



Proficiency Testing for Biological Agents

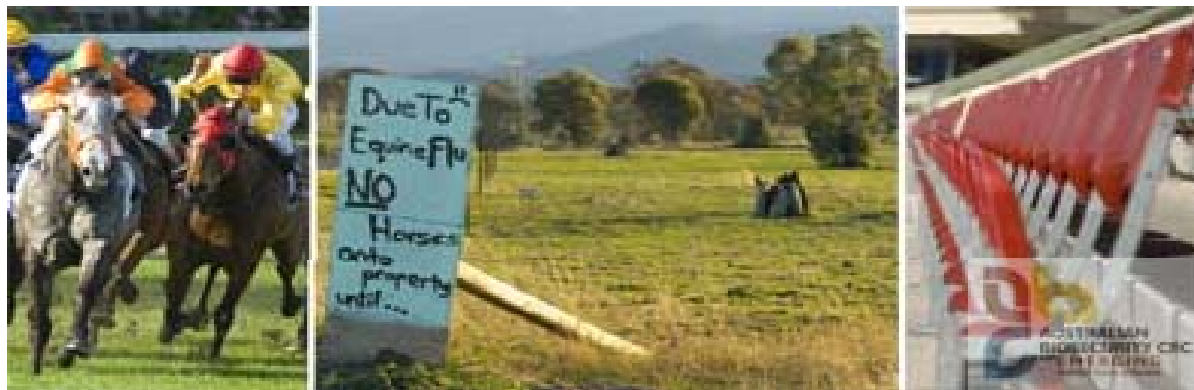


RCPA BioSecurity QAP



BioSecurity

Protection from biological harm:
the protection of the economy, environment,
and health of living things from diseases, pests
and bioterrorism





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There are three paths to obtaining a biological agent :

- ❖ Harvest it from nature
- ❖ Obtain it from a research centre
- ❖ Create it by either modifying another pathogen or synthesizing it from its obtainable components.



Source: Northern News Service online August 2010



Photo courtesy of Greg James, ICPMR, Westmead Hospital

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- ❖ Who are we?
- ❖ What is the program about?
- ❖ What is the content of surveys?
- ❖ Who are the participants ?
- ❖ Benefits of the program ?
- ❖ Future developments?

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Who are we;

- ❖ RCPA BioSecurity QAP;

Utilising a grant from the Australian Government Department of Health and Ageing (DoHA) to establish a proficiency testing program for biological agents.

- ❖ Staff of 3;

- ❖ Program Manager
- ❖ Senior Hospital Scientist (PhD)
- ❖ Development Scientist (PhD)

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Who are we?

Chair;

- ❖ Professor William Rawlinson, Director of Virology, SEALS Microbiology, Prince of Wales Hospital

Collaborators;

- ❖ Institute Clinical Pathology and Medical Research - NSW
- ❖ Queensland Health Forensic and Scientific Services - QLD
- ❖ Pathwest - WA
- ❖ Microbiological Diagnostic Unit - VIC
- ❖ Victorian Infectious Diseases Reference Laboratory - VIC
- ❖ Elizabeth MacCarthur Agricultural Institute - NSW

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What is the program about ?

- ❖ Commenced in June 2009 preparing surveys and reports for the proficiency testing of *Bacillus anthracis*
- ❖ Available to laboratories within Australia with the appropriate containment facilities
- ❖ Nine surveys will be offered in 2011 for 2 bacteria and 2 toxins
 - ❖ *Bacillus anthracis* (Anthrax)
 - ❖ *Yersinia pestis* (Plague)
 - ❖ Ricin
 - ❖ Botulism toxin
- ❖ An online version of the *B.anthraxis* module for non PHL in 2011
- ❖ Commence charging for the program
 - ❖ \$1,500 for all 9 surveys or \$500/module or analyte
 - ❖ Online version will be a pilot module - free of charge in 2011

