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

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Biosecurity and Bioterrorism Response
BIOE 122, EMED122/222, PUBLPOL 122/222 Course Winter 2018:
Stanford University School of Medicine
24 January 2018
Biosecurity

Broad Term for the Full Spectrum of ‘Biological’ Threats Whether of Natural or Nefarious Origin

Natural Epidemics and Bioterrorism Share Same Features in Terms of Potential to Harm and Disrupt Society

Preparedness and Response Capabilities Are Similar Irrespective of the Origin of the Biothreat
BIOSECURITY DILEMMAS
Dreaded Diseases, Ethical Responses, and the Health of Nations
CHRISTIAN ENEMARK

Biological Threats in the 21st Century
Filippa Lentzos (editor)

UNPREPARED
GLOBAL HEALTH IN A TIME OF EMERGENCY
ANDREW LAKOFF

PALE RIDER
THE SPANISH FLU OF 1918 AND HOW IT CHANGED THE WORLD

DEADLIEST ENEMY
Michael T. Osterholm, PhD, MPH and Mark Olshaker

THE END OF EPIDEMICS
The Looming Threat to Humanity and How to Stop It
JONATHAN D. QUICK, MD, with BRONWYN FRYER
The Social, Economic and Political Impact of Epidemic and Epizootic Disease

- Plague of Athens
- Bubonic Plague
- Small Pox
- Pandemic Influenza
- Foot and Mouth Disease
- Rinderpest
- African Swine Fever
- Rabies
“The Big Four”

TB

HIV

Malaria

Rx Resistance
New and Resurgent Viral Threats

- SARS-CoV
- MERS-CoV
- West Nile
- Yellow Fever
- Dengue
- Chikungunya
- Ebola
- Zika
Resurgent Infectious Diseases (2017)

- Madagascar: plague
- Yemen: cholera
- Brazil: yellow fever
- Democratic Republic of the Congo: Ebola
- Nigeria: monkeypox
- Angola: yellow fever
- Syria: polio
- India: Kyasanur Forest disease
Anthrax (2017)

Zambia/Namibia

Ivory Coast

Permafrost Thaw, Siberia

Threat Assessment: N. Korea
Infectious Diseases (Natural) and Bioterrorism (Nefarious)

Shared Features: Stealth and Spread
Detection of Infectious Disease Threats:

Very Different From Device or Hazmat Events

Emergency Rooms and Farms Will be the Front Line
The Biosecurity Quartet

Infectious Diseases of Natural Origin

Urbanization and Environmental Impacts on Disease Emergence (EIDs)

Military and/or Humanitarian Missions in Dense Urban Areas and ‘Hot Zones’

Bioterrorism, New Dual-Use Technologies and an Expanded Threat Spectrum
“Amerithrax” October 2001

“I will show you fear in a handful of dust”
-T. S. Elliot
The FSU Covert Biopreparat Program: Violation of 1972 BWC
The Appeal of CBW for Asymmetric Warfare and Terrorism
### Diversification of the Biosecurity Threat Spectrum

<table>
<thead>
<tr>
<th>Time</th>
<th>Low Probability: High Consequence</th>
<th>High Probability: High Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Today</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• bioterrorism</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• natural infectious diseases (pandemic)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>2025 (?)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• bioterrorism</td>
<td>X ?</td>
<td></td>
</tr>
<tr>
<td>• natural infectious diseases (pandemic)</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Anthropogenic Effects on Ecosystem Stability and Altered Patterns of Infectious Diseases

- Famine
- Contaminated water
- No water and desertification
- Depletion of natural resources
- Climate change and new vector ranges
- New vulnerabilities
Increased Refugee Migration and Humanitarian Disasters Created by Conflict
Global Urbanization

- estimated 180,000 people migrate to cities every day (employment, conflict)

- unprecedented demands (stresses) on infrastructure and services by 2030
  - food (35%↑), water (40%↑), energy (50%↑)

