Smallpox Infobrief #3

Written by Edward Hammond for the Third World Network and smallpoxbiosafety.org, May 2011
Third in a series of short informational briefings on the issue of destruction of smallpox virus stocks

Evidence Demonstrates the Significant Risk of Laboratory Accidents

"*The "control of nature" is a phrase conceived in arrogance, born of the Neanderthal age of biology and the convenience of man*." – Rachel Carson

Could smallpox escape from the lab and cause a new disease outbreak? The answer is an unequivocal yes. Of course on any given day, the chances of such an event are very small, and none has been recorded in recent years. Yet the last documented human cases of smallpox, in the UK in 1978, were the result of a lab accident. And both of the World Health Organization's (WHO's) authorized smallpox virus repositories, in the United States and Russia, have experienced serious mishaps in recent years – one a death due to human error, and another a serious design flaw in a newly constructed lab.

Will a smallpox accident happen again? In general, viruses have a habit of evading the best efforts of humans to control them, which makes the WHO's eradication of smallpox from the wild such a monumental achievement. Humans also make mistakes, and despite robust systems and procedures, accidents at high containment biological laboratories[1] occur with regularity. With smallpox, the risk is proportional to the length of time that smallpox is stored and the number of activities that are conducted with the stocks. In other words, the longer that the World Health Assembly (WHA) delays destruction of the stocks, and the more research that is permitted, the higher the likelihood of an accident.

Accidents in high containment labs are far more commonplace than most people realize. In many countries, including the US and in Europe, regulation of high containment facilities is limited. For example, in 2008, the US Government Accountability Office (the investigative office of the US Congress) determined that no US government agency had comprehensive regulatory authority for high containment labs nor, in fact, even knew the location of all such labs in the country. Further, reporting systems for lab accidents are inadequate and/or secretive, and even obligatory accident reporting rules have been disregarded by research institutions.

It is periodically reported to the WHA that WHO staff have inspected the facilities at the two Collaborating Centres and determined that they are adequate. It should be noted,

[1] By "high containment", we refer to labs classified as biosafety level three or four (BSL-3 or BSL-4), called P-3 or P-4 in WHO terminology. P-3 and P-4 labs share many safety features, the main difference being additional use of piped air supplies and full body "space suits" at P-4. These labs are designed to host research on disease agents that are easily transmissible and difficult or impossible to effectively treat. While there are no actual international standards that assign particular diseases to particular lab levels, it is widely agreed that smallpox research requires a P-4 facility.

however, that there are no international standards for high containment laboratory facilities established by the WHO or any other intergovernmental organization. Thus, there is no internationally agreed baseline against which these facilities can be judged. In addition, the WHO Biosafety Programme is quite small and unempowered, and is understandably preoccupied with laboratory conditions in countries with fewer resources than the US and Russia – for example, ensuring that labs do not become ground zero for outbreaks of Ebola, polio, or other diseases.

The US health minister recently characterized the likelihood of an accident involving smallpox as "miniscule". This statement is simply not correct, as evidenced by the following lengthy list of mishaps in high containment labs over the past decade, including problems at the two smallpox repositories, the US Centers for Disease Control's own labs, as well as at the Vector lab in Russia.

In 2004 at Vector, a researcher infected herself with Ebola virus and died as a result. In 2007 and 2008 at the US Centers for Disease Control (CDC), primary and backup power failed at high containment labs, indicating a loss of all-important negative air pressure (used to keep germs in). Making the accidents even more troubling, this serious design flaw in the electrical system was identified by one of CDC's own building engineers during lab construction, but his repeated pleas that it be addressed were ignored by management.

The following charts provide tabular information on historical smallpox accidents and recent laboratory accidents (and other incidents) involving high containment labs. Generally speaking, they can be divided into incidents involving human error and equipment failure – or sometimes both. This information clearly demonstrates that the risk of accidents at high containment labs is significant, and that they occur with regularity, including at the most highly secured and recently constructed lab facilities.