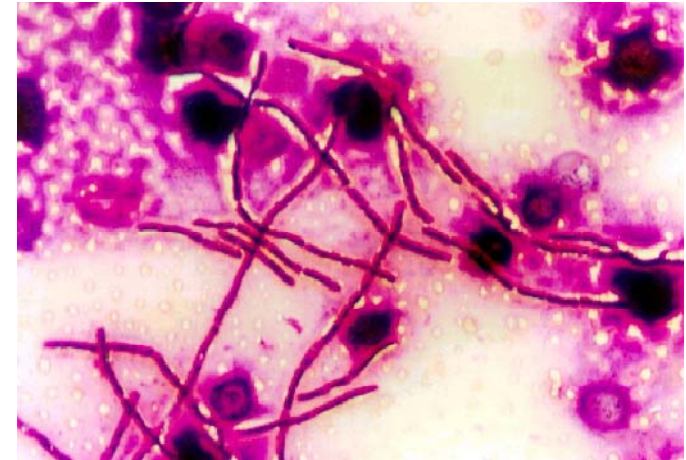
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What is the content of the surveys?

Options for surveys:

- ❖ Vaccine strains, surrogates
- ❖ Cultures - pure or mixed
- ❖ Clinical isolates – real or simulated
- ❖ Genetically modified microorganisms
- ❖ Environmental e.g. Decontamination samples
- ❖ White powders containing biological or inert materials
- ❖ Bioterrorism scenarios - each field receives different specimens
- ❖ Surveys with commercially available biothreat detection systems
- ❖ Nucleic acid preparations for testing using molecular techniques
- ❖ Virtual microscopy images
- ❖ Slides for staining
- ❖ Toxins – powder or liquid form
- ❖ Specimen free modules online



from: Gurcan et al. (2005) Yonsei Medical Journal
46 (1): 159 - 160

Note: The BioSecurity QAP will ensure that ALL survey material will be avirulent e.g. avirulent forms of SSBA or surrogate organisms.

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Results excerpt from the
Morphology Tests -
BioSecurity QAP Survey
A3:2010

Colony
Tenacity

| Tenacious | Not Tenacious |
|---------------------------|---------------|
| A, B, C, D, F, G, H, I, J | E |

Gram Stain

| Gram Positive | Gram Negative |
|------------------------|---------------|
| A, C, D, E, F, G, H, I | |

Shape of
Bacteria

| Bacilli | Cocci | Coccobacilli |
|------------------------------|-------|--------------|
| A, B, C, D, E, F, G, H, I, J | | |

Bacterial
Arrangement

| Chains | Clusters | Pairs | Single |
|---------------------------|----------|-------|--------|
| A, B, C, D, F, G, H, I, J | | | E |

Spores Present

| Present | Absent |
|---------------------|--------|
| A, C, F, G, H, I, J | D, E |

Spore Shape

| Oval | Round | Elliptical |
|----------------|-------|------------|
| C, F, G, H, I, | | A, J |

Spore Location

| Central | Sub-terminal | Terminal |
|---------|---------------|----------|
| C, H, J | A, C, F, G, I | |

Sporangium
Swollen

| Yes | No |
|-----|---------------|
| | A, F, H, I, J |

Parasporal
Bodies

| Present | Absent |
|---------|------------|
| | A, F, H, J |

Motility

| Motile | Non-motile |
|--------|------------------------|
| J | A, B, C, D, E, F, G, H |

Haemolysis on
Blood Agar

| α haemolytic | β haemolytic | Non-haemolytic |
|---------------------|--------------------|---------------------------|
| | D | A, B, C, E, F, G, H, I, J |

