INFECTIOUS DISEASE DISASTERS: BIOTERRORISM, EMERGING INFECTIONS, AND PANDEMICS

KEY DEFINITIONS

Bioterrorism:	The use of a biological agent or derivative to cause harm or death
Emerging Infectious Disease:	An infectious disease that is new to a population, or whose incidence has increased rapidly
Pandemic:	A global outbreak of disease that affects at least 2 continents and/or exceeds expected rates of morbidity and mortality
Infectious Disease Disaster:	A disaster caused by one of the above

BIOTERRORISM

- CAN BE USED TO INFLICT HARM ON PEOPLE, ANIMALS, OR CROPS
- TYPES OF BIOTERRORISM AGENTS INCLUDE BACTERIA, VIRUS, AND TOXINS (OF MIRCROBIAL, PLANT, OR ANIMAL ORIGIN)

COMMON CHARACTERISTICS OF BIOTERRORISM AGENTS

- ABILITY TO BE DISPERSED BY AEROSOL PARTICLES
- ABILITY TO DELIVER AEROSOL PARTICLES BY SIMPLE TECHNOLOGY
- FEASIBILITY OF THE AGENTS IF DELIVERED FROM A LINE SOURCE, LIKE AN AIRPLANE, UPWIND OF THE TARGET, TO INFECT LARGE NUMBERS OF THE POPULATION
- ABILITY TO SPREAD INFECTION, DISEASE, PANIC, AND FEAR

HOW BIOTERRORISM AGENTS ARE SPREAD

01

Contaminating food or water

02

Contaminating crops,

03

Infecting an animal, which then can cause animal-to-human spread

04

Releasing insects carrying the pathogen

05

Injecting the agent

06

Infecting a human and then having them enter a crowd once contagious]

07

Using physical objects (Like the 2001 anthrax attacks)

08

Releasing the agent as an aerosol (Most likely and dangerous method)

FACTORS INFLUENCING EMERGING INFECTIONS

- SOCIAL FACTORS
  - WAR
  - HUMAN MIGRATION
  - URBANIZATION
- MICROBIAL FACTORS
  - GENETIC MUTATION, RECOMBINATION, AND ASSORTMENT
  - ANTIMICROBIAL USAGE
- ENVIRONMENTAL FACTORS
  - NATURAL DISASTERS
  - CHANGES IN ANIMAL/INSECT POPULATIONS
  - CLIMATE CHANGE

EMERGING INFECTION IMPACT

Impact depends on the agent involved and the size of the event

It is expected that infectious diseases will continue to emerge

PANDEMICS

- PANDEMICS POSE THE BIGGEST POTENTIAL THREAT TO THE PUBLIC'S HEALTH OF ALL TYPES OF INFECTIOUS DISEASE DISASTERS
- CAN BE CAUSED BY MANY DIFFERENT PATHOGENS, BUT THE WORD "PANDEMIC" MOST OFTEN REFERS TO A PANDEMIC CAUSED BY A NOVEL STRAIN OF INFLUENZA
    - INFLUENZA HAS CAUSED THE MOST PANDEMICS
- LIKELY TO EVOLVE OVER TIME AS STRAINS MUTATE, BUT CAN OCCUR SUDDENLY
- INFLUENZA PANDEMICS OCCUR IN 6-8 WEEK WAVES, CORRESPONDING WITH LARGE PATIENT SURGES
- ATTACK RATES ARE EXPECTED TO BE HIGH DURING AN INFLUENZA PANDEMIC
    - ABOUT 30%
    - PEDIATRIC ATTACK RATES 40%

PHASES OF A PANDEMIC

Phase	Description of the phase
1	Low risk of human cases
2	Higher risk of human cases
3	No or very limited human-to-human transmission
4	Evidence of increased human-to-human transmission
5	Evidence of significant human-to-human transmission
6	Efficient and sustained human-to-human transmission

WHO NEEDS TO BE PREPARED FOR INFECTIOUS DISEASE DISASTERS

- PERSONAL PREPAREDNESS
  - PERSONAL/FAMILY EMERGENCY MANAGEMENT PLAN
    - PPE STORED AT HOME, INCLUDING RESPIRATORY PROTECTION
- SURGE CAPACITY FOR HEALTHCARE FACILITIES
  - THE JOINT COMMISSION REQUIRES THAT HOSPITALS BE PREPARED TO ACCOMMODATE INFLUX OF POTENTIALLY CONTAGIOUS PATIENTS
  - MOST HEALTHCARE FACILITIES DON'T HAVE ENOUGH RESOURCES OR INFRASTRUCTURE DURING AN INFECTIOUS DISEASE DISASTER. THEY GENERALLY LACK:
    - VENTILATORS
    - ANTIBIOTICS AND ANTIVIRALS
    - RESPIRATORY PROTECTION
    - NEGATIVE PRESSURE ROOMS
    - LAB SUPPORT AND SUPPLIES
    - LINEN
    - BEDS
    - TRAINED STAFF

WHO NEEDS TO BE PREPARED FOR INFECTIOUS DISEASE DISASTERS CONT.

