

The Uncertain Dynamics of Global Bioterrorism: Smallpox as a Hypothetical Case for Risks and Responses

Terrence M. O'Sullivan

Center for Risk and Economic Assessment of Terrorism Events (CREATE)
University of Southern California

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Many biological agents could be used to attack civilians, however, only a few, such as smallpox virus, have the ability to cause illness or panic to the extent that medical and public health systems would be overwhelmed.

- Centers for Disease Control and Prevention
Interim Smallpox Report¹

There is no longer any question that clandestine stocks of the smallpox virus exist; the only unknown is who has them and whether they'd be cruel enough to use them.

- Shannon Brownlee²

Post-9/11 we should not assume that anything is inconceivable. We should not assume people who would kill thousands [with airplanes] would hesitate to use smallpox ...or a backpack nuclear device...to kill 30,000 or 300,000 people.³

Much has been made of the perceived threat to the United States and the world of deliberate biological terrorism using smallpox (*variola*) virus. Immediately after smallpox was painstakingly eradicated from the natural environment in the late 1970s, few worried that this horrific disease, which killed 500 million people in the 20th century alone, might once again be a concern. But subsequent revelations about the Soviet Union's massive secret biological weapons programs in the 1990s, and particularly after the September 2001 al Qaeda terrorism and the unsolved American anthrax attacks, the United States, Europe and select other nations have dedicated considerable resources and effort to stockpiling vaccine, and to attempting to actually vaccinate

¹ CDC Interim Smallpox Response Plan and Guidelines, U.S. Centers for Disease Control and Prevention, p. 1.

² Shannon Brownlee, "Return of an old scourge? Smallpox may be the deadliest weapon in the biowarfare arsenal," *Washington Post National Weekly Edition* (November 26-December 2, 2001), p. 6.

³ Ehud Barak (former Israeli Prime Minister), in Keynote Speech at Biosecurity 2002 conference, Las Vegas, Nevada, November 18, 2002.

various segments of their populations, in anticipation of a possible attack.⁴ Whether smallpox or another biological pathogen (i.e., a disease-causing microbe) might be used, there is a growing perception that bioterrorism may represent not only a growing threat, but might be one that may exceed that of any other potential weapons of mass destruction (WMD)⁵ – including nuclear weapons.⁶

Yet in evaluating the extent of security threats and vulnerabilities from smallpox bioterrorism, there are numerous important questions which have not necessarily been answered, often sharply differing opinions on the subject among so-called subject matter experts, and in many instances there is little reliable data on which to base answers to these relevant questions beyond a level of educated guess or conjecture. Would terrorists actually be cruel enough to use smallpox – a virus that manifests frightening realities and hypothetical uncertainties about possible weaponization, engineered vaccine resistance, and public health response capabilities? Many analysts blithely assert, No: no one would crazy enough to risk infecting their own people, and therefore smallpox is not a “rational” bioterrorism weapon. Perhaps most pressing of all is the metaphysical question of whether and how humanity would bear the literal and psychological scars of even a small outbreak, let alone a massive smallpox pandemic.

At the American political and policy levels, the subject has generated impassioned debate about risks of either deliberate or accidental smallpox virus release, and the relative merits and drawbacks of various prevention and response strategies. Some officials and policy experts believe the risk of a smallpox outbreak is too low to merit costly investments of time, money and energy that could be used better in other areas of counter-terrorism or in overall public health improvement. More important is the concern that in the event of mass vaccination of healthcare workers and/or the general public the current and only “dirty” vaccines available will inevitably kill and sicken hundreds or thousands of Americans – all for a future disease outbreak that is presently purely hypothetical. Others – including members of the public, and many health-related and elected policymakers and security experts believe the likelihood of a future smallpox attack, while low, carries too high a potential price not to aggressively invest in protective mechanisms and prepare for prudently. In between are varying positions, all revolving around comparative risk assessment. What indeed are the odds that such an attack or accidental release might occur? For the moment, most analysts appear to believe the odds of smallpox being used as a biological weapon are low. But the

⁴ The American Bioshield program, for instance, has dedicated hundreds of millions of dollars to producing and stockpiling enough smallpox vaccine for every resident, though has had mixed success in prophylactic vaccination of its population. Over 100-200 thousand military personnel were given the *vaccinia* immunization, despite some deaths as a result, yet as of 2005 there had been little progress in convincing civilian health care workers to be vaccinated in anticipation of being called upon for bioterrorism response.

⁵ Definitions vary, but for this paper I will assume weapons of mass destruction to include CBNRE (chemical, biological, nuclear, radiological or high-explosive) methods, broadly including weapons capable of causing *either* mass casualties or large-scale economic losses (or both) – as well as potential widespread terror.

⁶ See for instance, the U.S. National Intelligence Council report, “Future ____ 2020,” (January 2005); and Graham S. Pearson, “Why Biological Weapons Present The Greatest Danger,” *The Seventh International Symposium on Protection against Chemical and Biological Warfare Agents*, Stockholm, 15 - 19 June 2001.

question of how low still remains, and how much damage could be done if an outbreak does occur?