- susceptibility of megacities to extreme weather events/natural disasters
  - littoral locations of 8/10 top megacities
  - vulnerability of vertical structures and slum zones
Ebola: West Africa 2014-15

A Glimpse of the On-Ground Challenge of Managing Epidemic Disease In Locations With Inadequate Infrastructure and Frightened Populations

Still a Small Scale Epidemic and Relatively Easily Contained Versus the Challenge of a Global Pandemic
Ebola in West Africa (2014-15)
Ebola West Africa: 2014-15

The Logistics (and Risks) of Waste Disposal

Burial Practices
The Dominant Role of Zoonoses in Emerging Infectious Diseases
Urbanization and Mega-Cities in Developing Countries and the Increased Threat of Exotic Zoonotic Diseases

- High Population Density With Inadequate Biosurveillance
- Major Gaps in Health Infrastructure and Disease Reporting
- Expanded Eco-niches and New Zoonotic Exposures/Risks
One Health: Recognition of the Importance of Zoonotic Diseases as Human Health Threats

- Pandemic (avian) influenza
- HIV
- West Nile virus
- MERS-CoV
- Ebola virus
- Bush meat food chain
- Zika virus
- What's out there?
Mapping the Global Virome and Potential for Zoonotic Spillover to Humans

- 586 mammalian viruses in 28 families identified to date in 754 mammalian species
- 263 (44.9%) also detected in humans
  - 188 (71.5%) are zoonotic
- Higher proportion of RNA viruses as zoonoses
- Higher zoonotic potential for enveloped viruses that replicate in the cytoplasm
- Viruses with arthropod vectors can infect a wider range of mammalian hosts

Bats as the Ebola Reservoir in W. Africa (2014)
The Global Virome: Analysis of 2805 Mammalian Host-Virus Association and Proportion of Zoonotic Viruses

Mapping the Global Virome and Potential for Zoonotic Spillover to Humans

- bats (chiroptera) harbor higher proportion of zoonotic viruses than other mammalian orders
  - Flavi-, Bunya- and Rhabdoviruses
- primates and rodents next two highest reservoirs
  - rodents (Bunya-, Flavi- and Arenaviruses)
- phylogenetic relatedness and cross-species spread (viral receptor affinities)
- higher mutation frequency in RNA viruses and cross species spillover
- sympatry (two or more species in same location)
- increased risk with rural to urban migration
The #1 Global Pandemic Threat? 
The Omnipresent Risk of Pandemic Influenza

INFLUENZA PANDEMIC
MORTALITY IN AMERICA AND EUROPE DURING 1918 AND 1919

DEATHS FROM ALL CAUSES EACH WEEK EXPRESSED AS AN AVERAGE RATE PER 1000

Spanish Influenza
has endangered the prosecution
of the WAR in Europe.
There are 116 cases in the Navy Yard,
36 deaths have already resulted
SPITTING SPREADS SPANISH INFLUENZA
DON'T SPIT
The Evolution of Pandemic Influenza Strains: The Bird → Pig → Human Transmission Chain

Avian Reservoirs and Global Flyways

Sporadic Transmission to Mammalian Hosts

Episodic Zoonotic Human Infections
The Evolution of Pandemic Influenza Strains by Continuous Mutation and Genetic Reassortment

High Frequency Mutation and Genetic Reassortment in Zoonotic Strains

High virulence $\times$ low transmissibility $\rightarrow$ high transmissibility

$\rightarrow$ 

high virulence $\times$ high transmissibility
Biosecurity Implications of the Rise of Intensive Agriculture in BRIC Countries

- consumer desire for animal protein (versus plant protein)
- diversion of grain to animal feed, disruption of global food chains and increased famine risk in Africa and new humanitarian crises
- juxtaposition of large numbers of birds (ducks/chickens) and pigs in same production centers
- increased cross-species influenza transfer and human zoonotic risk via genetic recombination(s) with pandemic potential
The Core Triad in Combating Infectious Diseases

- Global biosurveillance
- Preparedness
- Protection

- Threat spectrum
- Robust public health capabilities
- Countermeasures
Biosurveillance

What's Out There?