- COMMUNITY HEALTHCARE MUST ALSO BE PREPARED
  - NEED SURGE CAPACITY FOR THOSE COMING FROM ACUTE CARE TO LONG-TERM CARE, HOME HEALTH, ETC.
  - OTHER INFECTION PREVENTION AND CONTROL STRATEGIES
- INFECTIOUS DISEASE DISASTER PREPAREDNESS ADDRESSES THE 4 PRINCIPLES OF EMERGENCY MANAGEMENT:
  1. MITIGATION
  2. PREPAREDNESS
  3. RESPONSE
  4. RECOVERY
- INDIVIDUALS AND FACILITIES SHOULD ALSO DEVELOP AND EMERGENCY MANAGEMENT PLAN AND PRACTICE IT

ASSESSMENT

- First Step in preparing for an infectious disease disaster
- Assessments should be multi-departmental and multi-agency efforts
- Perform a specific vulnerability analysis using risk assessments

PLANNING FOR INFECTIOUS DISEASE DISASTERS

- HOSPITALS AND HEALTHCARE AGENCIES SHOULD HAVE A SECTION SPECIFIC TO THESE DISASTERS IN THEIR EMERGENCY MANAGEMENT PLANS
- DIFFERENT PLANNING GUIDES EXIST TO HELP PREPARE AND PLAN

IDENTIFICATION AND EARLY RECOGNITION OF AN INFECTIOUS DISEASE DISASTER

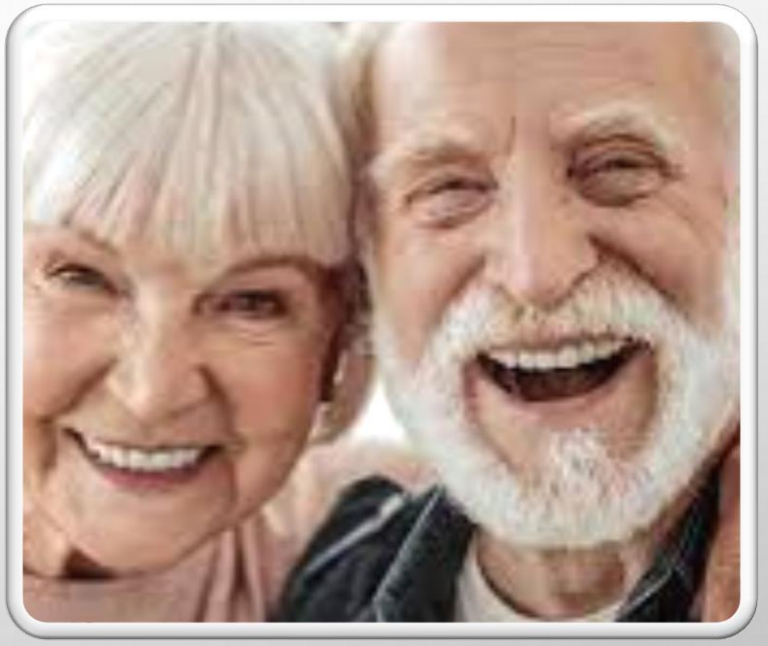
- EARLY DETECTION IS IMPORTANT, AS IT DECREASES MORBIDITY AND MORTALITY
- INFECTIOUS DISEASE DISASTERS ARE MORE DIFFICULT TO DETECT THAN OTHER MASS CASUALTY EVENTS
  - OFTEN PRESENT AS UNUSUAL DISEASES
  - TESTS MAY NOT BE READILY AVAILABLE FOR THE TYPE OF DISEASE
- SURVEILLANCE IS ESSENTIAL TO EARLY DETECTION
  - ACTIVE SURVEILLANCE-SURVEILLANCE ACTIVITIES THAT HELP DETECT DISEASE DISASTERS
    - LAB TESTS-NOT USUALLY FEASIBLE FOR RECOGNITION OF INFECTIOUS DISEASE DISASTERS
    - PATIENT SYMPTOMS
    - CHEST RADIOGRAPH RESULTS
    - SYNDROMIC SURVEILLANCE
  - PASSIVE SURVEILLANCE-WAITING FOR DISEASE TO PRESENT TO CLINICIANS OR IP'S

