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## Feature Article

# Shaken Baby Syndrome or Vaccine-Induced Encephalitis?

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Shaken baby syndrome (SBS) commonly describes a combination of subdural hematoma, retinal hemorrhage, and diffuse axonal injury (DAI) as the triad of diagnostic criteria. In some, the presence of rib or other fractures is also taken as a sign of abuse.(1-3)

The basic issue to be reviewed here is whether or not in some instances in which a father, family member, or caretaker has been accused of causing the death of an infant or child from the SBS, the true cause of death was a catastrophic vaccine reaction.

This article concerns an unpublished series of 25 cases involving accusations or convictions for the SBS, largely collected by attorney and jury counselor Toni Blake of San Diego, California (personal communication, 2000), as well as some from personal knowledge, which have the following features: 1) All occurred in fragile infants born from complicated pregnancies. Problems included prematurity, low birth weights, drug/alcohol problems, diabetic mothers, or other maternal complications. 2) All infants were 6 months or less of age. 3) Onset of signs and symptoms occurred at about 2, 4, or 6 months of age, within 12 days of vaccines. 4) All infants had subdural hematomas. 5) Some had multiple fractures.

Few published studies on vaccine effects include before-and-after studies of immune parameters or brain function studies such as electroencephalograms, or long-term safety monitoring. Inadequate consideration has been given to the additive or synergistic adverse effects of multiple simultaneous vaccines, although in the case of toxic chemicals, two compounds together may be 10 times more toxic than either separately, or 3 compounds 100 times more toxic.(4,5)

## Medicolegal Issues

As reviewed in an the amicus brief prepared for SBS cases by Toni Blake (personal communication, 2000), the following beliefs have become prevalent in courts dealing with the SBS: 1) Shaking alone in an otherwise healthy child can cause a subdural hematoma; 2) non-traumatic new bleeding in an existing subdural hematoma will always cause only minor symptoms; 3) a child suffering from an ultimately fatal brain injury will not experience any lucid interval; 4) short-distance falls by children are never fatal; and, 5) retinal hemorrhage occurs only in shaken babies. There is, however, a body of literature that casts doubt on the validity of these assumptions:

In the early 1970s, Guthkelch(6) and Caffey(3) offered concepts in the etiology of the shaken baby syndrome that have become widely accepted. This syndrome was presented in the context of a battered child with multiple injuries resulting from multi-directional forces. It was postulated that the weak neck muscles and the relatively large head size of an infant made him particularly susceptible to subdural injuries caused by shaking.(7) It should be noted that there was no experimental model to prove or disprove their theory, and no disinterested witness in their reports to confirm the shaking. In spite of this, the theory gradually became accepted as fact. However, several years later Duhaime et al developed a model in an attempt to demonstrate infant susceptibility to shaking. This team of scientists was unable to generate the force required to cause death or serious brain injury unless the head was impacted against a solid surface.(8,9) The authors of those studies concluded that severe head injuries commonly diagnosed as shaking injuries require impact to occur and that shaking alone in an otherwise normal baby is unlikely to cause the SBS.

The statement that rebleeding from a subdural hematoma requires new trauma is of doubtful validity. It has been demonstrated that the neomembrane surrounding an organizing subdural hematoma may itself bleed, and that expansion of a subacute/chronic subdural hemorrhage may cause new bridging veins to rupture, and that an acute clot may predispose to new bleeding.(10,11) New bleeding in an established subdural hematoma may occur spontaneously and without new trauma.(12) In the cited example, the child was in a hospital under the care of a physician.

Regarding belief #3, at least some children have lucid intervals prior to the development of symptoms, including those who die.(13,14) Ribas and Jane state that it is particularly important to emphasize that both contusions and intracerebral hematomas can cause neurologic deterioration after a lucid interval.(15)

Regarding belief #4, isolated reports of fatal falls and biomechanical analysis using experimental animals and adult human volunteers indicate the potential for serious head injury or death from as little as a two-foot fall.(7,16-19)

Finally, as to the assumption that retinal hemorrhages are always caused by nonaccidental head trauma, there is a report of 20 children resuscitated following events other than trauma, such as near-drowning, asthma, sudden infant death syndrome, and other causes, in which two children were found to have retinal hemorrhages.(20) In addition to this, retinal hemorrhages have been attributed to a vast array of causes, including MMR and DTP vaccines.(21)

It is noteworthy that vaccines such as pertussis are used to induce allergic encephalomyelitis in laboratory animals.(22) This is characterized by brain swelling and hemorrhaging similar to that caused by mechanical injuries.(23)