The calculus of using smallpox for bioterrorism has many strong factors against – but it has also unfortunately has many compelling, intensely attractive factors in favor, depending on the intent of the user. As with many issues considered irrational and unthinkable by “civilized” people, there are always those who can justify such a criminal, heinous act, based on their own criteria of rationality.

This makes expert predictions about smallpox risks among the least reliable in any discussion of bioterrorism probabilities. Martin Meltzer, chief economist for the CDC, notes this uncertainty: “Don’t be fooled into thinking there’s a lot of data about smallpox out there.” Somewhat curiously, however, and often with certainly bordering on disdain, Meltzer and others at the CDC and among the mainstream U.S. public health establishment frequently claimed in the same breath that there is a very low danger from smallpox even if an outbreak occurs.⁷ It is safe to say that no one truly knows what the reality of a contemporary outbreak would be, given the complex variables, the presence of human ingenuity and the paucity of evidence.

The CDC School of Smallpox Thinking

Among those who believe in very low odds of smallpox ever being used are the majority of public health and medical experts, especially those who worked decades ago for global smallpox eradication. As discussed above, officials such as D.A. Henderson and others are deferred to by public policy makers, believe the risk is at best low – that few terrorists would go to the trouble or be willing to use such a weapon. Also, these experts generally believe the United States is well equipped to control any outbreaks given its current smallpox vaccine supplies and public health infrastructure.

Stanley O. Foster, a key official during the WHO smallpox eradication campaign who supervised immunization programs in Bangladesh, Nigeria and Somalia, believes “the risk of smallpox being used as a weapon is very, very low.” He bases this on what I will refer to below as “*physical blowback*.” Foster believes that a would-be smallpox bioterrorist will recognize that he does not have “the knowledge and resources to control it.” He goes on to say:

Should it get back into areas of the developing world, such as the Indian subcontinent or [sub-Saharan] Africa, it would become a global disaster. This is significantly different from [an attack with] anthrax, which is essentially limited to people [who] are exposed. The possibility of somebody getting smallpox... is a much more horrifying scenario than whatever anthrax could do in this country.”⁸

⁷ Martin Meltzer, comments during presentation at Biosecurity 2002 conference, Las Vegas, Nevada, November 20, 2002.

⁸ Interviewed by Harry Goldhagen, “smallpox: The weapon that knows no borders,” *Medscape Infectious Diseases*, Vol. 3, No. 6 (2002). Accessed online 7/25/02 at <http://www.medscape.com/viewarticle/414954>.

Foster's analysis is based on a "rational" terrorist, who, he asserts, may be "willing to die, but they also have children and loved ones." This type of analysis clearly ignores or downplays the motivations of a doomsday, millenarian-type cult, as well as ruthless terrorists belonging to Al Qaeda and similar groups. There are additional factors in favor of smallpox use, listed below. Although Foster and many of his expert colleagues acknowledge the fact that however small the risk, society must be prepared for the high impact potential of smallpox, they differ from those who believe that adequate preparation involves mass vaccination. Foster does not believe in the predictions of Dark Winter, which envisions a grim scenario with millions of American smallpox cases. He and other "smallpox warriors" are, he says, unanimous in their belief in a surveillance and containment policy in response to any outbreak. "To go beyond [ring vaccination] – that is, to mass vaccination – we would have to have evidence of broad-scale exposure to the disease."⁹

Possession: 9/10ths of the Risk?

Clearly the most obvious factor increasing the risk that smallpox may reemerge accidentally or deliberately (since it has been eliminated from nature) is that the virus still exists – albeit in human laboratories. But of the two official WHO research repositories – one in Russia and one the U.S., at the CDC in Atlanta – it is the Soviet bioweapons program that is most likely to be responsible for any possible future outbreaks.

Why has attention focused on the Soviets and now Russians? In reality, there is only an infinitesimally small possibility that the virus could ever have been stolen from the very controlled storage conditions at the U.S. Centers for Disease Control and Prevention. There is also no public evidence the American bioweapons program ever experimented with offensive smallpox weapons before or after it was dismantled in the early 1970s, and only a very slight possibility that rogue governments capitalized on the WHO smallpox eradication program by keeping laboratory specimens in anticipation of future biowarfare "needs." Some experts believe North Korea and several other nations may have *variola* virus stores. Still, if any would-be bioterrorist possesses smallpox there is a good chance it may have originated from the former Soviet Union. Lastly, up until now it is highly unlikely rogue nations or bioterrorists had the expertise or wherewithal to cull live smallpox virus from the long-dead bodies of victims – although there was some analogous success in recovering viral DNA from 1918 Spanish influenza in the late 1990s.¹⁰

Thus, there is at least a high probability that any *variola* virus used for future catastrophic bioterrorism will probably have originated from the massive Soviet smallpox production and weaponization program of the 1970s and 80s – either smuggled out by people associated with the program, or stolen and sold to would-be terrorists or governments. Alternatively, as noted above, former Soviet scientists could

⁹ *ibid.*

¹⁰ See for instance Gina Kolata, *Flu: The Story of the Great Influenza Pandemic of 1918 and the Search for the Virus That Caused It*, (New York: Farrar, Straus and Giroux, 1999).

contribute their expertise to production and weaponization – as may have already been the case in Iraq.

