

# Brucella "Lessons learnt"

## Introduction

Brucella is a class 3 organism and as such poses a high risk to laboratory workers; it has been implicated as a potential agent of bioterrorism. In 2007, LabPLUS isolated three Brucella species from blood cultures and tissue. This led to a strict protocol being introduced to minimize risk of exposure to Brucella species. In May 2013, we isolated a further *Brucella suis* which initially did not meet the criteria for performing all manipulations in a biosafety cabinet. This led to staff exposure procedures being put into action and an additional step being added to our current protocol.

## Background

Brucellosis is a zoonosis usually transmitted to humans by contact with infected animals and consumption of contaminated animal products. The disease is one of the most common causes of laboratory transmitted-infection with 2% of all cases being laboratory acquired. The reason brucellae are easily transmissible to laboratory workers is mainly due to its low infective dose and the way it enters the body primarily through respiratory mucosa, conjunctivae, gastrointestinal tract, or abraded skin (1).

## 2013 Brucella case

- 54 year old Tongan Male
- August 2006 seen in Rheumatoid clinic 3-4 year history Left knee pain attributed to osteoarthritis Rx flucloxacillin
- Admission November 2011 pain and swelling left knee - unsuccessful aspiration
- 20<sup>th</sup> May 2013 Total knee joint replacement
- 24/5/13 Positive blood culture: Gram negative coccobacillus seen

## What happened next

### Day 1

- Blood culture plates examined in biohazard safety cabinet as per protocol. Isolate Oxidase negative so protocol not required and processed on open bench.
- Biomerieux VITEK MS = no valid identification

### Day 3

- Repeat Oxidase test = Positive
- API 20 NE possibility of Brucella species

### Staff exposure procedures put into action

### Day 4

- Sent for DNA sequencing (Brucella species suspected)

### Day 18

- Sent to Ministry for Primary Industries for confirmation
- Isolate confirmed as *Brucella suis* biovar 1

## Identification tests for brucella species

Specimens suitable for investigation are Blood, bone marrow, pus, synovial fluid, tissue, CSF, urine and genital exudates.

- Small gram negative bacillus (coccobacilli poor staining)
- Oxidase and Catalase positive
- Urea positive in 15mins-24hours
- Can be mis-identified as *Moraxella phenylpyruvica*
- Detection of agglutinating antibodies using an overnight Serum Agglutination Test (SAT)

## Symptoms

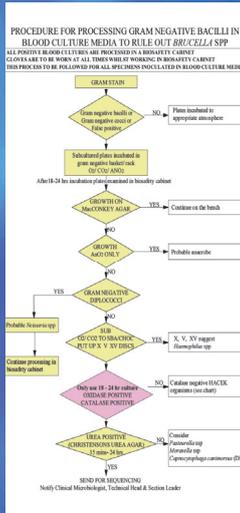
- Fever (undulating)
- Headache
- Arthralgia
- Night sweats
- Malaise
- Muscle aches

## Incubation period

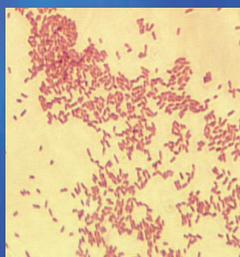
Ranges from 1-3 weeks to several months.



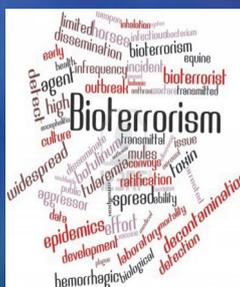
Transmitted from pigs, cattle, sheep, goats, pigs and camels through contact with blood, placenta, fetuses or uterine secretions, or consumption of contaminated animal products



Blood culture Current Laboratory Protocol



Brucella suis seen in Gram stain



Risk Group 3 Potential agent of Bioterrorism



Class 2 safety cabinet

## Laboratory exposure protocol

### High risk exposures classified as:

- Individuals who have performed a specifically implicated practice (e.g. sniffing bacteriological cultures, direct skin contact, present when aerosols have been generated).
- Individuals who were near (<5 feet) if work was performed with Brucella species on an open bench.
- Individuals in the laboratory during aerosol generating event.

### Low risk exposure classified as:

- Other staff in the laboratory at the time of manipulation on an open bench but who do not have high-risk exposures as defined above.

Occupational health to ensure followed up of all laboratory workers in high risk category and staff in low risk category should be noted in their occupational health records (2).

## Treatment

Oral doxycycline and rifampicin for 6 weeks, or a combination of oral doxycycline for 6 weeks and gentamicin or streptomycin for the first 2 weeks. Pregnant women trimethoprim-sulfamethoxazole for 6 weeks and complicated or life threatening clinical manifestations, such as endocarditis or meningitis require the use of 3 drugs (3).

## Prevention

- Raise awareness
- Occupational hygiene
- Food-safety measures
- Laboratory safety

## Conclusion

This experience has been a valuable lesson to us and has shown that suspicious Brucella cultures may require at the very least 18-24 hours growth on plate before a valid Oxidase result should be accepted. Awareness needs to be made that *Brucella suis* is not actually in the Biomerieux MS database. Strict adherence and enforcement of standard precautions are critical when Brucella is suspected and will help to reduce the chance of laboratory worker exposures. It is strongly recommended to follow-up directly exposed workers and give prophylaxis where necessary.

## Bibliography

Cowan and Steel's. 2003. Manual for the Identification of Medical Bacteria. 3<sup>rd</sup> Edn. Cambridge: Cambridge University Press

Mandell G. et al., 1995. Principles and Practice of Infectious diseases. 4<sup>th</sup> Edn. New York : Churchill Livingstone

## References

1. Young EJ. Brucella species. In: Mandell GL, Bennett JE, Dolin R, editors. Mandell, Douglas and Bennett's principles and practice of infectious diseases. Philadelphia: Elsevier, Churchill, Livingstone; 2005. p. 2669-74.
2. Procedural Checklist to follow after a laboratory exposure to Brucella spp. <[http://www.hpa.org.uk/Webs/HPAwebfile\\_C/1263812749489](http://www.hpa.org.uk/Webs/HPAwebfile_C/1263812749489)> [Accessed 14th June 2013]
3. Greenfield RA, Drevets DA, Machado LJ, Voskuhl GW, Cornea P, Bronze MS. Bacterial weapons and agents of bioterrorism. Am J Med Sci. 2002;323:299-315.

## Images

Wild hog [Online image] available from: <[http://www.cdc.gov/brucellosis/pdf/brucellosis\\_and\\_hoghunters.pdf](http://www.cdc.gov/brucellosis/pdf/brucellosis_and_hoghunters.pdf)> [Accessed 10<sup>th</sup> June 2013]

Brucella flow chart: LabPLUS blood culture processing manual owned and maintained by Mary Bilkey Section leader Microbiology

Brucella Gram stain [Online image] available from: <<http://doh.sd.gov/lab/resources/bt/Brucella/gram.aspx>> [Accessed 14<sup>th</sup> June 2013]

Bioterrorism [Online image] available from: <[http://www.123rf.com/photo\\_16498404\\_abstract-word-cloud-for-bioterrorism-with-related-tags-and-terms.html](http://www.123rf.com/photo_16498404_abstract-word-cloud-for-bioterrorism-with-related-tags-and-terms.html)> [Accessed 14<sup>th</sup> June 2013]

Class 2 safety cabinet [Online image] available from: <[http://www.allometrics.com/products/products\\_biological\\_safety\\_cabinets.html](http://www.allometrics.com/products/products_biological_safety_cabinets.html)> [Accessed 3<sup>rd</sup> Nov 2007]