Biosecurity: A Multi-Dimensional Challenge of Escalating Complexity and Urgency

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Biosecurity: Domestic and International Institutions
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- evolution over the last 150 years
- integrate new scientific, clinical, public health, legal and military/counter-terrorism perspectives of risk assessment and management
- desired but still elusive consensus on scope and nature of international cooperation
- diverse regulation, legislation, conventions, treaties and access controls
- rapid pace of new technology-driven risks render many current oversight approaches anachronistic
Biosecurity: Domestic and International Institutions Different Objectives and Scope of Authority

- public health versus warfare/terrorism
- human populations, livestock, crops and environmental resources
  - ‘one health’ concept gaining momentum
- food and water security
- refugee migration and care obligations
- disease surveillance, detection, mitigation and recovery measures
- transparent, prompt information exchange and international coordination (International Health Regulations: IHRs)
Biosecurity: Domestic and International Institutions Different Objectives and Scope of Authority

- legal and ethical frameworks for bioincident mitigation
- mandatory non-consented use of diagnostics and Emergency Use Authorization (EUA) countermeasures
- forced quarantines and other ‘lock-down’ vehicles
- track and trace systems and protection of individual privacy
- triage criteria for rationed care
- USG diversion of private sector resources for critical supply needs and distribution logistics
- law enforcement responsibilities and forensic evidence collection in case of suspected bioterrorism
Global Oversight and International Cooperation in Biosecurity

- Natural Infections and Global Public Health
- Chemical and Biological Weapons

Global Health Security Agenda

GHS INDEX
GLOBAL HEALTH SECURITY INDEX
Building Collective Action and Accountability

BIOLOGICAL WEAPONS CONVENTION
National Sovereignty and Global Policies for Infectious Disease Control

- IHRs (and most international policies) based on principles of legal and Westphalian sovereignty
- Autonomy of the state and its ability to exercise power (policy) without interference from external forces
- IHRs cannot force state-parties to act in accordance with global health interests or accept international assistance
- Risk of economic disincentives to outbreak reporting
Global Preparedness for Major Bioincidents
Major Deficits in 89% Countries

Key
- Yellow: Most Prepared
- Orange: More Prepared
- Red: Least Prepared

AFRAID
NOT!
US Policy Landscape for Bioweapons and Bioterrorism

- Biological and Toxin Weapons Convention (1972, 1975)
- Biological Weapons Anti-Terrorism Act (Public Law 101-298, 1990)
- Antiterrorism and Effective Death Penalty Act (Public Laws 104-132, 1996)
- USA Patriot Act (Public Law 107-56, 2001)
- Public Health and Bioterrorism Preparedness and Response Act (Public Law 107-188, 2002)
- Federal and institutional policies for oversight of dual-use research of concern (White House, 2012, 2015)
Biological (and Toxin) Weapons Convention (BWC)

- **Article I**
  - acquisition, retention and stockpiling of BW and delivery equipment for hostile purposes

- **Article II**
  - destroy existing BW stocks

- **Article III**
  - transfer, assist, encourage or induce third parties to acquire/retain BW

- **Article IV**
  - national compliance measures

- **Article V**
  - multilateral participation in problem in resolution

- **Article VI**
  - engage UN Security Council to investigate breaches

- **Article VII**
  - assist States exposed to danger by violations

- **Article VIII**
  - encourage peaceful uses of biological science and technology
Biological (and Toxin) Weapons Convention (BWC)

- no formal verification mechanism to monitor compliance
- lack of enforcement mechanisms
- members ‘encouraged’ to abide by confidence-building measures (CBMs) defined at the five-year review conferences
Export Controls on Technologies for WMD Threats and CBW Weaponization

Dual-Use Technologies and Export Control in the Post-Cold War Era

Documents from a Joint Program of the National Academy of Sciences and the Russian Academy of Sciences

Australia Group Common Control List Handbook
Volume I: Chemical Weapons-Related Common Control Lists

