US ARMY RDECOM

U.S. Army
Edgewood Chemical Biological Center

Innovative Approaches to CB Defense

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

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ECBC Mission/Vision

MISSION: The nation's premier provider of innovative chemical and biological solutions.

VISION: Provider of world class solutions

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Innovation at ECBC

- Creating an adaptive and innovative culture
- Internal investments to fill gaps and find solutions
- Open call to the workforce to pitch their ideas
- Putting a premium on collaboration, both internally and externally

Smaller, Better, Cheaper, Faster

Smaller

- MiniION technology puts sequencing in the palm of your hand

Better

- Super-antibodies to improve performance in austere environments

Cheaper

- Colorimetric paper assays provide low-cost solutions to CB detection

Faster

- Innovative scarf represents the changing face of respiratory protection

SMALLER:

Genomic analysis in the palm of your hand

Nanopore Sequencing for Genomic Analysis

MinION™

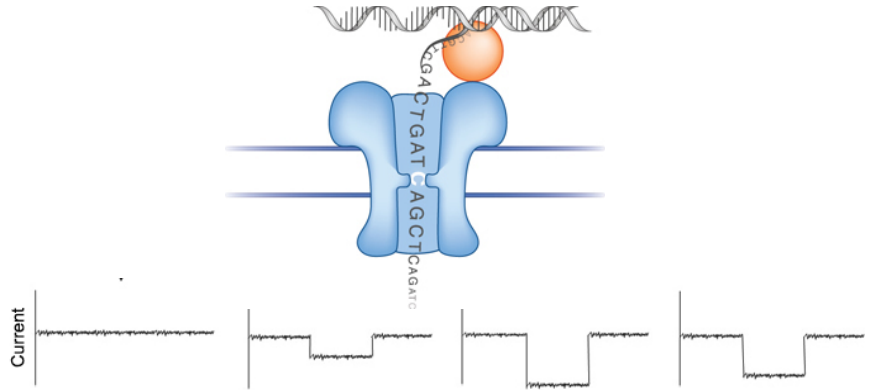
from Oxford Nanopore Technologies

- MinION™ utilizes a protein nanopore, powered and controlled from a laptop
- ECBC is a MinION Access Program (MAP) participant, receiving materials for method and application development during alpha-test phase

Current MinION™ projects:

Viral whole genome sequencing (Ebola)

Fieldable method development for far-forward deployment (universal sample prep, limited library prep, no cold chain, etc.)



BETTER:

Building a Better Antibody

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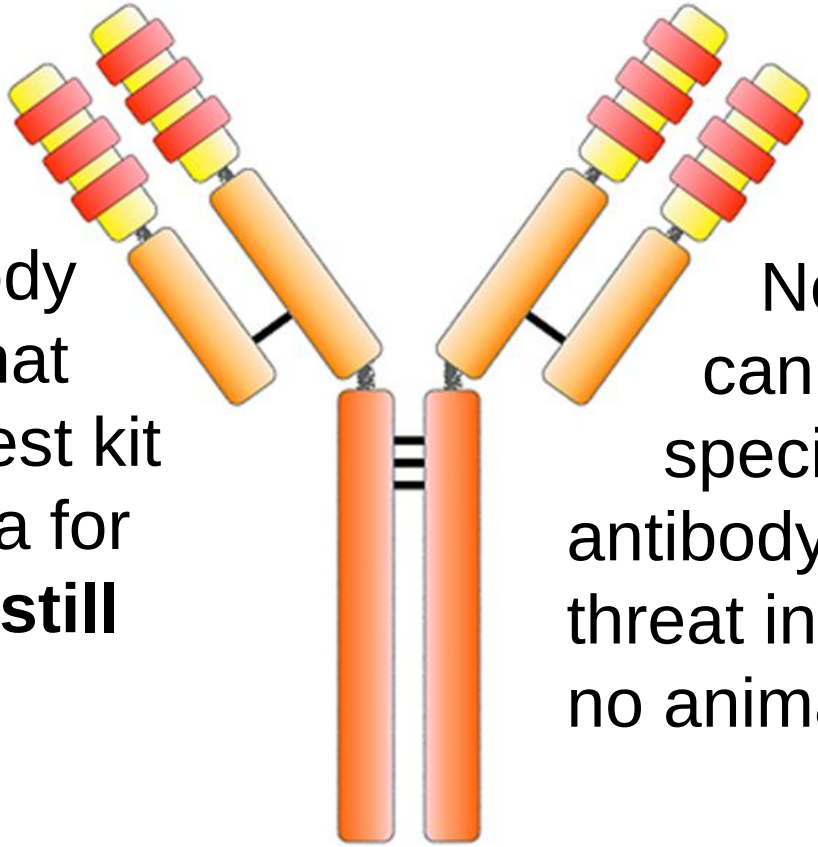
New Thermostable Antibody Detection Assays

