

Turning on a Dime: Can your Biosafety Plan Handle An Emerging Pathogen?

“If you can control [the problem] while it’s an ember, you can prevent the wildfire.” Scott Becker, Director of the Association of Public Health Laboratories.

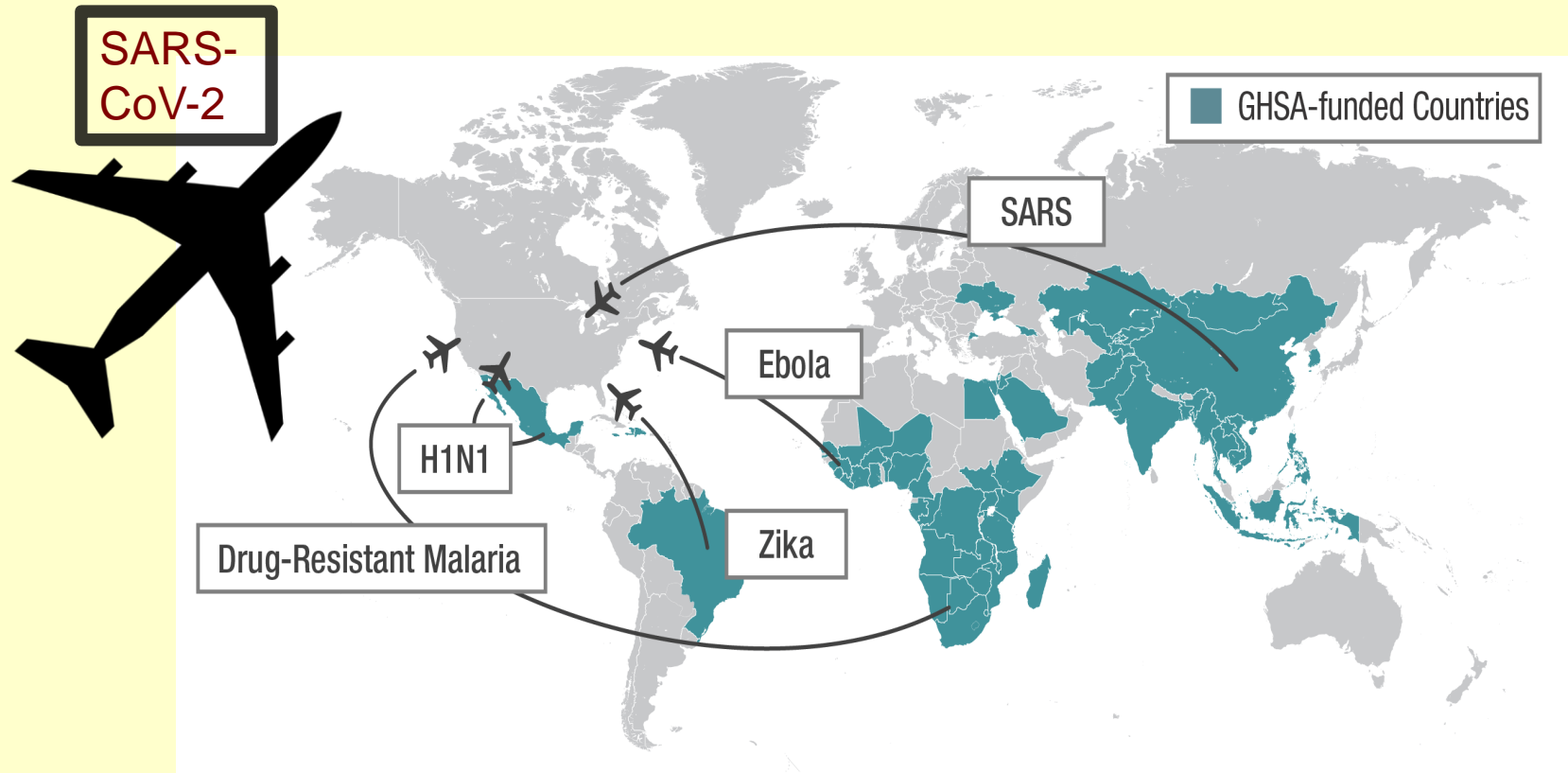
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Objectives

1. Define infectious disease emergence and re-emergence
2. Identify and explain factors which influence disease emergence and re-emergence
3. Identify key characteristics/factors related to disease emergence given a particular emerging infectious disease/pathogen (specifically, Ebola and MERS)

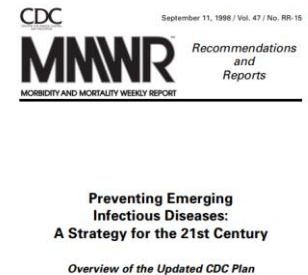
The next emerging threat is only a plane ride away.