Misdiagnosing a vaccine injury as the SBS has resulted in imprisonments. Testifying in a case in which a father was accused of causing brain injury to his child, San Diego pediatric neurologist Thomas Schweller stated: "There is a tendency in some medical arenas to discount completely the history provided by the family if you find a subdural hematoma." He cautioned against assertions of 100 percent certainty, and stated that even a three-foot fall could cause a fracture.(24)

## Issues of Medical Diagnosis

**"Immune Paralysis," a Possible Role in Spread of Infections:** There is a small body of medical literature suggesting that vaccines can bring about an immune paralysis, opening the way for spread of relatively minor infections, such as those of a viral nature, to other parts of the body. One such complication might be viral meningitis. In a small German study, a significant though temporary drop of T-helper lymphocytes was found in 11 healthy adults following routine tetanus booster vaccinations; in four subjects, the levels were as low as those seen in active AIDS patients.(25)

Parenthetically, if this was the result of a single vaccine in healthy adults, it is sobering to think of the possible consequences of the series of multiple vaccines given to infants. Unfortunately, other than clinical observations, we can only speculate as to these consequences. This simple before-and-after testing of immune parameters has never been repeated, as far as I am aware. A few studies are to be found that show depressed function of lymphocytes and segmented neutrophils following vaccines.(26-28) Unfortunately, these are of limited scope.

Historically, one of the earliest reports of disease spread following vaccines is found in the 1967 book, *The Hazards of Immunization* by Sir Graham Wilson.(29) Although not opposed to vaccines, the author did give an extensive review of their potential side effects. In a chapter entitled, "Provocation Disease," he described complications such as paralysis from poliomyelitis in an arm that had received a diphtheria/pertussis/tetanus (DPT) vaccine. In more recent times, a similar phenomenon was observed in Oman during a polio epidemic, in which it was found that a significantly greater proportion of polio cases had received the DPT vaccine within 30 days before paralysis than had controls.(30)

As to the possibility that vaccines may result in spread and escalation of minor viral infections into fulminant meningitis with resultant mimicking of the SBS, this area appears to remain unexplored.

**Brain Edema and Perivascular Lymphocytosis:** Other than occasional anecdotal reports, there is little to be found in the medical literature implicating vaccines in causing brain edema and perivascular/meningeal lymphocytic infiltrations in humans, probably because the phenomenon has never been systematically studied. There are several reports of infants who developed increased intracranial pressure with bulging fontanelles following DPT immunization.(31-33) but for the most part we must look to animal experiments for information in this area.

Perhaps one of the most revealing studies about the nature of vaccine reactions was that conducted by Munoz and co-workers,(34) in which an experimental encephalo-myelitis was elicited in mice by the injection of pertussigen, a derivative of *Bordetella pertussis*, along with mice spinal cord extract. Histologic findings of perivascular infiltrates, consisting largely of lymphocytes in the brain and spinal cord developed as a result. These findings suggest that histological appearances of vaccine-induced encephalitis may be similar to those seen in viral meningitis.

Although Munoz mentioned nothing about the presence or absence of brain edema in his report, Iwasa stressed the swelling of the brain as a complication of the pertussis vaccine.(23)

**Vasculopathies, Autoimmunity, and Cerebral Hemorrhages:** A scattering of reports suggest that the hepatitis B vaccine may play a major role, as yet largely unrecognized, in hemorrhagic complications from vaccines. Among the children diagnosed with the SBS were quadruplets who suffered subdural hemorrhages or bloody spinal fluid following hepatitis B vaccines. The mother of these children has been sentenced to l72.5 years in prison.

In a collection of abstracts from Med-Line research, from 1990 to October 1997, on adverse reactions from the recombinant hepatitis B vaccine, Dr. Andrea Valeri of Italy catalogued a total of 45 different types of reactions in the world literature (personal communication, 2000) Among these were necrotizing vasculitis,(35) vaccine-induced autoimmunity,(36) and segmentary occlusion of the central retinal vein.(37) In addition, vasculitis following hepatitis B vaccine has been reported.(38) Thrombocytopenia is listed as a possible complication in the *Physicians' Desk Reference*, 2001. In a report of 18 deaths of neonates following the hepatitis B vaccine by the Vaccine Adverse Event Reporting System, 1991-1998, hemorrhagic phenomena were common, including two patients with cerebral hemorrhages, four with pulmonary bleeding, one with bloody diarrhea, and several with blood in upper airway passages.(39) A report in *Postgraduate Medicine* on acute hemorrhagic encephalitis cites vaccines as one of the possible causes.(40)

