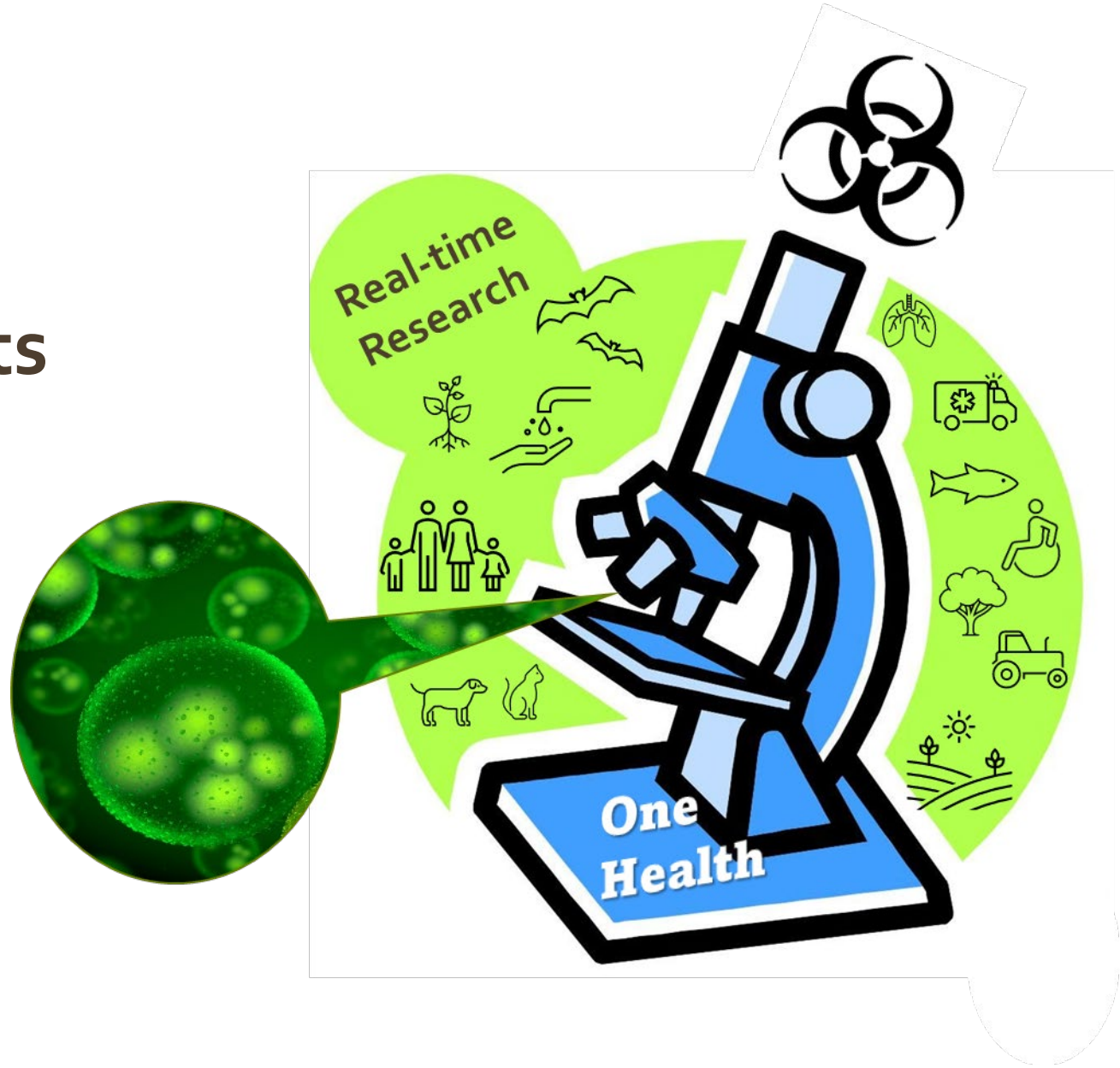
One Health Real-time Research Framework for Bioincidents

Dr. Tonya Nichols, PhD
Center for Environmental Solutions and Emergency Response
U.S. Environmental Protection Agency

CAPT Brianna Skinner, DVM, MPH, DACLAM
Office of Counterterrorism and Emerging Threats
U.S. Food and Drug Administration

