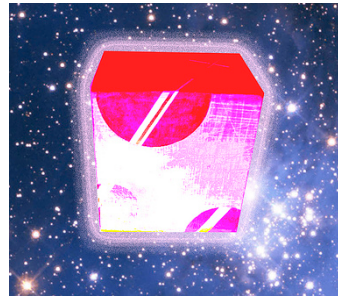


## Idea 1: Pathogen Detector

- 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.



[http://farm3.static.flickr.com/2387/2104157944\\_8521f42647.jpg](http://farm3.static.flickr.com/2387/2104157944_8521f42647.jpg)

## *Pathogen Detector:* Importance

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



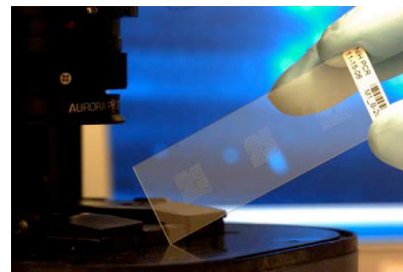
<http://news-service.stanford.edu/news/2005/april20/gifs/anthrax.jpg>

## *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



<http://www.wired.com/science/discoveries/multimedia/2006/11/72149>

## *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.



[http://www.gmleafinc.com/Catalog/Strainers/Strainer\\_Steel.jpg](http://www.gmleafinc.com/Catalog/Strainers/Strainer_Steel.jpg)

## *Biofilter:* Importance

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

## *Biofilter:* Impact

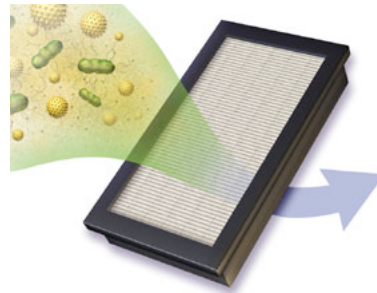
- Long-lasting shelters and quarantine locations
- Isolation of pathogen-contaminated locations from general population
- Pathogen-proof masks
- General decontamination of air



<http://www.otherlandtoys.co.uk/images/vaderSup800.jpg>

## *Biofilter:* Competition

### ■ HEPA filters



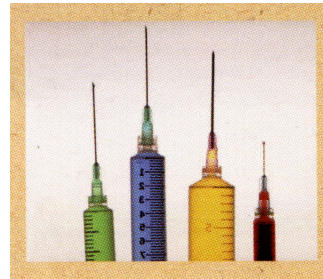
[http://images.healthcentersonline.com/allergy/images/article/HEPA\\_Filter.jpg](http://images.healthcentersonline.com/allergy/images/article/HEPA_Filter.jpg)

## *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.



<http://info.med.yale.edu/eph/eip/pictures/VACCINE.jpg>

## *Vaccine:* Importance

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



<http://www.chse.louisville.edu/graphics/bioterrorism.jpg>

## *Vaccine:* Impact

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



<http://www.libertysteward.com/images/vaccine.gif>

## *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