The Calculus of Smallpox as a Terror Weapon

The following are some of the most compelling reasons smallpox virus might – or might not – be used someday to kill again. Part A looks at factors increasing the appeal and ease of use for would-be terrorist or rogue governments – and thus presumably increasing risk of future smallpox bioterrorism, and Part B examines the disincentives and barriers that might lower the risk such that *variola* would be ever used as a biological weapon.

Factors *Increasing* The Risks of A Smallpox Bioterrorism Attack

1) Quantity & Availability

First is sheer quantity of smallpox virus that may be available. Soviet defectors and post-Soviet, former officials from the enormous Biopreparat military bioweapons program tell of tons of smallpox virus produced and stored by the Soviet bioweapons program – probably in more than one site. Western scientists who inspected many of the bioweapons facilities after the Cold War’s end confirm that such capability existed, and point to considerable circumstantial evidence backing up the claims of former Soviet bioweaponeers.¹¹ A 2002 CIA assessment asserts with “very high confidence” that Russia still keeps stocks of smallpox virus, even though that government continued to issue diplomatic denials.¹² The CIA’s Weapons Intelligence, Nonproliferation and Arms Control Center (WINPAC) believes three other nations – Iraq, North Korea, and France – are thought to have covert smallpox stockpiles.¹³

In theory, it might only require a handful of virus particles to cause a devastating global pandemic. The past or current existence of such staggering quantities of Soviet-made virus leads to inevitable concerns that even minute quantities could easily have been lost or taken by corrupt Soviet/Russian scientists – and sold to nations and/or terrorists. There is evidence as well of sloppy handling of bioagents at post-Soviet bioweapons facilities, especially after the 1990 USSR breakup.¹⁴ And it only requires a small amount of virus to act as seed for production of limitless quantities of more agent. Because smallpox virus is a living organism, it can be reproduced (if dangerously) with commercially available scientific equipment, using chicken eggs as a growth medium. Out of work or underpaid former Soviet bioweapons scientists might presumably have been very tempted to smuggle out a tiny, easily-concealed vial of virus, and in the past organizations such as al Qaeda have certainly demonstrated possession of plausible financial resources to pay handsomely for such services and product.

2) Aerosolized, Weaponized & Super Strains?

¹¹ See the book by defector and former bioweaponeer, Ken Alibek, with Stephen Handelman, *Biohazard: The Chilling Story of the Largest Covert Biological Weapons Program in the World – Told from Inside by the Man Who Ran It*, New York: Random House (1999).

¹² Gellman, “4 nations thought to possess smallpox,” p.A01.

¹³ *ibid.*

¹⁴ See Alibek, *Biohazard*.

Second, and perhaps even more alarming, however, are the reports and circumstantial evidence that the Soviets enhanced the disease causing abilities of smallpox and many already deadly agents. The former bioweapons scientists related details about the aggressive weaponization of agents, as well as experimentation with isolating ever more deadly and virulent strains of different bioagents, and pursuit of bioengineering enabling a smallpox agent to overcome the immune systems of even vaccinated people.¹⁵

This is true as well with smallpox weapons development. A former Soviet army general bragged in a press interview about the potency of the smallpox virus that in 1971 reportedly exposed a research ship sailing off of Vozrozhdeniye Island in the Aral Sea, and may have led to a smallpox epidemic in the city of Aralsk, Kazakhstan. This outbreak was noteworthy in that it sickened even those who had been vaccinated against smallpox – an immunity that normally should have afforded substantial protection from the virus in most people for at least ten years after receiving the *vaccinia* inoculation.¹⁶ Just as sobering was the fact that of the three who died, though they were unvaccinated, all appear to have contracted the rare (averaging 2 percent of natural cases) and almost universally fatal hemorrhagic version of smallpox. While the cases are too few to be statistically significant, there is circumstantial evidence that the outbreak was caused by a particularly deadly smallpox strain, possibly India-1. And if true, such a strain had also survived aerosol dissemination of smallpox virus from the Aral Sea bioweapons facility – over a distance of as much as 15 kilometers. Such a bioweapon could overcome the standard transmissibility limitations of unaltered smallpox virus and be capable of infecting countless numbers of people simultaneously. And as noted above, an even greater danger is the threat of an engineered smallpox virus, capable of overcoming the immune systems of even those inoculated against the disease.¹⁷

Not all public health or bioterrorism experts agree that Aralsk was a bioweapon release – accidental or otherwise. At conferences since the release of the Monterey Institute report there has been considerable skepticism about the Tucker-Zelicoff conclusions. Many such critics believe the burden of proof is on the analysts. The debate is reminiscent of a similar one over 20 years earlier – over the likelihood of such conclusions in the case of the Sverdlovsk anthrax outbreak – vigorously argued by the U.S. public health community to be a naturally occurring epidemic at the time, yet eventually confirmed as an accidental bioweapons release after the fall of the Soviet Union.

