Occupationally Acquired Melioidosis in the Darwin Prospective Melioidosis Study (DPMS)

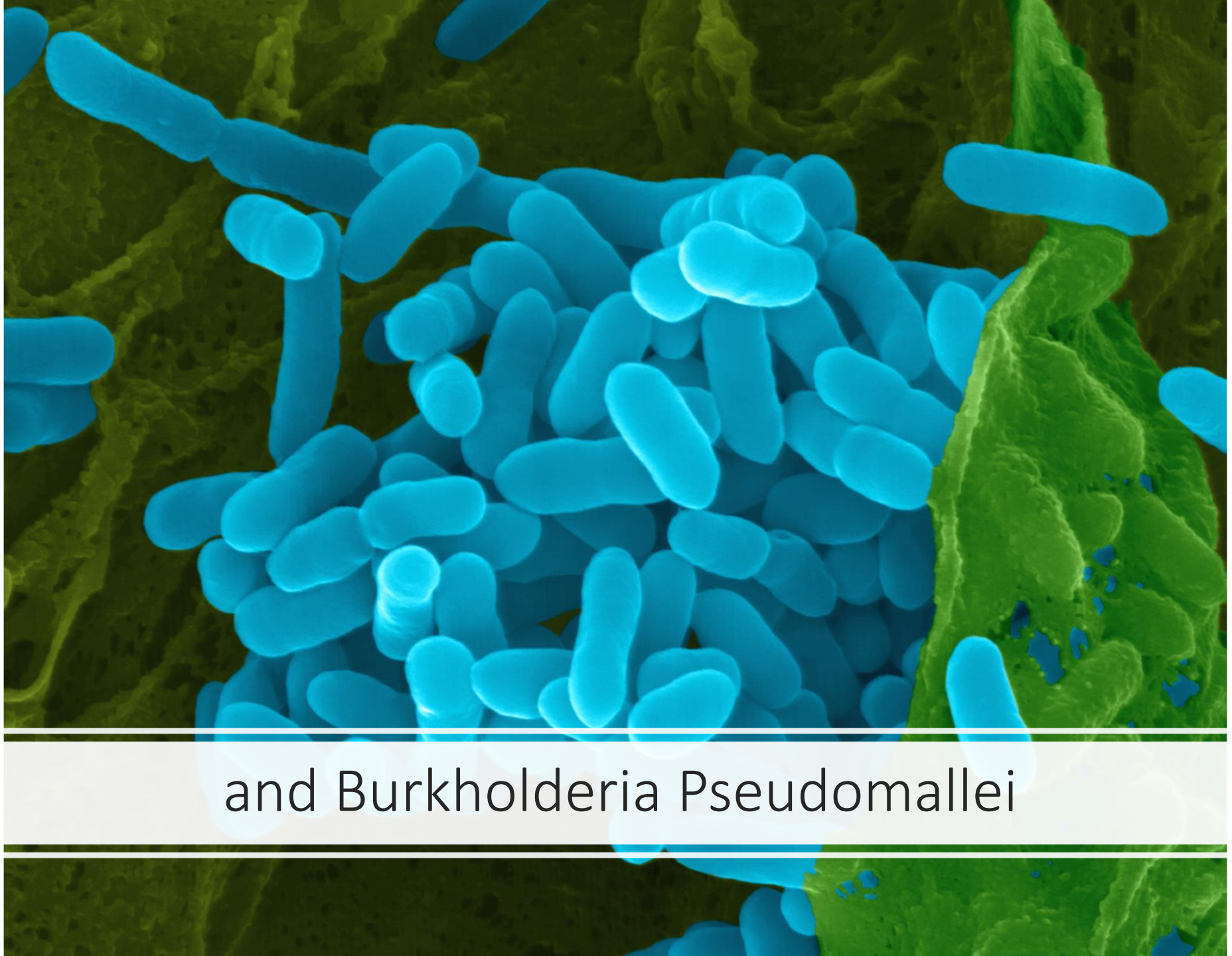
Ramazinni Presentation

Dr Rebecca Dingle

The Top End of Australia is home to many great things

The Northern Territory also has a few hazards....

