

# Neurological Complications of Vaccinations

By Charles M. Poser MD FRCP

Neurological complications of immunizations have been recorded in the medical literature for many years, yet many physicians fail to recognize their clinical manifestations and identify their etiology. This is due in part to their rarity, and to the well-publicized, overriding public health benefits that make these complications easily overlooked. Yet they can be devastating despite the fact that early treatment is often successful.

A great deal of knowledge regarding their pathogenesis has accumulated over the years based on the existence of excellent animal models of the human disease, acute disseminated encephalomyelitis, the commonest neurological manifestation of an adverse immune response to vaccines. Experimental allergic encephalomyelitis and neuritis faithfully reproduce the pathologic alterations of the nervous system that may complicate immunizations.

Adverse reactions involving the nervous system from a wide variety of immunizations result from the same pathogenetic mechanism. They may affect any and all parts of the central and peripheral nervous systems. With rare exceptions, e.g. rubella immunization, the nature of the vaccine does not seem to influence the nature of the response.

Thus the nervous system ailments include many different clinical forms, ranging from the classic acute disseminated encephalomyelitis to aseptic meningoencephalitis. In rare instances, in the case of live viruses, e.g. polio and smallpox, an actual infection by the virus itself may ensue. Many different vaccinations involving many different sites in the nervous system have been reported. This is particularly true of vaccines commonly used in children against measles, varicella and rubella.

The pathogenetic mechanism is as follows: the primary effect of the hyperergic (immune) reaction is on the small blood vessels of the nervous system, usually capillaries, but occasionally involving arterioles and venules; in exceptional circumstances, even major arteries such as the carotid may be affected. The vasculopathy may cause vessel obstruction and ischemia, a stroke. Rupture of the vessel wall results in hemorrhage.

More commonly, however, there is alteration of the blood-brain barrier, exsudation of water and edema (swelling) of nervous tissue. Inflammation and disorganization of the myelin lamellae (layers) and destruction of myelin may ensue but are not obligatory. In some cases, there is sufficient red blood cell diapedesis (migration through the vessel wall) to produce what is known as acute hemorrhagic leukoencephalopathy, which despite its awesome appearance is usually responsive to vigorous treatment.

The extent of pathological involvement of nervous tissue also varies greatly, as seen in

vaccination against measles, mumps and varicella. In infants, brain swelling, also known as congestive edematous encephalopathy, may be the only complication, a condition that often responds dramatically to treatment with corticosteroids. It occurs most commonly in vaccination against smallpox.

The diagnosis of acute disseminated encephalomyelitis, the commonest complication of vaccinations in both children and adult, has been aided by magnetic resonance imaging (MRI). The pictures are reasonably characteristic, yet, unfortunately, despite many published descriptions, these images are not always correctly interpreted, and are often misread as those of multiple sclerosis.

There is also some confusion in terminology: "encephalitis" and "meningoencephalitis" refer to actual invasion of the brain by a virus, while "encephalopathy" is a generic term that simply describes a pathological condition of the brain; "encephalomyelitis" refers to an "allergic" or immune reaction of the nervous system. It is the latter term that should be generally used for the nervous system complications of vaccinations.

The official publications that commented on the ill effects of the 1976 swine-flu (A-New Jersey 76) vaccination campaign illustrate the problems that arise when there is need to extrapolate scientific data to judicial considerations. The report stating that the Landry-Guillain-Barré syndrome (LGBS) was the only "real" complication of the swine-flu vaccine passed over published reports to the contrary. The statement that there had been underreporting of complications was simply ignored. The accepted view is that if an adverse reaction does not reach the magical figure of 5 percent, it does not exist.

The reverence accorded to statistical analyses overlooks the value of anecdotal reports in constructing valid medical hypotheses; this is despite the warnings by respected epidemiologists that such studies can never deny the existence of a cause-and-effect relationship. This is illustrated by the report of nervous system complications following vaccination against hepatitis B. Another problem arose from the decision to limit the "acceptable" time period of onset after immunization, which ignored a number of reports of well-documented delayed reactions.

In the last few years a new mantra has emerged to the effect that all published results such as proposed new treatments, must meet the test of being "evidence-based," which means that they must be derived from statistically verified data. Thus calculations of probabilities, also known as educated guesses, will take precedence over clinical, pathological, radiological or experimental data. Close examination of some specific situations will reveal the flaws of this concept.

There is no way of predicting who will have an adverse reaction to vaccination. The individual's susceptibility is determined by the genetic background and previous immunological history. We are constantly exposed to a wide variety of viral antigens that cause our immune system to develop antibodies against them. The phenomenon of molecular mimicry explains why some people's immune system will mistakenly respond to the measles antigen, for instance, in the vaccine because some of its amino acid

groupings, its epitopes, are the same as those in the protein of a previously encountered viral antigen.

This is why there was an unexpected preponderance of people in their 50s and 60s who developed LGBS after swine-flu vaccination, because they might have been exposed to the "Asian flu" caused by a somewhat similar virus in the 1920s. It is also germane to point out that vaccines contain a number of substances, many of them as antigenic as the one for which they were designed. Preservatives may also contribute to the adverse side effects. It is extremely difficult to distinguish the effects of the vaccines' constituents.

Physicians often neglect to ask about previous vaccinations when confronted with puzzling neurological illness. Most of them appear to have been convinced that immunizations are completely harmless. Many also believe that such reactions must occur within one month from vaccination, and therefore do not inquire about immunizations in previous months.

Because of the expense of testing drugs, vaccines and other medical products, the pharmaceutical industry has assumed an increasingly important role in the conduct of therapeutic trials and post-marketing surveillance. This is both understandable and often beneficial. On the downside, however, is the appearance of conflict of interest when the analyses of the results are carried out by the pharmaceutical firm itself, or the government agency charged with guarding the safety of the product.

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