

*Editorials***SMALLPOX VACCINATION POLICY —  
THE NEED FOR DIALOGUE**

THE recent cases of anthrax due to bioterrorism and the terrorist attacks of September 11, 2001, have led to an unprecedented degree of concern and urgency regarding the vulnerability of our society to more such attacks.<sup>1</sup> At the Department of Health and Human Services, efforts to counter bioterrorism are focused on a group of pathogenic microbes that include *Bacillus anthracis* (the cause of anthrax), variola virus (the cause of smallpox), *Yersinia pestis* (the cause of plague), *Francisella tularensis* (the cause of tularemia), *Clostridium botulinum* (which causes botulism), and the hemorrhagic-fever viruses such as Ebola.<sup>1</sup> Within this group, smallpox stands out because of its ease of transmissibility, its high mortality rate, and its established ability to ravage populations. There is a relative lack of immunity against smallpox in the population, and the thought of a smallpox epidemic instills terror in nearly everyone.<sup>2</sup>

Forty years ago, smallpox could not have posed a serious bioterrorist threat, since most of the U.S. population and that of the world was immune to the disease as a result of compulsory vaccination programs.<sup>3</sup> Indeed, smallpox was eradicated by an organized worldwide program of vaccination; the last naturally occurring case was in 1977 in Somalia.<sup>3</sup> The last case of smallpox in the United States occurred in 1949. In 1971, the Public Health Service recommended the discontinuation of routine vaccination.<sup>4</sup>

What was then considered a triumph has now become our problem. The vaccination program was discontinued in the United States because there were several vaccine-related deaths each year while there was little or no risk of naturally occurring disease. There is now growing public debate concerning the appropriate vaccination policy. The adverse effects of the vaccinia virus vaccine are well recognized, yet the benefits are unclear, given our inability to know whether smallpox will be used as an agent of bioterrorism. In short, the debate is whether to vaccinate the entire population and effectively eliminate the threat of such an attack or to implement a restricted program of vaccination only after an attack has occurred or if the likelihood of an attack is deemed high by federal law enforcement or intelligence authorities.<sup>5</sup>

Although there is a real possibility that smallpox will be used as an agent of bioterrorism, the degree of risk is most likely very small. Samples of smallpox

are stored at the Centers for Disease Control and Prevention (CDC) in Atlanta and at a repository near Novosibirsk in Russia. These samples are not of major concern; rather, it is the possible existence of other, unaccounted-for supplies that poses a problem. From the 1970s until the early 1990s, the former Soviet Union produced large amounts of smallpox, anthrax, and other agents of mass destruction as part of the Biopreparet program of biologic warfare.<sup>6</sup> Although these stores were reported to have been destroyed, some samples may have fallen into the hands of rogue governments or potential bioterrorists. Therefore, we must assume that the threat of a deliberate release of smallpox as an agent of bioterrorism is real. Indeed, the CDC recently updated its smallpox-response plan to address the possibility of a bioterrorist attack involving smallpox.<sup>5</sup>

The recently updated plan and guidelines of the CDC are based on a “ring-vaccination” approach after the identification of a case of smallpox. In this approach patients with suspected or confirmed smallpox are isolated, and contacts are traced, vaccinated, and kept under close surveillance, as are the household contacts of those contacts.<sup>5</sup> The plan also identifies other high-risk persons who may have had direct or indirect contact with the patients and who therefore should also be vaccinated. Local quarantine and travel restrictions may be enforced if deemed appropriate. The plan does not recommend mass vaccination campaigns either in response to documented cases of smallpox or in anticipation of a potential outbreak.

The ring-vaccination approach successfully contained outbreaks of smallpox during the eradication program. In addition, it minimizes the potential for vaccine-related adverse events that would accompany a campaign of mass vaccination. Despite the fundamental soundness of this approach and its success in previous naturally occurring outbreaks, there is considerable skepticism about the feasibility of this strategy because of the possibility of simultaneous attacks in multiple cities. An attack could overwhelm the ability of the CDC and local health authorities to carry out the plan.<sup>7</sup> Furthermore, the success of this approach in previous outbreaks has been in the context of existing herd immunity and not in an essentially nonimmune population.<sup>8,9</sup> These issues have prompted some to advocate mass vaccination against smallpox in anticipation of a bioterrorist attack, as articulated by Bicknell elsewhere in this issue of the *Journal*.<sup>8</sup>

The strongest argument for preemptive mass vaccination is that it would eliminate the threat of smallpox as an agent of bioterrorism. Accordingly, it would eliminate the disarray, confusion, and panic that would most likely accompany simultaneous attacks at multiple locations. In addition, it would obviate the need for massive quarantines.<sup>10</sup> The argument against pre-

This article was published at [www.nejm.org](http://www.nejm.org) on March 28, 2002.

emptive mass vaccination centers on the potential for vaccine-related adverse events, in particular the 1 to 2 deaths per million recipients of the vaccine as well as probably hundreds of cases of generalized vaccinia, eczema vaccinatum, progressive vaccinia, and post-vaccinal encephalitis per million recipients.<sup>2</sup> The initiation and maintenance of universal vaccination for smallpox would also require considerable resources.