Imagine an antibody that is so stable that you can make a test kit that sits in a sauna for three days **and it still works!!!!**

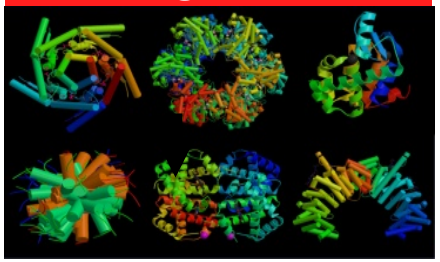


Now imagine you can make a specific super-stable antibody to a new threat in 3-4 weeks with no animals.

From the Lab to the Field!

Molecular Display Technology

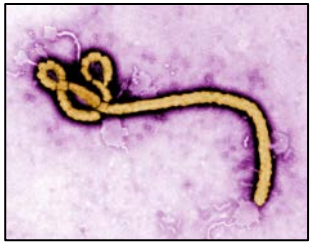
Warfare Agents



New Specific Antibodies

Targets completed:

Ebola
Ricin
SEB
Vaccinia
B. anthracis



….and the list goes on

- No animals are required!
- Fast generation of specific antibodies.
  - In as little as 3-4 weeks
- Thermostable antibodies that do not require cold chain.
  - no refrigeration ever required
  - shelf-life >20 years
- Cheap and portable assays for use in the field.
  - rain or shine, hot or cold

CHEAPER:

