



Dynamic Chiropractic – September 18, 2000, Vol. 18, Issue 20

Report: Rotavirus Vaccine May Trigger Juvenile Diabetes

By Michael Devitt

Last year, the Centers for Disease Control and Prevention (CDC) withdrew its recommendation that infants receive a vaccine to protect them from rotavirus, a common cause of diarrhea in babies and young children, citing concerns that the vaccine could cause a rare and potentially fatal bowel disorder.

New research conducted by a team of scientists in Australia may have found a link between the vaccine and another childhood disease. The report, which appears in the August 2000 issue of *Diabetes*,¹ suggests that infection with rotavirus may mimic a type of protein that could lead to the onset of Type I diabetes in some children.

Type I diabetes (also called juvenile or insulin-dependent diabetes) accounts for approximately 10% of all diabetes cases in the U.S. Unlike the more common Type II, which usually affects people in middle age, Type I diabetes is an autoimmune disease usually seen in children and young adults. As with most diseases, some people are at a higher risk genetically of developing the condition than others.

The disease occurs when the body's immune system attacks specialized cells in the pancreas that produce insulin. By destroying those cells, the body is unable to control its levels of blood sugar, leaving some patients to rely on daily insulin injections to regulate blood sugar properly.

Rotavirus has long been suspected as a contributing factor to juvenile diabetes. Some of the first substantial evidence on the subject was presented two years ago, when Dr. Margo Honeyman of the Walter and Eliza Hall Institute of Medical Research (in Melbourne, Australia) noticed that parts of some rotavirus proteins appeared quite similar to proteins that trigger the negative immune response in pancreatic cells.²

To provide further evidence of a link between juvenile diabetes and rotavirus, Dr. Honeyman and a team of researchers monitored the progress of 54 babies for six years. All 54 had a parent or sibling with Type I diabetes, meaning they were at a greater risk of developing the disease.

All 54 children studied became infected with some form of rotavirus, with 24 showing clear signs of developing juvenile diabetes. In those 24, levels of antibodies in their blood (signaling an attack on the pancreas) increased every time they had a rotavirus infection. This effect did not show up in the children who did not develop diabetes, nor did the virus cause an antibody response in body organs.

The scientists were unable to determine exactly how rotavirus might trigger the onset of diabetes. One proposed theory is that the rotavirus might damage pancreatic cells directly when it infects them, which would provide a more causal link between the virus and the disease.

Another theory, however, suggests that the rotavirus might only mimic the proteins that incite the immune system into attacking the pancreas. If this theory were to hold true, it would mean that while receiving the rotavirus vaccine would protect some individuals from developing Type I diabetes, it could also trigger the disease in people who are genetically susceptible. "If rotavirus is directly infecting the pancreas, then a vaccine will be safe and protective," said Dr. Honeyman. "But if it's mimicry alone, or both infection and mimicry, the vaccines may be dangerous."

"The idea of molecular mimicry is extremely interesting," added David Cubitt, a virologist at the Great Ormond Street Hospital in London. "But obviously lots of other bits of the puzzle need to be put in."

The study by Honeyman's team is the latest in a series of reports indicating possible drawbacks to the rotavirus vaccine.

First licensed for approval by the Food and Drug Administration in August 1988, the vaccine was designed to protect children from becoming infected with rotavirus, the most common cause of diarrhea in infants and young children in the United States. However, efficacy trials completed in the U.S. and Finland showed the vaccine to be no more than 68% effective against any type of diarrhea caused by rotavirus, while a report from the CDC stated that natural infection from rotavirus provided between 75-88% protection against subsequent infections.

In October 1988, the CDC issued a fact sheet stating that although the vaccine was effective against severe cases of diarrhea caused by the virus, "a large number of milder cases of rotavirus diarrhea will still occur" and that the vaccine "does not prevent all childhood diarrhea."

Almost a year to the day after issuing its fact sheet, the CDC's Advisory Committee on Immunization Practices issued a statement saying it "no longer recommends immunization of infants" with the rotavirus

vaccine after receiving more than 100 reports of intussusception, a rare and sometimes fatal bowel disorder, among infants who had recently been vaccinated.

References

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2. Honeyman MC, Brusic V, Stone N, Harrison LC. Neural network-based prediction of candidate T-cell epitopes. *Nature Biotechnology* October 1998;16(10):966.



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