

Adapting Biosecurity to Meet the Demands of Emerging Infectious Disease: Applications for Global Health Security

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Agenda

- Biosecurity
- Case studies
- Global Health Security
- Summary

Biosecurity

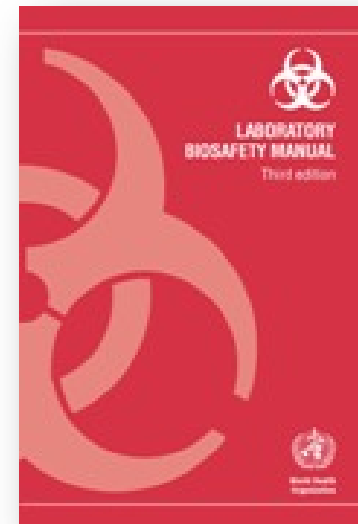
Biosecurity



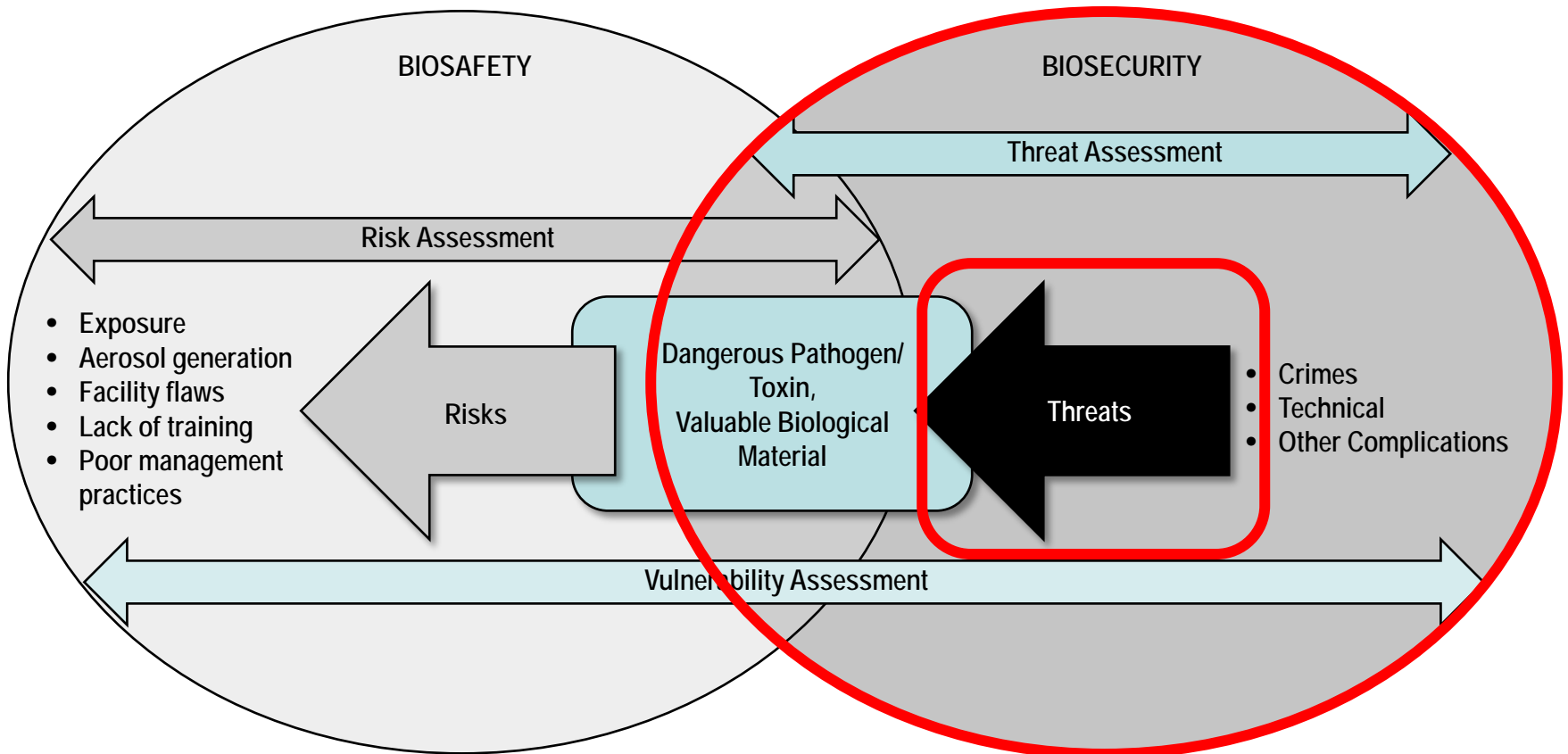
“**laboratory biosecurity**...[as the] institutional and personal security measures designed to prevent the loss, theft, misuse, diversion, or intentional release of pathogens and toxins.”

