Idea 1: Pathogen Detector

- A pathogen detector, similar to a smoke detector or a carbon monoxide detector would monitor for dangerous organisms in the air and detect release of known pathogens.

Pathogen Detector: Importance

- necessity for a detector in public areas
- response to dispersion of pathogens in the air
- reduction of casualties
Pathogen Detector: Impact

- Prompt response → reduces the efficiency of the attacks
- Harder to execute → fewer attempts
- Bottom-up response to attack

Pathogen Detector: Competition

- Microarray of markers for known pathogens (smallpox, anthrax, etc.)
  - "Biochip system" developed at Argonne National Lab
- Biosystem easier to upgrade - no need for complete replacement

Pathogen Detector: Knowns and Unknowns

- Known: pathogen detectors exist and are possible
- Unknowns:
  - number of required detectors in infrastructure
    - balance of economic maintainability and safety
  - maintainability:
    - stable population?
    - ease of/need for replacement?
  - upgradeability of biosystem vs. durability of microarray chips?

Idea 2: Biofilter

- Many pathogens spread and infect healthy people by traveling through air.
**Biofilter: Importance**

- Air circulation for:
  - Quarantine locations
  - Disease free shelters
- General decontamination of air

**Biofilter: Impact**

- Long-lasting shelters and quarantine locations
- Isolation of pathogen-contaminated locations from general population
- Pathogen-proof masks
- General decontamination of air
Biofilter: Competition

- HEPA filters

Biofilter: Knowns and Unknowns

- Unknown:
  - lack of pathogens effect on human immune system
  - Mutability
  - Effectiveness
    - degradation or trapping?
    - in large spaces
  - When to replace

- Unknown: what happens if you get a virus that infects the bacteria in the filter, breaking the filter, and the same virus can hurt humans?
Idea 3: Vaccine

- It takes months or years to develop a vaccine for a known pathogen using codon deoptimization.

Vaccine: Importance

- Vaccines reduce the spread of viruses
- Prevent one outbreak from becoming pandemic
- Technology would be a deterrent
  - fewer attempts at bioterrorism
**Vaccine: Impact**

- Limits infection radius
- Prompt response to new pathogen (natural or manufactured)

**Vaccine: Competition**

- Other vaccine manufacturing methods
- Post-exposure medical treatment
- Immune system boosters (Airborne, multivitamins, Echinacea)
Vaccine: Knowns and Unknowns

- Knowns:
  - This process works (polio vaccine)
  - Useful with or without terrorism

- Unknowns:
  - Will this process yield effective vaccines?
  - How fast does a response have to be?
  - Ensuring that vaccines are not too virulent