3) High Mortality and Transmissibility

¹⁵ Richard Preston, “Annals of warfare: The bioweaponers,” *New Yorker* (March 9, 1998) and Alibek, *Biohazard* provide examples.

¹⁶ Though smallpox experts note that numerous factors may reduce the effectiveness of vaccination, including spoiled *vaccinia* or poor inoculation technique that may not allow the vaccination to “take,” thus not conferring optimal (or potentially any) immunity. Such may have been the case in the Aralsk area, notes DA Henderson.

¹⁷ Tucker and Zilinskas, *The 1971 Smallpox Epidemic in Aralsk, Kazakhstan, and the Soviet Biological Warfare Program*.

Another factor making smallpox a desirable terror weapon of mass destruction is the high mortality it causes among the immunologically vulnerable. For a BT agent, this is one of the most contagious, as well – though estimations of how many people are infected by each contagious person vary. This is one of the issues underlying debates about renewing mass vaccinations of the general public as a preventive measure against bioterrorism. Unvaccinated people are believed to be almost universally susceptible to smallpox, and in the West it is a disease that has not been substantially a problem since before World War II. In the less developed, poorer countries of the world, smallpox epidemics continued to be damaging until the WHO's eradication campaign made significant headway, in the 1960s and early 70s, and finally eliminated the naturally originating virus. According to experts, even those people vaccinated up to the 1970s have by now mostly or totally lost their immunity to the virus. The world is thus a population now highly vulnerable to smallpox, and any outbreak would have the potential for global calamity – particularly given the current shortage of vaccine doses and the slow speed, given existing technology, with which new vaccine could be produced. In worst case scenarios, tens of millions of people could die before a global pandemic were to be contained.¹⁸ In best case, any outbreak would start small and be quickly contained by aggressive public health intervention. Smallpox must be considered simultaneously a potential biological weapon of mass destruction, capable of killing broadly and indiscriminately, and a highly terrifying agent of psychological terrorism. Both of these factors might make its use more appealing to a would-be terrorist.

4) Higher Terror Potential: The King of Catastrophic Infectious Disease Outbreaks?

Therefore, because of the history and severity of smallpox's ravaging sweeps across the human biomass, the disease has a cachet that exceeds most others up to now. Any outbreak – or rumor of one – would cause a global crisis, and present a unique potential for mass panic among the world's populations. Global travel and commerce would be severely curtailed as quarantines would likely be imposed on and within afflicted countries, and beyond the immediate sickness and death the global economy could be devastated even after outbreak containment. Given the public perception of smallpox, an epidemic would provide among the highest possible disruption, fear, and psychological impact potential of any BT agent. Used on a target country by suicidal or religious martyrs unconcerned about their own death(s) or those of their fellows, smallpox is virtually unmatched in its combined potential for fear, disruption and death.

5) Stealth and Immunity For Perpetrators

Smallpox, as with most bioweapons, is frightening in part because it is unseen. Unlike a bomb, a nuclear explosion or a chemical attack, the effects of exposure may not be seen in its victims for days or even weeks after infection if the dispersion is covert. This stealth can enable the perpetrators to do their work and escape long before the attack is discovered. Smallpox has an average historical incubation period, the time before a victim becomes symptomatic, of 7-17 days after exposure (an average of 11-12) – although it is possible that an inhaled, enhanced weaponized version might

¹⁸ As noted below, this could either encourage or deter would-be smallpox terrorists, depending on their motivations.

considerably shortened this incubation period. During the initial pre-symptomatic period a victim is not generally contagious to those around him, but this is also the time during which immunization and drug therapy intervention is most effective. By the time a sneak attack were discovered, as patients presented at hospitals, those initially exposed would generally be at the mercy of fate absent any proven, effective antiviral treatments.

In addition, mindful of the dangers from unvaccinated exposure to variola virus, a resourceful bioterrorist might acquire the resources to be immunized with *vaccinia*, reducing the chances of self-infection by his smallpox bioweapon. This would considerably increase the safety of handling smallpox, for any terrorist who cares to live through his attack, particularly compared to the dangers and inconvenience of transporting and handling conventional explosives, chemicals and nerve agents, radioactive “dirty bomb” materials or nuclear explosive devices.