World Health Organization. Laboratory Biosafety Manual, 3rd Ed.

***How will this change
as we move out of
the laboratory?***



Biosafety & Biosecurity



Source: Burnette, R.N. *Biosecurity: Understanding, Assessing & Preventing the Threat*. Wiley. 2013.

5 Pillars of Security

- Physical
- Information
- Material
- Personnel
- Transport



Challenge



- To extrapolate, expand, and adapt principles of biosecurity to combat naturally-occurring outbreaks and man-made distribution of infectious diseases



Case Studies

Foot & Mouth Disease: Comparison



2001

- Origin: imported animal products?
- Spread: >2000 sites; animal movement; human and vehicle movement (infected animals)
- Losses: Overall economic losses estimated >£8 billion; >4 million infected; >6 million animals slaughtered

2007

- Origin: drainage pipes at Pirbright
- Spread: focal; 8 sites; vehicle movement (drainage site)
- Losses: £150 million; >2,000 animals slaughtered

Foot & Mouth Disease: Controls



2001

- Reporting: 21 days
- Natl. movement controls: 3 days

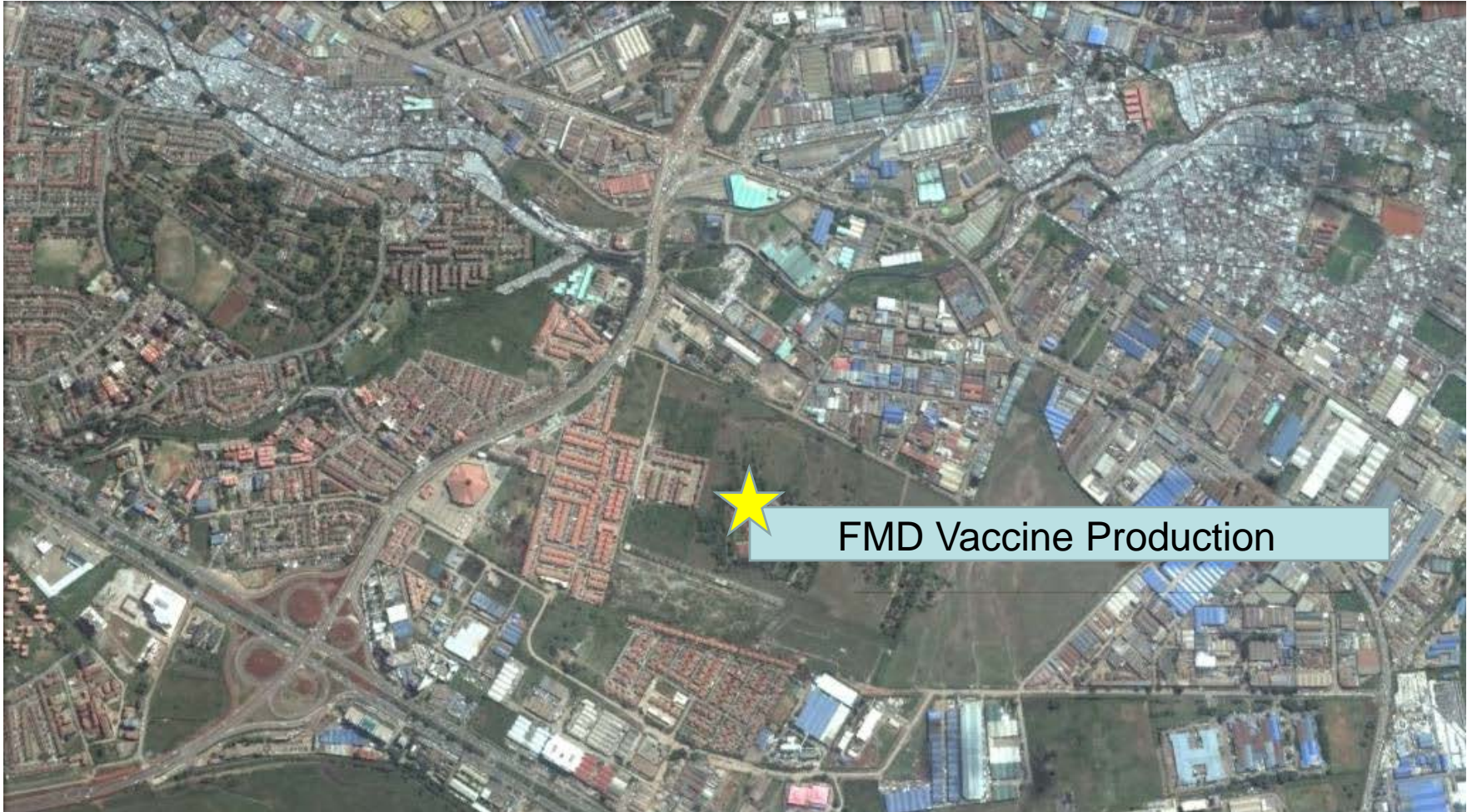
2007

- Reporting: 4 days
- Natl. movement controls: immediate

▪ **Primary Differences:**

- Physical Control: point-source outbreak
- Transport Control: movement of animals in-country shut down immediately; clearer zoning definitions; 2007
- Others?

