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Global Biosecurity

**A Fundamental But Dangerously Neglected
Dimension of National Security**

The Relentless Changing Dynamics of Infectious Diseases

**old foes:
resurgent drug – resistance**



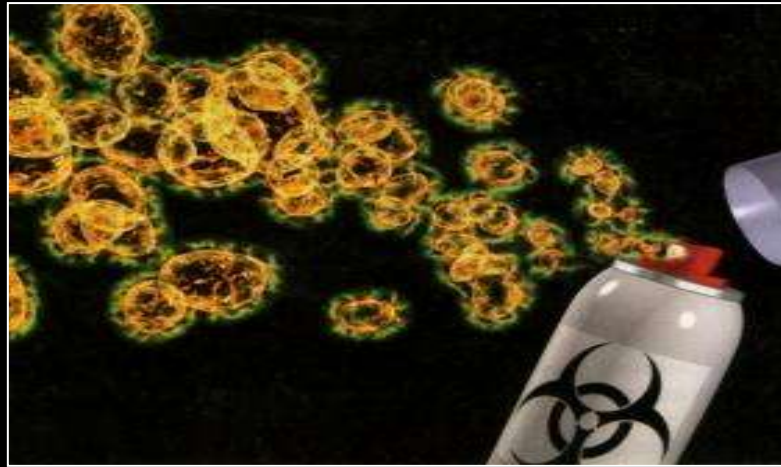
**omnipresent
pandemic threats**



**new foes:
emerging infectious diseases**



**global connectivities
and faster spread**



**bioterrorism and
dual-use technologies**

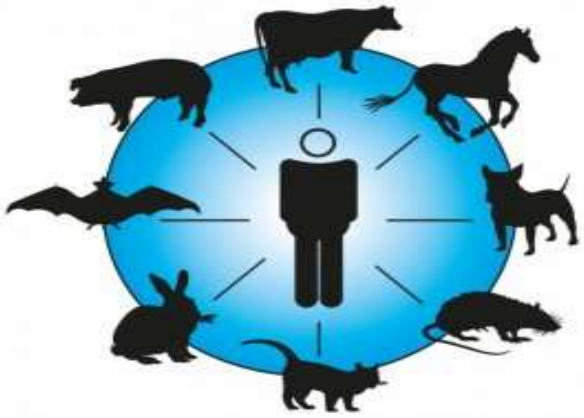


**new technologies: genomics
and synthetic organisms**

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



Rapid Global Spread: Chikungunya (and Dengue)