Crocodile surfing at Nightcliff beach



and Burkholderia Pseudomallei

Melioidosis

- The clinical syndrome caused by Burkholderia Pseudomallei [1,2,3]
- Notifiable condition in the Northern Territory
- Associated with a diverse range of clinical presentations [1,2,3]
- Serious and common cause of pneumonia presentations at the Royal Darwin Hospital[1,2,3]
- Potentially fatal with mortality rate of between 10% and 50% [1,2,3]
- Melioidosis is seasonal [1,2,3]

Inoculation can occur through [1234] :

- Inhalation
- Ingestion
- Percutaneous/ dermal contact

Established risk factors[(1,2,3)]:

- Diabetes (Type 1 and 2)
- Chronic lung disease
- Chronic renal disease
- Congestive heart failure
- Rheumatic heart disease
- Hazardous alcohol ingestion

Occupational Melioidosis in the DPMS

- The aim of this study was to further assess the cases with an occupational exposure in the DPMS and describe the epidemiology of occupationally acquired melioidosis.

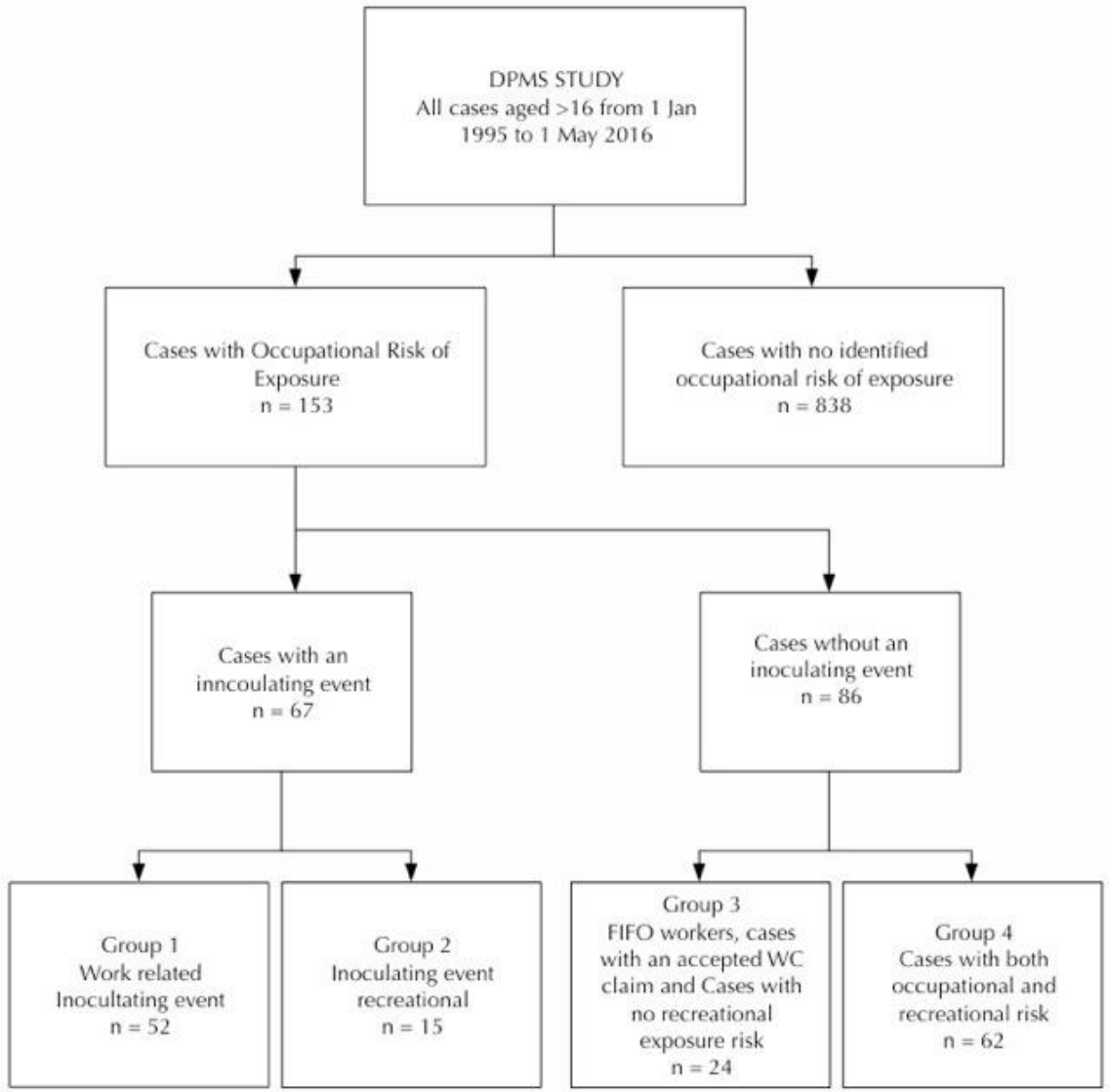
Method

- Cases were obtained from the Darwin Prospective Melioidosis Study cohort
- All cases with a documented occupational risk between 1 Jan 1995 to the 1st of May 2016 were identified and reviewed
- Cases were considered to have an occupational risk if work activities or environment placed the subject at risk of exposure to B. pseudomallei through exposure to wet soil, water, dust and storm/monsoon conditions.

Method

- This resulted in the identification of 153 cases with an occupational risk, of which 67 cases had an identified inoculating event and 52 cases where the inoculating event was most likely work related.

Case Allocation



Method

- Cases with an identified occupational risk and cases with a work related inoculating event were compared to all other cases in the DPMS until 2016.
- Bivariate and multivariate analysis was performed for patient demographics, risk factors and outcomes (death and clinical presentations) for patient demographics and risk factors.

Demographics-Age