Emerging Infectious Diseases

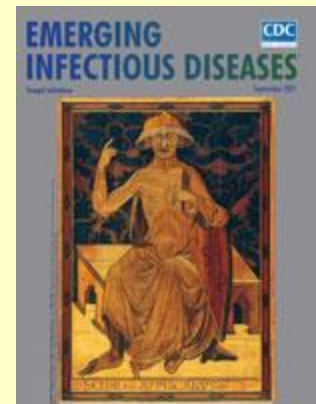
- Caused by new or previously unrecognized microorganism
- Recognized as an important outcome of host-pathogen evolution
- May have severe public health consequences
- Are carefully tracked – ProMED, CDC
- Re-emergence also occurs

Emerging Infectious Diseases:

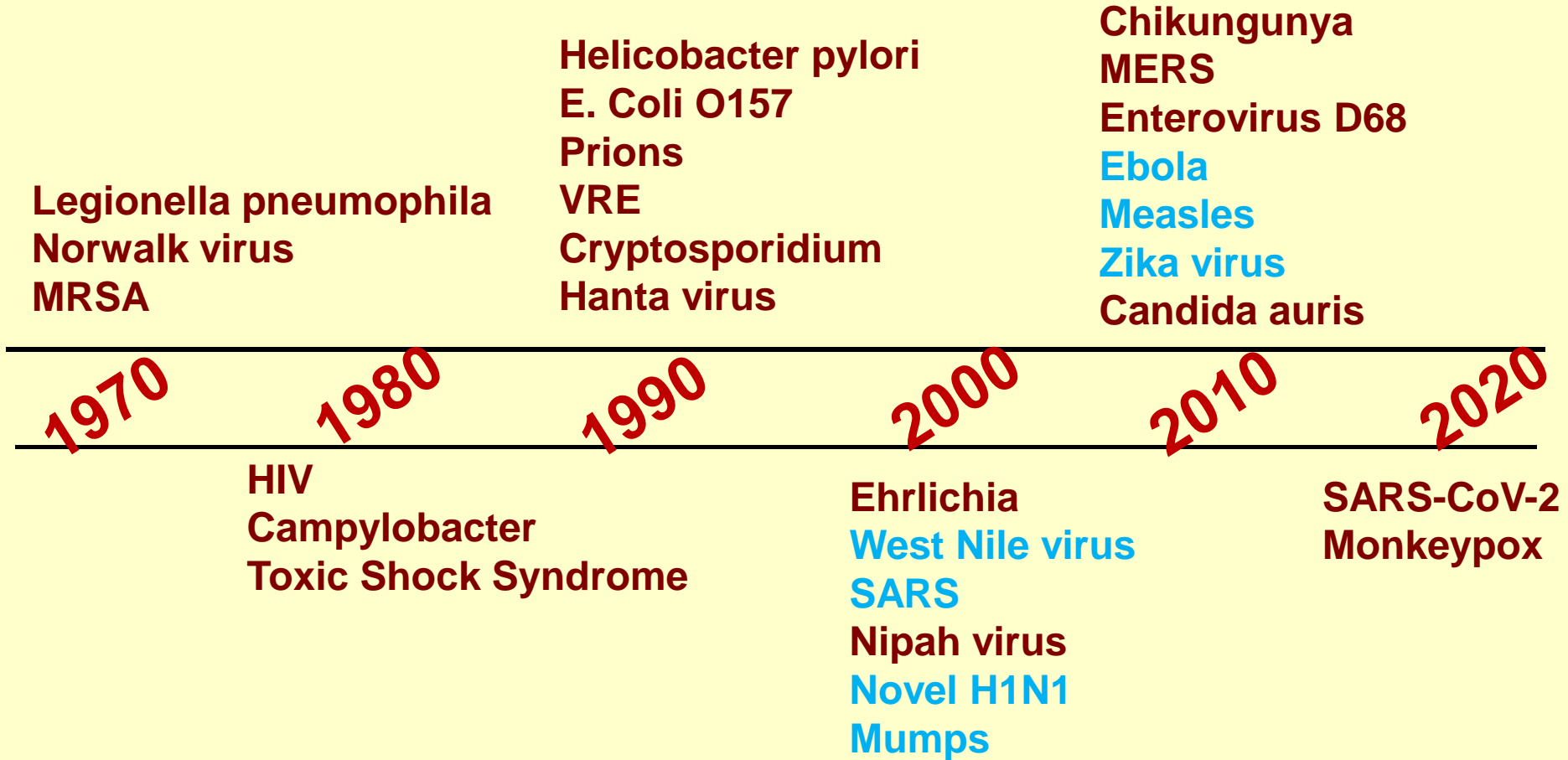


- “Those infections that are increasing over time or threaten to increase. New infections resulting from new unknown pathogens, known infections which are increasing over new geographic areas, and known infections that are reemerging as a result of both resistance to antimicrobial therapies and the failure of public health measures”
- 50+ emerging or reemerging diseases
- mid-1990s CDC implemented Emerging Infections Program begun a Prevention Strategy for US
- later expanded globally as part of CDC’s Global Disease Detection Program

Can you name some?



Emerging Pathogens by Decade



Blue denotes outbreaks in recent past

Examples of Emerging Infectious Disease and Change in Environment, Host or Organism

Organism	Factor
Hantavirus	Climatic changes allowing Mice expansion
Rift Valley Fever	Dams, irrigation, climate change
Dengue	Increased global travel, urbanization, increase in mosquito reservoir
Cholera	Climate change, international travel, shipment of foods
Malaria	Population growth & movement, declining use and effectiveness of insecticides
E. Coli STEC	Growth-centralized agriculture promoting cross contamination