Billion Cross-Border Travelers/Year



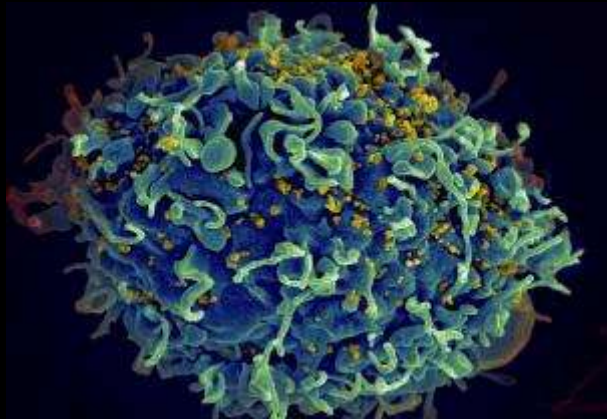
Global Biosurveillance Capabilities

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

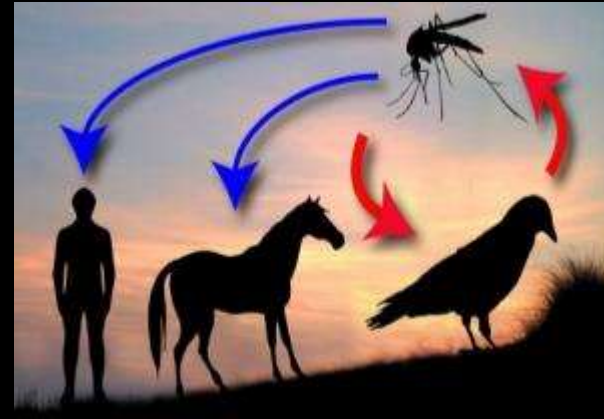
**pandemic (avian)
influenza**



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



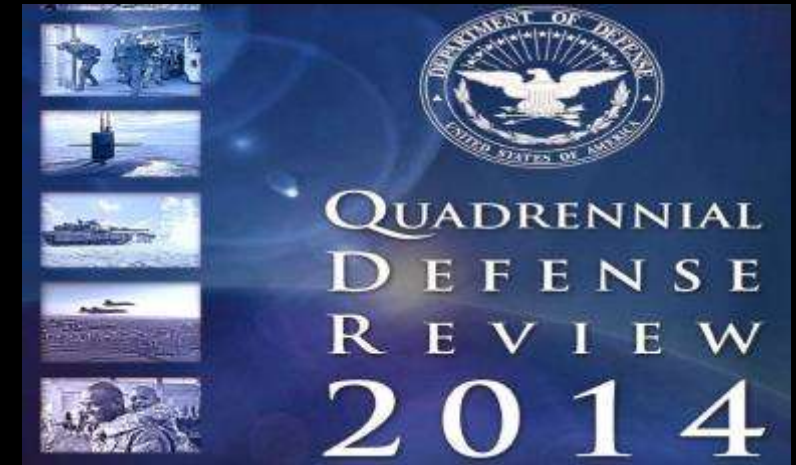
Social Unrest and Infrastructure Breakdown

Old Lessons Learned May Not Apply



Gangs and No Go Zones

Force Protection in Infectious Hot Zones



Major Gap in Military Strategy?

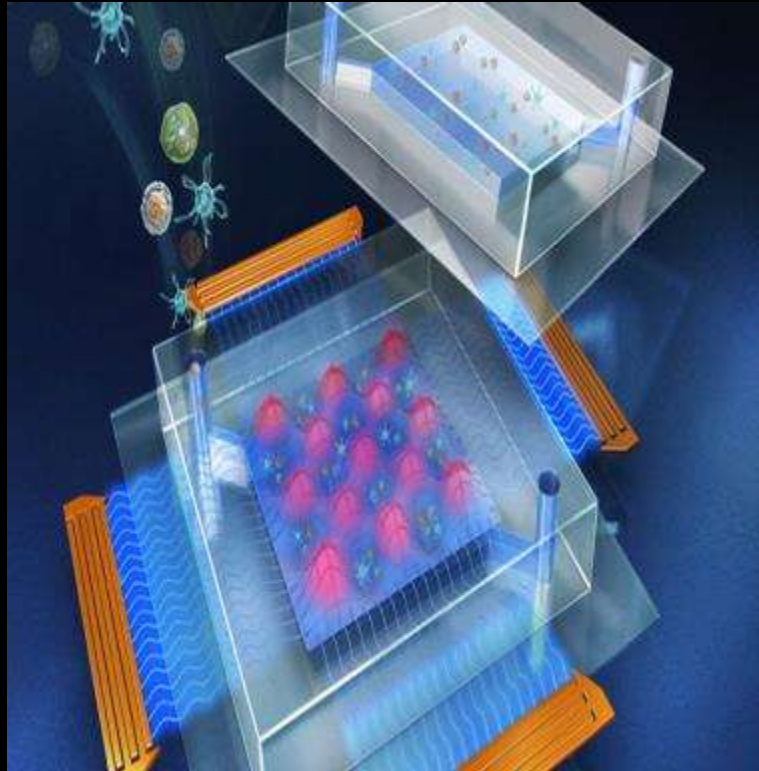
Biosurveillance - Faster Diagnosis Saves Lives: The Primacy of Early Detection and Preparedness Mobilization

