Initial Protective Actions for Biological Agent Releases

or

Everything I needed to Know I learned in Kindergarten

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AUDIENCE

- Raise your hands if you are an Emergency Planner
- Raise your hands if you are a Laboratorian
- Raise your hands if you are BOTH

WHAT COLOR IS THE BALL

Biological . . .
A very strange Bird

The planning and development of Initial Protective Actions for biological agents and toxins requires a

COORDINATED EFFORT

between DOE/NNSA

SITE MEDICAL PERSONNEL

and

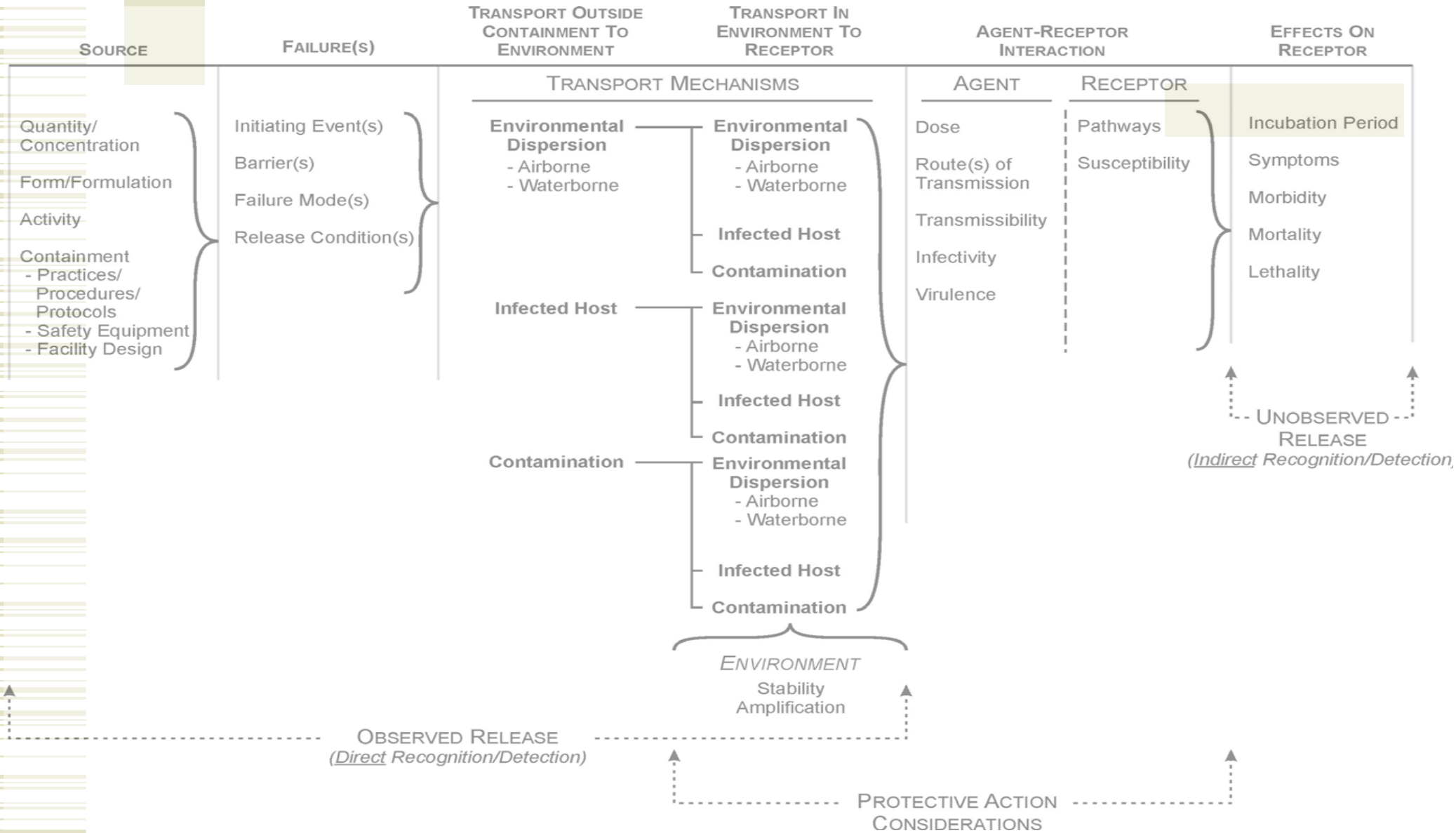
OFFSITE PUBLIC HEALTH AGENCIES.

