GEORGE POSTE
Chief Scientist, Complex Adaptive Systems Initiative and Del E. Webb Chair in Health Innovation
Arizona State University
george.poste@asu.edu
www.casi.asu.edu
Global Biosecurity

A Fundamental But Dangerously Neglected Dimension of National Security
The Relentless Changing Dynamics of Infectious Diseases

old foes: resurgent drug resistance

omnipresent pandemic threats

new foes: emerging infectious diseases

global connectivities and faster spread

bioterrorism and dual-use technologies

new technologies: genomics and synthetic organisms
Biosecurity: The ‘One Health’ Concept
The Health of People, Animals, Plants and Ecosystems Are Inextricably Linked

- zoonotic disease threats
- feeding 9 billion
- dirty water
- no water
- depletion of non-renewable resources
- intensive agriculture and new disease patterns
- climate change and new vector ranges
- fragile global biosurveillance and response infrastructure
Disease Burden as a Driver of Economic, Social and Political Instabilities in Developing Countries and Triggers of Military Humanitarian and/or Combat Engagements

- inadequate health infrastructure
- distrust of authorities
- overcoming poverty and illiteracy
- famine

- HIV and orphan child soldiers
- refugee migration and disease spread
- humanitarian military operations
- force projection and protection in hot zones
Every Local Event is a Potential Global Event

Super-Vectors

Billion Cross-Border Travelers/Year

Rapid Global Spread:
Chikungunya (and Dengue)

Global Biosurveillance Capabilities
One Health: Recognition of the Importance of Zoonotic Diseases as Human Health Threats

- Pandemic (avian) influenza
- HIV
- West Nile virus
- MERS

- Ebola virus
- Bush meat food chain
- Zika virus
- What's out there?
Urbanization and Mega-Cities in Developing Countries: The Increased Threat of Zoonotic Diseases

- High Population Density With Inadequate Surveillance/Containment
- Expanded Eco-niches and New Zoonotic Exposures/Risks
- Major Gaps in Health Infrastructure and Disease Reporting
Military Operations in Collapsing Urban Environments
Mogadishu On Steroids!

Doctrine and ConOps

Old Lessons Learned May Not Apply

Force Protection in Infectious Hot Zones

Social Unrest and Infrastructure Breakdown

Gangs and No Go Zones

Major Gap in Military Strategy?
Biosurveillance - Faster Diagnosis Saves Lives: The Primacy of Early Detection and Preparedness Mobilization

Profile
Genetic Signatures of Infectious Agents

Detect
Rapid, Automated Diagnostic Tests

Act
Real-time Situation Awareness and Decision Authority
Geodemographic Information Systems (GIS): Ground Zero Data

Comprehensive Front Line Sampling of Sentinel Species

Real-time Intelligence and Faster Preparedness
Notice the Resemblance?
Hygiene and Quarantine as the Only Protection
Absent Drugs or Vaccines

**Bubonic Plague**
Physician 15th Century

**Ebola, Liberia**
21st Century
Vaccines or Viagra?

Incentives for Industry Re-Engagement in Development of Diagnostics, Drugs and Vaccines to Combat New Threats

Proactive Investment in Robust Preparedness Versus Poorly Coordinated Reactive Responses
Out-of-Sight – Out-of-Mind: Comfort and Complacency as the Enemies of Vigilance and Preparedness

Antibiotics: A Transformative Innovation

The Predictable Rise of Pan-Antibiotic Resistance

Polio: A National Priority

Post 9/11 Preparedness: Minimal Progress, Wasted Billions and No Accountabilities
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?

Technology Diffusion, Automation and Simplification

Outdated CBW Convention: New International Oversight Needed

Genome Editing Listed In The Top Six Threats
Biosecurity: A Complex, Multi-Dimensional Challenge: A Dangerously Neglected Element of National Security

- One health: integrated knowledge of human, animal and ecosystem interactions
- Globalization, urbanization and new disease patterns
- Robust global biosurveillance infrastructure
- Private sector incentives for drugs and vaccines
- Synthetic biology and expanding dual-use threats
- Major gaps in preparedness: strategy, policy and capabilities