All Cases with any occupational risk

- No statistical difference in age median age 49 (IQR 38-57) compared to 49 (IQR 38-60)(p 0.109)

Cases with a specific inoculating event

- Younger – average age 41(IQR 32-55) compared to 49 (IQR 38-60) in the non-occupational risk group

Demographics - Gender

Less likely to be female in both groups

- in any occupational risk group - OR 0.21 (95%c1 0.11-0.375, p<0.001), and
- in those with a specific inoculating event.

OR 0.2 (95% CI0.07-0.49, p 0.001)

Demographics - Indigenous Status

Less likely to be indigenous in both groups

- any occupational risk - OR 0.2 (95% CI0.07-0.49, p 0.001)
- Specific inoculating event - OR 0.14 (95% CI 0.06-0.31p<0.001).

Risk Factors: No other risk factors

Occupational risk group

- 19% had no risk factors and in the group with an

Occupational inoculating event,

- 31% had no risk factors

This was compared to 11% in the rest of the DPMS

Risk Factors: Alcohol

Increased likelihood of hazardous alcohol use in the group with any occupational risk of exposure OR 1.4 (95% CI 0.99-2.22) however, this was not statistically significant (p 0.058).

There was no difference in rates of hazardous alcohol consumption in the group with specific inoculating events

Risk Factors Co-morbidities in the any occupational risk group

A limited healthy worker effect was seen in any occupational risk group with reduced:

- renal disease (OR 0.06, 95% CI 0.01-0.45, p 0.006)
- malignancy (OR 0.20, 95% CI 0.08-0.52, p 0.0010)
- Chronic lung disease (OR 0.37, 95% CI 0.21-0.61, p <0.001)

- No statistically significant difference in diabetes

Risk Factors Co-morbidities in the occupational inoculating event group

- Reduced risk of :
- Diabetes (OR 0.37, 95% CI 0.18-0.77, p 0.007)
- Chronic lung disease (OR 0.13, 95% CI 0.04-0.43)
- Malignancy (OR 0.11, 95% CI 0.01-0.11, p 0.033).
- No statistically significant difference in the likelihood of having a renal disease, RHD/CCF, kava use and the hazardous use of alcohol.