MDR TB	Misuse of antibiotics, crowding in prison, slums, hospitals
Cryptosporidium	Contaminated water supplies, increases in immunocompromised populations

Emerging Infectious Diseases: NIH

- NIH defines emerging and reemerging disease by dividing them into 3 groups
 - Group 1 diseases newly recognized in the last 20 years
 - group 2 diseases reemerging diseases
 - group 3 diseases bioterrorism threat
 - NIH more comprehensive listing of EIDs/ReIDs than CDC
- majority of diseases on both the NIH and CDC lists are categorized in NIH list group 3: emphasizing focus for bioterrorism



Slide courtesy of C. Petersen

Historical Context

- EID are NOT a new phenomena
 - In 1347 human plague was imported to Europe from the Orient during the siege of Caffa by Mongolians and then entered into the port of Messina, Sicily.
 - 25 Million people died in less than 5 years
 - Epidemiologic surveillance systems, modern hygiene measures, rapid lab diagnostic testing, vaccines and antibiotic treatment are the tools that we have today to interrupt transmission

What favors the emergence?

- Modern demographic and ecologic conditions:
 - increasing poverty and urban migration
 - more frequent movement across international boundaries by tourists, workers, immigrants, and refugees
 - alterations in the habitats of animals and arthropods that transmit disease
 - increasing numbers of persons with impaired host defenses
 - changes in the way that food is processed and distributed.

