The Variola Template

This article, the fourth in a series on biochemical warfare and terrorism, reviews the threat of a smallpox epidemic, and some things physicians should think about.

In a middle class Toronto home two men confer. The younger speaks in hushed tones, with a peculiar intensity, and elation.

"All 20 warriors are ready. Four long years of preparation will not go to waste, in the will of God."

"There is no suspicion of..."

"None. All have been legal residents for at least three years, all are married and work in various Canadian cities. They have made the same flights before, for various legitimate reasons. They use credit cards, with appropriate documentation."

The older man, immaculately dressed in a business suit, rises, walks away and stares pensively out the window at a small, frozen pond. His companion, bright yellow-shirted, and dressed casually in cowboy boots and faded Levi's, goes to his side, and continues.

"Do not fear, my friend. God is with us."

"I'm only concerned that they'll be discovered. Or become too ill, and unable..."

But the younger man again interrupts. "No! The plan is prefect in all respects! On May 1st, each was infected with smallpox. Today, each begins a flight to a different large US airport terminal. Not one of our brave men knows what his role will be. Each will be met on arrival and assisted by a colleague who has been vaccinated, but will not get his instructions until that very day. All smallpox warriors will become ill at about the same time. At that point they will be taken to crowded airport terminal waiting areas, as if awaiting a flight. When these human aerosol bombs are in extremis, when we can no longer control their fever and rigors with analgesics, their battle will be over. They will be taken and relieved of pain forever, God be praised. Two weeks later, the Almighty will strike tens of thousands of devils with the holy pestilence, and in two months, millions."

"Yes, but some passengers will leave the US and take the disease with them; some will reach our own homeland."

"If that happens we are prepared to contain outbreaks."

"Some nations are both poor and unprepared. They...

A third time the other butts in angrily.

"Woman talk! No war is without casualties. The devil himself calls it Ôcollateral damage.'

No more talk. Leave it to God! I must go."

"OK, see you here. Tuesday morning"

"In his name."

The scene above is fiction, of course, but it depicts one more way our transportation technology might be turned against us. It is a template for any low-tech suicidal bio-terror attack using a grave infection like smallpox, well transmitted through coughing in crowded indoor areas. The world population, unvaccinated for 25 years or more, is almost uniformly susceptible.

Smallpox, unlike anthrax, is a very well studied disease. The CDC has set forth a detailed plan for response,[1] based on solid experience with outbreaks prior to world-wide eradication in the 1970s. This plan relies on early detection and reporting of index cases; rapid response to isolate and treat cases; prompt vaccination of contacts and health providers; and quarantine of high-risk people. It is expected that supplies of vaccine will be adequate, and that outbreaks can be aborted. Use of a 50 percent glycerine diluent for reconstitution of vaccinia vaccine is being evaluated, and is expected to significantly amplify vaccine availability.[2] It is assumed that physicians, nurses, EMTs, police, military and other first responders can be almost fully protected by vaccination at time of exposure, and partially protected by vaccination up to four days after exposure.

As I see it, the weakest links in this elaborate chain of response are the reliance on early diagnosis, and the possibility that multiple cases in multiple areas might be overwhelming. Although local primary care professionals would become involved, almost none of us are vaccinated, and few are familiar with the actual procedure for vaccination — nor the expected side effects and complications, although these are well described in medical literature.[3]

Several older reports on vaccination complications are available,[4] and so is a more recent one from the Israeli army.[5] In adults, death from vaccination have been rare, on the order of one in 5 million. Serious but survivable complications are expected in about one in 1 million. With proper screening, and rejection of those with compromised immunity, or close contact with the immunosuppressed, or with multiple skin lesions, it is probable that complication rates can be reduced further. It is not known if antivirals are helpful, though Varicella Immune Globulin is recommended in some cases.

On the UC Davis campus, selected Primate Center employees are required to maintain current smallpox immunity when work may expose them to vaccinia virus modified for research purposes, or to cross reactive primate-hosted orthopox viruses.

Recently a retrospective review of 100 smallpox vaccinations was made.[6] Vaccinated employees were seen at days 0, 3, 7 and 14. Troublesome side effects usually consisted of fever up to 101F during days 10-12, and 8-15 cm areas of pain, redness, and swelling, sometimes with lymphadenopathy. One recipient had a transient generalized fine rash of no clinical importance. Two employees reported fever and coryza after one or two days, which resolved within a day, and were felt to be due to concomitant viral illness. Three employees entered a claim for workmen's compensation injury, but symptoms responded readily to analgesics, and no employee was absent from work because of vaccinia side effect.

From my standpoint of a "grunt" physician potentially recruitable in an emergency, I make the following observations, which are my own, and do not reflect those of SSVMS or the UCD Employee Health Services:

1. In a mass vaccination, relatively benign side effects will lead to many calls to local physicians or health departments; it would be wise to be well aware of their scope and treatment.

2. For effective "herd immunity," not all members of a population need be immunized. It is reasonable to aggressively exclude higher-risk people from vaccination, following CDC recommendations, especially avoiding those who are immuno-suppressed or are in close physical contact with immuno-suppressed persons, and individuals with eczema, sunburn or multiple skin lesions.

3. Some quarantines may be imposed, as in schools and day care or nursing homes, since the very young,[7] and the elderly may be at increased risk of complication. People at age extremes also can be encouraged to self quarantine, avoiding vaccination.

4. Minor procedural details, and side effects of vaccination, may be troublesome during mass inoculations. The very process of vaccination can be daunting. For example, just how deep is the innoculum, and how big an area should be used? If vaccination fails, is it due to the procedure or the batch of vaccine? (Repeat vaccination is often successful.) Also challenging for the inexperienced are instructions for care of the vaccine site: how to change the bandage, what kind of hand washing to use, the kind of disposable gloves to use, and what to say to people about the ugly 2 cm wide scab or 7 cm redness and swelling or fever that can develop.

   It might be wise for primary caregivers to look over the CDC plan, and to be able to find it quickly. Up to date links can be found at www.cdc.gov/nip/smallpox/News.htm.

5. Because the risk is relatively low, I believe primary caregivers should be given the option of vaccination now. This would provide some local experience with the vaccination process and its side effects, as well protection. Furthermore, vaccination of local first responders may actually reduce the attractiveness of smallpox as an instrument of terror.

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2. FDA-BBIND 9829 revision 12-4-01 by CDC Atlanta
3. Package Insert Wyeth Smallpox Vaccine, Dried Calf Lymph Type (Dryvax. Dried smallpox vaccine.)
4. Lane JM, et al. Complications of smallpox vaccination. 1968: results of ten statewide surveys. Nengl J Med 1969:281: 1201-8
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