November 2, 2022
DOD One Health Webinar Days



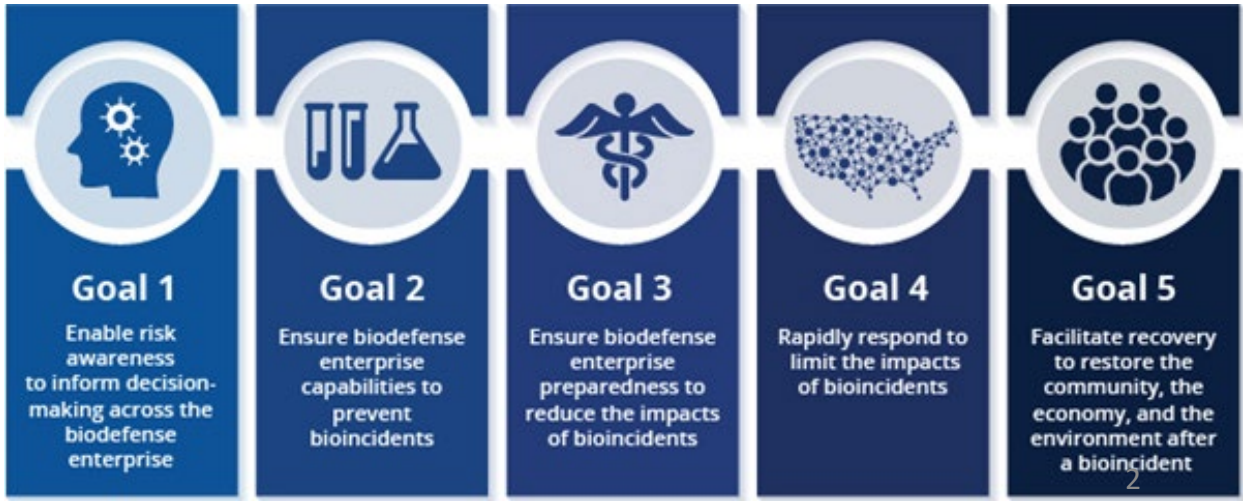
NATIONAL BIODEFENSE STRATEGY AND IMPLEMENTATION PLAN

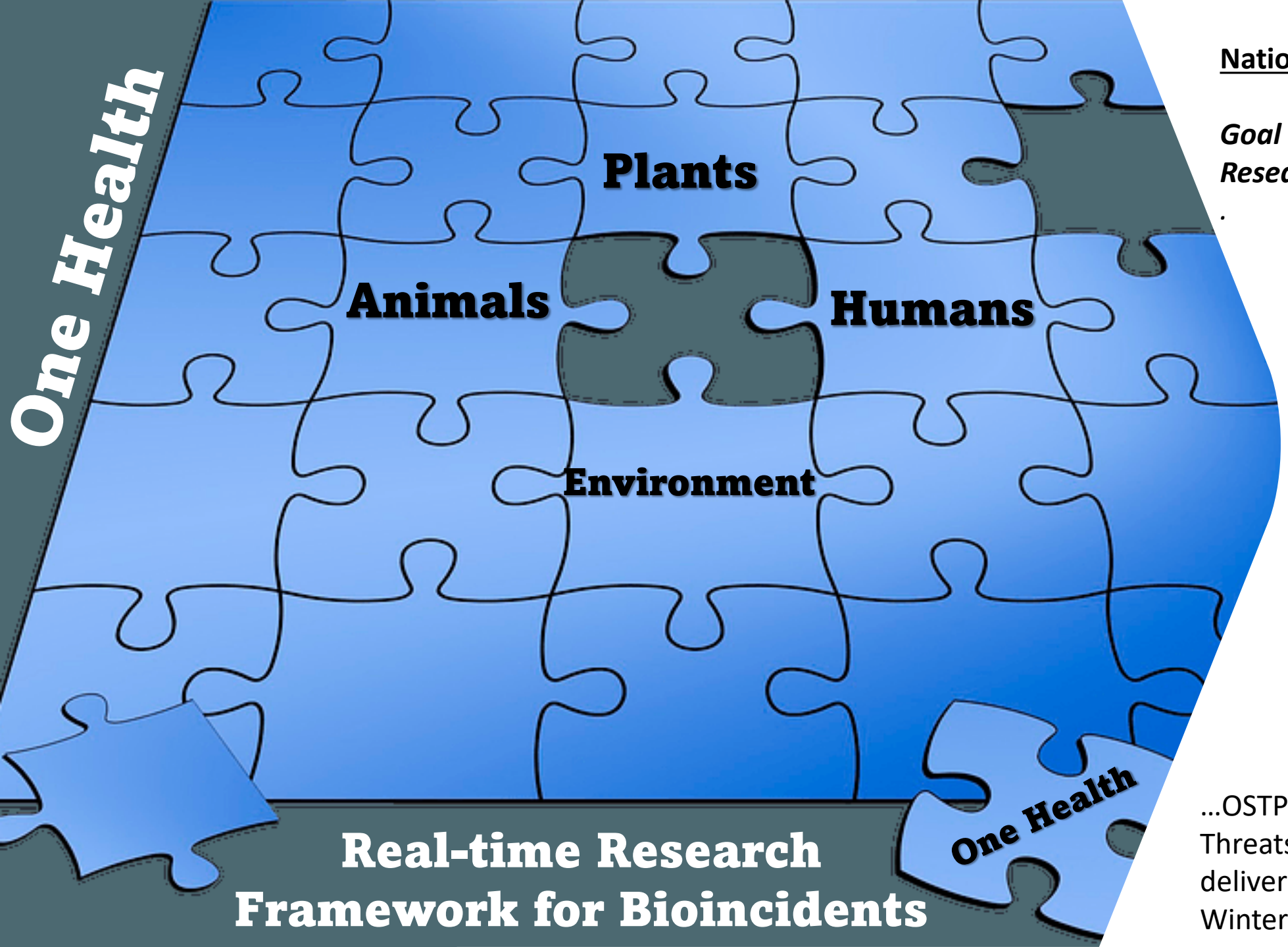
FOR COUNTERING BIOLOGICAL THREATS, ENHANCING PANDEMIC PREPAREDNESS, AND ACHIEVING GLOBAL HEALTH SECURITY

OCTOBER 2022

A One Health Approach Reduces the Occurrence and Impact of Bioincidents.

Implementing a coordinated One Health approach is a best practice for understanding, communicating, and mitigating biological threats swiftly and efficiently.





National Biodefense Strategy

Goal 4.1.3. Coordinate Real-Time Research for Response

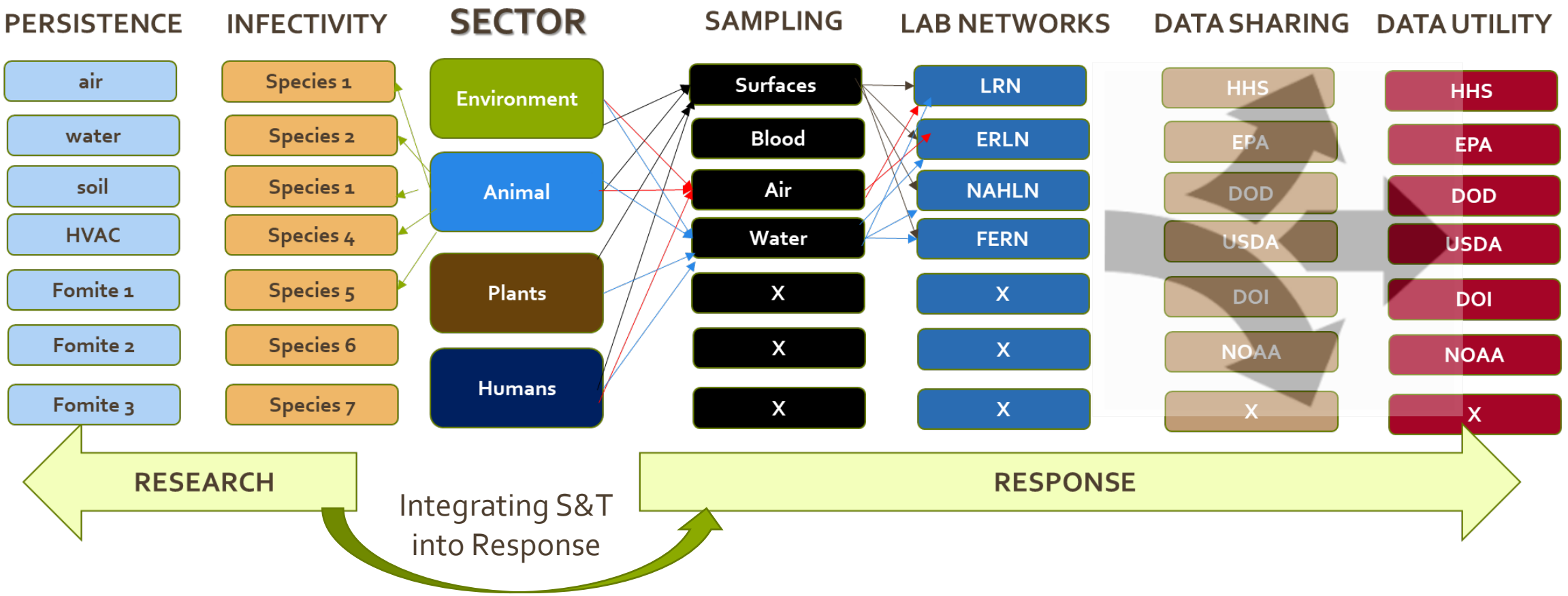
.