Foot & Mouth Disease: Access

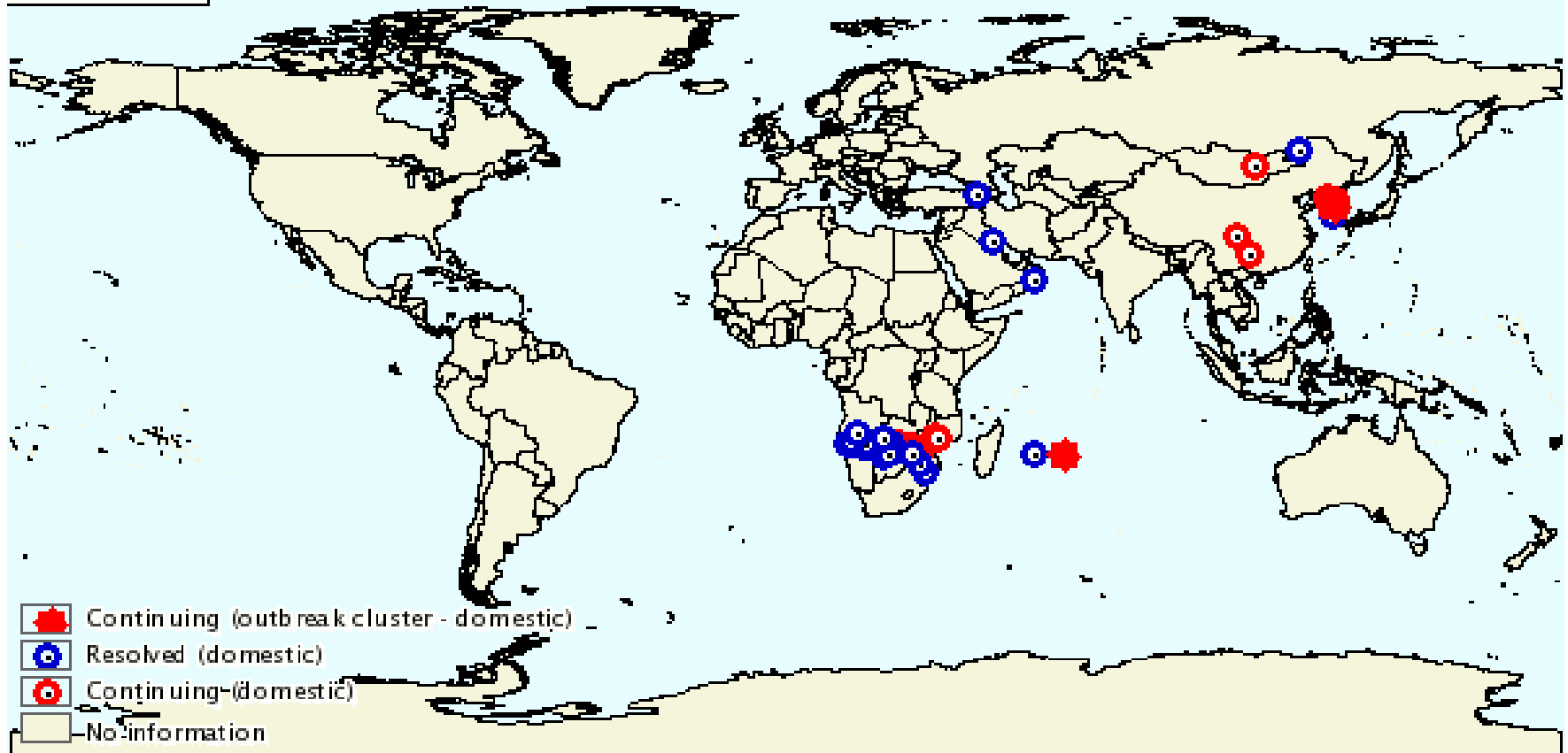


FMD Vaccine Production

Foot & Mouth Disease: Access



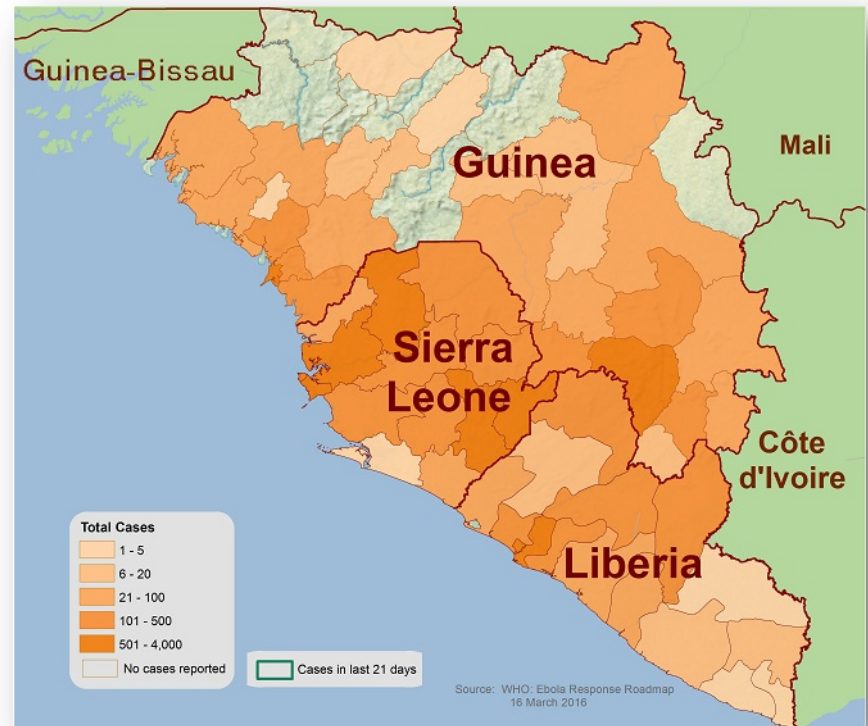
WHD OIE © 2016



Ebolavirus Disease (EVD); West Africa, 2014



Country	Lab-Confirmed Cases	Total Deaths
Guinea	3,358	2,544
Sierra Leone	8,706	3,956
Liberia	3,163	4,810
Total	15,227	11,310