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| Participant | Gene Targeted | Result |
|-------------|-------------------------------|--------------|
| A | BA1 | Detected |
| | BA2 | Not detected |
| | BA3 | Detected |
| B | capC (capsule) | Detected |
| | cya (oedema factor) | Not detected |
| | lef (lethal factor) | Not detected |
| | pagA (protective antigen) | Not detected |
| | Ba813 (chromosomal factor) | Detected |
| | cry1 | Not detected |
| | cry2 | Not detected |
| C | Ba813 (chromosomal marker) | Detected |
| | lef (lethal factor) | Not detected |
| | cya (oedema factor) | Not detected |
| | pagA (protective antigen) | Not detected |
| | capC (capsule) | Detected |
| D | Ba813 (chromosomal marker) | Detected |
| | lef (lethal factor) | Not detected |
| | capC (capsule) | Detected |
| | Ba_5345 | Detected |
| E | capB | Detected |
| | pagA | Not detected |
| F | capB (capsule) | Detected |
| | pagA (protective antigen) | Not detected |
| | cry1 (B thuringensis crystal) | Not detected |
| G | Ba813 (chromosomal marker) | Detected |
| | capC (capsule) | Detected |
| | pagA (protective antigen) | Not detected |
| H | capB (capsule) | Detected |
| | pagA (protective antigen) | Not detected |
| I | cya (oedema factor) | Not detected |
| | lef (lethal factor) | Not detected |
| | pagA (protective antigen) | Not detected |
| | capC (capsule) | Detected |
| | rpoB (chromosomal marker) | Detected |

Results excerpt from the
Nucleic Acid Testing
(NAT) BioSecurity QAP
Survey A3:2010

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Who are the participants?

- ❖ Public Health Laboratories (PHL)
- ❖ Veterinary Laboratories
- ❖ Forensic Laboratories
- ❖ Armed Forces

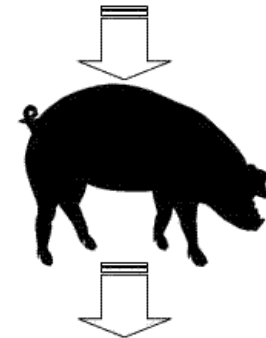


Go to Office located at: _____
Or call _____ at phone number: _____

Biosecurity Risks

Potential Points of Disease Vector

| | |
|--|-------|
| Pigs | Feed |
| Semen | Water |
| Supplies | Air |
| Equipment | |
| Recycle Water | |
| Pests (insects, rodents etc.) | |
| People (including shoes, clothing, etc.) | |



Potential for Transmission

Pigs (including weaners, market hogs, gilts, culls etc. and deadstock)
Semen
Equipment
Used Supplies
Pests (insects, rodents etc.)
People (including shoes, clothing etc.)
Air
Manure

Future participants;