Reports of autoimmune/neurological type reactions from hepatitis B vaccine include the following: polyneuropathy,(41) uveitis,(42) Guillain-Barre Syndrome,(43) myasthenia gravis,(44) erythema nodosum,(45) CNS demyelination,(46-48) optic neuritis,(49) transverse myelitis,(50) visual loss,(51) rheumatoid arthritis,(52) and Reiter's syndrome and arthritis.(53)

In a study devised to provide an animal model for the systemic and neurological complications observed following the pertussis vaccine in children, Steinman and coworkers discovered a lethal shock-like syndrome in mice after immunization with pertussis vaccine and sensitization to bovine serum albumin. Post-mortem examination of the brains revealed diffuse vascular congestion and parenchymal hemorrhages in both cortex and white matter.(54)

As early as 1975, Urbaschek described the role of pertussis endotoxin in bleeding and coagulation disorders.(55) More recently, McCuskey et al described the initial responses to endotoxemia as microvascular inflammation with activation of endothelium from its normal anticoagulation state to a procoagulation state.(56) *Harrison's Principles of Internal Medicine* also points out that the endotoxin from gram negative bacteria activates several steps in the coagulation process.(57)

Platelet injury by endotoxin may result in a dramatic rise in serotonin, which can initiate coronary chemoreflex causing hypotension, bradycardia, and cardiac collapse, sometimes seen in premature infants following vaccination.(58) It is also said that the hemorrhagic complications from the "black plague" of the Middle Ages were simply due to an unusually virulent form of endotoxin, a property common to all disease-causing bacteria (R. Reisinger, personal communication, 2000).

Consideration must also be given to the possibility that the various vaccines, given in combination, may be synergistic in causing hypersensitivity and autoimmunity.

At least two of the vaccines, *H. influenza* type b (Hib) and pertussis, are noted for their sensitizing potencies(59) and are routinely given together in infancy.

**A New Syndrome?** Based on observation and a limited but suggestive body of medical literature, it appears that we may be witnessing in many SBS cases the adverse effects from interactions of highly potent vaccines given in combination. These potentially include: Hepatitis B (hemorrhagic vasculopathies, autoimmune reactions, neuropathies), *Hemophilus influenza* (hypersensitization), tetanus (hyper-sensitization), and pertussis (hypersensitization, brain edema, and the effects of endotoxin in causing vascular inflammation and hyper-coagulability).

There now appears to be a new syndrome that develops within a 12-day period following immunizations, and which may include elements of adverse reactions from each of the vaccines listed above. The most important of these include brain edema and inflammation of blood vessels, resulting in increased fragility and friability of blood vessel walls. These in turn may lead to spontaneous hemorrhages from a shearing of subdural blood vessels and the development of subdural hematomas, thus mimicking what is now thought to represent the SBS.

These findings are as yet largely unrecognized because unsought. In the name of justice to those now wrongfully imprisoned for child abuse leading to the SBS, and to those who will be accused in the future, let us hope that this area receives the investigation that it deserves.

**Vaccines, Scurvy, and Hemorrhagic Diatheses:** In the 1970s, infant mortality among the aborigines was as high as 50 percent in some areas. Dr. Archivides Kalokerinos recognized cases of scurvy among children, whose diets were very poor. Observing that the children frequently died following immunizations, especially if they had colds, he recognized that there might be a connection between vitamin C deficiency and the deaths from vaccines. With improved nutrition and regular vitamin C supplementation, infant mortality was virtually abolished.(60) As a result of this work he was awarded the Australian Medal of Merit in 1978.

One of the primary roles of vitamin C in the body being that of producing and maintaining connective tissue, Dr. Kalokerinos hypothesized that with minor viral infections further depleting the body's limited stores, the administration of vaccines would precipitate fulminating scurvy in children already deficient in vitamin C. One of the primary complications of scurvy being hemorrhage from weakened blood vessels, vitamin C deficiency could conceivably play a role in vaccine-induced encephalopathy/hemorrhagic syndrome.

**The Latent Period Following Immunizations:** According to the current guidelines of the Congressional Childhood Vaccine Injury Act of 1986, the onset of encephalitis must occur within a specified time period, depending on the vaccine, for the vaccines to be recognized as having caused the encephalitis. (The accepted latent period for pertussis vaccine reaction is 3 days, and that for measles vaccine, 7 days). Inaccuracy in designating this time range could cause many misdiagnoses.