Because people of good intentions disagree on government policy regarding smallpox vaccination in the context of a bioterrorist threat, the general public must understand the decision-making process as well as the rationale behind decisions that may affect their health and their lives. The need to be forthcoming is of particular importance, given the terrible trauma caused by the unforeseen events of September 11, 2001, as well as the anxiety associated with the continued threat of bioterrorist attacks. Because the population feels powerless, it must rely heavily on the deliberations and decisions of government leaders.

Despite the fact that mass voluntary vaccination is not recommended in the CDC plan,<sup>5</sup> there are many who would like to have the opportunity to make their own decision about smallpox vaccination if sufficient stores of vaccine were available once they have been apprised of the risks of the disease itself and the risks of vaccination. This is a reasonable desire. The decision not to vaccinate all potential first responders including local health officials, hospital workers, firefighters, and police, for example, has been influenced by the fact that there are insufficient supplies of vaccine to accomplish such a goal. However, recent studies suggest that the current stockpile of 15 million doses of smallpox vaccine may safely be diluted to yield at least 75 million doses.<sup>11,12</sup> In addition, the ongoing production of second-generation smallpox vaccines will increase our supply to approximately 286 million doses by the end of this year.<sup>11</sup> Moreover, the Department of Health and Human Services recently announced its intention to obtain more than 75 million additional doses of smallpox vaccine that have been stored by a pharmaceutical company since 1972, provided that this vaccine supply is proved to be safe and immunogenic.<sup>13</sup> Thus, the availability of vaccine will soon become less of a factor in the formulation of a policy. Furthermore, the fears produced by a documented outbreak of smallpox, no matter how small or well contained, may prompt the American public to demand universal, voluntary immunization. Since sufficient stores of smallpox vaccine will soon become available, an open and public dialogue on the advantages and disadvantages of universal voluntary vaccination, as well as on the smallpox response plan of the CDC, should be initiated before any attack occurs. Given the fears about bioterrorism, such an approach will strengthen the confidence of the pub-

lic in a process that is designed to safeguard their health.

ANTHONY S. FAUCI, M.D.

National Institute of Allergy and Infectious Diseases  
Bethesda, MD 20892

## REFERENCES

1. Lane HC, La Montagne J, Fauci AS. Bioterrorism: a clear and present danger. *Nat Med* 2001;7:1271-3. [Erratum, *Nat Med* 2002;8:87]
2. Henderson DA, Inglesby TV, Bartlett JG, et al. Smallpox as a biological weapon: medical and public health management. *JAMA* 1999;281:2127-37.
3. Breman JG, Arita I. The confirmation and maintenance of smallpox eradication. *N Engl J Med* 1980;303:1263-73.
4. Public Health Service recommendation on smallpox vaccination. *MMWR Morb Mortal Wkly Rep* 1971;20:339.
5. Interim smallpox response plan & guidelines. Atlanta: Centers for Disease Control and Prevention, 2001. (Accessed April 5, 2002, at <http://www.bt.cdc.gov/DocumentsApp/Smallpox/RPG/index.asp>.)
6. Alibek K. Biohazard: the chilling true story of the largest covert biological weapons program in the world, told from the inside by the man who ran it. New York: Random House, 1999.
7. U.S. details response to smallpox. *Washington Post*. November 27, 2001:A1.
8. Bicknell WJ. The case for voluntary smallpox vaccination. *N Engl J Med* 2002;346:1323-5.
9. Gani R, Leach S. Transmission potential of smallpox in contemporary populations. *Nature* 2001;414:748-51.
10. O'Toole T. Smallpox: an attack scenario. *Emerg Infect Dis* 1999;5:540-6.
11. HHS awards \$428 million contract to produce smallpox vaccine. In: HHS News. Washington, D.C.: Department of Health and Human Services, November 28, 2001.
12. Frey SE, Couch RB, Tacket CO, et al. Clinical responses to undiluted and diluted smallpox vaccine. *N Engl J Med* 2002;346:1265-74.
13. HHS may acquire more than 75 million doses of smallpox vaccine. HHS News. Washington, D.C.: Department of Health and Human Services, March 29, 2002.

Copyright © 2002 Massachusetts Medical Society.

## THE NUTS AND BOLTS OF PEANUT ALLERGY

**I**N this issue of the *Journal*, Sampson<sup>1</sup> reviews the clinical features of allergy to peanuts. The question is why, in a small but apparently increasing percentage of the population, does the ingestion of a seemingly innocuous and healthful food result in an allergic reaction?

The clinical manifestations of an allergic reaction to foods are the end result of an orchestrated series of events involving the immune system that have their origins in a prior exposure to the offending allergen (Fig. 1). During the initial exposure, which may occur in utero, during breast-feeding, or in early childhood, antibodies of the IgE isotype, which are highly specific for epitopes on the surface of the food allergen (usually proteins or glycoproteins), are elaborated. The propensity to produce IgE antibodies against commonplace substances is the hallmark of the allergic diathesis. The factors underlying this propensity remain incomplete-