6) Domsday Appeal, Cornered Dictator Syndrome and “From the Grave” Sponsorship

Clearly there is a risk of over-dramatizing smallpox in a lurid fashion. On the other hand, there is no question that *variola* represents a terror weapon with dramatic potential. The potential for wide scale, random death may be the only motivation needed for groups who have no particular political goals. The existence of doomsday cults such as the Japanese Aum Shinrikyo is testament to “irrational” terrorists possessing their own logical agenda. In addition to perpetrating the 1995 Tokyo subway sarin attack, Aum Shinrikyo is documented as having experimented with anthrax, Ebola and other bioterrorism agents, and made an attempt to spread anthrax (a non-lethal strain) prior to the Tokyo sarin attack.

For an organization intent on causing as much mayhem and death as possible, with little or no political rationale or concern for credibility or blowback, smallpox would be an appealing acquisition. While there is no public evidence that such non-governmental organizations or religious cults have possession of the virus, these are precisely one of the profiles of people who would be most interested in its reemergence. Another such profile might be called the “cornered dictator syndrome.” This would include leaders who believe they face impending demise, or believe they have nothing to lose by using destructive bioweapons such as smallpox.

Such a behavior was hypothesized for Saddam Hussein’s regime before the 2003 U.S. invasion of Iraq, asserting that WMD deterrence was possible as long as the regime stayed in power, but that in the event of impending regime demise the incentive to go out with a blaze of glory would be too great to resist. This of course did not happen, either because the regime was either too hesitant (or incompetent) to deploy and launch such weapons, or, more likely, they had indeed destroyed or disabled their WMD programs at some point in the 1990s and U.S. intelligence was faulty. Of course, another possibility is that the doomed regime opted for “from the grave” sponsorship of terrorist organizations willing to take charge of some or all of the Iraqi smallpox and

other bioweapons. There would be risks in this, or course, if such sponsorship emerged through informants or captives.

Another potential flash point for state-led strategic bioweapons use or covert bioterrorism is North Korea, where the combination of a paranoid, megalomaniacal (and possibly insane) President Kim Jung Il might be led to military action and use of his nuclear, biological or chemical weapons if feeling cornered by either Western economic sanctions or military actions. Indeed, the North Koreans, unlike the Iraqis, have the potential to kill millions with their conventional weapons alone, should they decide their survival is at stake from a pending U.S. invasion or a military strike against their nuclear facilities. The overthrow of the Iraqi regime has made such concerns more real, and the North Koreans' combined threat to develop their own nuclear weapons as well as sell nuclear bomb materials to other states, has highlighted the potential risk that they might do the same with biological weapons. According to the CIA, the Kim government is believed to possess smallpox virus within their biological weapons program. Authoritarian governments in general appear to prefer failsafe mutual assured destruction mechanisms to improve their survival potential.

The Soviet Union's development, production and placement on strategic ICBMs of tons of weaponized smallpox in the 1970s and 80s was ostensibly done for use as a horrific doomsday weapon. The motivation was to spread the smallpox virus over the United States in the aftermath of any strategic nuclear exchange – apparently with the intention of killing the survivors.¹⁹ The interesting aspect of this program was that its secrecy was closely guarded, thereby invalidating its first strike MAD potential. One is led to speculate whether it was intended as a last ditch diplomatic card to play on the brink of nuclear war, or just a spiteful last word to the surviving American (European, etc.) leaders living in hardened shelter, attempting to ride out the ensuing fallout and nuclear winter. Unfortunately, variations on such doomsday scenarios and motivations are not unfathomable.

7) The *Smallpox Security Paradox/Dilemma*: Decreased Immunological Vulnerability May Actually Increase Chances of Smallpox Bioterrorism

One perhaps counterintuitive, even paradoxical factor that may increase rather than decrease the incentive for a terrorist use of smallpox is the very fact of evolving, diminishing vulnerability in Western countries. Thus, I propose that even as smallpox's potential as a weapon of mass destruction wanes in the face of vaccinated populations, the incentive for its potential *use* as a terror and disruption weapon may correspondingly *increase*. As time passes, American, European and other wealthy possible targets are mounting ambitious security, research and public health responses to prevent, contain and minimize a potential smallpox attack – including production of vaccine, the vaccination of public health first responders, possibly the mass vaccination of large percentages of their populations, and pursuit of research on anti-viral treatments. These efforts might actually increase the incentive for use for bioterrorists otherwise wary of blowback. This is possible because the otherwise high risk of contagious

¹⁹ See Miller, Engelberg and Broad, *Germes*.

smallpox blowback globally would at least be diminished, while the psychological terror factor would likely continue well past and beyond actual physical dangers to American, French, Japanese or other Western citizens who might be immune to an attack.

In addition, while the United States population, for instance, might sometime in the future be comparatively (though never fully) immune to some *variola* smallpox strains, it is highly unlikely that the rest of the world's populations will ever be widely vaccinated again (barring a major global smallpox pandemic). Even a less vulnerable United States or Europe attacked with smallpox would be subject to quarantine and isolation by other nations in the event of any outbreak – causing considerable economic, social, psychological and political disruption in the process. Oil, food and billions of dollars in other imports and exports would be disrupted, travel and tourism harmed for possibly years after. Such large scale quarantines have not been seen since past centuries' cholera and plague outbreaks, but they may be a substantial factor in altering the future face of global economic and even political regimes.