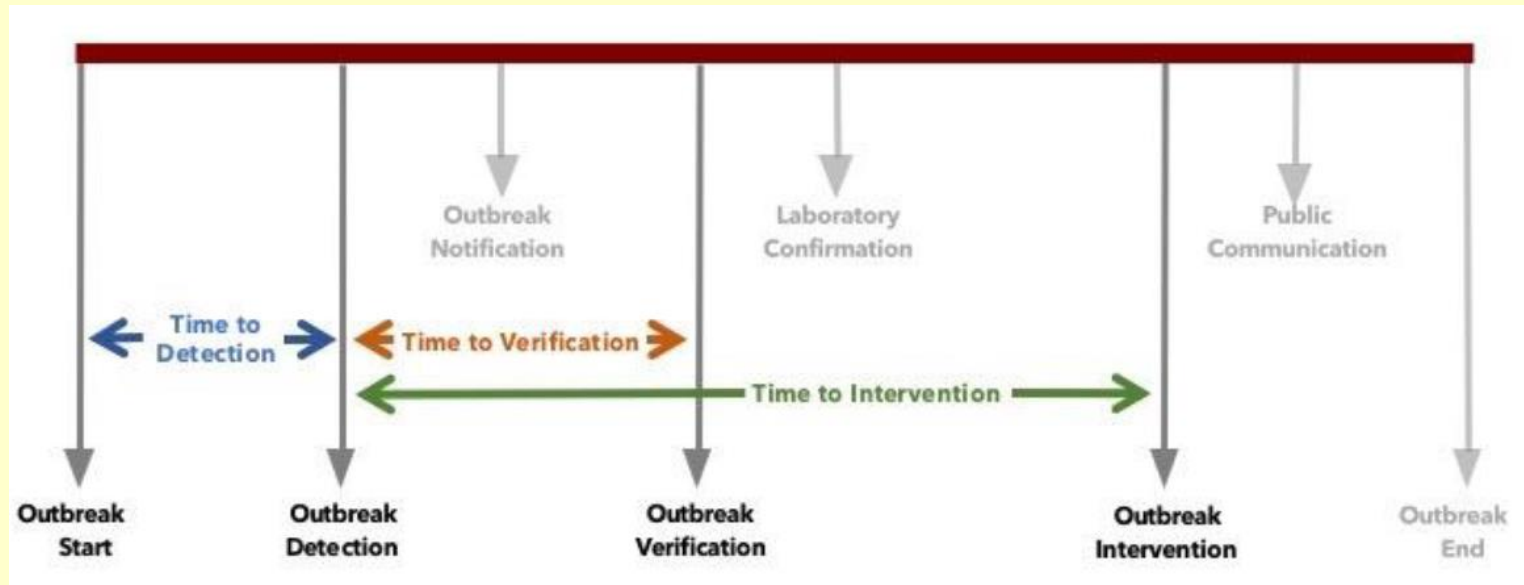
Candida auris

- First identified in Japan in 2009, in the ear canal of a 70-year-old woman.
- Since then it has spread rapidly around the globe, emerging in at least five continents, with the first UK case detected in 2013.
- Causes severe disease in hospitalized patients
- Can be Resistant to all three classes of antifungals: azoles, polyenes, echinocandins
- Difficult to identify
- Can spread to other patients



What maybe next?

Taking action to handle an emerging pathogen



Effective containment of any pathogen demands rapid, accurate test results.
Balance between providing quality testing and risk to staff/community.
Laboratories must contain the pathogen and not spread it.

Step 1: Learn as much as possible about the suspected routes of transmission

- When a new pathogen emerges, typically, little scientific data are available on handling specimens.
- Compare to other pathogens you have planned for how it fits into the biosafety plan you have in place
- Often other pathogens serve as a surrogate for biosafety plans
 - Ebola, found in blood and body fluids, was a significant risk for all lab sections
 - Coronavirus mostly posed a risk for handling respiratory samples



Step 2: Communicate with staff and public health

- Front-line laboratorians concerns:
 - How infectious are the samples?
 - Are the controls sufficient?
 - Will handling infectious samples impact the workflow?
 - Should I agree to handle the samples?
- Laboratory management concerns:
 - Should we accept samples or refer them to a higher BSL lab?
 - How will accepting these samples impact other tests?
 - What is the risk of environmental contamination?
- Contact Public Health
 - Verify connections for information
 - Determine how, where, and when testing will be performed
 - Review sample collection
 - Identify packaging and shipping needs



Step 3: Perform a risk assessment for collection, receiving, and handling specimens from patients expected to be infected with the emerging agent

- Do a provisional risk assessment – pre, analytic and post analytic
 - Facility specific that reviews the procedures performed, identifies the hazards involved in test performance, determine personnel competency level, and evaluates the equipment and facility design
 - Identify mitigation strategies
- Remember planning is important but it is what you do everyday to build the culture of biosafety that will predict the success of your plan



Testing Continuum

Pre-analytic

Sample collection
Transport
Reception and Unpacking
Centrifugation
Uncapping
Aliquoting
Transport within the Lab
Transport to Reference Labs

Analytic

Chemistries
Blood Gases
Hematology
Bacteriology
Virology
Molecular Testing
Transfusion Medicine

Post-Analytic

Waste Management
Sample Storage - Retrieval

Step 4: Based on the risk assessment, mitigate the risk

Fill the biosafety gaps before first case

- PPE selection, use, and enforcement
- Equipment and instrument safety and disinfection
- Laboratory waste management
- Disinfectant coverage
- Handwashing reminders



When a new pathogen is on the horizon...mitigate risk

- Review the SOPs
- Determine if PPE supply levels are sufficient to meet needs
- Determine if there will be staffing challenges during the response
 - Consider additional issues including increased staff fatigue etc.
 - Will infections in staff jeopardize the response?
- Keep calm!