Early Detection Saves Lives!

PON/POC Diagnostic Tests, Population Triage and Managing the Worried Well

- **26 December 2013**
  - index case zero
  - Emile Ouamouno (Meliandou, Guinea)

- **21 March 2014**
  - first report by WHO-AFRO region

- **8 August 2014**
  - WHO declaration of Public Health Emergency of International Concern (PHEIC)

- Index case zero
- First report by WHO-AFRO region (Meliandou, Guinea)
- WHO declaration of Public Health Emergency of International Concern (PHEIC)
- 26 December 2013
- 8 August 2014

Over 11,000 Deaths
Faster Diagnosis Saves Lives: The Primacy of Early Detection and Preparedness Mobilization

Profile
- Signatures of Infectious Agents

Detect
- Rapid Automated PON/POC Diagnostics

Act
- Real-time Situation Awareness and Decision Authority
Ground Zero Biosurveillance Data

Comprehensive Front Line Sampling of Sentinel Species

Real-time Intelligence and Faster Response Mobilization
Global Disease Surveillance

EMERGEncy ID NET

World Health Organization

IDSA

Infectious Diseases Society of America

OIE

Centers for Disease Control and Prevention

CDC

ProMED-mail

GIDEON

Joint Programme Executive Office of Chemical and Biological Disease

GPHIN

RMISP

biocaster

U.S. Influenza Sentinel Provider Surveillance Network

DoD - GEISWeb

Global Emerging Infections System

BioPortal

GeoSentinel

Quarantine Activity Reporting System (QARS)

Public Health Department’s Surveillance

Quarantine Activity Reporting System (QARS).

TropNet Europ

Human and Animal Rabies

GEIS

BSVE

Argus Research Operations Center

EUNID

European Network of Infectious Diseases

EMPPRES WATCH

NNDSS

National Notifiable Diseases Surveillance System

NATIONAL CENTER FOR MEDICAL INTELLIGENCE
Species From Feces: Identification of Predator-Prey Relationships from DNA Analysis of Fecal Samples

Percent of reads

AMNHBelize1  AMNHBelize2  AMNHBelize4  AMNHBelize5  AMNHBelize6  AMNHBelize7  AMNHBelize8  AMNHBelize9

Desmodus rotundus  Natalus stramineus  Chrotopterus auritus

Courtesy of Drs. F. Walker and N. Simmons NAU.edu/batdna
Detection of *Bacillus cereus* biovar *anthracis* in Carrion Flies Feeding/Ovipositing on Mammalian Carcasses as Proxy Marker for Anthrax Endemicity

From: C. Hoffmann et al. (2017) Nature 548, 82
Metagenomic Identification of Pathogens and Their Evolution

Influenza Virus

Zika Virus

Anomaly Detection and Early Alert

Disease Progression

Satellite Surveillance and Predictive Modeling of Disease Trends
Coming to an Airport Near You:

Modeling Airport Connectivities, Traffic and Distance Relationships and Implications for Epidemic Spread via the Global Aviation Network

Mobile Devices, Disease Tracking, Contact-Tracing and Education
Street Vendors of Pharmaceuticals: Haiti
Detection of Infectious Disease Threats:

Very Different From Device or Hazmat Events

Emergency Rooms and Farms Will be the Front Line
The Lag Phase in Bioincident Detection

Primary Care Physicians and Pharmacists

initial non-specific illness

progressive illness

Hospitals

unusual illness patterns

Social Media and m.Health

BIOINCIDENT CONFIRMATION

ER Walk-ins
Consequence and Crisis Control in a Bioincident

Command Center
- public health
- logistics
- communications
- medical
- law enforcement
- coordination
- local
- national
- international
- regional

Primary Care Physicians and Pharmacists
- acute care
- triage
- mortuary
- Dx triage
- transport logistics
- mass Rx/vaccination

Social Media and m.Health

Hospitals

Neighbourhood Emergency Centers

Media
- police, EMS
- volunteers
- military

Community Outreach

“The Worried Well”
Management of Major Bioincidents

Key Success Factors

- tested incident management plan
- responder training and education
- command structure
  - demarcated roles, responsibilities, authority
  - robust communication channels
- single source POC for key interfaces
  - ground zero staff (multiple ground zeros in CBW)
  - emergency services and first responders
  - medical/public health
  - politicians and inter-agency coordination
  - conventional media and social media
Who’s In Charge?