In sum, while wealthy Western governments might be able protect themselves, they are far from being capable of protecting the rest of the world upon which they are dependent for trade and other commerce. Thus, even a subsequently well-contained bioterrorist-caused outbreak – even among only a few un- (or ineffectively)-vaccinated individuals could be enough to send anxious tremors through the respective society, in light of the horrifying, visceral image *variola* historically conveys to populations long accustomed to comparative invulnerability to diseases such as smallpox. And it would justifiably terrify a world without protective stores of vaccine, probably willing to give up the benefits of trade and tourism to prevent epidemics among their respective populations.

As an added bonus for would-be smallpox bioterrorists, under such a scenario the very act of a Western nation's increasing its internal protection by mass immunization would diminish – though of course never eliminate – the odds that a terrorist's own people might be exposed to the "blowback" of an amplified epidemic escaping the borders of the intended victim. Overall, such preventive, defensive measures taken against smallpox would decrease the value of *variola* as a weapon of mass destruction, yet oddly improve incentives for use as one of mass disruption and terror. For real-life reference, see the tremendous ripple effect created from 5 American anthrax deaths (out of 11 inhalation cases) in 2001, where an inaccurate perception of danger and the fear of the unknown caused disruption in most cases (the exception being among hapless Postal Service employees) far in excess of the actual danger from anthrax.

Factors Potentially Reducing The Odds of A Smallpox CIDO

The presumed advantages of using smallpox as a bioweapon aside, the contrasting disadvantages may serve as a significant deterrent.

1) Smallpox Virus is *Probably* Not Easily Acquired

It is highly likely that smallpox virus still remains in the military storage and production facilities of the former Soviet Union, especially since the civilian, WHO-sanctioned viral

repository was apparently taken over and moved by the Russian military after the end of the Cold War. Russian authorities now refuse to acknowledge any such programs in the past or present. Given presumed incentive for continued, potentially tight security at Russian facilities, it may be very difficult and costly to acquire *variola* virus from theft or smuggling from such a source. On the other hand, there may be more than enough financial (and possibly ideological) incentive among disaffected and underpaid Russian bioweapons scientists and technicians to encourage smuggling of the minute amounts of virus that would be required as seed stock for variola bioweapon production, or of the expertise needed to do so. American intelligence reports suggest the possibility that a Russian smallpox expert, a veteran of the 1960s/70s eradication campaign, made unusual trips to Iraq that may have been associated with Hussein's military weapons of mass destruction program. The presumed, comparative difficulty in acquiring smallpox virus can be compared to the historical comparative ease of acquiring anthrax bacteria, which until the early 1990s had been widely available from commercial biological supply firms (the painfully easy method of acquisition believed employed by Iraq in the 1980s and 90s), and which in any case exists in natural form as well in most countries of the world (though the more lethal strains are not universally available). Thus, it is probably a disincentive for would-be terrorists to try to get the smallpox virus without being discovered. And as noted above, substantial evidence appears to exist sufficient to convince American intelligence officials that North Korea, Iraq and France possess variola virus. There is thus far no evidence, however, that smallpox virus has fallen into the hands of non-state actors or terrorist groups.

2) Dissemination Questionable

Regardless of smallpox's contagious and deadly characteristics, it may be difficult to disperse effectively unless it is effectively weaponized. Standard smallpox usually must be inhaled to infect its victim, but naturally occurring cases of *variola major* are generally transmitted when a symptomatic victim, complete with the characteristic fever and pox on the face, hands, feet and other extremities, in particular, exhales near someone else in the vicinity. While the virus may infect from close contact with inanimate objects contaminated with virus, this is probably not an efficient method to infect large numbers of people simultaneously. Thus, unless the virus has been engineered or weaponized to float and survive in the air for some time, mass infection would be tricky. Of course, if circumstantial evidence holds true, as it may in the case of the Aralsk smallpox epidemic in the early 1970s, Soviet smallpox stores may already possess such characteristics and might be transferred to would-be attackers.

3) Smallpox is Difficult to Handle

Unless a terrorist has been effectively immunized against a strain of variola, it would be difficult to safely handle smallpox given how highly transmissible it is. Unlike most existing natural anthrax strains, for instance, with which a would-be bioterrorist might prevent self-infection with prophylactic antibiotic (e.g., Ciprofloxacin) doses, smallpox is almost universally capable of infecting those who are exposed and unvaccinated. Even with immunization, included in this calculus must be the nature of the variola strain in question. Even a properly vaccinated terrorist might expose himself and fall victim to one such as the weaponized, highly virulent India-1 Soviet bioweapon strain that

circumstantially appears to have created the 1971 Aralsk smallpox epidemic. If former Soviet scientists did create a genetically-engineered strain that resists vaccine-conferred immunity, as was hypothesized, there would be a possibility of self infection even if terrorists could have been pre-vaccinated. Without careful handling, expertise and care, an unpracticed bioterrorist could succumb to the equivalent of soccer's proverbial "own goal."

