

Adverse Event Related to Smallpox Vaccination

Correspondent: Nellie Bristol

A 2-year-old Indiana boy faced a life-threatening infection caused by his soldier father's smallpox inoculation.

The Centers for Disease Control and Prevention (CDC) say that the boy's eczema vaccinatum is the only reported case of the disease as a secondary reaction since limited reactivation of smallpox immunization began in December 2002. More than 1 million inoculations have been administered in that period.

The toddler, who was in critical condition at University of Chicago's Comer Children's Hospital, has a history of eczema. Eczema and atopic dermatitis among both vaccine recipients and close contacts are cited as risk factors for potential adverse events in the vaccine literature.

The boy, whose name is not being released, needed extensive support care and was breathing with the assistance of a ventilator. According to the CDC, the virus can affect the body much as a severe burn does, causing skin damage, sepsis, and difficulty regulating fluids. The toddler was admitted to the hospital March 3, 2007 and released April 23. A hospital spokesperson said he is recovering well.

According to the hospital, the father was vaccinated in late January 2007 before being deployed to Iraq. When his departure was delayed, he was allowed to return home in mid-February, 3 weeks after the vaccination. His son developed a severe skin rash and was hospitalized several weeks later.

Inger Damon, MD, chief of the poxvirus section of the CDC's Division of Viral and Rickettsial Diseases, said the child first received vaccinia immune globulin (VIG) and cidofovir, an antiviral, but his condition continued to deteriorate. After consultation with smallpox experts throughout the US, the boy was given an investigational drug, ST-246, developed by SIGA Technologies. According to the company, the drug has not been tested in humans.

In addition to ST-246, physicians increased doses of VIG for the boy, Damon said. "We found that we hadn't really bolstered [his immune system] that much with the supplementation of VIG," she said, and so higher doses were added. She added that individuals with skin conditions similar to the

toddler's often have immune system disorders that make them more susceptible to infection.

The boy and his mother, who contracted a milder skin virus, were isolated in a negative-pressure room to prevent spread to health care workers and other patients, according to the hospital.

The military has vaccinated more than 1 million individuals since December 2002. More than 95,000 have been medically exempted. The vaccine is part of a "suite" of immunizations given primarily to those deployed to Iraq and Afghanistan. Anthrax vaccinations also are given as well as recommended immunizations for travel to the area and updates on routine adult shots. Another 40,000 public health and health care workers have received the smallpox vaccine since 2002. The inoculation is associated with more adverse events than most vaccines. It also is more easily spread because it deposits live vaccinia virus into the skin where it can be touched both by vaccinees and close contacts.

John Grabenstein is the former head of the military's vaccine program, now director of scientific affairs for Merck's vaccine division and the author of *Immunofacts: Vaccines & Immunologic Drugs*. Grabenstein said the military is extremely careful in education and screening efforts for vaccine programs. "Nothing is ever perfect, but we took great pains and invested a lot of time and a lot of labor in making sure that the health care workers understood the need for precautions and that the vaccinees understood the need for precautions."

According to an Army spokesperson, educational materials include videos and brochures that detail care of the vaccinee and the efforts needed to avoid infections both to the vaccinee and close contacts. Precautions listed include keeping the site bandaged, wearing long sleeves, and frequent hand washing. They also suggest avoiding ointments, hot tubs, and swimming pools and sharing towels and clothes. The brochures say the vaccine virus can be present at the inoculation site for 14 to 28 days or until the scab falls off.

The brochures indicate that, historically, 1000 of every 1 million vaccinated individuals experienced serious but not life-threatening reactions. They usually involved spreading the virus to other parts of the body. It also said that between 14 and 52 of 1 million vaccinees experienced potentially life-threatening reactions, including skin reactions and en-

cephalitis. A total of 1 or 2 in 1 million people may die of the vaccine, they said.

From December 2002 through June 14, 2006, the US Department of Defense (DoD) reported 120 cases of myopericarditis after smallpox vaccination. Sixteen cases of “ischemic” heart disease occurred within 6 weeks of inoculation. There were an additional 56 cases of contact transfer of vaccinia virus, primarily to spouses and adult intimate contacts. Eight deaths following vaccination have been reviewed. At least 1 of those may have been caused by the vaccine, DoD documents indicate.

The military recommends that people with compromised immune systems, pregnant women, and breast-feeding mothers not get vaccinated. The procedure also is contraindicated for individuals diagnosed with eczema or atopic dermatitis or other skin conditions and for those with household contacts with those conditions. The program also screens out individuals with serious heart conditions or risk factors, those taking steroid eye drops or ointments, and people with previous allergic reaction to vaccines.

Grabenstein said the program contains multiple screening steps to avoid adverse reactions, but said he is sure DoD is reviewing the case and protocols involved.

“There is shared responsibility throughout the process,” Grabenstein noted. “The health care workers with DoD are actively looking for people who shouldn’t be vaccinated [and conducting] intensive education programs for the vaccinees so they know how to take care of the site. We consider the

effectiveness of the training [to be] pretty good considering most of the adverse events that did occur were happening at rates lower than historical expectations.” He emphasized that the child’s case is important and that the program will look to ensure it is not repeated.

“Was it an individual who wasn’t paying attention at some point or is there a flaw in the system?” Grabenstein asked.

The US Department of Health and Human Services said it considers smallpox a “high-priority biological threat.” The stockpile of vaccine has grown from 90,000 doses in 2001 to “enough vaccine to protect every man, woman, and child in America,” it adds. The agency is supporting the development of an attenuated vaccinia. “Use of attenuated vaccinia viruses may reduce risk in [people] with impaired immune systems as the attenuated viruses have more limited capacity to reproduce and cause side effects,” Health and Human Services documents say. “Early clinical trial data in a limited number of human subjects suggest that a Modified Vaccinia Ankara (MVA) vaccine may be safe and capable of producing an immune response in humans.”

About the Author

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