- ill-defined responsibilities and accountabilities lead to operational confusion
- delusional to believe that optimum disaster response is a physician/health system-centric process
- crucial medical component but multi-disciplinary, multi-sector ‘bigger picture’ complexities requires sophisticated integration of diverse expertise and proficient large scale logistics
US High Level Isolation Units (HLIU’s)*

- 56 designated hospitals by CDC as Ebola Treatment Centers (ETC’s) in response to W. Africa Ebola (2014-2016)
- subsequently 1 ETC designated in each HHS region as Regional Ebola and other Special Pathogens Treatment Centers (RESPTC)
  - capable of managing highly infectious diseases for extended periods
- economic sustainability of maintaining ‘warm’ facilities
  - lack of funding for non-RESPTCs
  - high absorbed non-reimbursed standup costs

*J.J. Herstein et. al. (2017) Emerge. Inf. Dis. 23, 965
Resource Asymmetries in Management of Global Bioincidents
Distribution of Medical Emergency Supplies for a Major Epidemic/Pandemic

- pre-positioning for known threats: The Strategic National Stockpile (select agents only)
- rapid movement by commercial carriers
Use of GIS for Management of Population Movement, Healthcare Facilities and Supply Chains for Optimum Bioincident Control
Vulnerability of Global, National and Local Supply Chains in a Major Epidemic/Pandemic

- "just-in-time" supply networks
  - major hospitals 2 or 3 deliveries per day
- out-patient prescription drugs
  - insurance company limits on prescription volume (USA)
- majority of drug intermediates, excipients and final products sourced off-shore
- 95% generic drugs used in US (80% of total Rx) are made off-shore, primarily in PRC and India
- no national stockpile for routine prescriptions
Medical Countermeasures (MCMs) for Special Populations: Emergency Use Authorization

Children

Pregnant

Aged

Immunosuppressed

Impaired Major Organ Function

ICU-Critical Care
Stockpiling Ventilators for Influenza Pandemics: Estimated Deaths and Hospitalization

- 1918
  - estimated 675,000 US deaths, 50 million globally

- 1918 like
  - severe pandemic
    - projected 9.9 million hospitalizations

  - 865,000 ILI hospitalizations

Ethical Considerations for Decision Making Regarding Allocation of Mechanical Ventilators during a Severe Influenza Pandemic or Other Public Health Emergency

Prepared by the Ventilator Document Workgroup, Ethics Subcommittee of the Advisory Committee to the Director, Centers for Disease Control and Prevention

July 1, 2011
Modeling of Peak-Week Ventilator Demand in an Influenza Pandemic

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mild (2009-like)</th>
<th>Moderate 1957/68-like</th>
<th>Severe 1918-like</th>
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</thead>
<tbody>
<tr>
<td>Hospitalization Overload</td>
<td>1</td>
<td>x 3</td>
<td>x 36</td>
</tr>
</tbody>
</table>
## Constraining Capabilities for Effective Mechanical Ventilation for Large Scale Public Health Emergency

From: A. Ajao et al. (2015) Disaster Med Public Health Prep 9, 634

<table>
<thead>
<tr>
<th>Components/subcomponents</th>
<th>Number of additional patients that can be ventilated nationally by capacity level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conventional Capacity Level</td>
</tr>
<tr>
<td><strong>Space</strong></td>
<td><strong>Beds</strong></td>
</tr>
<tr>
<td><strong>Staff</strong></td>
<td><strong>Physicians</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Respiratory Therapists</strong></td>
<td>22,500 – 67,500</td>
</tr>
<tr>
<td><strong>Critical care Nurses</strong></td>
<td>25,200 – 50,300</td>
</tr>
</tbody>
</table>

