

## Biological Security and Health in the Post-pandemic World:

### The Infectious Disease Community's 'Mushroom Cloud'?

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#### Summary

Having served in the US Army at the interface of health and security for most of my career, I have often found myself on committees and boards in government where the topic was 'WMD' (Weapons of Mass Destruction). It was common in those settings for there to be one or two 'biologists' to every ten nuclear physicists or arms control experts. When we got to the infectious disease or 'biodefense' portion of the agenda, some—not all—of the physicists would be ready for a 'break'. The biology was either too squishy for a brilliant engineering mind or just not that interesting. I might lean over to a friend—if I had one in the meeting—and whisper, "Too bad WE don't have a 'mushroom cloud.'"

#### The Cold-War

During the cold war and for ten years thereafter, the United States of America (USA) and other countries developed physical and medical countermeasures to protect their military forces from what we loosely called the "dirty dozen" biological agents previously weaponized in the Soviet Union. Most of the threat agents for which we developed medical and physical countermeasures were similar to the weapons agents developed by the offensive programs of the US and its allies before 1972 when the biological weapons convention was signed.<sup>1</sup> Throughout this period, our defensive biological work was on a small scale, compared to our nuclear weapons programs, and probably little known or appreciated outside our service laboratories.

Some might find it interesting that the US and Soviet weapons agents were not highly contagious. For example, the list of characteristics sought by US weaponeers through the '60s read like this: pathogenic for humans or animals, causes disability or lethality, highly infectious but not contagious, medical countermeasures available, stable during logistical operations, stable in small particle aerosol, readily and rapidly producible, weaponized in munitions and delivery systems and produce desired effects on the target.<sup>2</sup> During this period, our defensive focus was on environmental detection, physical protection, vaccines and diagnostics. While we were attempting to protect our military force globally, we also 'practiced' by responding to emerging infectious diseases, mostly through collaborations in Africa or South-East Asia. The total science and technology budget for the US biodefense program was approximately \$137M in 1997. The overall

biodefense budget would jump to \$14.5 billion spent between 2001 and 2004 in response to the ‘anthrax letters.’<sup>3</sup>

### **Post 9/11 and the ‘Anthrax Letters’**

After attacks on the World Trade Center and mailing of the ‘anthrax letters’ in September of 2001, the focus in biological defense turned toward protecting citizens from weapons produced by individuals or sub-state terrorist organizations. A self-proclaimed survival medicine expert—sounding like nature at its worst—listed the following as likely threat agent characteristics during that era: infectious and contagious, causing long-term debilitation or death, few available preventatives or therapies, easily deliverable to a target population and low likelihood of harming the perpetrators.<sup>4</sup> During this period, we quickly realized that it was significantly more difficult to protect citizens of any country than it had been to protect a hypothetical military force on a European battlefield. The threat agent list became more difficult to construct and necessary medical countermeasures and defensive practices more difficult to define. Who should be vaccinated; against what agents; when? Furthermore, environmental detectors could not be placed everywhere, and ordinary citizens could not, or would not, carry a protective mask or know when to don it. The problem became ‘too hard’ to solve with technical solutions. As Noble Laureate Joshua Lederberg told us, “There is no technical solution to the problem of biological weapons. It needs an ethical, human, and moral solution if it’s going to happen at all. Don’t ask me what the odds are for an ethical solution, but there is no other solution”.<sup>5</sup> Less than a decade into this phase we turned much of our biosecurity focus toward naturally occurring emerging infectious disease. After all, we had seen essentially no more bioterrorism after the anthrax letters

and the FBI’s conclusion based on circumstantial evidence was that the letters were mailed by an ‘insider’ from one of our labs.<sup>6</sup> We began a system of heavy-handed regulation and micromanagement of our domestic infectious disease laboratories where scientists worked with high-hazard pathogens.<sup>7</sup> We also turned our focus toward surprises that might come from nature rather than from nations, sub-national forces or even individuals.

### **Emerging Infectious Disease**

That refocusing made sense, as the rate of occurrence of highly-pathogenic emerging infectious diseases increased: SARS in China, 2002; chikungunya in numerous countries from 2007 to 2014; MERS in the Arabian Peninsula, 2012; Ebola in West Africa, 2014 and Zika in America in 2015.<sup>8</sup>

Almost in parallel with the Ebola outbreak in West Africa the Global Health Security Agenda<sup>9</sup> (GHSa) was endorsed by a group of, now more than 60, countries plus international organizations, NGOs and private sector companies to help make the world safe and secure from infectious disease threats. The GHSa would evaluate preparedness and even support improvements in a nation’s capability to respond to an outbreak or epidemic caused by an emerging infectious disease. Then, even as the West African Ebola epidemic spread, the GHSa financial condition worsened; the program may have disappeared but for an infusion of ‘left-over Ebola money’.