4) Smallpox "Suicide" Terrorism is Probably Inefficient

This would not deter a suicide terrorist bent on glorious martyrdom, of course. But even if someone chose to deliberately infect himself to act as a human smallpox "munition," the contagious stage of smallpox does not occur until a victim is acutely ill – and probably immobilized by the disease. Also, only a few days after onset of fever and prostration he exhibits difficult to hide pox on the hands, feet, face and arms. Thus while media speculation about a walking smallpox time bomb have caused considerable anxiety, most sick individuals would have trouble blithely walking through an airport lobby or unobtrusively sitting on a crowded airplane without showing signs of severe illness. Smallpox may initially be mistaken for chickenpox, a much less acute disease (though occasionally deadly in adults) -- but given heightened awareness among healthcare experts about the distinctive differences between the two, and publicity about variola, any physical manifestations could easily tip the hand of such an infected terrorist. This would severely limit the effectiveness of such a ploy. Of course, such limitations beg the question of whether a score of deliberately self-infected individuals wouldn't successfully sow panic among the public, no matter how few others subsequently came down with the disease.

5) There is Potential for *Physical* (versus Political) Blowback, or Direct or Indirect Self-inflicted Damage

Perhaps more of a disincentive for smallpox terrorism, at least among individuals or governments with group affiliations and political motives, would be the danger of *blowback*. Blowback is any unintended, negative consequence from an act – particularly one involving espionage or terrorism. In this case, the blowback potential would include the possibility of causing a global epidemic, or pandemic, that might reach beyond the intended target and devastate the terrorists' own people. Should a rogue state such as Iraq, or a terrorist organization like al Qaeda unleash smallpox on an enemy such as the United States, there is strong potential that such a catastrophic outbreak could extend well beyond U.S. borders. Given the ease of international travel and likelihood of panicked flight of people from the initially afflicted areas, a smallpox CIDO could easily extend to global regions with no access to vaccine and little adequate healthcare infrastructure to contain it. In contrast, the U.S. and even its European allies would have access to existing and commissioned stores of vaccine and antiviral pharmaceuticals, enabling the richer nations to minimize the impact on their people.

The tremendous political demand for domestic mass vaccination in such a smallpox event would make WHO (or even Western allies') pleas for supplies from smallpox

vaccine stores very difficult to honor by the United States. Thus, a hypothetical al Qaeda terrorist might endanger the very Islamic empire of his ambitions by killing millions of Muslims worldwide. This might be a rational tradeoff for some of the most extreme fanatical terrorists, of course, but it would at least deter those with more focussed political goals. On the other hand, failure of U.S., EU, Israeli or other Western nations to deliver vaccine to afflicted Muslims in the Middle East, Indonesia or elsewhere could be seen as an incentive to radicalize survivor populations or governments.

6) International Taboo: *Political Blowback*

Along these lines, there is little doubt that such an attack would confront the strongest possible international condemnation, and wrath that would be directed toward any perpetrators – if discovered. The difficulty in uncovering the source of America's 2001 anthrax attacks, demonstrates, of course, that this would only come to be if the terrorists were ever discovered. But the danger of invalidating one's political legitimacy in the eyes of the world would be great, as well as the possibility of nuclear retaliation or overthrow of any implicated regime should such terrorists be discovered to be state-sponsored.

Alternatively, the taboo aspect of bioweapons use is at the core of "the cornered dictator syndrome." Thus, assuming he even possessed such weapons at the start of the 2001 Gulf War II, Saddam Hussein may have assumed that in perpetrating a chemical, smallpox or other biological attack, he would seal his fate and be overthrown (or perhaps reduce his chances for asylum). Of course, assuming the regime had had in the first place, or was willing to develop at the last minute ties to such organizations, Iraq could potentially have disseminated a Pandora's box of bioagent among non-state terrorist organizations intending to release them in Western nations. Such "from the grave" state sponsorship of bioterrorism would not be easily discovered, given the ease of hiding smallpox virus – especially when compared to maintaining a viable nuclear program or smuggling such weapons.

7) Civilian Biodefense Countermeasures

A growing disincentive over the next several years may be the increasing countermeasures and preventive actions and technologies emanating from Western countries. This progress may include institution of preventive mass vaccination in would-be target countries such as the United States, the interim existence of large stores of preexisting, c. 1970s *vaccinia* vaccine, research, and development and production of safer, more effective smallpox vaccines and antiviral treatments, as noted above. As with all counter-terrorism issues, aggressive intelligence gathering and infiltration of groups with the potential to use bioweapons will be very important. Thus, the risks to Western nations' populations may steadily diminish in time, leaving the less-developed nations, from which many (though by no means all) terrorist groups originate, as the largest pools of vulnerable victims .

