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The Peace Gun and the Eradication of Smallpox

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The eradication of smallpox is often named one of the greatest medical accomplishments in recent history, taking nearly 200 years, multiple nations, various inventions, immunization techniques, and hard work to complete the task. Before worldwide eradication, the disease was still endemic in 33 countries, with an average mortality rate of 30%. Smallpox has been eradicated in the United States since the 1950s, and the last known natural case in the world was recorded in Somalia in 1977. Complete eradication was announced by the World Health Organization in May 1980.¹

Smallpox is a highly contagious disease, does not have an animal vector or host, and is easily spread through bodily fluids. As a result, smallpox can quickly spread in close quarters, such as military barracks or overcrowded housing. Smallpox, among other easily transmittable diseases, can impact the U.S. military and can be debilitating to otherwise healthy service members.²⁻⁴ Immunization



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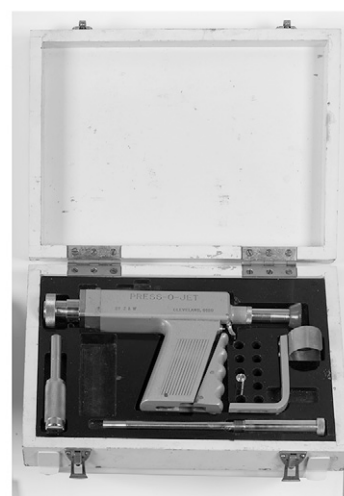


FIGURE 1. (Top) Patient receiving injection using a Press-O-Jet device, Bacteriology Research Laboratory, Armed Forces Institute of Pathology. (NCP 013106-13) (Otis Historical Archives, National Museum of Health and Medicine, Silver Spring, Maryland). (Bottom) Press-O-Jet Injector, 1955. By the Vietnam War, injectors distributed vaccines and medications on a large scale. The Walter Reed Army Institute of Research prototyped this example. This object is on display at the National Museum of Health and Medicine. (M-179.00155) (National Museum of Health and Medicine photo by Matthew Breitbart/Released)

programs not only ensure and maintain the health of service members, but can also protect civilians from diseases contracted during deployment.

The development of the smallpox vaccine paved the way for the advancement of new vaccines to prevent communicable disease. By the 20th century, service members were receiving upward of 20 different immunizations as part of their initial health screenings.^{3,5} To provide a more painless, effective, and efficient means of vaccination, the Walter Reed Army Institute of Research developed the “Press-o-Jet,” or multidose jet injector (Fig. 1). The practical mechanism was developed in 1955 by COL Abram S. Benenson, Aaron Ismach, and Dr. Joel E. Warren, as part of the Commission of Immunization of the Armed Forces Epidemiological Board.^{4,6,7} The “Press-o-Jet” allowed for quick, mass inoculations with little to no pain. Through the action of its spring-loaded piston, the exact measured dose of vaccine is pushed under high pressure through a narrow orifice roughly 0.005 inches in diameter, such as the skin. Compared to previous models, the “Press-o-Jet” used electricity to engage the spring action of the piston. The average velocity of the jet injector was over 600 feet per second and only required 0.4 seconds to discharge 1 mL of fluid. The quickness and accuracy of the injector allowed for up to 1,000 injections per hour, compared to an average of 250 per day with a hypodermic needle injection.^{4,6–9}

After multiple military clinical studies, the jet injector was tested as part of the ongoing smallpox eradication campaigns in Brazil and Liberia during the 1960s. Although the injector was successful at first, several challenges faced the eradication of the disease. Known as the “peace gun,” the injector was able to quickly inoculate thousands of individuals. However, in the early 1960s, live smallpox viruses were still being used and the vaccine was not able to withstand the hot climate of West Africa and Brazil. The jet injectors were also problematic in remote regions where electricity was not accessible to operate the machinery. As a result, an alternative approach was developed by D. A. Henderson to complete the eradication of smallpox by the

World Health Organization.¹⁰ D. A. Henderson and staff used the process of “ring vaccination,” along with the newly developed bifurcated needle and frozen attenuated vaccine, to finally eliminate the disease.^{10,11} Stockpiles of the vaccine still reside in several countries and in 2002, because of increased concerns about potential bioterrorist threats, President George W. Bush reinstated the smallpox vaccination program for all service members.⁸

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