Indicate the constraining component at each capacity level.
The Challenge of Vector Control
“For most of us design is invisible until it fails”
Bruce Mau
The ‘Fog of Disaster’: Crisis Standards of Care and Proliferation of Unanticipated Events and Consequences
Legal Aspects of Public Health and Counter-Terrorism Actions to Contain Bioincidents

- suspension of civil liberties
- imposition of quarantine
- triage decisions and $R_x$/vaccine rationing
- mandatory medical examination and treatment
- mandatory treatment with unapproved drugs and vaccines
  - informed consent
  - indemnification
  - special populations
Control of Population Movement and Supply Chain Networks
Supply Chain Logistics in Disaster Management
The Critical Role of Communication and Gaining Public Trust in a Major Bioincident

Managing the “Worried Well”

Timely, Authoritative and Accurate Information
False Threat Alerts and Public Panic

Hawaii, 13 January 2018

Japan, 16 January 2018
Public Awareness of Potential Risk
Political Media Sensationalism, Public Fear and Irrational Populist Decisions by Political Leadership
Informing the Public: A Critical and Unenviable Challenge

- media sensationalism and public panic
- pressure on governments to make illogical but politically expedient decisions
- in a severe outbreak the shock factor from any major level of fatalities will be unprecedented in modern peace times with unpredictable consequences for public responses
- unpredictable unilateral decisions by other governments, restricting trade, travel and shipment of goods
- extended supply chains might break down completely

red = global health security agenda
green = other PHEM activities

“Aliens Have Landed”
Fear and Distrust: Proliferation of Myth and Misinformation

- deliberate spread by Governments
  - delay elections
  - genocidal assault on Kissi tribe
- deliberate spread by healthcare workers (HCW)
- treatment centers as organ harvesting operations for western countries
- attacks on HCW and contact tracers
Amplifying Fears and Resentment

forceful capture of individual who fled from treatment center

military enforcement of quarantine zone and public hostility
Breakdown of Civil Order and Incident Management

- Constrained Mobility
- Constrained Access
Containing Epidemics Without Effective Drugs or Vaccines
Notice the Resemblance?
Hygiene and Quarantine as the Only Effective Containment Absent Drugs or Vaccines

Bubonic Plague
Physician 15th Century

Ebola, Liberia
21st Century
Out of Sight: Out of Mind!

The Cocoon of Protection: How Quickly We Forget Past Epidemics and Their Toll

Reduced Investment in Public Health and Biosecurity: A False Economic Gain
Comfort and Complacency: The Enemies of Vigilance and Preparedness
Drug Discovery and Development: One of the Most Complex Intellectual and Logistical Exercises Undertaken by Modern Industry

- $750 million to $2 billion R&D cost/drug
- $400 million to $1 billion R&D cost/vaccine
- multi-year R&D cycles
- market incentives
  - vaccines vs. Viagra
  - antibiotics vs. alopecia
  - diseases of the developing world
  - EIDs of epi(pan)demic potential
NO ESKAPE!: Resistant Bugs and Few New Drugs

- increasing resistance in G\(^{+}\) and G\(^{-}\) pathogens in hospital and community settings

- the ESKAPE pathogens
  - *Enterococcus faecium*
  - *Staphylococcus aureus*
  - *Klebsiella pneumoniae*
  - *Acinetobacter baumanii*
  - *Pseudomonas aeruginosa*
  - *Enterobacter species*
Multidrug Resistant Organisms (MDROs): Growing, Spreading and Killing