Develop and implement an integrated, adaptive, and flexible federal One Health research agenda that coordinates real-time federal and public and private sector research to support rapid domestic response and mitigation, within fourteen days of the determination of a nationally or internationally significant biological incident

…OSTP – NSTC – Health Security Threats Subcommittee charged with delivering a framework (anticipated Winter 2023)

ENDGOAL:
One Health Implementation for Response Research

leveraging expertise and resources to provide timely data and solutions for response decisions

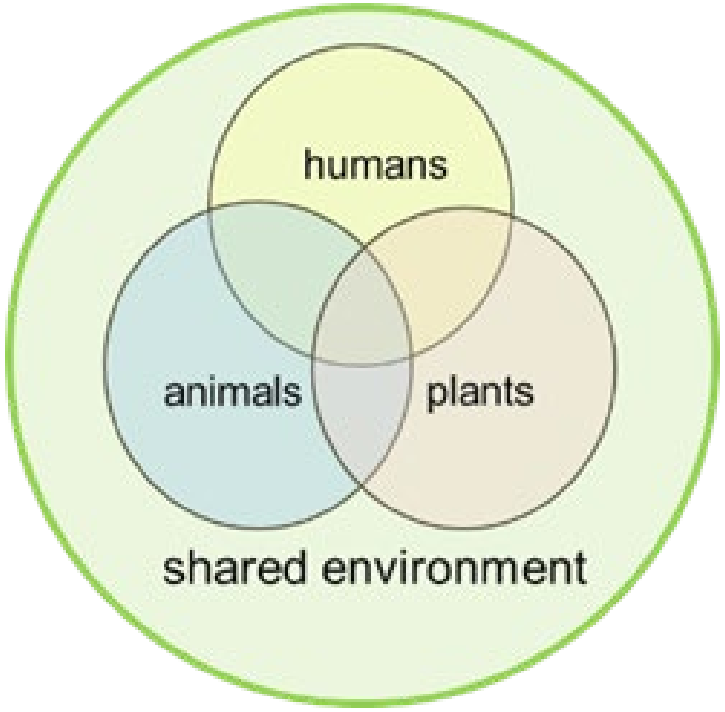


NSTC Project Leads:

Tonya Nichols (EPA)

CAPT Brianna Skinner (FDA)

(COL Jennifer Kishimori – retired)



Sector Leads:

Environment - Lance Brooks, Eletha Roberts (EPA)

Plants – Tim Widmer, Jack Okamuro (USDA)

Animals – Cyril Gay (USDA), Camille Hopkins (USGS)

Humans – Lisa Hensley (NIH-> USDA), Milena Lolic (FDA)

Integration – Blair Budd (EPA)

Overwhelming support /interest: Approximately 130 SMEs have volunteered from 13 different Departments and Agencies

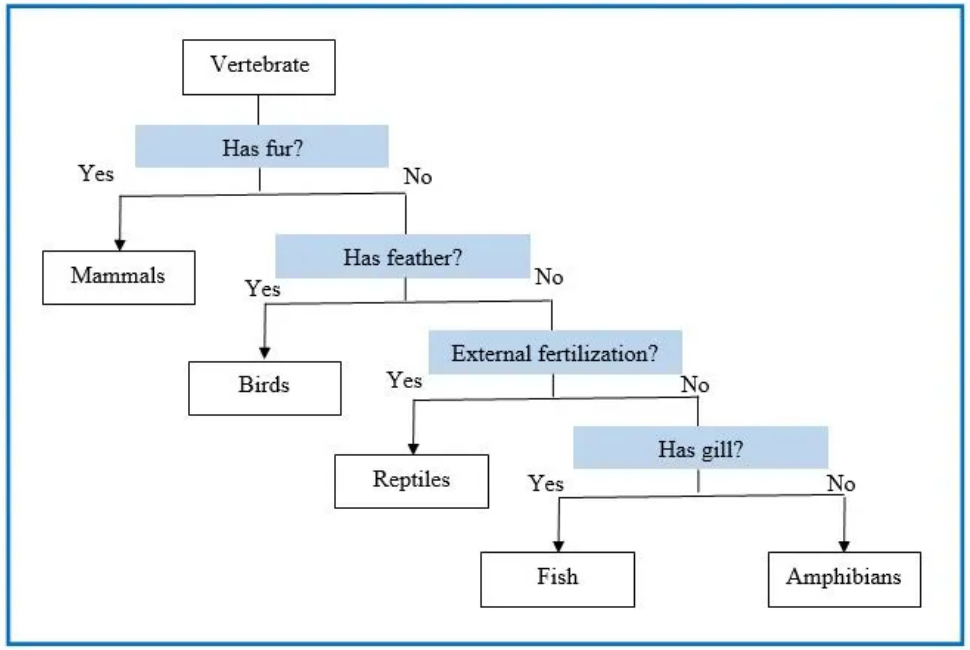
Phases of Project Development:

- Phase 1: Develop Research Sector Keys for Incident Data Needs
- Phase 2: Workshops to exercise Sector Keys
- Phase 3: Finalize One Health Framework
  for Realtime Bioincident Response Research

Sector Research Keys → OH Research Response Chart → OH Integrated Bioincident Worksheet

What is a Research Sector Key?

- A systematic, easily followed step-by-step logic tree that identifies research needed by each One Health sector (Human, Animal, Plant, and Environment) to respond to emerging or on-going bioincident.
- Research questions formatted similarly to taxonomic keys



EXAMPLE of Sector Key:

One Health Research Response
Plant Diseases
May 10, 2021

1. Is the causal agent known?
   - 1a. No ..... Conduct Research
   - 1b. Yes 2
2. What is the dispersal mechanism?
   - 2a. Unknown ..... Conduct Research
   - 2b. Direct (Soil, Seed, Plant material) 3
   - 2c. Indirect (Vectored, Wind, Water, Humans) 4
3. Are disinfectants/soil fumigants known?
   - 3a. No ..... Conduct Research
   - 3b. Yes 15
4. Control measure target?
   - 4a. None known ..... Conduct Research
   - 4b. Vector/Pathogen 5
   - 4c. Resistant varieties/cultivars 9
5. What is the nature of the control measure?
   - 5a. Insecticides 6
   - 5b. Antimicrobials 7
   - 5c. Biological Control agents 8
   - 5d. Biotechnology 10
6. Are there insecticides available that can control the vector?
   - 6a. No ..... Conduct Research
   - 6b. Yes 15
7. Are there antimicrobials available that can control the pathogen?
   - 7a. No ..... Conduct Research
   - 7b. Yes 15
8. Are there commercially available products?
   - 8a. No ..... Conduct Research
   - 8b. Yes 15
9. Is resistant plant material readily available for dissemination?
   - 9a. No ..... Private Industry
   - 9b. Yes ..... Implement
10. What is the application of the biotechnology?
    - 10a. Plant material 11
    - 10b. Vector/Pathogen 14
11. Is there genetically modified (GM) plant material available that is resistant?
    - 11a. No ..... Conduct Research
    - 11b. Yes 12
12. Is GM plant material registered for release and human consumption?
    - 12a. No ..... FDA, EPA, APHIS
    - 12b. Yes 13
13. Is GM plant material readily available for dissemination?
    - 13a. No ..... Private Industry, EPA
    - 13b. Yes ..... Implement
14. Is there a current biotechnology option ready for use?
    - 14a. No ..... Conduct Research
    - 14b. Yes 15
15. Are any currently labelled for use?
    - 15a. No ..... EPA, FDA, APHIS
    - 15b. Yes ..... Implement