SYNDROMIC SURVEILLANCE

- ACTIVE SURVEILLANCE USED TO DETECT AN INFECTIOUS DISEASE DISASTER
- CONSISTS OF COLLECTING AND ANALYZING NONTRADITIONAL DATA FOR EARLY DETECTION OF AN INFECTIOUS DISEASE DISASTER
- ANY INDICATOR THAT MIGHT SIGNAL AN INCREASE IN ILLNESS IN THE COMMUNITY
- EXAMPLES:
  - NUMBER OF PATIENTS SEEN IN ER
  - NUMBER OF PATIENTS WITH FLU-LIKE ILLNESS
  - NUMBER OF PURCHASES OF OTC MEDICATIONS
- NEWER APPROACHES INCLUDE INCORPORATING ANIMAL AND INSECT SURVEILLANCE DATA
  - MORE THAN 60% OF EMERGING DISEASES ARE ZOONOTIC
  - CAN COMBINE ANIMAL AND HUMAN INDICATORS TO GET A MORE ACCURATE PICTURE

VULNERABLE POPULATIONS

- MORE AT RISK FROM MORBIDITY AND MORTALITY DURING AN INFECTIOUS DISEASE DISASTER
- MEETING THE NEEDS OF THESE GROUPS NEEDS TO BE PART OF INFECTIOUS DISEASE DISASTER PLANNING
    - INCLUDE IN THE EMERGENCY MANAGEMENT PLAN
- PEDIATRICS
- ELDERLY
- IMMUNOCOMPROMISED
- HEALTHCARE PERSONNEL



EPIDEMIOLOGICAL INVESTIGATION OF BIOTERRORISM OR OUTBREAK OF AN EMERGING INFECTIOUS DISEASE

- FIND OUT DATE AND LOCATION FOR BIOTERRORISM ATTACK
- FIND OUT SOURCE OR POTENTIAL VECTOR FOR EMERGING INFECTIOUS DISEASE
- CONTAGIOUS AGENT MAKE EPIDEMIOLOGICAL INVESTIGATIONS EVEN MORE CRITICAL
- THREE PRIMARY FACTORS OF CONTEXTUAL CONCERN:
    1. PERSON
    2. PLACE
    3. TIME
- INFORMATION TO DETERMINE ASAP:
    1. CAUSATIVE AGENT
    2. CASE DEFINITION
    3. DATE OF RELEASE
    4. LOCATION OF RELEASE
    5. APPROXIMATE LENGTH OF EXPOSURE TIME
    6. POTENTIALLY EXPOSED GROUPS

TRIAGE AND SCREENING

- ASSESSMENT OF DISEASE/INJURY SEVERITY
  - WHO NEEDS TREATMENT FIRST
- SCREEN FOR POTENTIAL CONTAGIOUSNESS
  - SCREEN BEFORE ALLOWING ENTRY INTO HEALTHCARE FACILITIES
  - SCREEN HEALTHCARE PERSONNEL BEFORE EACH SHIFT
- SCREENING ITEMS SHOULD BE BASED ON CASE DEFINITION
  - INFORMAL SCREENING
    - PLACE FORMS WHERE THOSE GOING INTO FACILITY CAN SEE
  - FORMAL SCREENING
    - DESIGNATE A SCREENING AREA WITH A TRAINED SCREENER
- IN SOME CASES VISITORS CAN/SHOULD BE RESTRICTED

ANTI-INFECTIVE THERAPY, PROPHYLAXIS, AND VACCINATION

- SEVERAL DISEASES THAT MAY OCCUR IN AN INFECTIOUS DISEASE DISASTER HAVE TREATMENT REGIMENS
  - OFTEN TREATMENT REGIMENS NEED TO BE GIVEN EARLY
  - PEP = POST-EXPOSURE PROPHYLAXIS
  - ANTIVIRALS ARE STOCKPILED IN THE CDC'S STRATEGIC NATIONAL STOCKPILE
    - HOSPITALS AND REGIONS SHOULD STOCKPILE ANTIVIRALS AS WELL AS OTHER MEDICAL COUNTERMEASURES TOO
  - VACCINATIONS ARE AVAILABLE FOR SOME DISEASES
  - PRIORITIES FOR PROPHYLAXIS IF SUPPLIES ARE LIMITED
  - POINTS OF DISPENSING (PODS) ARE USED TO ADMINISTER PROPHYLAXIS IN LARGE-SCALE DISASTERS

