

Biodetection Tools for First Responders

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NONSPECIFIC BIOLOGICAL TESTS

Key Features

- Low specificity/low sensitivity
- Some white powders can impact detection limit up to 5X resulting in false negatives
- Some white powders can cause false positives



Protein Test

- Detects ANY type of protein
- Manual read of color change for protein and pH
- High ease-of-use
- Time-to-result: ~5 minutes
- Detection limit: 10 million-100 million *Ba* spores
- Assay cost: \$42
- 12 month shelf life
- Biocheck (20/20 BioResponse)
- HazCat (Haztech Systems)



ATP Test

- Tests if ANY bacterial cell is present and alive
- Differentiates bacteria from skin cells and yeast
- Does not detect ricin or bot (*immunoassay strips available*)
- Time-to-result: 20 Minutes
- Detection limit: ~10,000 *Ba* spores
- Luminometer reader cost: \$5k
- Assay cost: \$5
- 12 month shelf life
- Profile-1 (*New Horizons Diagnostics*)



DNA Test

- Detects ANY type of DNA
- 3-plex separate immunoassay ticket included for ricin/bot/SEB
- Uses a fluorescence reader
- High ease-of-use
- Time-to-result: ~5 minutes
- Detection limit: 1 billion-10 billion *Ba* spores
- Instrument cost: \$12k
- Assay cost: \$200 (*microbe + toxins*)
- 12 month shelf life
- Prime Alert (*GenPrime*)



FTIR Spectroscopy

- Detects ANY type of protein
- High instrument and upgrade costs (\$35k-95k)
- No consumables
- Moderate ease-of-use; mixtures difficult to interpret
- Time-to-result: <5 minutes
- Detection limit: ~10% protein content in sample
- HazMatID (*Smiths*); TruDefender (*Thermo*)

NOTE: The infectious dose of *Bacillus anthracis* (*Ba*) is ~ 8,000-50,000 spores, but can be much lower for immuno-compromised individuals

Technologies listed above are for illustrative purposes only and do not include all variations of available products.

IMMUNOASSAY

Key Features

- Moderate specificity/moderate sensitivity
- Occasional false positives (*powder interferences*) and false negatives (*powder interferences and hook effect*)
- High ease-of-use
- Available for a wide range of pathogens and toxins
- Time-to-result: 5-15 minutes
- Detection Limit: ~100,000-10 million *Ba* spores
- 12-24 month shelf life



Single Test

- Assay cost: ~\$25-30
- Reader cost: \$5k-10k
- Reader improves sensitivity and accuracy and may help to identify a hook effect condition
- BADD (*Advnt*); BioDetect (*Alexeter*); many others



Multiple Test

- 3 to 8-plex tickets
- Assay cost: ~70-\$100
- Pro Strips (*Advnt*); RAID (*Alexeter*), others
- 5-plex tickets with Reader (\$7.5k)
- NIDS (*Smiths*)



Automated Systems

BIOSENSOR 2200R (MSA)

- 2-plex (*Ba, ricin*)
- Detection limit: ~10,000 spores
- \$16k
- Assay cost: \$50

RAPTOR (*Research Int.*)

- 4-plex
- \$49.5k
- Assay cost: \$200

POLYMERASE CHAIN REACTION (PCR)

Key Features

- Highest specificity and sensitivity technology
- Time-to-result: 30-60 minutes
- Detection limit: TBD (100-1,000 spores)
- Single use disposable assay cartridges



- 6 sample ports, 1 threat per sample
- Instrument cost: \$45k
- Assay cost: \$30
- Assay shelf life: 18 months
- BioSeq PLUS (*Smiths Detection*)



- 4 sample ports, 1 threat per sample
- Instrument cost: \$16k
- Assay cost: \$12
- Assay shelf life: 12 months
- T-COR 4 (*Tetracore*)



- 1 (10 threat test) or 2 (single threat test) sample ports
- Instrument cost: \$38k
- Assay cost: \$180-\$200
- Assay shelf life: 6 months
- RAZOR EX (*Idaho Technologies*)



- 1 sample port
- 17 tests per sample
- Instrument cost: \$49k
- Assay cost: \$180
- Assay shelf life: 6 months
- AC powered (*potential future development of fieldable version*)
- FilmArray (*Idaho Technologies*)

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