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**



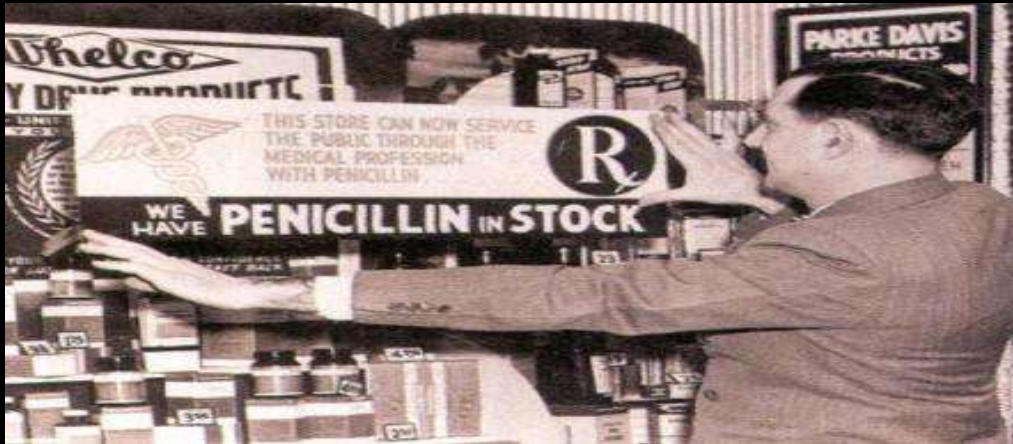
Vaccines or Viagra?

**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**

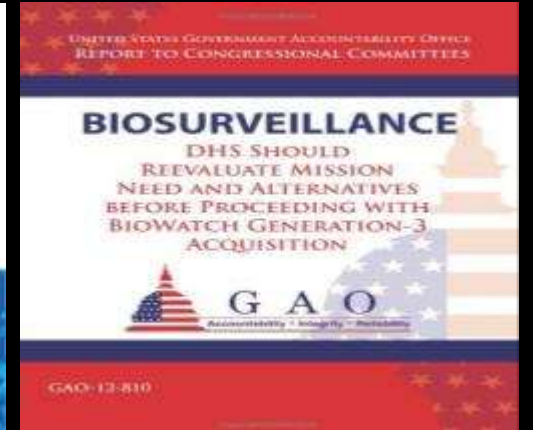
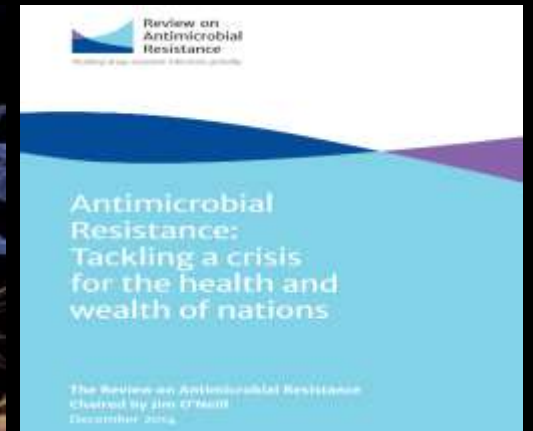
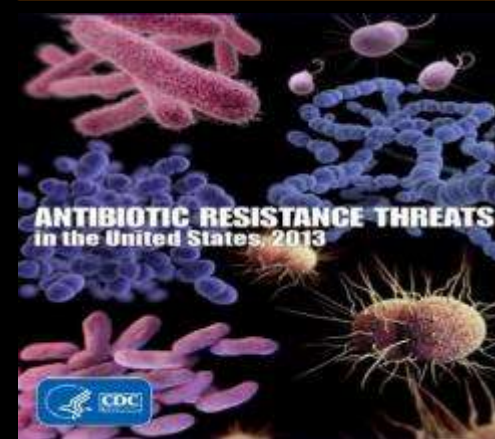
Out-of-Sight – Out-of-Mind: Comfort and Complacency as the Enemies of Vigilance and Preparedness