- ❖ Non PHL
- ❖ Routine Diagnostic Laboratories

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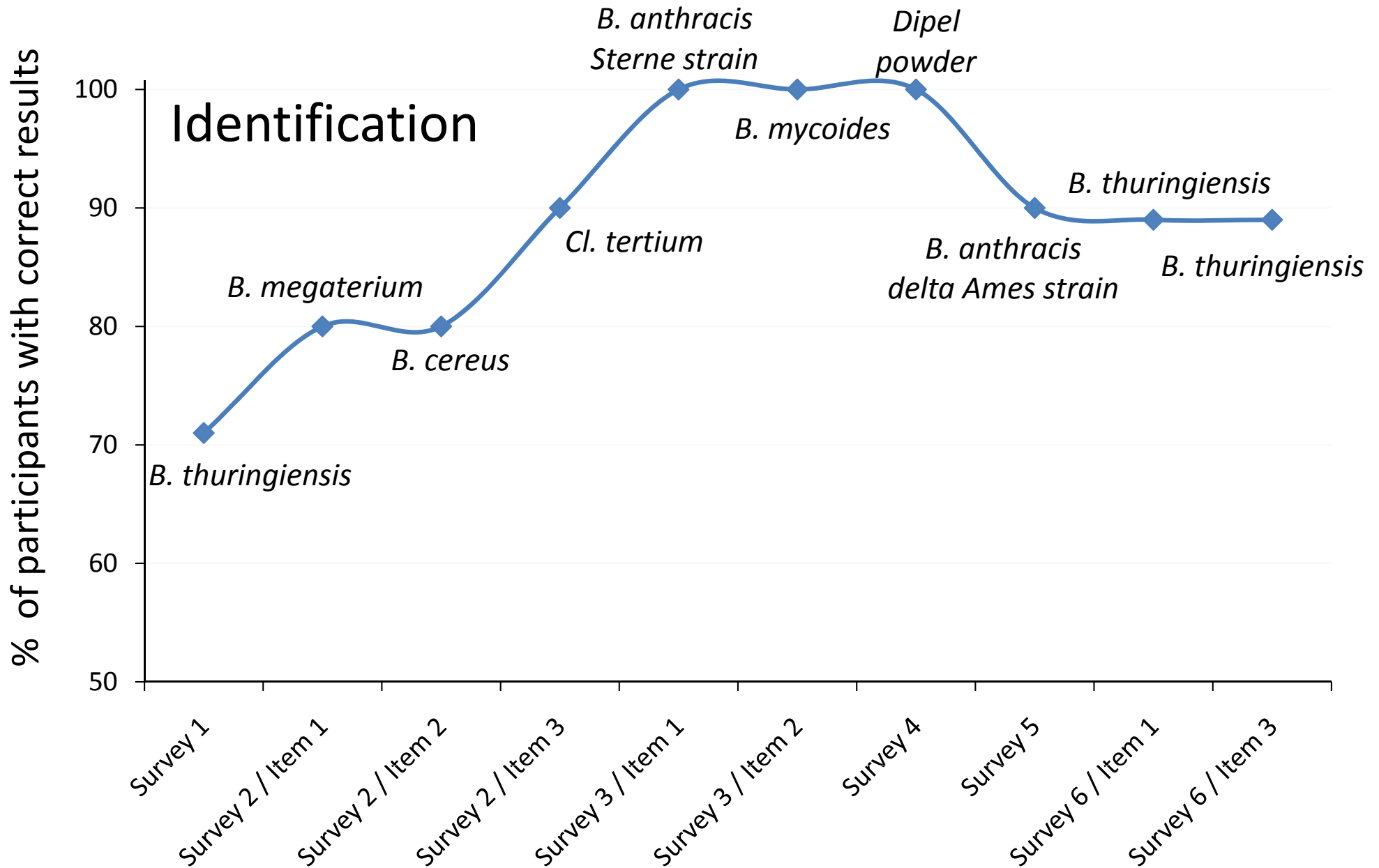
Benefits of the program?

- ❖ Confidence to confirm or rule out SSBA
- ❖ Ability to characterise SSBA
- ❖ Establish antibiotic profiles
- ❖ Understand and comply with SSBA regulatory scheme
- ❖ Gain knowledge in biosecurity/bioterrorism
- ❖ Insight into emerging and developing technologies



Source: WHO Smallpox slide set

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What is the content of the surveys?



The tenacious nature of *B. anthracis* colonies allows them to stand up when teased with a loop.

(Photo courtesy of John Bates, Queensland Health Forensic and Scientific Services)

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Benefits of the program ?

