Elevated Levels of Measles Antibodies in Children with Autism

Vijendra K. Singh, PhD, and Ryan L. Jensen, BS

Introduction

Autism is a complex disorder of the central nervous system (CNS), manifesting both neurological as well as behavioral impairments. The disorder causes severe deficits of higher mental functions such as social interaction, language, communication, imagination, and cognition. The etiology and pathogenesis of the disorder is not well known or established. Current theories include genetic factors, immune factors, viral factors, neural factors, and yet other unidentified factors. To that end, we focused on autoimmune mechanism of pathogenesis for autism [1-4]. Because viruses are common trigger agents for autoimmune diseases, we hypothesized that a virus-induced autoimmune response may play a causal role in autism [5,6]. Since viral studies are extremely scarce in autism, we conducted a serological study of three viruses, namely measles virus, mumps virus, and rubella virus. In this communication, we describe elevated levels of measles antibodies in autistic children, possibly as a consequence of a misguided immune response to measles vaccine.

Materials and Methods

We conducted a serological study of measles virus (MV), mumps virus (MuV), and rubella virus (RV) in autistic children and control children. The study included 88 autistic children (aged 3-10 years), 32 normal children (aged 4-10 years) and 15 siblings of autistic children (aged 4-11 years). However, because of our limited resources, not all sera were tested for all three viruses. The samples for analysis were randomly selected and tested in a blinded fashion to avoid inherent bias. As described previously [1-3], the clinical diagnosis of autism relied essentially on standard DSM-IV criteria of the American Association of Psychiatrists (APA), Washington, DC. The Institutional Review Board (IRB) reviewed and approved our research protocol that involved the use of human serum samples. At the time of blood draw or a minimum of two weeks before the blood draw, none of the patients or controls was taking any prescription medications such as antipsychotic or neuroleptic drugs. Because of our ongoing research of autoimmunity in autism [3-5], we used previously collected sera that were kept frozen at −20C. In this study, we included children with a firm diagnosis of autism only. According to individual records, all children in the study had their measles-mumps-rubella (MMR) immunization but none had any history of a wild-type infection to measles, mumps, or rubella virus. Viral antibodies were measured by using commercially available ELISA kits (Sigma Diagnostics, St. Louis, MO). These assays were performed essentially according to technical instructions of the manufacturer of the ELISA kits. Subsequently, the antigenic detection of measles virus was attempted by immunoblotting that was performed according to our published report [4-6]. The source of the virus was measles virus vaccine (MVV) (Merck & Co, Inc., West Point, PA); this choice was made because we did not have access to proper facilities for handling the wild strain of measles virus. Briefly, the viral proteins were separated in 12%
Results and Discussion

Serologically, the quantitative levels of viral antibodies are described in Figure 1. It should be noted that the measles antibody level was significantly (p = .003) higher in autistic children as compared to normal children. However, in these two groups of children, the level of mumps antibodies or rubella antibodies did not attain statistical significance; the p values were 0.759 and 0.879 for mumps antibodies and rubella antibodies, respectively. Moreover, a similar result was found when the comparison was made between autistic children and siblings of autistic children, i.e., autistic children harbored significantly (p ≤ 0.0001) higher levels of measles antibodies but not mumps or rubella antibodies when compared to siblings of autistic children. Furthermore, the immunoblotting analysis of antigens immunopositive for measles antibodies is illustrated in Figure 2. The antibody in the autistic serum recognized a protein of approximately 74 kd molecular weight in the MVV blot (Figure 2, right panel 4 blots) but the normal serum did not show this antibody reaction (Figure 2, left panel 4 blots). While not revealed here, the sera of siblings of autistic children were also negative.
mononuclear cells of autistic children [11]. Serological data described here showed a significant increase of measles antibody in autistic children but the increase was not found for two other viruses (mumps and rubella) that we studied. In this regard, it is important to note that the serology for HHV-6 and CMV also did not differ between autistic children and normal children [4]. Thus autistic children have a hyper-immune response to measles virus specifically, but not to other viruses such as mumps, rubella, HHV-6 or CMV. Taken together, these findings suggest an etiological role of measles virus with the disorder.

Furthermore, in an attempt to determine antigenicity of the virus, we found that measles antibodies were immunopositive to measles virus vaccine (MVV), specifically to a protein of approximately 74 kd molecular weight. For this purpose, we did not use the wild strain of virus because we did not have proper laboratory facilities to handle the live strain of the virus. However, we are planning to address the vaccine versus the wild strain issue in near future. The nature of the MVV-derived protein is presently not known but its molecular weight appeared to resemble the molecular weight of hemagglutinin (HA) antigen of measles virus; the initial characterization of MMR vaccine-derived proteins was recently described elsewhere [6]. Thus the hyper-immune response to measles virus could possibly be directed towards the HA antigen; however, more research is needed to firmly establish this result. Moreover, it should be pointed out that none of the autistic children in our study had any history of a measles rash or wild type measles infection but they all have had their immunization with measles vaccine MMR [4-6]. This vaccine in a small population of genetically predisposed children may perhaps manifest an atypical measles infection that does not yield a clinical rash but produces neurological symptoms similar to those seen in children with autism. Alternatively, a mutant measles infection, similar to the one recently described [12], might exist in autistic children. While more research is necessary to uncover the etiology of autism, the hyper-immune response to measles virus might indicate virus reactivation that triggers a misguided humoral immune response in children with the disorder.

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References