INITIAL PROTECTIVE ACTIONS

Dependent Upon Several Factors

- Transport Mechanism
- Category of Release
- Material Characteristics
- Population locations
- Time Available to issue

FACTORS


Source
Failure(s)
Transport Outside Containment To Environment
Transport In Environment To Receptor
Agent-Receptor Interaction
Effects On Receptor
Transport Mechanisms
Agent
Receptor
Quantity/ Concentration
Form/Formulation
Activity
Containment
- Practices/ Procedures/ Protocols
- Safety Equipment
- Facility Design
Initiating Event(s)
Barrier(s)
Failure Mode(s)
Release Condition(s)
Environmental Dispersion
- Airborne
- Waterborne
Infected Host
Contamination
Environmental Dispersion
- Airborne
- Waterborne
Infected Host
Contamination
Environmental Dispersion
- Airborne
- Waterborne
Infected Host
Contamination
Environmental Dispersion
- Airborne
- Waterborne
Infected Host
Contamination
Dose
Route(s) of Transmission
Transmissibility
Infectivity
Virulence
Pathways
Susceptibility
Incubation Period
Symptoms
Morbidity
Mortality
Lethality
Unobserved Release
(Indirect Recognition/Detection)
Environment
Stability
Amplification
Observed Release
(Direct Recognition/Detection)
Protective Action Considerations

Observed Releases

Recognition will likely occur at the facility, as the result of direct detection of the release through observations of event indicators (e.g., initiating event, barrier failure).

In these cases, the agents will generally be known and response measures (onsite and offsite) can usually be initiated shortly after recognition of the event.

Unobserved Releases

Unreported infected host or contaminated vectors could remain undetected for a substantial period following the actual event at the facility.

The recognition of these events can occur as the result of the indirect detection of the release, when infected receptor(s) present symptoms of the disease.

An active, ongoing medical surveillance program within the DOE/NNSA community and in the local community can provide an essential detection capability for identifying a possible release from the facility.

Coordinated Response

The planning and development of protective actions for biological agents and toxins requires a coordinated effort between **DOE/NNSA site medical personnel** and ***offsite public health agencies***.

Coordinated Response

It is important that site medical personnel coordinate protective action planning with the local/State public health agency to ensure that initial measures taken by the site or recommendations made to offsite response organizations are consistent with the expectations of local/State public health authorities, as different public health jurisdictions may have different capabilities.

INITIAL PROTECTIVE ACTIONS - OBSERVED RELEASE

- Access Control
- Sheltering/Shelter in Place
- Evacuation
- Decontamination
- Medical Surveillance
- Quarantine

LONGER TERM PROTECTIVE ACTIONS - OBSERVED RELEASE

- Vector Control
- Control/Disinfection (water supplies)
- Control of Contaminated Food Products
- Changes in Livestock and Agriculture Practices

INITIAL PROTECTIVE ACTIONS - UNOBSERVED RELEASE

The source may not be confirmed for some time AFTER the actual release

- General Initial Protective Actions May Not Be Employed Until A Release Event is Recognized

However

- Once Recognized – Protective Actions Must Be Considered – Although Some May Be To Late.

PROTECTIVE ACTIONS

Example Only

The Actual Facility-specific Protective Actions Must Reflect the Actual situation Onsite and Offsite

TRANSPORT MECHANISM IN THE ENVIRONMENT	PROTECTIVE ACTIONS
Environmental Dispersion	
Airborne	
1 2 3	
Waterborne	**1** *8*
Infected Host	
Human	**4 5**
Vector	**1 3** *7*
Contamination	
Human	**6**
Vector	**1 3** *7*
Medium/Objects	
Soil	**1 3 6**
Water	**1 3** *8*
Agricultural products	*9 10*
Equipment	**1 6**

1. Access control
2. Sheltering/Shelter-in-place
3. Evacuation
4. Medical surveillance
5. Quarantine
6. Decontamination
7. *Vector control*
8. *Control/disinfection of contaminated water supplies*
9. *Control of contaminated food products*
10. *Changes in livestock and agricultural practices*

LET'S WALK THROUGH A SCENARIO

LET'S WALK THROUGH A SCENARIO

Conditions: The Class II BSC in this facility exhausts directly to the HVAC system rather than to the laboratory space. The facility has installed a HEPA filter on the HVAC system ensuring that all of the exhaust streams are filtered prior to exiting the facility. A release to the environment from an anaerobic jar exploding in the Class II BSC requires that the HEPA filters in the Class II BSC and in the HVAC system are both non-operational at the same time. If the jar were outside of the Class II BSC, then just the HEPA filters in the HVAC would have to be non-operational for a release to the environment.

SOURCE & RELEASE PARAMETERS

Recognition: The possible release of a biological agent into the external environment is the basis for declaring an Operational Emergency. Recognition indicators that may be used as the basis for an Operational Emergency event declaration may include:

The anaerobic jar and flask inside explodes in the Class II BSC.

The HEPA filters in the Class II BSC are non-operational.

The HEPA filters in the HVAC system are non-operational.