Low-cost Detection Solutions

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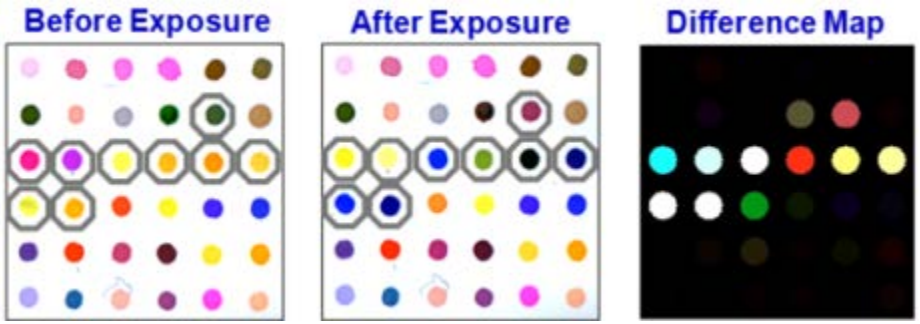
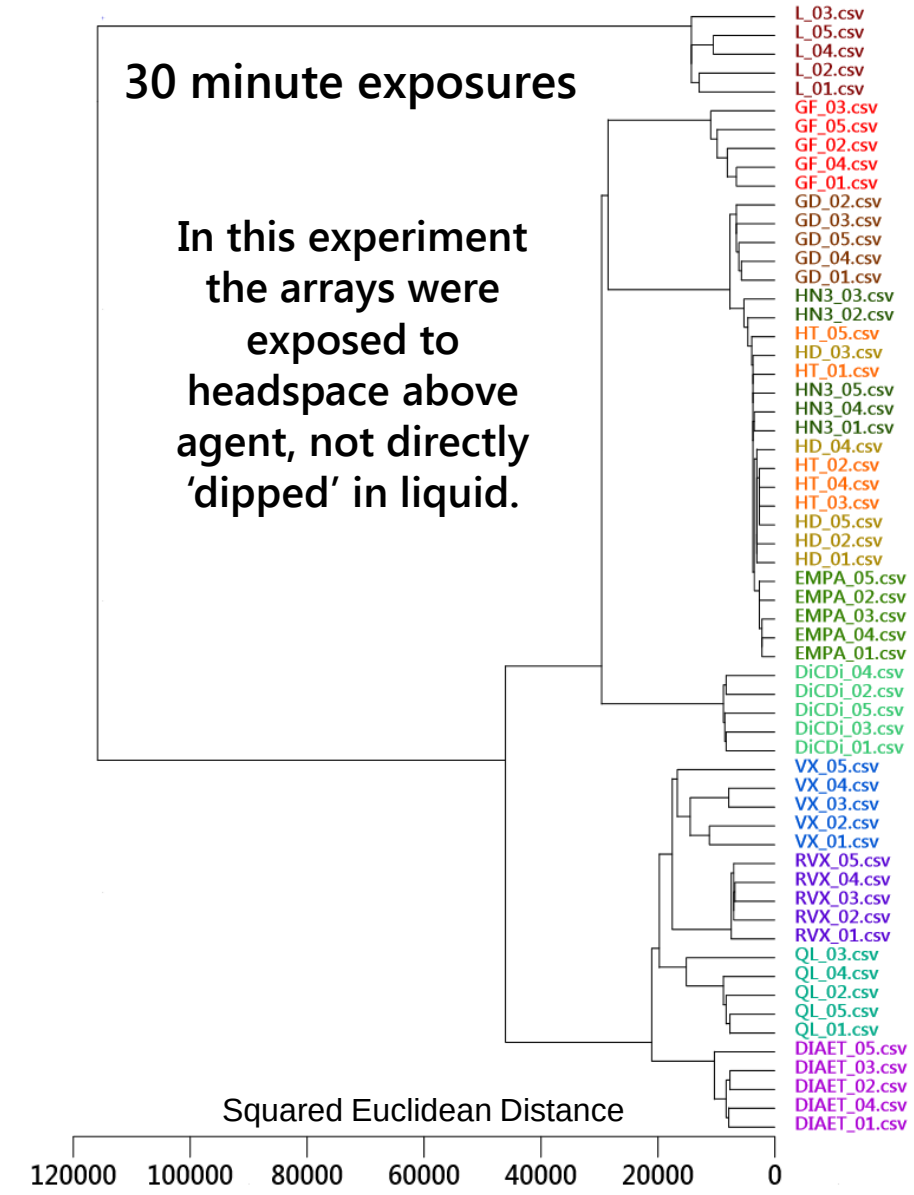
Low-cost Colorimetric CB Detection

- Paper Assays are multiplexed chemical assays that cost 12
- Numerous printed dots on a small (≈1 in^2) piece of paper
- Each dot a unique indicator dye, responds to a different chemical moiety or property.
- Pattern of dots gives unique fingerprint to identify agent
- Paper Assays can detect both chemical and biological agents