These images depict a patient with septic shock and purpura fulminans caused by β-lactamase-negative ampicillin-resistant Hemophilus influenzae. Images A and B: Day 1 of hospitalization. Image C: Hospital day 9, in which gangrene of the bilateral limbs, the facial region, and penis progressed gradually. All the limbs were complicated with infection and eventually amputated. The patient succumbed to sepsis on hospital day 34.
Safety Fears Threaten Global Dengue Vaccine Control Efforts
Responding to Agent-X

The Imperative for New Technology Approaches to Vaccine Development

Speed: Reduce Vaccine Development Cycle from Years to Weeks

Scalability: From Millions of Doses to Billions
Combating Agent–X: Agile Adaptive Manufacturing for Rapid Preparedness Against Novel Infectious Agents

From Pasteur to Computationally Predicted Epitopes

From Biological to Chemical Vaccines
The Coalition for Epidemic Preparedness Innovations (CEPI)

- launched at WEF, Davos, January 2017
- 200 organizations
- develop 4-6 candidate vaccines to end of Phase 2 by 2021
  - non-Zaire strains(s) of Ebola
  - Lassa Fever
  - MERS-CoV
  - Nipah
- preclinical status of candidate vaccines
  - Lassa (7), Nipah (20), MERS-CoV (8 plus 8 in Phase 1)
New Technologies and Increased Complexity of Dual-Use Issues in Biosecurity: Synthetic Biology, Genome Editing and Manipulation of Biological Circuits

digital biology: “it from bits”
de novo synthesis of organisms
engineered virulence

targeted modification of any biological circuit in any organ
mapping neural circuitry and brain – machine interfaces
accelerating technological diffusion
Synthetic Biology, Genome Editing and National Security: The Ultimate Dual-Use Technology for Modification of Biological Systems?

Statement for the Record

Worldwide Threat Assessment of the US Intelligence Community
Senate Select Committee on Intelligence

James R. Clapper
Director of National Intelligence
February 9, 2016

Technology Diffusion, Automation, Simplification and Cost Reduction

New Oversight Mechanisms and International Harmonization
Gene Drives and Sterilization of Mosquitoes
De Novo Synthesis of Pathogens

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

Jeronimo Cello, Aniko V. Paul, Eckard Wimmer*

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

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

1 Department of Medical Microbiology & Immunology and Li Ka Shing Institute of Virology, University of Alberta, Edmonton, Alberta, Canada, 2 Tonix Pharmaceuticals, Inc., New York, New York, United States of America
Functional Genomic and Computational Assessment of Threats (Fun GCAT)

The Functional Genomic and Computational Assessment of Threats (Fun GCAT) program intends to develop new approaches and tools for the screening of nucleic acid sequences, and for the functional annotation and characterization of genes of concern, with the goal of preventing the accidental or intentional creation of a biological threat. Advances in biotechnology and synthetic biology over the past decade have the potential to address important societal challenges in food, energy, and medicine. Despite the promising advances these technologies might enable, the potential for their deliberate or accidental misuse exists, warranting the development of approaches to help prevent the creation of biothreats. Currently, biological threats are organized based on genetic relatedness, resulting in static, threat-based lists that fail to emphasize biological functions, or assess the risks of unknown sequences. In order to better address biosecurity concerns, the Fun GCAT program intends to develop next-generation computational and bioinformatics tools to improve DNA sequence screening, to augment biodefense capabilities through the characterization of threats based on function, and to advance our understanding of the relative risks posed by unknown nucleic acid sequences. These tools will enhance the ability to computationally and functionally analyze nucleic acid sequences, ascribe threat potential to known and unknown genes through comparisons to the functions of known threats, and facilitate the ability to screen and identify sequences of concern, including genes responsible for the pathogenesis and virulence of viral threats, bacterial threats, and toxins.
The Expanded Dimension of the ‘Bio’ Challenge

- thinking beyond ‘bio’ as just infectious agents

- systems biology
  - targeted disruption of ANY body function
  - novel C and B threats

- synthetic biology
  - exploring biospace: designing new life forms
  - designer organisms to attack materials/infrastructure
We ignore the link between health security and international security at our own peril.