Ebolavirus Disease (EVD); West Africa, 2014

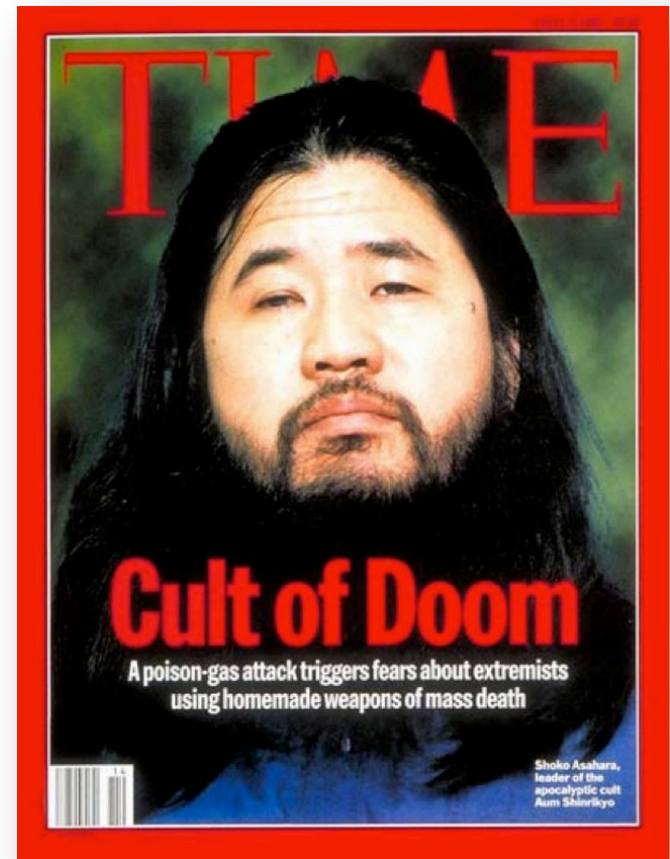


- Personnel Management:
 - Thousands of patients
 - Hundreds of frontline healthcare workers (total unknown)
- Material/ Waste Management:
 - Bodily fluids, greywater from washing, laundry, and wash-down of PPE, used and damaged PPE, clinical waste, and general organic and inorganic solid wastes
 - Poor-functioning sewage treatment facilities, low levels of improved water supply, extremely low levels of safe sanitation coverage, and very basic solid waste management practices