Accurate Detection of Chemicals

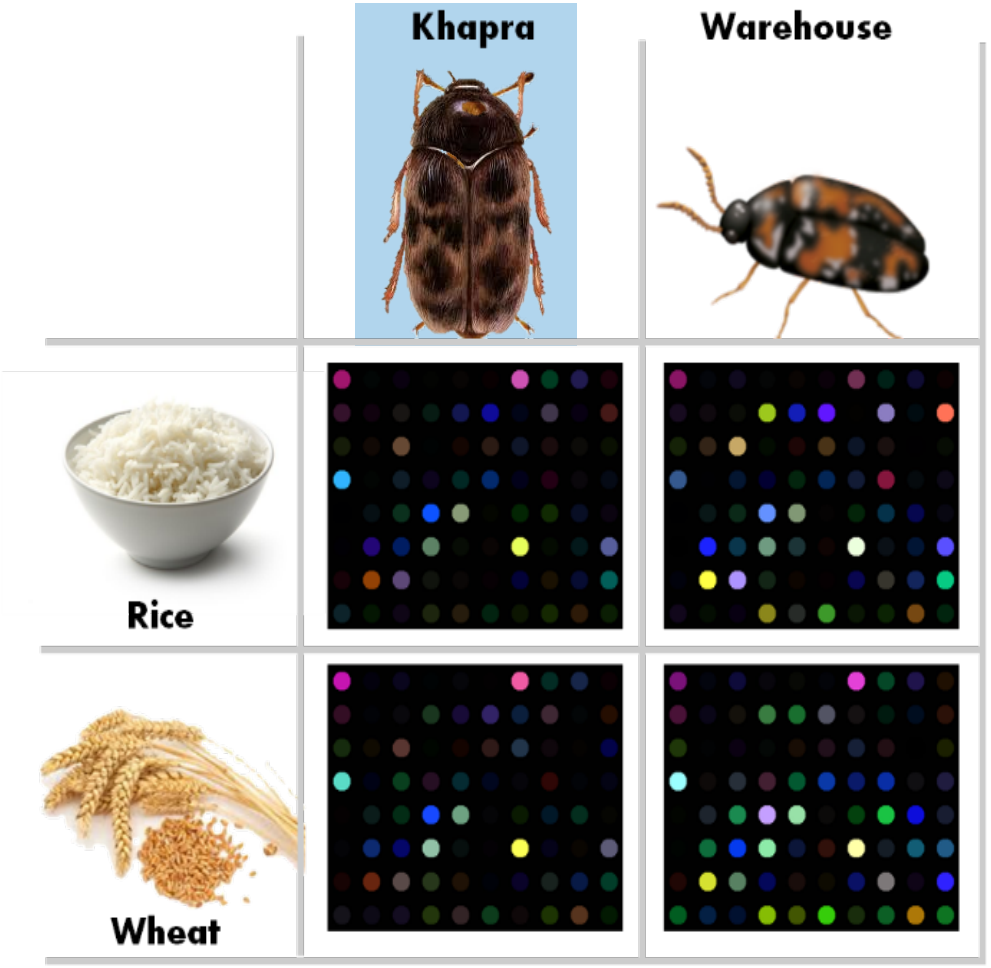


- Paper arrays distinguish VX, GF, HD, GB, from precursors
- Agent patterns are stored in a database for rapid identification
- Not spoofed by interferrants
- Can work on vapor but also by direct contact with liquids
- Being integrated into sampling kits and other remote devices
- Can communicate results to Smartphone or to the cloud

Accurate Detection of Biologicals

Building a library of colorimetric sensor color changes to identify signatures of pests found in grain crops

- *What are the unique signatures of insects?*
- *Can we distinguish between insect types?*
- *Do signatures vary based on food source?*



Remote Inspection of Shipping Containers

Problem: Opening agricultural commodity crates infested with microorganisms and pests risks exposing unspoiled produce handled within the same shipping or processing facilities.

Solution: Construct a Volatile Organic Compound (VOC) signature library using existing colorimetric sensing arrays to create a wireless "contamination indicator system" for agricultural imports.

- ✓ Inexpensive, disposable "VOC Reader"
- ✓ Placed within a crate prior to shipment
- ✓ Queried by a smart phone from up to 25 feet away
- ✓ Allows inspectors to assess food security and quality *without having to open the container*

FASTER: *The face of innovation in respiratory protection*

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Integrated Respiratory and Eye Protective Scarf (IREPS)

Summary: Mission essential head borne components do not integrate well with traditional full-facepiece air-purifying respirators that can fit on all types of faces. Create a traditional mask that could be donned quickly and without helmet removal.

Innovation: Development of an easily deployed Integrated Respiratory and Eye Protective Scarf that offers bearded user protection against particulates and RCA vapors, maintains head-borne equipment compatibility and maximize user input.

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In Conclusion

ECBC prides itself in its ability to make CB Defense equipment that is *smaller*, *better*, *cheaper*, and *faster* than current products used by our warfighters, allies and first responders.

Questions?

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