Antibiotics: A Transformative Innovation



Polio: A National Priority

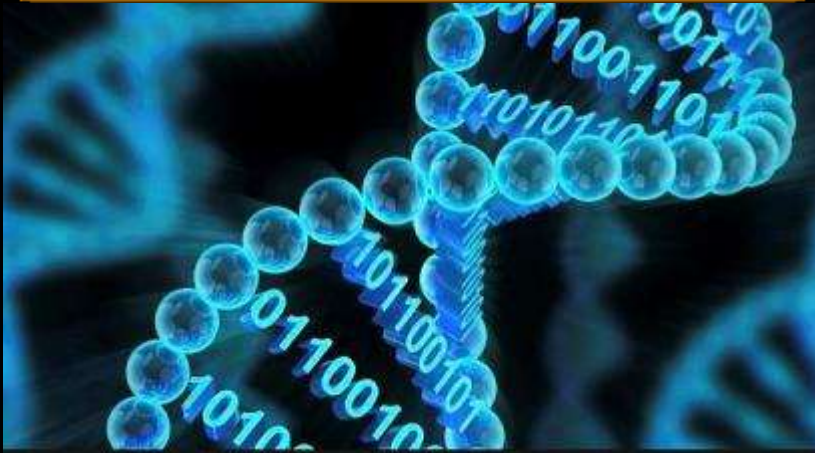
The Predictable Rise of Pan-Antibiotic Resistance



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

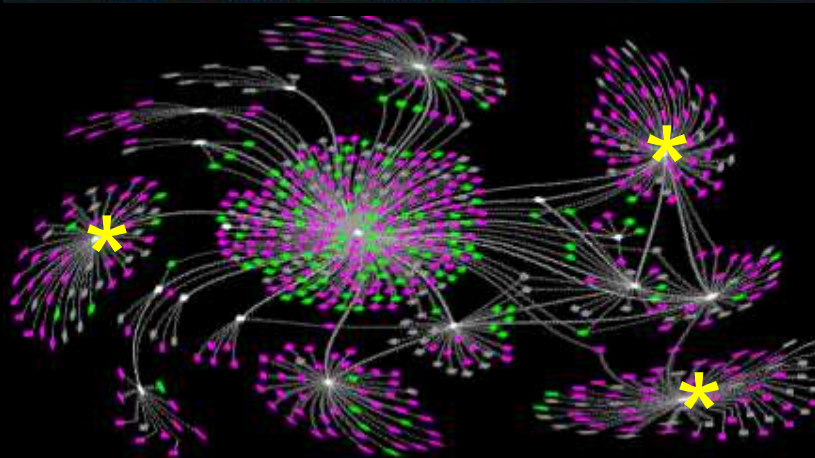
digital biology:
“it from bits”



de novo
synthesis of organisms



engineered
virulence



targeted modification of any
biological circuit in any organ

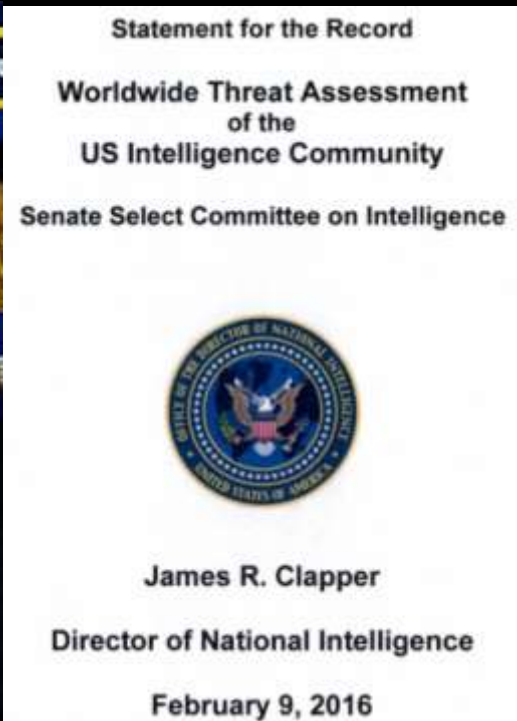


mapping neural circuitry and
brain – machine interfaces



accelerating technological
diffusion

Synthetic Biology, Genome Editing and National Security: The Ultimate Dual-Use Technology for Modification of Biological Systems?



**Genome Editing Listed
In The Top Six Threats**



**Technology Diffusion,
Automation and
Simplification**



**Outdated CBW
Convention: New
International
Oversight Needed**

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