5. What is the nature of the control measure?
   - 5a. Insecticides 6
   - 5b. Antimicrobials 7
   - 5c. Biological Control agents 8
   - 5d. Biotechnology 10
6. Are there insecticides available that can control the vector?
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7. Are there antimicrobials available that can control the pathogen?
   - 7a. No ..... Conduct Research
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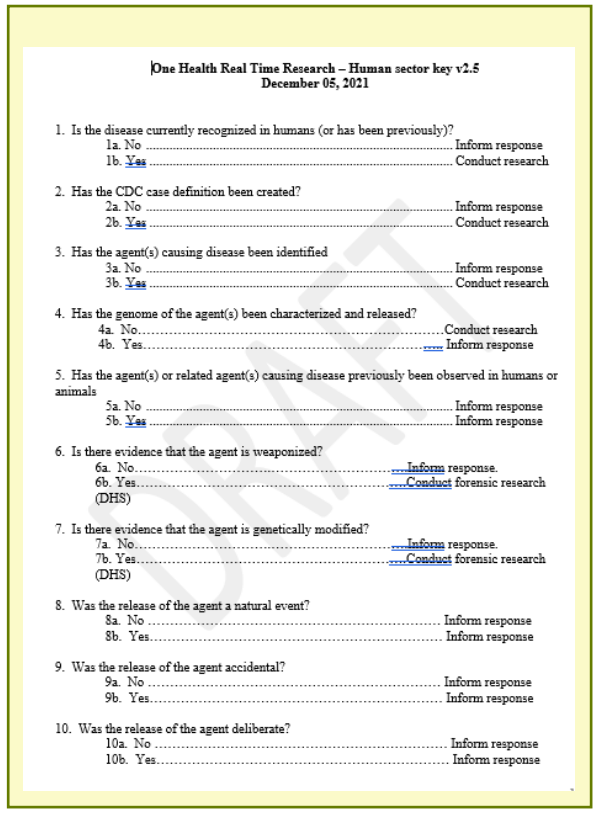
8. Are there commercially available products?
   - 8a. No ..... Conduct Research
   - 8b. Yes 15
15. Are any currently labelled for use?
   - 15a. No ..... EPA, FDA, APHIS
   - 15b. Yes ..... Implement

Phase 1: Develop Sector Keys for Incident Data Needs

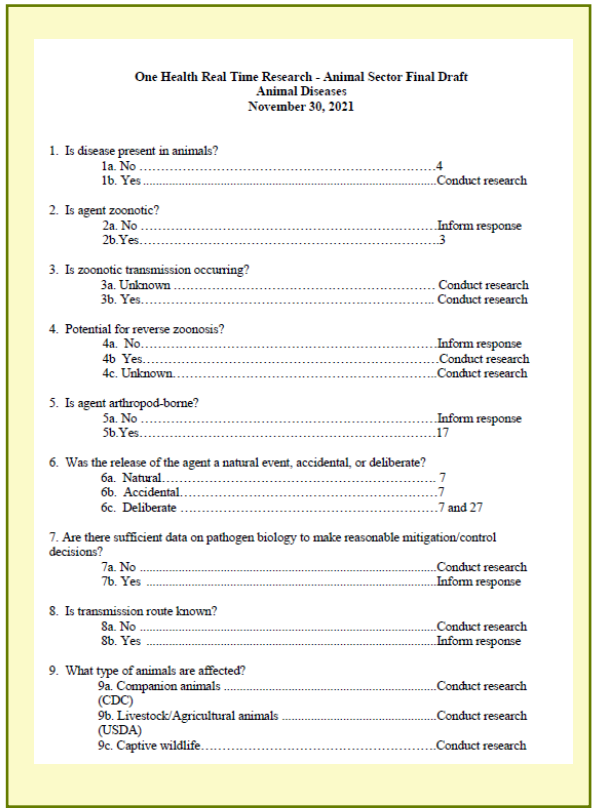
Human Sector
Lisa Hensley
Milena Lolic



One Health Real Time Research – Human sector key v2.5
December 05, 2021

1. Is the disease currently recognized in humans (or has been previously)?
   - 1a. No ..... Inform response
   - 1b. Yes ..... Conduct research
2. Has the CDC case definition been created?
   - 2a. No ..... Inform response
   - 2b. Yes ..... Conduct research
3. Has the agent(s) causing disease been identified
   - 3a. No ..... Inform response
   - 3b. Yes ..... Conduct research
4. Has the genome of the agent(s) been characterized and released?
   - 4a. No ..... Conduct research
   - 4b. Yes ..... Inform response
5. Has the agent(s) or related agent(s) causing disease previously been observed in humans or animals
   - 5a. No ..... Inform response
   - 5b. Yes ..... Inform response
6. Is there evidence that the agent is weaponized?
   - 6a. No ..... Inform response.
   - 6b. Yes ..... Conduct forensic research (DHS)
7. Is there evidence that the agent is genetically modified?
   - 7a. No ..... Inform response.
   - 7b. Yes ..... Conduct forensic research (DHS)
8. Was the release of the agent a natural event?
   - 8a. No ..... Inform response
   - 8b. Yes ..... Inform response
9. Was the release of the agent accidental?
   - 9a. No ..... Inform response
   - 9b. Yes ..... Inform response
10. Was the release of the agent deliberate?
    - 10a. No ..... Inform response
    - 10b. Yes ..... Inform response