NON-PHARMACOLOGICAL INTERVENTIONS

- Surveillance/screening
- Patient cohorting
- Staff cohorting
- Visitor restriction
- Hand hygiene
- Respiratory etiquette
- Isolation
  - Surge capacity especially for airborn transmitted diseases
- PPE Use
  - Appropriate Training
  - Stockpiling for surge capacity
- Social distancing
  - Includes Quarantine

QUARANTINE

- SOMEONE WHO HAS BEEN EXPOSED WITHOUT SYMPTOMS SOCIAL DISTANCES, WATCHES FOR SYMPTOMS, AND ISOLATES IF SYMPTOMS DEVELOP
- HOME QUARANTINE, FACILITY QUARANTINE, WORK QUARANTINE
- QUARANTINE SHOULD ONLY BE USED IN DRASTIC SITUATIONS
  - CAN CAUSE PSYCHOLOGICAL STRESS
- COMPLIANCE IS AN ISSUE

INFECTION PREVENTION AND CONTROL WHEN AGENT IS UNKNOWN

- IF PATHOGEN IS NOVEL, FOLLOW CDC GUIDELINES
  - GUIDELINES WILL BE UPDATED FREQUENTLY

Guidelines to Follow if Causative Agent is Unknown	
Respiratory-type Symptoms	Droplet Precautions
Severely Ill/Rapidly Prog. Resp. Symptoms	Airborn Precautions
GI Symptoms	Contact Precautions
Unusual Rash	Contact and Airborn Precautions (Could be Smallpox)
Bleeding Profusely from Multiple Orifices	Contact and Airborn Precautions (Probably Viral Hemorrhagic Fever)
Unusual or Severe Lesion or Wound	Contact Precautions
Enlarged and Very Painful Lymph Node	Contact Precautions if Broken Skin (Possibly Bubonic Plague)
Descending Flaccid Paralysis and Botulism is	No Isolation Necessary

FOOD AND WATER SAFETY

- NOT USUALLY A PRIMARY CONCERN IN AN INFECTIOUS DISEASE DISASTER
- CAN BE A PROBLEM IN SOME BIOTERRORISM ATTACKS
- VETERINARIANS HAVE STARTED COLLABORATING WITH PUBLIC HEALTH
    - SURVEILLANCE OF LIVESTOCK
        - DISCOVER BIOTERRORISM ATTACKS
        - EMERGING ZOONOTIC DISEASES
- ENVIRONMENTAL SAMPLING IF FOOD OR WATER DO BECOME CONTAMINATED

HEALTHCARE WORKER SURGE CAPACITY

- Up to 30% of the community is anticipated to become infected during a pandemic
- Others unwilling to work due to family obligations or fear
- Healthcare workers at a higher risk
- Plan for 40% absenteeism rate during the peak of a pandemic

INCREASING HEALTHCARE WORKER SURGE CAPACITY

- Back-up contracts for obtaining extra staff
- Providing financial and other incentives
- Prioritizing healthcare workers for medical countermeasures and ppe
- Offering medical countermeasures to healthcare workers' family
- Cohorting patients to decrease staff workload
- Cohorting staff
- Cross-training staff to other areas
- Having adequate PPE
- Warning: make sure Healthcare Workers don't work while sick; have a liberal sick-leave policy

DECONTAMINATION

- DECONTAMINATION IS IMPORTANT IN MANY INFECTIOUS DISEASE DISASTERS
  - PATIENT AND ANIMAL DECONTAMINATION
    - PATIENT DECONTAMINATION USUALLY NOT NEEDED; EXCEPTION IS AN ANNOUNCED BIOTERRORIST ATTACK
  - OUTDOOR DECONTAMINATION
    - WHEN DISEASE IS SPREAD BY DIRECT AND INDIRECT ROUTE, AND OUTSIDE HAS GOTTEN CONTAMINATED
    - NOT USUALLY NEEDED FOR BIOTERRORIST ATTACK
      - WIND AND SUNLIGHT KILL AEROSOLIZED AGENTS
  - INDOOR DECONTAMINATION
    - SPORE-FORMING AGENTS OR DISEASE SPREAD BY INDIRECT CONTACT ROUTE MORE CRITICAL TO DECONTAMINATE
  - CHOOSE THE RIGHT DISINFECTANT FOR THE SPECIFIC AGENT