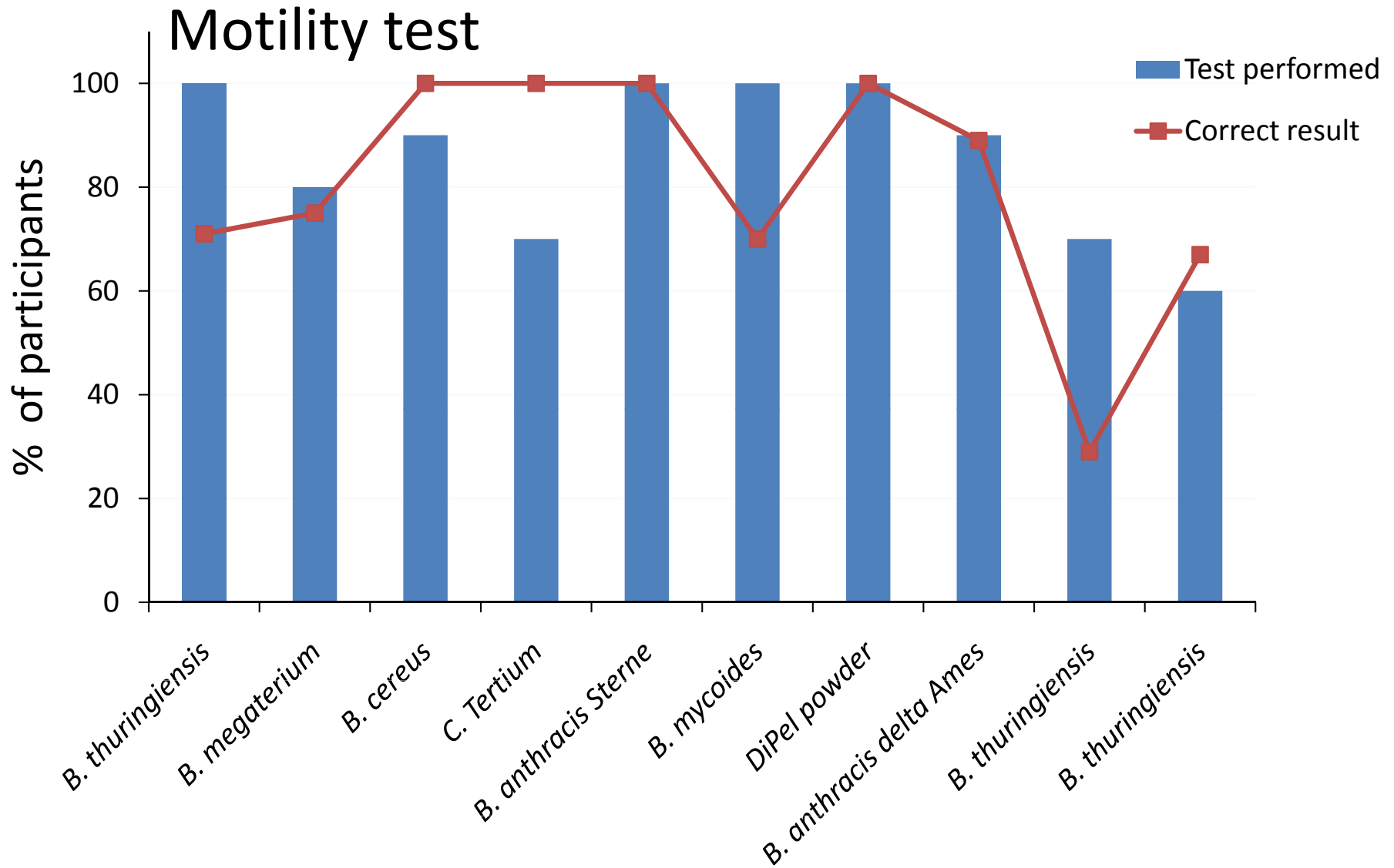
Identified problem areas;

- ❖ Motility testing – important for identification
- ❖ Antibiotic profiling – important for treatment and prophylaxis
- ❖ Testing regimes – varied depending on molecular testing reliance
- ❖ Reporting mechanisms

New opportunities for improvement;

- ❖ Timely reporting

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- ❖ RCPA QAP , in consultation with the DoHA, may consider expanding the program to other biological agents in the future e.g.
 - ❖ *Ebolavirus*
 - ❖ *Foot-and-mouth disease virus*
 - ❖ Highly pathogenic influenza virus, infecting humans
 - ❖ *Marburgvirus*
 - ❖ *Rinderpest virus*
 - ❖ SARS coronavirus
 - ❖ *Variola virus* (Smallpox)
 - ❖ *Francisella tularensis* (Tularaemia)
 - ❖ *Burkholderia pseudomallei* (Meliodosis)
 - ❖ *Coxiella burnetti* (Q Fever)

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