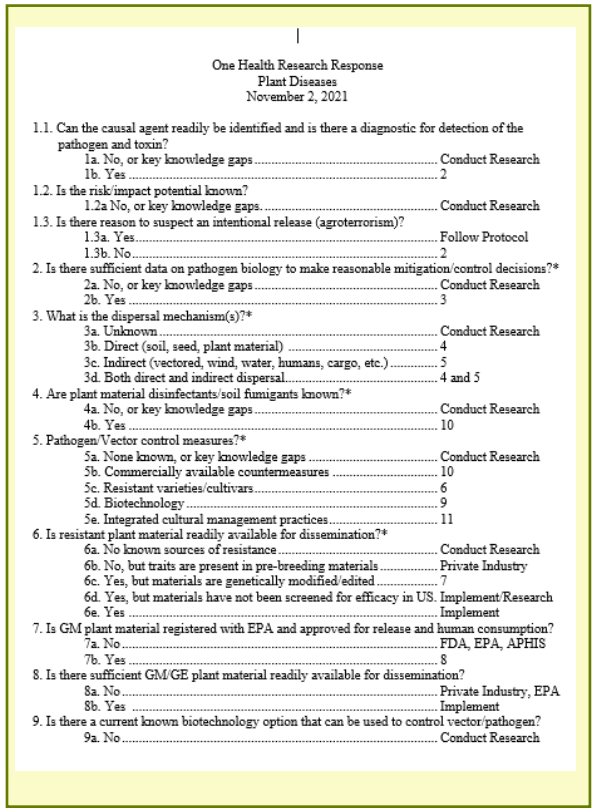
Animal Sector
Cyril Gay
Camille Hopkins



One Health Real Time Research - Animal Sector Final Draft
Animal Diseases
November 30, 2021

1. Is disease present in animals?
   - 1a. No 4
   - 1b. Yes ..... Conduct research
2. Is agent zoonotic?
   - 2a. No ..... Inform response
   - 2b. Yes 3
3. Is zoonotic transmission occurring?
   - 3a. Unknown ..... Conduct research
   - 3b. Yes ..... Conduct research
4. Potential for reverse zoonosis?
   - 4a. No ..... Inform response
   - 4b Yes ..... Conduct research
   - 4c. Unknown ..... Conduct research
5. Is agent arthropod-borne?
   - 5a. No ..... Inform response
   - 5b. Yes 17
6. Was the release of the agent a natural event, accidental, or deliberate?
   - 6a. Natural 7
   - 6b. Accidental 7
   - 6c. Deliberate ..... 7 and 27
7. Are there sufficient data on pathogen biology to make reasonable mitigation/control decisions?
   - 7a. No ..... Conduct research
   - 7b. Yes ..... Inform response
8. Is transmission route known?
   - 8a. No ..... Conduct research
   - 8b. Yes ..... Inform response
9. What type of animals are affected?
   - 9a. Companion animals (CDC) ..... Conduct research
   - 9b. Livestock/Agricultural animals (USDA) ..... Conduct research
   - 9c. Captive wildlife ..... Conduct research

Plant Sector
Tim Widmer
Jack Okamuro



One Health Research Response
Plant Diseases
November 2, 2021

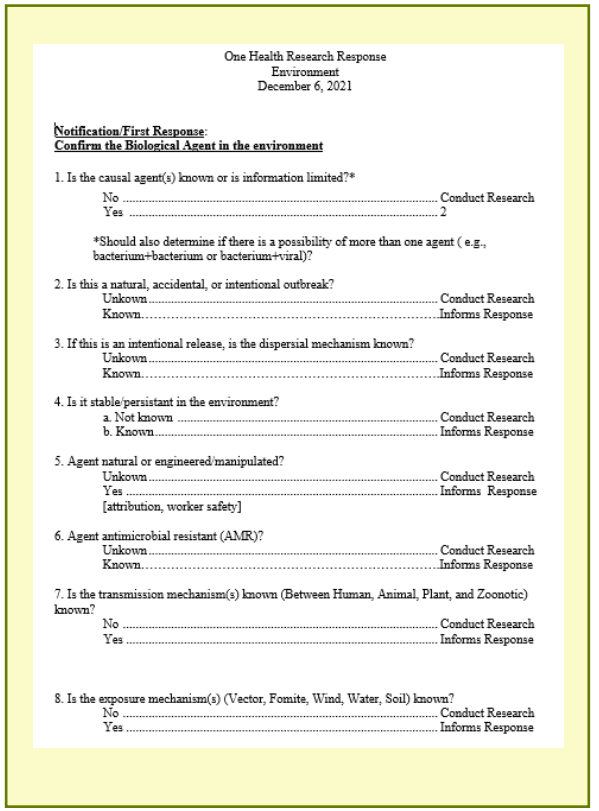
1.1. Can the causal agent readily be identified and is there a diagnostic for detection of the pathogen and toxin?
   - 1a. No, or key knowledge gaps ..... Conduct Research
   - 1b. Yes 2

1.2. Is the risk/impact potential known?
   - 1.2a No, or key knowledge gaps. ..... Conduct Research

1.3. Is there reason to suspect an intentional release (agroterrorism)?
   - 1.3a. Yes ..... Follow Protocol
   - 1.3b. No 2

2. Is there sufficient data on pathogen biology to make reasonable mitigation/control decisions?*
   - 2a. No, or key knowledge gaps ..... Conduct Research
   - 2b. Yes 3
3. What is the dispersal mechanism(s)?*
   - 3a. Unknown ..... Conduct Research
   - 3b. Direct (soil, seed, plant material) 4
   - 3c. Indirect (vectored, wind, water, humans, cargo, etc.) 5
   - 3d. Both direct and indirect dispersal ..... 4 and 5
4. Are plant material disinfectants/soil fumigants known?*
   - 4a. No, or key knowledge gaps ..... Conduct Research
   - 4b. Yes 10
5. Pathogen/Vector control measures?*
   - 5a. None known, or key knowledge gaps ..... Conduct Research
   - 5b. Commercially available countermeasures 10
   - 5c. Resistant varieties/cultivars 6
   - 5d. Biotechnology 9
   - 5e. Integrated cultural management practices 11
6. Is resistant plant material readily available for dissemination?*
   - 6a. No known sources of resistance ..... Conduct Research
   - 6b. No, but traits are present in pre-breeding materials ..... Private Industry
   - 6c. Yes, but materials are genetically modified/edited 7
   - 6d. Yes, but materials have not been screened for efficacy in US. ..... Implement/Research
   - 6e. Yes ..... Implement
7. Is GM plant material registered with EPA and approved for release and human consumption?
   - 7a. No ..... FDA, EPA, APHIS
   - 7b. Yes 8
8. Is there sufficient GM/GE plant material readily available for dissemination?
   - 8a. No ..... Private Industry, EPA
   - 8b. Yes ..... Implement
9. Is there a current known biotechnology option that can be used to control vector/pathogen?
   - 9a. No ..... Conduct Research

Environment Sector
Lance Brooks
Eletha Roberts



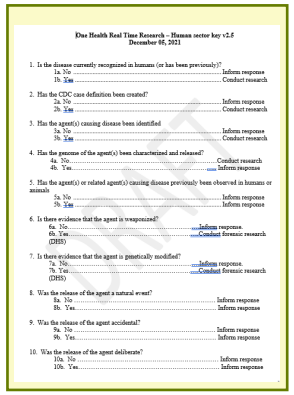
One Health Research Response
Environment
December 6, 2021