Historical Accidents Involving Smallpox Virus[2]

Type and Date	Location	Narrative
Smallpox outbreak, 1973	London School of Hygiene and Tropical Medicine (UK)	Lab worker who did not personally work on smallpox nevertheless became infected, two more persons infected at hospital. Two fatalities.
Escaped primate, 1975	University of Munich (Germany)	Variola-infected chimpanzee escaped from the lab, swinging in the trees of a nearby park for several days before recapture.
Smallpox outbreak, 1978	University of Birmingham (UK)	Photographer working one floor above a smallpox lab became infected. Her mother was then infected. The photographer, Janet Parker, died. Parker was the last recorded human smallpox fatality.

[2] Tucker J. 2001. **Scourge**. Grove Press. New York, pp. 122-23. Also Pennington, H. 2002. **Smallpox Scares**. London Review of Books. 5 September.

Some Recent High Containment Laboratory Incidents

Type and Date	Location	Narrative
Human error, SARS accidents, 2003-04[3]	National University of Singapore National Defence University (Taiwan) Beijing Institute for Virology	In separate incidents, workers were infected with SARS coronavirus in each lab. In China, an infected worker spread the disease to family members and a health care provider.
Equipment failure, design failure, 2007-08.[4]	Centers for Disease Control (US)	In separate incidents, one caused by lightning and the other by a bad transformer, high containment labs lost primary power. Each time, backup power also failed, leaving high containment facilities without power for negative air pressure, freezers, etc. CDC ignored warnings from engineers.
Natural Disaster-related flooding and power outage, 2008.[5]	University of Texas Medical Branch (US)	The University operates two P-4 labs on a barrier island historically battered by catastrophic hurricanes (cyclones). A 2008 storm knocked out primary and secondary power and flooded the basement of a new P-4 facility, including animal holding areas and mechanical areas for the lab.
Mentally ill researcher deliberately releases weaponized anthrax, 2001[6]	US Army Medical Research Institute of Infectious Disease	US law enforcement has concluded that the 2001 anthrax letter attacks were the work of a mentally ill senior scientist at the US Army's premiere high containment lab. Lab managers had access to psychiatric records documenting the sociopathic illness of the researcher, but did not restrict his classified research or his access to disease agents.
Human error, Ebola infection, 2004[7]	Vector (Russia)	Researcher contracted fatal Ebola infection by sticking herself with a needle. Vector is the WHO authorized smallpox repository in Russia.
Official cover-up: Lab-acquired infections unreported, 2006-07[8]	Texas A&M University (US)	By human error and faulty equipment, university researchers infected themselves with brucella and Q fever (*C. burnetii*). The infections were not promptly diagnosed. Senior officials at this major research university then decided to ignore the law requiring the incidents to be reported, ultimately resulting in a research shutdown and large fine.

The reality of human and equipment failures at high containment labs, including labs with the latest technology and training, demonstrates the substantial risk of accidental (or even deliberate) release of smallpox virus. These stocks no longer serve any essential public health purpose, and the longer they are retained, the greater the likelihood of an outbreak.

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[3] A synopsis can be found at: Enemark C 2006. **Preventing Accidental Disease Outbreaks: Biosafety in East Asia**. Nautilus Institute. URL: http://www.nautilus.org/publications/essays/apsnet/policy-forum/2006/0631a-enemark.html

[4] Young J 2008. **CDC lab containing deadly virus suffers power outage**. Atlanta Journal-Constitution. 12 July.

[5] Frase M 2009. **The Price of Ike: UTMB in Galveston Continues to Struggle**. American Association of Medical Colleges Reporter. March.

[6] Amerithrax Expert Behavioral Analysis Panel 2011. **Report of the Expert Behavioral Analysis Panel**. Research Strategies Network. See URL: https://www.researchstrategiesnetwork.org/pages/view/Amerithrax/

[7] Associated Press 2004. **Scientist dies after lab accident involving Ebola virus**. 24 May.

[8] Kaiser J 2007. **Pathogen Work at Texas A&M Suspended**. Science Now. 2 July. URL: http://news.sciencemag.org/sciencenow/2007/07/02-01.html