Biosafety vs. Biosecurity

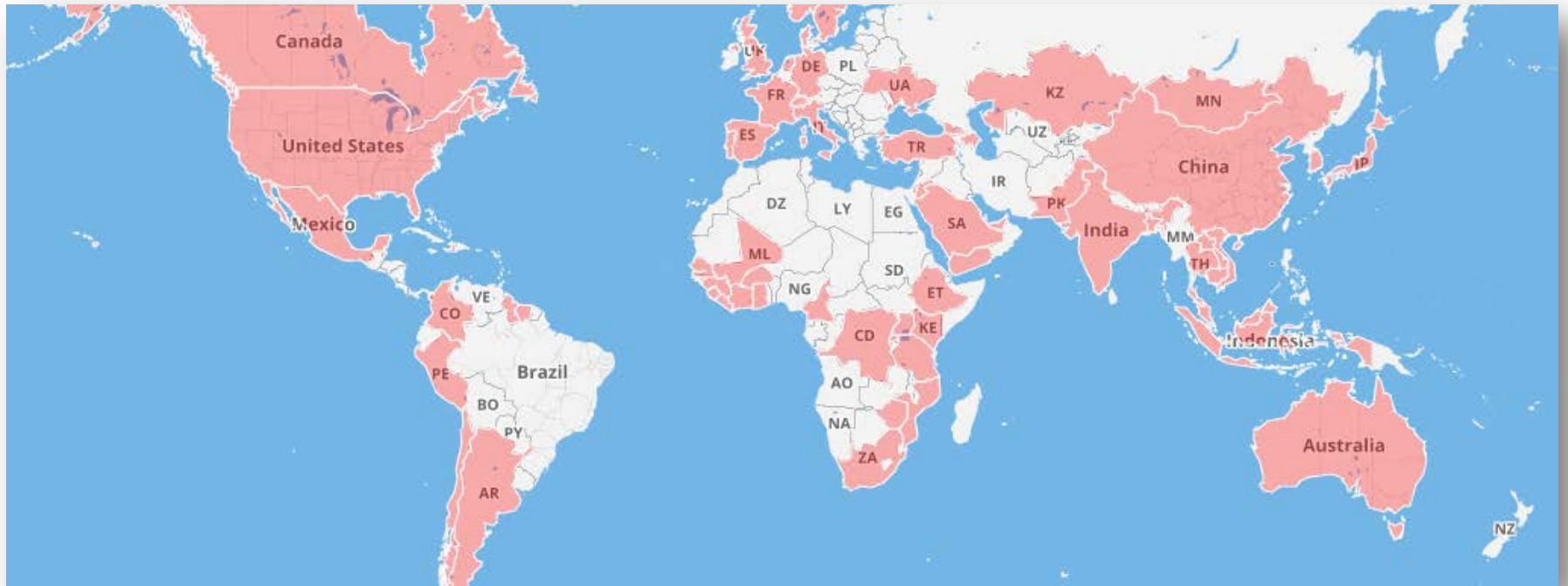
Exploiting Outbreaks

- Aum Shinrikyo cult/ terrorist organization has a history with EVD
- 1992, sent 40 medical personnel to Zaire to support local EVD outbreak
- Tried to obtain EVD samples
- Ultimately failed



Global Health Security

Global Health Security Agenda



Ghsagenda.org

GHSA Action Packages

- Prevent 1: Antimicrobial Resistance
- Prevent 2: Zoonotic Disease
- ***Prevent 3: Biosafety and Biosecurity***
- Prevent 4: Immunization
- Detect 1: National Laboratory System
- Detect 2 & 3: Real-Time Surveillance
- Detect 4: Reporting
- Detect 5: Workforce Development
- Respond 1: Emergency Operations Centers
- Respond 2: Linking Public Health with Law and Multisectoral Rapid Response
- Respond 3: Medical Countermeasures and Personnel Deployment Action Package



GHSA Action Package #3

Biosafety & Biosecurity



- **5 Year Implementation Goals:**
 - National biosafety and biosecurity systems (whole-of-government)
 - Pathogen consolidation/ minimum number of facilities
 - Training
 - Reduce DURC risks
 - Mitigate proliferation
 - Legislation
- **Leading countries:** Canada, Denmark, Kenya, Peru, Portugal, Spain
- **Contributing international organizations:** FAO, IAEA, INTERPOL, OIE, WHO

Summary

Adapting the 5 Pillars



Pillar	Laboratory	Field
Physical	Locks, doors, fences, biometrics	Zoning and compartmentalization, facility-level biosecurity; movement controls; wildlife controls; trespassing
Information	Firewalls, IT systems	Reporting access, comms., info sharing and dissemination; joint training across disciplines
Material	Inventory mgmt., access control	Waste mgmt. in EVD outbreak; access to infectious waste; carcass management
Personnel	Background checks, screening, observation, reporting, training	Lack of education, training, experience, credentialing, "disease discrimination"
Transport	Licensing, training, regulations	Movement controls (samples, infected), trade restrictions; zoning

Summary

- Outbreaks represent biosecurity challenges
- EVD demonstrated lack of preparedness and inspired a growing ***culture of biosafety*** in outbreak response
- Similarly, a ***culture of biosecurity*** is also an important aspect of epidemic prevention and response
- ***Application of existing ideas***

Thank You



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