DRILLS

- IMPORTANT TO ASSESS EMERGENCY MANAGEMENT PLANS
- IMPORTANT TO PRACTICE EMERGENCY MANAGEMENT PLANS
- EMERGENCY MANAGEMENT DRILLS NEED TO REGULARLY INCLUDE A BIOLOGICAL AGENT SCENARIO

QUESTION 1:

- WHICH IS NOT A COMMON CHARACTERISTIC OF A BIOTERRORISM AGENT?

a. ABILITY TO BE DISPERSED BY AEROSOL PARTICLES

b. ABILITY TO SPREAD INFECTION, DISEASE, PANIC, AND FEAR

c. FEASIBILITY OF THE AGENTS IF DELIVERED FROM A LINE SOURCE, LIKE AN AIRPLANE, UPWIND OF THE TARGET, TO INFECT LARGE NUMBERS OF THE POPULATION

d. COLORED AGENT SO THAT IT CAN BE SEEN WHERE THE AGENT DROPPED

ANSWER: D

COLORED AGENT SO THAT IT CAN BE SEEN WHERE THE AGENT DROPPED

QUESTION 2:

HOW ARE BIOTERRORISM AGENTS NORMALLY SPREAD? (SELECT ALL THAT APPLY):

a. RELEASING INSECTS CARRYING THE PATHOGEN
b. TAINTING FOOD AND WATER
c. DROPPING SOLID WASTE OUT OF AN AIRPLANE
d. USING AEROSOLIZED AGENTS

ANSWER: A, B, D

RELEASING INSECTS CARRYING THE PATHOGEN

TAINTING FOOD AND WATER

USING AEROSOLIZED AGENTS

QUESTION 3:

HOW HIGH IS THE ATTACK RATE ESTIMATED TO BE DURING AN INFLUENZA PANDEMIC (NON-PEDIATRIC):

a. 15%

b. 25%

c. 30%

d. 50%

ANSWER: C

30%

QUESTION 4:

HOW HIGH IS THE PEDIATRIC ATTACK RATE ESTIMATED TO BE DURING AN INFLUENZA PANDEMIC:

a. 30%

b. 40%

c. 55%

d. 20%

ANSWER: B

40%

QUESTION 5:

WHAT ARE THE 4 PRINCIPLES OF EMERGENCY MANAGEMENT:

a. MITIGATION, PREPAREDNESS, RESPONSE, RECOVERY
b. MITIGATION, PREPAREDNESS, MANAGE, RECOVERY
c. MITIGATION, SURGE CAPACITY, RESPONSE RECOVERY
d. MITIGATION, PREPAREDNESS, TRIAGE, RECOVERY

ANSWER: A

MITIGATION, PREPAREDNESS, RESPONSE, RECOVERY

QUESTION 6:

WHAT TYPE OF ACTIVE SURVEILLANCE IS USED IN DETECTING INFECTIOUS DISEASE DISASTERS?

a. DISEASE SURVEILLANCE
b. SYNDROMIC SURVEILLANCE
c. DETECTION SURVEILLANCE
d. EPIDEMIOLOGIC SURVEILLANCE

ANSWER: B

SYNDROMIC SURVEILLANCE

QUESTION 7:

THE CDC'S STRATEGIC NATIONAL STOCKPILE OF ANTIVIRALS SHOULD BE ENOUGH FOR EVERYONE IN THE CASE OF A PANDEMIC?:

a. TRUE

b. FALSE

ANSWER: FALSE

QUESTION 8:

NON-PHARMACOLOGICAL INTERVENTIONS THAT SHOULD BE USED DURING AN INFECTIOUS DISEASE DISASTER INCLUDE: (SELECT ALL THAT APPLY)

a. PATIENT COHORTING

b. VISITOR RESTRICTION

c. PPE USE

d. HIRING MORE STAFF

ANSWER: A, B, C

PATIENT COHORTING, VISITOR RESTRICTION, PPE USE

QUESTION 9:

DURING AN INFECTIOUS DISEASE DISASTER WHAT IS THE RATE OF ABSENTEEISM THAT IS EXPECTED BY STAFF?:

a. 30%

b. 25%

c. 45%

d. 40%

ANSWER: D

40%

QUESTION 10:

DECONTAMINATION IS ALWAYS NECESSARY FOR PEOPLE EXPOSED TO AN INFECTIOUS DISEASE?:

a. TRUE

b. FALSE

ANSWER: FALSE