Bill Gates
Co-Chair, Bill & Melinda Gates Foundation

We need to build an arsenal of new weapons against disease – vaccines, drugs, and diagnostics.

Bill Gates
Co-Chair, Bill & Melinda Gates Foundation

Munich Security Conference 2017
“Is global health intended to improve population to health, or to be a diplomatic tool for countries to exert their soft power?

The securitization of global health is little more than fear mongering.

…..(and) justifies government violations of human rights in the name of health.”

Andre Heller Perache
Head of Programmes, MSF
cited in Lancet 2017 389, 892
Biosecurity

- one health: humans, animals, ecosystems
- urbanization and environmental impacts on disease emergence
- economic and political instabilities and escalating conflict risk
- bioterrorism, dual use technologies and expanded threat spectrum

International Engagement, Commitment and Political Resolve
Escalating Biosecurity Risks

Can No Longer Be Relegated to the ‘Too Hard’ Class of Strategic Challenges

Lack of Preparedness, Inadequate Institutions and Strategic Policy for Robust Domestic and Global Engagement in Addressing the Biosecurity Challenge

Preparing for the Long Game/the Long Emergency
Governing Frameworks for Global Health Security

1851 to 1938
- 14 conferences
- International Sanitary Convention (ISC) (1892) - cholera, plague, yellow fever
- influential in formation of WHO (1948)

1951
- International Sanitary Regulations

1969
- renamed International Health Regulations

2005
- International Sanitary Regulations

2014
- only 64 states met core capacities
- 48 failed to even provide information to WHO

2017
- G7 Global Health Security Agenda and strategy for prioritized international support to ‘hot zone’ regions
launched February 2014

partnership of 64 nations, international organizations, NGOs

elevate global health security as a national and global priority

strengthen global capacity to prevent, detect and respond to infectious diseases

WHO Joint External Evaluation to assess national capacities
A NATIONAL BLUEPRINT FOR BIODEFENSE:
LEADERSHIP AND MAJOR REFORM NEEDED TO OPTIMIZE EFFORTS

BIPARTISAN REPORT OF THE BLUE RIBBON STUDY PANEL ON BIODEFENSE
October 2015

BIODEFENSE INDICATORS
ONE YEAR LATER: EVENTS OUTPACING FEDERAL EFFORTS TO DEFEND THE NATION
A Bipartisan Report of the Blue Ribbon Study Panel on Biodefense
December 2016

DEFENSE OF ANIMAL AGRICULTURE
BIPARTISAN REPORT OF THE BLUE RIBBON STUDY PANEL ON BIODEFENSE
October 2017
The Curse of Contemporary Governance: ‘Quick Fixes’ and the Retreat from Complexity

- Society increasingly “cocooned” from complexity and risk
- Pervasive and dangerous scientific illiteracy among legislative and policy makers about biosecurity
- “Quick fixes”: unidimensional, short term policies that do not address long term, multidimensional complexity
- Public policy defined increasingly by length of legislative terms
- Influence of media in shaping public policy priorities and potential compromise of operational preparedness and incident management
Building Robust Defenses for Biosecurity

- Governments must accord higher priority to ‘biosecurity’ as an integral component of national security and foreign policy.

- (Re)building a national and international infrastructure for the surveillance, diagnosis and containment of infectious diseases is fundamental to future protection against major instabilities triggered by infectious agents, whether of natural or malevolent origins.
Biosecurity: A Classic Complex System of Systems Challenge

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

Science and Technology
- Societal priorities and cost of biosecurity
- Proactive preparedness
- Conflicting political ideologies, intents and capabilities

Public Health and Healthcare Delivery

Intelligence, Foreign Policy and Military Strategies
“Politics is the art of the possible, the calculated science of survival”

Prince Otto von Bismarck

“Survival owes little to the art of politics, but everything to the calculated application of science”.

Professor Rudolph Virchow (in reply)
Slides Available
@ http://casi.asu.edu/