes autism (Andrews et al.).

Are Children with Autism More Likely to Have Gut Problems?

One implication of Wakefield’s discredited research was that children with autism should have more gastrointestinal problems than children who are typically developing. However, medical researchers from the Mayo Clinic have shown that children with autism are no more likely to have diarrhea, vomiting, gastroesophageal reflux, or abdominal discomfort than their typically developing peers (Ibrahim, Voigt, Katusic, Weaver, & Barbaresi, 2009). This finding supports earlier research conducted by Black, Kaye, and Jick (2002) who found that children with autism were no more likely to have signs of irritable bowel disorder than their typically developing peers. The study by Ibrahim et al. reviewed historical medical records of 121 children with a diagnosis of autism in Minnesota. They then selected two control subjects for each child with autism and similarly reviewed their medical records. Records were reviewed for signs of constipation, diarrhea, gastroesophageal reflux and vomiting, abdominal discomfort and irritability, and feeding issues or food selectivity. They did find statistically significant differences in the incidence

of constipation and feeding problems, but there were no differences in any of the gastrointestinal symptoms that Wakefield suggested produced developmental regression. It is not an unusual or alarming finding that constipation and food selectivity occur more often in children with autism relative to their typically developing peers. A delay in a child learning to use the toilet independently is a frequently encountered problem with all developmental disabilities and one of the most commonly reported pediatric problems for typically developing children, and delays in toilet training are usually accompanied by constipation (Fishman, Rappaport, Cousineau, & Nurko, 2002). Moreover, food selectivity has been reported to occur more often in children with autism by a number of studies, and at least one study found that children who were selective were most likely to selectively consume starchy foods, which can be associated with constipation (Ahearn, Castine, Nault, & Green, 2001).

Should Diets Be Used to Treat Autism?

The unsupported notion that children with ASDs are more prone to gastrointestinal problems has led to the propagation of treatments geared towards altering the diets of children with autism. Currently, the most popular diet promoted as a “cure” for autism involves restricting casein and gluten from the child’s diet. The unfounded assumption behind recommending that casein and gluten be restricted is that the processing of these substances causes many of the symptoms of autism (Cade et al., 1999). One very important reason to not restrict, for instance, access to casein and gluten from a child’s diet is that there is no scientific evidence that casein, gluten, or any other ingested substance causes autism.

Dietary interventions for developmental and learning disabilities have been controversial for decades. When a child presents with a metabolic disorder, it often follows that diet may be a critically important variable. For example, phenylketonuria, is effectively managed by diet. Many other common disorders are not responsive to dietary interventions. Feingold (1975) first proposed that eliminating certain substances like preservatives would result in a child with attentional problems becoming more focused and less hyperactive. These claims did not turn out to be valid for 95% of the children treated with diet (NIH, 1996) and those who were helped tended to have clearly identifiable food allergies. Evidence suggests that attention deficit hyperactivity disorder (ADHD) is a neurological condition, and a complex disorder with little compelling information about its cause(s). Nevertheless, it is generally agreed that ADHD is unlikely to be caused by

food allergies, excessive sugar intake, or other variables that do not affect an individual's neurological make-up (NIH, 1996).

Unless a child with autism has a specific food allergy or intolerance or a metabolic condition, it is unlikely that dietary changes will affect them in a positive manner. Though children with ASD seem no more likely to have gastrointestinal difficulties, including food allergies, than typically developing children (see Buie et al., 2010, for an expert consensus statement on these issues), the fact is that both children with ASD and those who are typically developing can have gastrointestinal difficulties. Food allergies are clearly an appropriate concern for all children. In fact, at times they can involve severe reactions that are life threatening.

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Food allergies occur because the body develops antibodies specific to the allergen in the offending food. The next time that this substance is ingested, the antibodies then trigger the release of histamine and an allergic reaction occurs. They have symptoms that are typical of an allergic reaction, may vomit frequently, and often have abnormal bowel movements. Symptoms such as diarrhea, tingling or swelling in the mouth area, difficulty breathing, pronounced rashes especially on the face or torso, typically appear shortly after ingesting the allergen. Most children outgrow their allergies, although it is thought that allergies to nuts (and peanuts), fish, and shellfish are likely life-long allergies (Cianferoni, & Spergel, 2009).

If a child has a documented food allergy then removing the allergen(s) from the child's diet is one necessary component of resolving the problem. However, determining that the child has a specific food allergy is a critical first step. If a child is suspected of having an allergy because of symptoms, then there are two tests commonly accepted as valid means of diagnosing food allergy. These are the skin prick assessment and the RAST (radioallergosorbent test), administered by allergists. These tests can be combined with information gathered by alternately exposing or restricting access to the suspected allergen and determining whether symptoms respectively appear and dissipate to confirm test results. For the child with a food allergy, the benefit of removing the allergen will be apparent in that the overt symptoms caused by ingestion of the offending substance will dissipate. Although a child with autism might be more receptive to instruction and have a more positive affect when

they are no longer experiencing gastrointestinal distress, there is no evidence that removing the allergen is likely to function as a cure for the core symptoms that result in an autism diagnosis. For more sound information about food allergies, go to the National Library of Medicine's food allergy site at <http://www.nlm.nih.gov/medlineplus/foodallergy.html>.

What Behavior Analysts Should Know about Effective Treatment

Despite its invalidity, the MMR vaccine-causes-autism hypothesis has likely distracted parents from effective treatments for the unique problems associated with autism, and treatments geared towards treating autism through dietary restrictions will likely not improve conditions for those diagnosed with autism. A child diagnosed with autism presents a challenge first and foremost to the child's family but also to their physician, teachers, and many others. Once a diagnosis is made, the family must decide what they will do for their child. Hopefully, at some point the family will encounter a behavior analyst who can design effective programs to teach important skills and address excessive problem behaviors. It is also important for the behavior analyst to provide accurate and effective advice with respect to treatments that were not developed by or for behavior analysts.

Invariably, behavior analysts will be challenged as to why they are not recommending the latest fad with respect to autism intervention. This paper provides a set of responses for addressing but one example and provides behavior analysts with some resources describing the evidence against the notions that the MMR vaccine is related to autism or that gut problems are related to the symptoms of autism.

Every behavior analyst providing services should develop skills for critically evaluating information about the causes of the disorders encountered and the commonly recommended non-behavioral interventions for them. To do this it is necessary to regularly review the published scientific literature. A Google search, though not the best place to turn to for reliable information, will place you in contact with some of treatments suggested for various disorders. This type of online search must, however, be followed by a review of the scientific evidence for these treatments. For most people, the scientific literature is best accessed through PubMed.gov, the search engine maintained by the United States National Library of Medicine and available to the public at no charge.

Any claim for treatment efficacy should be supported by reliable and replicable experimental research. For example, the evidence for early intensive behavioral intervention (EIBI) for autism would be very poor if there were only case reports in which caregivers reported that the children improved. Fortunately, there is a vast scientific literature base demonstrating that EIBI produces clinically significant changes in reliably measured indicators of cognitive functioning and adaptive

behavior (for a review, see Eldevik, Hastings, Hughes, Jahr, Eikeseth, & Cross, 2009). EIBI is not the only treatment approach necessary for effectively meeting the needs of persons with ASDs. For example, medical treatments are important for treating some of the physiological problems that regularly accompany ASDs, like seizures. Nevertheless, new treatment approaches must be subject to the same types of empirical analyses as those conducted on EIBI, and adoption should only follow when clear evidence of the treatment's efficacy has accumulated.

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Action Editor: Matthew P. Normand, Ph.D., BCBA