Most early literature dealing with vaccine-induced encephalitis is related to the pertussis vaccine. In 1930, Flexner noted a strong tendency for the nervous system manifestations to declare themselves between the 10th and 13th days.(61) In a review of 108 cases recorded before 1929,(62) the onset of encephalitis was strikingly constant, usually observed between the 10th and 12th days following vaccination, commonly with a febrile period on the 7th and 8th days followed by recovery until the onset of encephalitis. In 1929, an increase in severe neurological complications following infections and inoculations was noted, occurring on about the 11th day after vaccination.(63)

More than 50 years later, Munoz found the same latent period of 11 to 13 days in a mice study of experimental encephalomyelitis elicited by injection of pertussigen.(34)

Literature in the 1980s and 1990s reported an entirely different pattern, with the onset of encephalopathy largely falling within a 3-day period following immunization.(64-66) We can only speculate the reason for this changing pattern. Perhaps it could be attributed to the fact that, in those early years, children may have been given the pertussis vaccine alone or possibly in combination with tetanus and diphtheria vaccines, whereas in recent years they have been receiving the polio, hepatitis B, and Hib vaccines at the same time.

Other studies throwing light on the latent period include one from Japan, showing two peaks of histamine sensitivity in mice from pertussis vaccine, one on the 4th day and another on the l2th day.(67) In 1976, 20 percent of cases of severe neurologic damage following DPT vaccine occurred later than 3 days post-vaccine.(68)

In *Vaccination and Behavioral Disorders* by Greg Wilson, the author made the following comments about the latent period:(69) *Contemporary studies on the pertussis vaccine select an arbitrary time limit in which reactions have to occur to be considered as vaccine related. This time limit is usually from 3 to 7 days. Perhaps the only study which explores the dynamics of the post-DPT reactions is an independent Australian study by Karlsson and Scheibner which, with a monitor which followed breathing volumes, found particular times of stress-induced breathing following DPT injections.*

Times of stress-induced breathing occurred as early as day 2 and as late as day 21.(70)

Coulter and Fisher provide, in their book, *A Shot in the Dark*, a number of case reports, both published and unpublished, from their own files, with latent periods longer than 3 days.(71) However, they found an almost insuperable difficulty in obtaining dependable data on the latent period due to the extreme reluctance of doctors to report vaccine reactions, a pattern which has existed since the early days of vaccine programs.

There are a number of reasons for this reluctance. From their earliest years of training, doctors have been taught to look upon vaccines as one of the greatest achievements of medical science, and any question about them is often looked upon as disloyalty to the profession. "Most doctors have been taught very little in medical school about reactions, or the neurologic damage that can be caused by the pertussis vaccine."(72) A lawyer specializing in defending vaccine-damaged children stated: "As is the case with many pertussis vaccine-injured children, none of the treating physicians would commit themselves to a final etiological diagnosis. It is strange that parents of pertussis vaccine-damaged children often can only get an etiological diagnosis by hiring an attorney and seeing one of the few recognized experts in the U.S. on post-pertussis vaccine encephalopathy."(72)

Either of the two classes of immunity, humoral (antibody-producing) or cellular, can produce autoimmunity.(72) Obviously, the 3 to 7 day limitations on the latent period, which now stands as a medicolegal standard, excludes a recognition of the delayed-type (cellular) autoimmune reactions, which are thought to have latent periods ranging between 2 and 3 months.(73) By inference, it even denies their existence. Little is known about vaccine-induced autoimmunity because the area

has been largely neglected in clinical and laboratory studies.(74) Large numbers of cases of vaccine-induced cellular autoimmunity could occur unrecognized and unreported because not sought.

**Allergic Sensitization: T**he increasing incidence of allergic disorders in Western nations is now universally recognized, with every third child in industrialized societies suffering an allergic disorder.(75) Since this trend coincides with vaccine programs, reports are now appearing on the question of a possible causal relation. Among these are four controlled studies from widely separated geographical areas showing a marked increase in allergic disorders among fully vaccinated children as compared to those with limited or no vaccines.(76-79) Further indications of the propensities of vaccines, especially pertussis and Hib, to induce hypersensitivity reactions and/or encephalitis are to be found in a number of studies.(80-83) The action of vaccines in shifting the immune profile in favor of the T helper 2 (Th2) system#84 could play a role in the rapid increase in atopic disorders.

The Hib vaccine, which shares notoriety with pertussis for its sensitizing potential, paradoxically causes a temporary reduction in antibody in most adults and children following immunization. This could increase risk of invasive disease should the subject be harboring a colonization of *H. influenza* at the time of Hib immunization.(85)

Additionally, a 1991 report by the National Institute of Medicine cited evidence of a causal relation between the DPT vaccine and anaphylaxis.(86)

**Rib and Other Skeletal Fractures:** Although skeletal fractures in themselves are not attributable to vaccine reactions, when they are present they are often used as evidence of abuse by prosecutors in SBS trials.