Australia Group Common Control List Handbook
Volume II: Biological Weapons-Related Common Control Lists

Intergovernmental Agreement on Biosecurity Review
July 2016
Submission by the Export Council of Australia
History of Biosecurity Threats: Pandemics and Plagues
2000 Onwards

- 9/11/2001 attack on USA and formation of US Department of Homeland Security
- Increased concern about potential use of biological agents by terrorist groups, substate actors and nation states
- Expanded ‘homeland security’ strategic requirements added to mission of multiple USG agencies, notably DOD and the Intelligence Community (IC)
Federal Select Agent Program

http://www.selectagents.gov/publications.html

- managed jointly by HHS, CDC and USDA
- registered entities
- compliance
- report detection of select agents or toxins
- transfer, theft, loss or inadvertent
- security risk assessment and inspection

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Dual-Use Applications of Synthetic Biology Misuse, Error or Accident

Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments

PLOS ONE January 19, 2018

Ryan S. Noyce¹, Seth Lederman², David H. Evans¹ *

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Chemical Synthesis of Poliovirus cDNA: Generation of Infectious Virus in the Absence of Natural Template

Jeronimo Cello, Aniko V. Paul, Eckard Wimmer*

Science (2002) 297, 1016
Biodefense in an Era of Synthetic Biology and Precision Gene Editing

- what are the implications for the future biothreat spectrum?
- what are the timeframes that particular novel threat categories are likely to evolve?
- what new surveillance and counter-measures will be needed?
- how do current international agreements regarding WMD/CBW need to be updated to address the changing threat spectrum?
China’s Export of Fentanyl and Derivatives: A New Biosecurity Threat
Gray Zone Threats

An Emerging Dimension of Hybrid Warfare

New Risks in the Gray Zone Between Peace and Major Conflict

Implications for Biosecurity
Darker Shades of Gray: The Emerging Dimension of Hybrid Warfare

- deception, disinformation and propaganda
- weaponized narratives ("fake news")
- lawfare; exploiting loopholes and seeding ambiguity
- plausible deniability
- exploit Western public reluctance for military deployments
Gray Zone Tweets and Biosecurity: Russian Trolls and Twitter Bots

- purposeful social media disinformation
- weaponized health communications disinformation
  - anti-vaccination campaigns
  - anti-GMO movements
  - exploit health disparities and racial tensions
- compromise health care computer systems and or other critical computing capabilities in bioincidents
- Russian FSB Novochok chemical attack on Sergei and Yulia Skripal in UK (3/4/2018)
  - Salisbury UK hospital computers hacked
  - thwarted hack of Organization for Prohibition of Chemical Weapons (The Hague) conducting forensic analysis of incident samples
Recent Emerging Infection Diseases

Cell 182, D. Morens, A. Fauci (2020), 1082
The Need for International Cooperation in International Public Health Has Never Been Greater

- COVID-19 and economic effects on LDCs on infection detection/control programs
- COVID-19 Global vaccine logistics
- US withdrawal from WHO (5/2020) effective 7/6/2021
The Need for International Cooperation in International Public Health Has Never Been Greater

- COVID-19 and economic effects on LDCs on future infection detection/control programs
- COVID-19 global vaccine distribution logistics
- US withdrawal from WHO (5/2020) effective 7/6/2021

- major investment and reinvigoration of large-scale global programs
  - biosurveillance
  - PPE and related clinical stockpiles
  - inter-operative data systems
- incentives for proactive engagement of private sector
The Threat from Pandemic Influenza Remains!
Biosecurity: A Classic Complex System of Systems Challenge

- Global perspectives
- Biological, socio-economic, and political ecosystems

Science and Technology

Public Health and Healthcare Systems

Intelligence, Foreign Policy and Military Strategies

- Societal priorities and cost of biosecurity
- Proactive preparedness
- Conflicting political ideologies, intents and capabilities (global and national)