By 2018, the US CDC was threatened with budget cuts to programs that conducted infectious disease research and support for other nations internationally.<sup>10</sup> That same year, the Trump administration made clear the low priority of pandemic preparedness and the value of keeping a finger on the pulse

of emerging disease; it abolished the White House Office of Global Health Security and placed the responsibility under the Weapons of Mass Destruction Directorate. [Note that the same office had been abolished by the second Bush administration as well as the Obama administration, only to be reinstated after the anthrax letter attacks and Ebola '14 epidemic respectively.]<sup>11</sup> Pandemic preparedness isn't easy when there is not a pandemic.

## **The Pandemic**

And then in December of 2019, a handful of cases of SARS-like pneumonia were reported in a very large but little-known city in the middle of China: Wuhan. Almost overnight our world changed.<sup>12</sup> Now, we wish we had paid closer attention to medical epidemiologists and emerging disease experts who have been warning us for the last decade or more that a lethal pandemic was all but inevitable.<sup>13, 14</sup> One organization in the US has described our situation during the COVID-19 pandemic as "forewarned but not forearmed".<sup>15</sup> Will we all learn from this global experience that we must make pandemic preparedness a priority going forward?

## **The world has changed**

As many of us sit in our homes we often feel helpless, attempting to maintain working relationships and activities electronically while helping to fight the war on COVID-19 as best we can. Many watch as their personal treasure and even livelihood slip away and most of us watch as our nations' economies come sliding to a near halt. We're told that a vaccine will be the best answer, but there are still so many unknowns. Yet, we are hopeful. There are some promising drugs in the pipeline. Diagnostics must get better and faster, both for the identification of virus-infected individuals and serology to see who is possibly protected by an antibody

response. What about herd immunity? We are sorting through a swirling mass of new and old science to find relevant public health information to aid in halting the pandemic.

It is too early to know how individuals, populations, nations and global organizations and their policies will change after the COVID-19 experience. Nations will likely reconsider their supply chains for critical medical devices, clothing, personal protective equipment, drugs, vaccines and maybe even for the basics like food and fuel. Just-in-time supply, while efficient for both producer and consumer may not be feasible when we are cut off from global supplies for many months. Access to enough medical materiel through an international shifting of inventories may work for a local or regional crisis but may not be logistically or politically possible in a crisis that impacts globally. Modern medicine has allowed us to reduce hospital bed numbers *per capita*, but a number of countries in the COVID-19 crisis have had to improvise on the fly to house the massive number of humans needing intensive care. Will we change the way we build hospitals or even hotels and schools with the thought of quickly making them 'hospitals' in a crisis? So much has changed. Will infectious disease be discussed more seriously as a national security issue in the future? How long will we remember?

## **Impact on public thinking**

Will our citizens change the way they think about the infectious disease after this most traumatic experience? Will there be stronger public support for vaccines? Will we be more attuned to the principles of preventive medicine, public health and 'one health'?<sup>16</sup> Will we alter our lifestyles to reduce comorbidities such as obesity, diabetes, heart and pulmonary disease? Will our young people be drawn to careers in medicine and the biological sciences more strongly after this experience?

Will we expect more from our governments, both local and national? Will we get more? In the US we have a National Strategy for Pandemic Influenza (2005) and a Pandemic Influenza Plan (2017 Update); now, in the bright light of the COVID-19 pandemic, is the time to see what difference they made, and adjust as necessary.<sup>17</sup> Strategies and plans can be nothing more than a stack of papers on a shelf unless recommendations are kept up to date, implemented and practiced regularly. Will our political leaders take pandemic planning more seriously? We have been warned so many times but it's difficult to find support for a once-in-a-century event in a political world that measures time in two and four-year increments. Or is the once-in-a-century rule still valid for pandemics? A big piece of this pandemic planning must be driven by our domestic departments and ministries with initial coordination that can only happen at the top strata of our respective governments. It requires funding, of course, but even more importantly, sound leadership. Much of this must occur within our nations, but with transportation what it is today, we can't afford to become isolationist in our thinking regarding the infectious disease. Remember, the 'bugs' know no borders. A highly contagious viral disease such as influenza or a coronavirus in my country today can be in your country tomorrow. We must work together.

### **Nations and the International Community**

Like never before in our lifetimes, we face a common enemy. This enemy does not respect the seal on the cover of our passports, political ideologies, economic power, military might, age or gender. Fortunately, to the degree that we had been working together internationally before the pandemic, we have been able to leverage relationships of friendship and trust between

experts, scientists and clinicians during the crisis. Global networks of scientific and clinical subject matter experts are powerful tools before, during and after a pandemic.<sup>18</sup> We must work together internationally.