RECOGNITION FACTORS

Source						Failure(s)			
Scenario	**Agent/Toxin**	**Quantity**	**Form & Activity**	**Containment Barriers**	**Procedures/ Protocols**	**Initiating Event(s)**	**Barrier (Initial)**	**Failure Mode(s)**	**Release Condition(s)**
3.	*Clostridium botulinum* toxin	300 ml with 1 x 10^9 cells per ml	Production of *Botulinum* toxin from spores in solution	Anaerobic jar; Class II BSC with HEPA filter; HEPA filter on HVAC exhaust; PPE; facility design	Procedures for using anaerobic jar in BSC II	Wire capsule is not placed around catalyst causing the anaerobic jar to explode	Anaerobic jar	Shattering of the anaerobic jar	HEPA filter in Class II BSC fails or is not in use; HEPA filter on HVAC exhaust fails or is not in use; air-handling systems on the BSC and the facility draw air from laboratory space and exhaust to the environment.

RECOGNITION FACTORS

Scenario (Agent/Toxin)	Transmissibility	Transport to Environment	Recognition Factors
3. Anaerobic Jar Explosion [*C. botulinum* bacteria and toxin released as an aerosol]	**No**	Airborne dispersion via the ventilation system	The anaerobic jar explodes in the CLASS II BSC The HEPA filters in the CLASS II BSC are non-operational. The HEPA filters in the HVAC system are non-operational

EXAMPLE PROTECTIVE ACTIONS

Scenario (Agent/Toxin)	Transport to Environment	Stability of Agent/Toxin in the Environment	Transport to Receptors	Candidate Protective Actions for Collocated Workers & the General Public
3. Anaerobic Jar Explosion [*C. botulinum* bacteria and toxin released as an aerosol]	Airborne dispersion via the ventilation system	The stability of botulinum toxin is not equal in all environments. It is most stable in neutral or alkaline foods. Aerosolized botulinum toxin is estimated to degrade at a rate of 1% to 4% per minute. [High stability in the environment]	Inhalation through airborne dispersion	**1 2 3**
			Contamination	**1 3 6** *7 8 9 10*

1. Access control
2. Sheltering/Shelter-in-place
3. Evacuation
4. Medical surveillance
5. Quarantine
6. Decontamination

7. Vector control
8. Control/disinfection of contaminated water supplies
9. Control of contaminated food products
10. Changes in livestock and agricultural practices

Generic Initial Protective Actions

Airborne Release; agent is *NOT TRANSMISSIBLE*

Standard Initial Protective Actions

Access control: Control of personnel access to areas of potential exposure and/or contamination outside the biocontainment area to prevent unnecessary exposures and minimize the spread of contamination. Access control is most effective when implemented immediately upon recognizing that an area has been or will be affected by a hazardous material release.

Sheltering/Shelter-in-place: Directing people to seek shelter inside a building or similar location and to remain inside until the threat of exposure at dangerous levels passes. Shelter-in-place means directing people to stay inside at their current locations until the threat of dangerous exposure passes. Sheltering/ shelter-in-place is used when evacuating collocated workers and/or the public would cause greater risk than staying where they are, or when an evacuation cannot be performed.

Generic Initial Protective Actions

Airborne Release; agent is *NOT TRANSMISSIBLE*

Standard Initial Protective Actions (con'd)

Evacuation: Moving all people from a threatened area to a safer place. To perform an evacuation, there must be enough time for people to be warned, to get ready, and to leave an area. If there is enough time, evacuation is the best protective action. Evacuees should be sent to a definite place, by a specific route, far enough away from the incident site so they will not have to be moved again if the wind shifts.

Decontamination: The removal of hazardous material from personnel and equipment to the extent necessary to prevent potential adverse health effects. Contaminated clothing and equipment should be removed after use and stored in a controlled area until cleanup procedures can be initiated. Decontamination also applies to removal of hazardous materials that may have been deposited on the ground and on other structures in the vicinity of the release.

Generic Initial Protective Actions

Airborne Release; agent is *TRANSMISSIBLE*

Standard Initial Protective Actions (plus)

Quarantine: Separation and restriction of movement of persons, who while not yet ill, have been exposed to a transmissible biological agent and therefore may become infectious. Since quarantine may sometimes require long periods of time pending definitive laboratory results, considerations for support of personnel may include food, water and diversionary activities.

Medical Surveillance: Immediate and active medical surveillance activities, including a process to *identify*, *screen, test, and assess* people that are most likely to have been exposed. Based on medical surveillance results, identify candidates for monitoring and/or treatment.

EXPECTATIONS

- The site is responsible for initiating prompt, initial protective actions onsite as well as making recommendations for offsite protective actions.

- Local and/or State Public Health Agencies will (should) assume the responsibility for initiating LONG TERM protective measures.

THEREFORE

IN CLOSING

FOR EFFECTIVE RESPONSE

- It is imperative that site medical personnel coordinate protective action planning with the local/state public health agency.
- This will ensure that the initial measures taken by the site and the recommendations made to offsite RO'S are consistent with the expectations of the local/state public health authorities.