Notification/First Response:
Confirm the Biological Agent in the environment

1. Is the causal agent(s) known or is information limited?*
   - No ..... Conduct Research
   - Yes 2

   *Should also determine if there is a possibility of more than one agent (e.g., bacterium+bacterium or bacterium+viral)?
2. Is this a natural, accidental, or intentional outbreak?
   - Unkown ..... Conduct Research
   - Known ..... Informs Response
3. If this is an intentional release, is the dispersal mechanism known?
   - Unkown ..... Conduct Research
   - Known ..... Informs Response
4. Is it stable/persistant in the environment?
   - a. Not known ..... Conduct Research
   - b. Known ..... Informs Response
5. Agent natural or engineered/manipulated?
   - Unkown ..... Conduct Research
   - Yes ..... Informs Response
   - [attribution, worker safety]
6. Agent antimicrobial resistant (AMR)?
   - Unkown ..... Conduct Research
   - Known ..... Informs Response
7. Is the transmission mechanism(s) known (Between Human, Animal, Plant, and Zoonotic) known?
   - No ..... Conduct Research
   - Yes ..... Informs Response
8. Is the exposure mechanism(s) (Vector, Fomite, Wind, Water, Soil) known?
   - No ..... Conduct Research
   - Yes ..... Informs Response

Phase 2: Workshops to exercise Sector Keys



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7. Is there evidence that the agent is genetically modified?
7a. No ..... Inform response.
7b. Yes ..... Conduct forensic research (DHS)

8. Was the release of the agent a natural event?
8a. No ..... Inform response
8b. Yes ..... Inform response

9. Was the release of the agent accidental?
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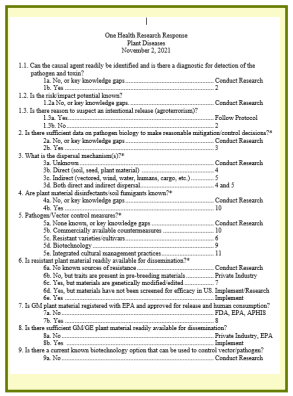
9b. Yes ..... Inform response

10. Was the release of the agent deliberate?
10a. No ..... Inform response
10b. Yes ..... Inform response



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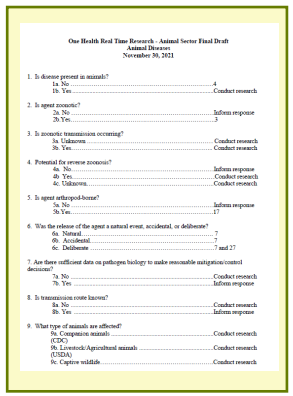

One Health Real Time Research - Animal Sector Final Draft
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4. Potential for reverse zoonosis?
4a. No ..... Inform response
4b. Yes ..... Conduct research
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8. Is transmission route known?
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9. What type of animals are affected?
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9b. Livestock/Agricultural animals (USDA) ..... Conduct research
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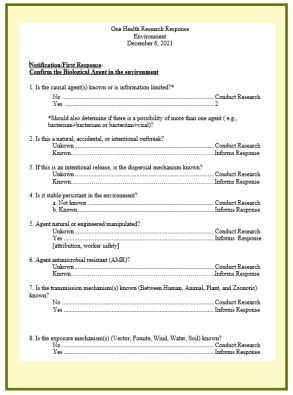


One Health Research Response
Environment
December 6, 2021

Notification/First Response
Confirm the Biological Agent is the environment

1. Is the causal agent(s) known or is information limited?*
No ..... Conduct Research
Yes 2

*Should also determine if there is a possibility of more than one agent (e.g., bacteriae>bacterium or bacterium>viral)?

2. Is this a natural, accidental, or intentional outbreak?
Unknown ..... Conduct Research
Known ..... Informs Response

3. If this is an intentional release, is the dispersal mechanism known?
Unknown ..... Conduct Research
Known ..... Informs Response

4. Is it stable/persistant in the environment?
a. Not known ..... Conduct Research
b. Known ..... Informs Response

5. Agent natural or engineered/manipulated?
Unknown ..... Conduct Research
Yes ..... Informs Response
[attribution, worker safety]

6. Agent antimicrobial resistant (AMR)?
Unknown ..... Conduct Research
Known ..... Informs Response

7. Is the transmission mechanism(s) known (Between Human, Animal, Plant, and Zoonotic) known?
No ..... Conduct Research
Yes ..... Informs Response

8. Is the exposure mechanism(s) (Vector, Fomite, Wind, Water, Soil) known?
No ..... Conduct Research
Yes ..... Informs Response

1. Zoonotic Outbreak

(Avian Influenza)

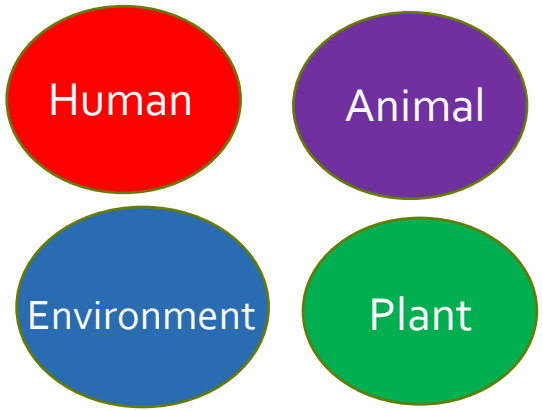
2. Ag Scenario

(Aflatoxin)

Integrated One Health Research Agenda based on Scenario

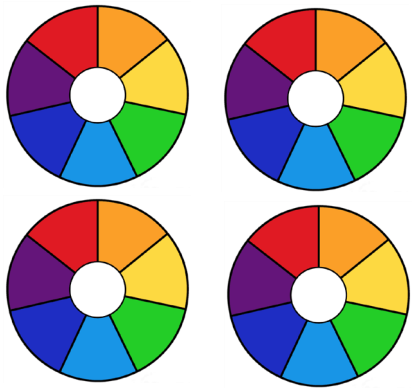
One Health Real-time Research Framework Workshop

Morning session
Sector - Focused



Interdisciplinary
Integration
Transdisciplinary

Afternoon session
One Health- Focused



Using the Sector Keys:

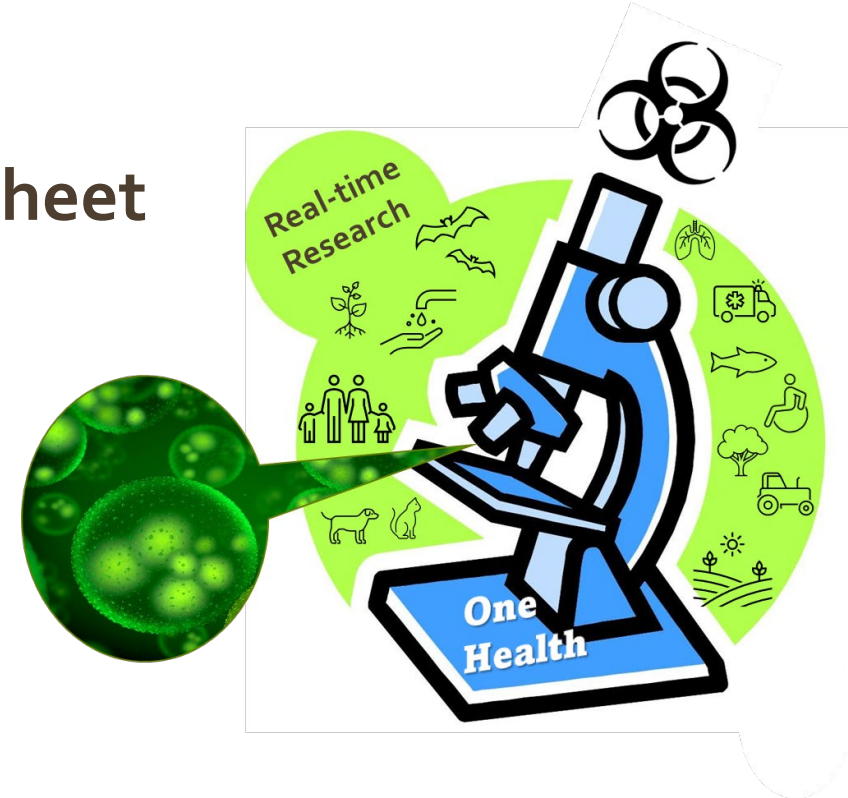
- Identify the data gaps that are impeding response decisions.
- Which sectors need this data?
- Is there research that is on-going to fill in the data gap?
- Does research need to be stood-up to fill the data gap for a timely response?
- Near-term, Intermediate, or Long-term research?

Build a One Health Research Agenda for this Incident

- What data is needed? By whom?
- How can we work together to conduct needed research for sector(s) and response decisions?
- Who has the research facilities for experiments?
- Who else do we need to coordinate with?
- What are the challenges (authorities, regulations, funding, etc.) that may impact research?
- How do we coordinate and communicate research results? Information sharing networks?
- What are the social and economic impacts?

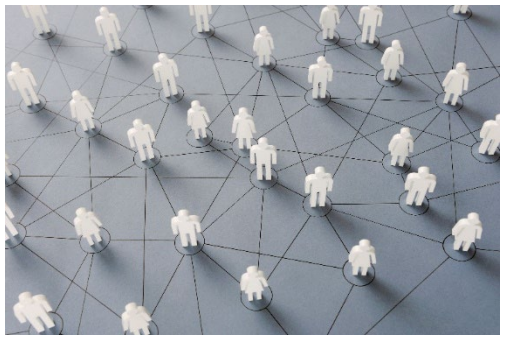
Phase 3 : Finalize One Health Framework for Realtime Bioincident Response Research

- One Health Research Response Chart
- One Health Integrated Bioincident Worksheet



One Health Research Response Chart

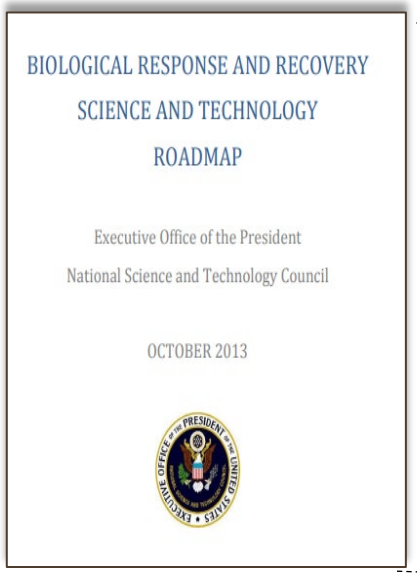
- Updating the (2013) NSTC Biological Response and Recovery S&T (BRRST) Roadmap Chart
- Aligning with the Response goals and objectives in the 2022 National Biodefense Strategy and Implementation Plan
- One Health Approach to Bioincident Research Response
  - Begins with Agent Characterization in all sectors
  - Recognizing individual sector roles and responsibilities
  - Incorporating Community Health in the research paradigm



- Each table row lists a summary of proposed research activities to conduct when coordinating assessments of impacts, implementing strategies, and informing interagency response mechanisms across One Health sectors.

Sector Research Keys → OH Research Response Chart → OH Integrated Bioincident Worksheet

Updating **OSTP BRRST 2013**


BIOLOGICAL RESPONSE AND RECOVERY
SCIENCE AND TECHNOLOGY
ROADMAP

Executive Office of the President
National Science and Technology Council

OCTOBER 2013

Response and Recovery						
Crisis Management		Consequence Management				
		Remediation/Cleanup				
Notification	First Response	Characterization	Decontamination	Clearance	Restoration/ Re-occupancy	
Initiate first response activities, including notification of proper authorities Develop a public-engagement campaign Evaluate Threat Credibility	Operational Coordination Law enforcement, intelligence, and investigative response When and how to distribute medical countermeasures Recommend staying-in-place or evacuation Recommend quarantine/isolation/social distancing Implement transportation restrictions Provide safety and health guidance and protections to impacted first responders and citizens Issue guidance on personal hygiene or decontamination Provide support for mass casualty Establish mass medical treatment facilities Implement modified standards of care	Develop/ implement strategies for characterization in facilities and the outdoors Implement strategies and procedures to identify, stabilize, and maintain infrastructure and property Determine requirements and methods to protect natural and cultural resources Implement strategies and means to contain and mitigate the spread of contamination and eliminate sources of further distribution (e.g., insecticides for flies)	Decontaminate outdoor areas and/or buildings Decontaminate wide areas Implement required capabilities for sustained environmental decontamination operations Implement decontamination waste handling requirements Decontaminate critical infrastructure	Provide guidance for determination of effectiveness of decontamination	Provide guidance for re-occupancy and reuse criteria and goals Provide guidance for controls to implement, reduce, mitigate any potential exposures or future incidents after re-occupancy Implement public messaging to instill confidence in the public and workforce that re-occupancy is safe Implement measures to retain, maintain and improve the economic vitality of a region Implement long term health treatment, intervention and surveillance strategy

Figure 1. Key Response and Recovery Decisions

One Health Approach

Tasks are aligned with 2022 NBS

One Health Real-time Research Agenda

One Health Approach to Biological Incident Response					
Consequence Management					
Clarification of authorities and roles for response operations in accordance with BINA, NRF-ESFs, BIA, Food/Ag Annex, SLTT operational plans and government regulations.					
Establish and implement communications plans incorporating internal and external lines of communications (D/A, ICS, FSLTT, industry, academia, and public)					
Establish and /or enhance integrated biosurveillance networks across impacted sectors to monitor spread of disease in communities and regions.					
Develop, implement, and update as needed, a coordinated, transparent , United States Government real-time research response agenda tailored to biological incident					
Agent Characterization	**Human Health Response**	**Animal Health Response**	**Plant Health Response**	**Environmental Health Response**	**Community Health Response**
Genotypic and phenotypic characterization of the causal agent	Identify high-risk groups or populations to prioritize targeted interventions	Identification of susceptible animals species (domestic and wild) and risk of spillover (ie., zoonotic potential)	Identification of susceptible plants	Assess risks for potentially contaminated areas, infrastructure, and assets; coordination of sampling and analysis and analytical laboratory capacity	Identification of Cross-Sector Interdependencies
Assessment of transmission routes, potential reservoirs and susceptible hosts	Make available at scale vaccines, therapeutics, diagnostics, and PPE and support their effective use in all impacted populations.	Identification of diagnostic assays	Identification of	Stablize and maintain infrastructure and property	