In the case of rib fractures, a study of 2,080 children seen at a pediatric trauma center found that among 33 children with multiple rib fractures, these injuries were accompanied by severe internal thoracic injuries in 85 percent of the cases.(87) An absence of internal injuries, therefore, would weigh heavily for spontaneous fractures and against abuse.

There are two situations in which spontaneous fractures are prone to take place: temporary brittle bone disease (TBBD) and scurvy, with imperfect connective tissue formation in fetal or infant skeletal tissue. In 26 infants with multiple fractures that fit the criteria of TBBD,(88,89) there was a striking association between TBBD and decreased fetal movement during pregnancy, which might occur in extreme prematurity, multiple-birth pregnancies, and chronic oligohydramnios as a result of inadequate uterine space for fetal movement.

Vitamin C deficiency may contribute to inadequate connective tissue formation in the bones before birth, making them susceptible to green-stick fractures and/or metaphyseal plate (costochrondal junction) slippages in utero or during the mechanical stresses of childbirth. During the trial of a father accused of causing the SBS in which there were rib fractures, Dr. Kalokerinos quoted from an older text dealing with scurvy that states:

*Scurvy disrupts these areas, the bone breaks down, and the ribs may over-ride, forming in typical cases "beads." Then healing commences with new bone formation looking just like true healing fractures. Furthermore, not all the ribs may be involved in this process, and the changes will not all occur at the same time --- giving the appearance of multiple fractures of different ages.*(90)

A study of children at the Royal Children's Hospital, Victoria, Australia has cast doubt on the acceptance of multiple metaphyseal plate fractures as definite roentgenologic evidence of battering. This type of fracture occurs in scurvy without undue trauma to the child.(91)

**Thimerosal (Mercury) Content:** Some vaccines given at ages 2, 4, and 6 months of age contain thimerosal, including diphtheria/tetanus/acellular pertussis (DTaP) (25 micrograms of mercury in most preparations), hepatitis B (12.5 micrograms in some preparations), and Hib (25 micrograms in some preparations).(92) It is possible that some infants receive more than l00 times the amount of mercury that the U.S. Environmental Protection Agency says is the maximum allowable daily exposure. Current EPA standards limit the daily safe dose of mercury to 0.1 µg/kg, or less than 1.0 µg for the average two-month-old infant.(93)

For centuries, mercury has been known as a potent neurotoxin and one of the most toxic of the heavy metals. Recently it has also been shown to be sensitizing,(84) so that along with pertussis and the Hib vaccines, we have three potentially sensitizing agents in the vaccines given to this age group.

**Brain Function:** In a 1955 study, electroencephalograms (EEGs) were performed on 83 children before and after pertussis immunization. In two children, the EEGs became abnormal following the vaccines in the absence of signs or symptoms, suggesting that mild but possibly significant cerebral reactions may occur in addition to the reported very severe neurological changes.(94)

The implications of this study are enormous, considering the very large number of children diagnosed with attention deficit/hyperactivity disorder, previously called "minimal brain dysfunction." Unfortunately, as Greg Wilson commented, "Studies such as Low's, which closely examine individual children, are extremely rare in the study of vaccine reactions and virtually nonexistent in today's literature."(70) A literature search disclosed only one other comparable study, done in Japan. Immunizations were given to 61 children with a history of febrile seizures or epilepsy, who had not had a seizure for one year. Epileptic spikes reappeared after 10 immunizations and increased after 10 out of 73 vaccines given, including DTaP, diphtheria/ tetanus (DT), and Bacillus Calmette-Guerin (BCG).(95)

## Conclusion

This article has been written to show that the theories on which the SBS is based are both undocumented and flawed and that convictions in many cases of the SBS may have been the result of misdiagnosis, the true cause of death or injury having been vaccine-related.

The larger issue is the adequacy of vaccine safety testing. There is a growing public outcry over mandatory vaccines, much of it originating from parents who believe their children have been seriously harmed.

Parents demand the right to accept or reject vaccines for their children based on informed consent. Some believe that the dangers of current vaccines may approach or even exceed the dangers of the infectious diseases themselves. It is difficult to answer their questions because there have been little more than token investigations of potential serious adverse effects. We need definitive investigations into both the immediate and longterm effects on the immunologic and neurologic systems.

*Acknowledgment:* The inspiration for this article has been largely the case of Alan Joe Yurko, an infant who died at 10 weeks of age, soon after receiving a combination of 6 vaccines. The father is now serving a life sentence, having been convicted (wrongly, many believe) of causing the SBS.

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