For the foreseeable future, even the hint of an outbreak among a broadly vaccinated population would carry the potential for massive disruption and fear – regardless of

official reassurances. In addition, all things being equal, diminishing smallpox vulnerability in the West might actually increase the incentive for bioterrorists using it – the “smallpox security dilemma” noted above – since the risk of contagious blowback would be diminished by an effective American, European, or other Western target’s public health response and containment, while the psychological terror factor would linger well beyond the existence of effective physical countermeasures. Added to this is the unknown potential for a genetically engineered *variola* virus that could overcome mass vaccine-induced immunity.

The Calculus of Smallpox Bioterrorism, In Sum

What, then, are the odds that such an outbreak will ever occur? No one can truly say, since the minds of potential terrorists or state leaders can never be read accurately, and it is still uncertain all of whom might currently possess viable smallpox virus stocks. What is more necessary is a complex cost-benefit analysis comparing the low – perhaps very low – odds of a manmade twenty-first century smallpox outbreak with the high – potentially very high – level of death and disruption that might occur. With Earth-asteroid collisions now on the minds of astronomers as well as the public and some policymakers, we are left with a similar dilemma: At what cost preparation, and at what cost inaction? Nonetheless, the odds of smallpox use in our lifetimes are undoubtedly much higher than those of being hit by a catastrophic asteroid strike – while the death and suffering could be similarly unimaginable. One is reminded that mankind has yet to invent a weapon that was not used eventually for purposes of war or mayhem.

What can be said, is that the likelihood of deliberate smallpox bioweapons release, the development of a genetically enhanced strain of smallpox or other “superbug” pathogens engineered to kill efficiently will increase over time. It is inevitable given the trajectory of biotechnology and access, and the main question that remains is how well prepared ahead of time the targets, and the world, will be. The “face of battle” in the coming biosecurity century is widening, getting more confused and complex, and necessitates more than ever preventive defense – versus the historic, reactive fighting of the last battle common to human nature and history.

THE CALCULUS OF SMALLPOX BIOTERRORISM: POTENTIAL ADVANTAGES AND DISADVANTAGES FOR USING THE VARIOLA VIRUS FOR A TERRORIST ATTACK

Advantages

Disadvantages

<ul style="list-style-type: none"> ▪ Stocks exist in Russia, probably Iraq, North Korea, France, etc. ▪ Successfully produced in quantity - by Soviet bioweapons program (with potential for being stolen and/or smuggled out) ▪ Stable weaponized versions already made - for aerosol dissemination, likely produced by Soviets, given evidence ▪ Enhanced version(s) may exist - Ability to overcome standard <i>vaccinia</i> immunization, such a strain may have been isolated or engineered by Soviets ▪ High mortality, mass casualty potential, no cure for disease - Especially for a BT agent (among unvaccinated) ▪ Highly contagious Cat. A agent ▪ One of most effective potential agents of disruption, fear, chaos ▪ <i>Pina Colada principle</i> - Perpetrators can be far away (sipping drinks on a resort beach) before impact felt, due to historic 7-17 day smallpox incubation period ▪ <i>Vaccinia immunization greatly reduces self-infection risk</i> ▪ Dramatic doomsday-cult weapon ▪ <i>Cornered Dictator Syndrome</i> - Perceived threat of state demise <i>increases</i> likelihood nation will use WMD; less MAD ▪ <i>Smallpox Security Dilemma</i> - More preparation may increase smallpox attack risk (less terrorist blowback danger) ▪ Pathogen may be untraceable - even with advance genetic “finger printing” techniques; thus, retaliation, MAD may be ineffective deterrent(s) 	<ul style="list-style-type: none"> ▪ May be difficult, costly to acquire ▪ May be difficult to disseminate effectively - unless virus weaponized, aerosolized, infection is mainly from face-to-face contact ▪ Virus difficult to handle safely - highly contagious and/or even deadly to those already vaccinated; ▪ Vaccination protection difficult to acquire -<i>vaccinia</i> immunization not publicly available in West until recently ▪ Smallpox “suicide” terrorism inefficient if mass casualties sought - given course, symptoms of disease ▪ <i>Physical Blowback</i> - possibility of causing a global epidemic, causing deaths among terrorists’ own people ▪ <i>Political Blowback, Global Taboo</i> - International condemnation, wrath directed toward perpetrators (if ever discovered); possible loss of support among previously sympathetic populations; greater likelihood of being turned in by informants? ▪ Possible nuclear retaliation or overthrow of regime if terrorists discovered to be state-sponsored ▪ Civilian Biodefense - future vaccination of populations, new anti-virals, antiterrorist virus detection technology, etc. may reduce smallpox mass casualty potential ▪ Delayed gratification for terrorists - epidemics take time to develop, versus the instant drama of bombs, etc.
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