We have exceptional examples of science academies, academic centers, military-to-military programs and even industrial partners working synergistically across international borders. When we look closely, however, it is often individuals within these systems and organizations who find a colleague with common technical interests anywhere in the world. Common interests fuel conversation and communication which leads to sharing what I have long called "good news and bad news". This kind of frank exchange over time results in trust between the two parties. Where trust exists, the relationships are often both sustained and supercharged. These nodes of friendship and trust between technical experts are empowered, in some cases, by connecting with other similar nodes to contribute to an even broader network of likeminded individuals. National leadership is, of course, central to domestic and global preparation for the next pandemic, but politics so often get in the way. However, through relationships of trust grounded in common technical interests, each of us as individuals can contribute our small piece to the 'fight', technically and through effective communication. Both enlightened leadership and excellent subject matter experts are essential. And now, sadly, we do have our very own biological 'mushroom cloud'.

### **Endnotes:**

- <sup>1</sup> UN, The Biological Weapons Convention. <https://www.un.org/disarmament/wmd/bio/>
- <sup>2</sup> Personal Communication with William C. Patrick III, former US biological weapons expert, ca. 1997.



- <sup>3</sup> Franz, David R. (2013) "The Dual Use Dilemma: Crying Out for Leadership," *Saint Louis University Journal of Health Law & Policy*, V. 7. <https://scholarship.law.slu.edu/jhlp/vol7/iss1/4> (page 8)
- <sup>4</sup> Alton, Joe, MD, *Doom and Bloom*, 17 Oct 2014, <https://www.doomandbloom.net/>
- <sup>5</sup> Preston, Richard, *The Bioweaponeers*, New Yorker, March 9, 1998, pp 52-65.
- <sup>6</sup> National Research Council. 2011. Review of the Scientific Approaches Used During the FBI's Investigation of the 2001 Anthrax Letters. Washington, DC: The National Academies Press. <https://doi.org/10.17226/13098> .
- <sup>7</sup> David R. Franz, "Implementing the Select Agent Legislation: Perfect Record or Wrong Metric?" *Health Security*, pp. 290-294, Aug 2015, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4544819/>
- <sup>8</sup> Emerging Infectious Diseases, Baylor College of Medicine, <https://www.bcm.edu/departments/molecular-virology-and-microbiology/emerging-infections-and-biodefense/emerging-infectious-diseases>
- <sup>9</sup> Global Health Security Agenda, <https://ghsagenda.org/>
- <sup>10</sup> Ed Yong, "The CDC Is About to Fall Off a Funding Cliff," *The Atlantic*, February 2, 2018, see <https://www.theatlantic.com/health/archive/2018/02/cdc-funding-pandemics/552224/>
- <sup>11</sup> Kenneth W. Bernard, "The White House signals that bioterrorism and disease don't matter — again," *the Washington Post*, May 23, 2018, [https://www.washingtonpost.com/opinions/the-white-house-signals-that-bioterrorism-and-disease-dont-matter—again/2018/05/22/5a5b0c0c-5dd1-11e8-b2b8-08a538d9dbd6\\_story.html](https://www.washingtonpost.com/opinions/the-white-house-signals-that-bioterrorism-and-disease-dont-matter—again/2018/05/22/5a5b0c0c-5dd1-11e8-b2b8-08a538d9dbd6_story.html)
- <sup>12</sup> Robin Muccari, Denise Chow and Joe Murphy, "Coronavirus timeline: Tracking the critical moments of COVID-19," *NBC News*, May 11, 2020, <https://www.nbcnews.com/health/health-news/coronavirus-timeline-tracking-critical-moments-covid-19-n1154341>
- <sup>13</sup> *Deadliest Enemy: Our War against Killer Germs*, Michael T. Osterholm and Mark Olshaker; Little, Brown and Company, Boston, Massachusetts, USA; ISBN-13: 978-0316343695. [https://wwwnc.cdc.gov/eid/article/24/1/17-1081\\_article](https://wwwnc.cdc.gov/eid/article/24/1/17-1081_article)
- <sup>14</sup> Laurie Garrett, "The Coming Plague," <https://www.lauriegarrett.com/the-coming-plague>
- <sup>15</sup> Blue Ribbon Study Panel on Biodefense is now the Bipartisan Commission on Biodefense, <https://biodefensecommission.org/>
- <sup>16</sup> "One Health Initiative will unite human and veterinary medicine," One Health Initiative, <http://www.onehealthinitiative.com/>
- <sup>17</sup> National Pandemic Strategy, <https://www.cdc.gov/flu/pandemic-resources/national-strategy/index.html>
- <sup>18</sup> Biological Threat Reduction Program, <https://www.nap.edu/search/?term=bioloigal+threat+reduction+program>