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One Health Integrated Bioincident Worksheet

- Designed to illustrate the integration, alignment, and synchronization of bioincident research operational activities among federal agencies and One Health domains.
- Research planning derived from sector keys and implementation efforts guided by the response and recovery charts are integrated on the worksheet using a One Health approach.
- The trending bioincident, location(s), agency roles, and points of contacts can be easily viewed and referenced.
- Agent characterization, impact potential, research and data collection methods, mitigation and containment measures, and risk analysis can be updated and augmented by agencies as necessary.

Sector Research Keys → OH Research Response Chart → OH Integrated Bioincident Worksheet

One Health Integrated Worksheet

Trending Incident:

Location:	
National: State, Region, City	
International: County, City, Province	

Point of Contact *(Last name, First name)*	**Agency/:** *(Division, Branch, Office)*	**Authority or Role** Lead	Support	Human	Animal	Environment	Plant	**Notes:**
1.		☐	☐	☐	☐	☐	☐	
2.		☐	☐	☐	☐	☐	☐	
3.		☐	☐	☐	☐	☐	☐	
4.		☐	☐	☐	☐	☐	☐	
5.		☐	☐	☐	☐	☐	☐	
6.		☐	☐	☐	☐	☐	☐	
7.		☐	☐	☐	☐	☐	☐	
8.		☐	☐	☐	☐	☐	☐	
9.		☐	☐	☐	☐	☐	☐	
10.		☐	☐	☐	☐	☐	☐	
11.		☐	☐	☐	☐	☐	☐	
12.		☐	☐	☐	☐	☐	☐	
13.		☐	☐	☐	☐	☐	☐	
14.		☐	☐	☐	☐	☐	☐	
15.		☐	☐	☐	☐	☐	☐	
16.		☐	☐	☐	☐	☐	☐	
17.		☐	☐	☐	☐	☐	☐	
18.		☐	☐	☐	☐	☐	☐	
19.		☐	☐	☐	☐	☐	☐	
20.		☐	☐	☐	☐	☐	☐	

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Pathogen/agent host or source:	Human	Animal	Environment	Plant
Endemic or Foreign	Choose an item.	Choose an item.	Choose an item.	Choose an item.

Pathogen Name			**Pathogen Type**			
Genus	Species	Subspecies/Variant	Human	Animal	Environment	Plant
			Choose an item.	Choose an item.	Choose an item.	Choose an item.
			Choose an item.	Choose an item.	Choose an item.	Choose an item.
			Choose an item.	Choose an item.	Choose an item.	Choose an item.

Isolate source(s):	Human	Animal	Environment	Plant
	Choose an item.	Choose an item.	Choose an item.	Choose an item.
	Choose an item.	Choose an item.	Choose an item.	Choose an item.
	Choose an item.	Choose an item.	Choose an item.	Choose an item.
	Choose an item.	Choose an item.	Choose an item.	Choose an item.
	Choose an item.	Choose an item.	Choose an item.	Choose an item.

One Health Integrated Worksheet

Method of Data Collection:	Human	Animal	Environment	Plant
Method of data analysis (quantitative, qualitative, mixed method, other)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Laboratory test (e.g., pathology, toxicology, chemistry, gene sequencing, persistence, disinfection, decontamination, efficacy)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Clinical/Research setting of sample collection (e.g., hospital, clinic, mobile unit, abattoir, government facility [FSLTT], university, extension, private industry, diagnostic lab, other, etc.)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Clinical/Research Setting of sample testing (e.g., hospital, clinic, mobile unit, abattoir, government facility [FSLTT], university, extension, private industry, diagnostic lab, other, etc.)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Field assessment (e.g., environmental monitoring, biosurveillance, mapping, modeling etc.)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Database (reports, bibliographic, recordings, video, clinical records)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Social media (specify site)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Observations (ethnographic, statistics, reports)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Interviews (focus groups, surveys, polls)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Method of Spread:	**Human**	**Animal**	**Environment**	**Plant**
Type of release: Intentional (e.g., deliberate release); unintentional (e.g., man-made accidental release); naturally occurring (e.g., by common or emerging presence).	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Mode of transmission/dispersal (specify in notes section): Direct [e.g., physical contact through bite, scratch, body fluid, fecal-oral, water, soil, seed, plant material, etc.]; Indirect [e.g., vectored, parasitic, water, air/wind, fomites, sporulation, cargo, etc.]	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Containment/Mitigation Measures:	**Human**	**Animal**	**Environment**	**Plant**
Type of containment (e.g., engineering controls, quarantine, isolation/self-isolation, depopulation, decontamination, disinfection, sterilization, social distancing, travel restrictions, contact tracing, PPE, agent countermeasures [vaccine, drugs], waste disposal and management, etc.)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Critical infrastructure needing containment/mitigation measures (e.g., ~~services,~~ food and agriculture sector, educational sector, commercial facilities, transportation sector, dams, waste and wastewater system, etc.)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Impact Potential:	**Human**	**Animal**	**Environment**	**Plant**
Geographical scale (select "other" and specify in note section if more than one choice)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Population/Ecosystem/Environment impacted (e.g., rural, urban, industrial, agricultural, transportation venue, educational venue, sporting venues, educational settings, field crops, nursery/ornamental crops, etc.)	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Economic (specify type in notes section): Direct [property, assets, infrastructure] or indirect [cost, production, services, etc.]	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Specify items or resources impacted (products, trade, communications, transportation, etc.).				
Risk Analysis:	**Human**	**Animal**	**Environment**	**Plant**
Risk assessment methods (e.g., identify hazards or conditions leading to occurrence of risks for one or more ~~domains~~qualitative, quantitative, vulnerability-based, threat-based).	Choose an item.	Choose an item.	Choose an item.	Choose an item.
Risk management implementation: specify actions that eliminate or reduce risk to an acceptable level for each domain (e.g., vaccinations, decontamination, environmental				

NSTC One Health Real-time Research Framework for Bioincidents

Questions?
Comments?
Suggestions?

DISCLAIMER

The views expressed in this presentation are those of the authors and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency or U. S. Food and Drug Administration.

Tonya Nichols, PhD

One Health Coordinator

US Environmental Protection Agency

nichols.tonya@epa.gov

Brianna Skinner, CAPT, USPHS

Senior Regulatory Veterinarian

US Food and Drug Administration

Brianna.skinner@fda.hhs.gov