Clinical Presentations and outcomes

- Both groups were more likely to have cutaneous melioidosis as the primary clinical diagnosis.
- Mortality was significantly reduced in both groups
  - 14% mortality in the non-occupational group
  - 3.9% in the occupational risk group
  - 5.8% in the work related inoculating event

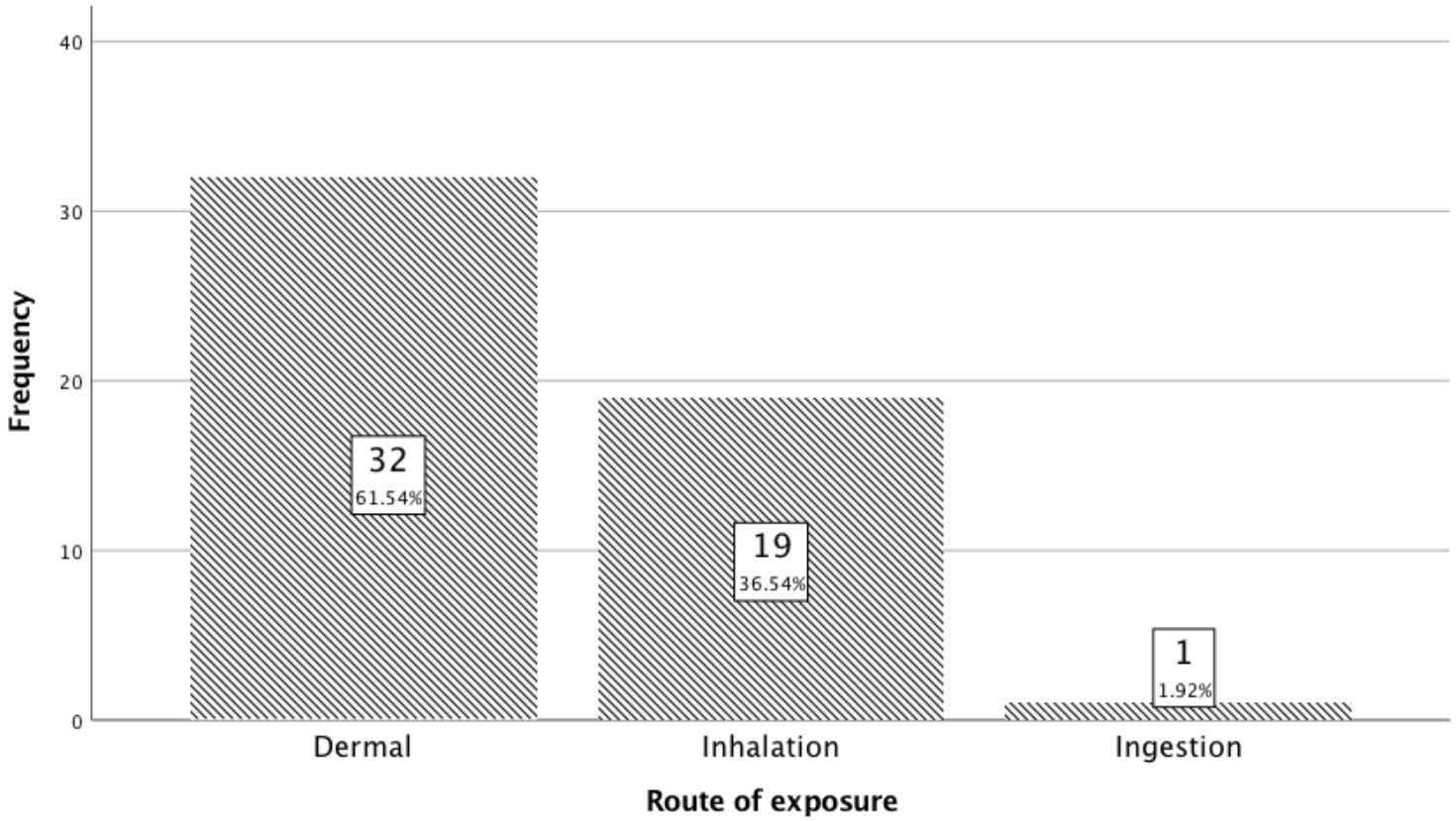
Occupations- any occupational risk

- Occupational groups accounting for 5% or more in cases with any occupational risk were;
  - miscellaneous labourers, 13% (20),
  - horticultural trade workers 12% (18),
  - Mobile Plant operators 7% (10),
  - plumbers 6% (9), automotive technicians 5% (8)
  - Defence, firefighters and police 5%

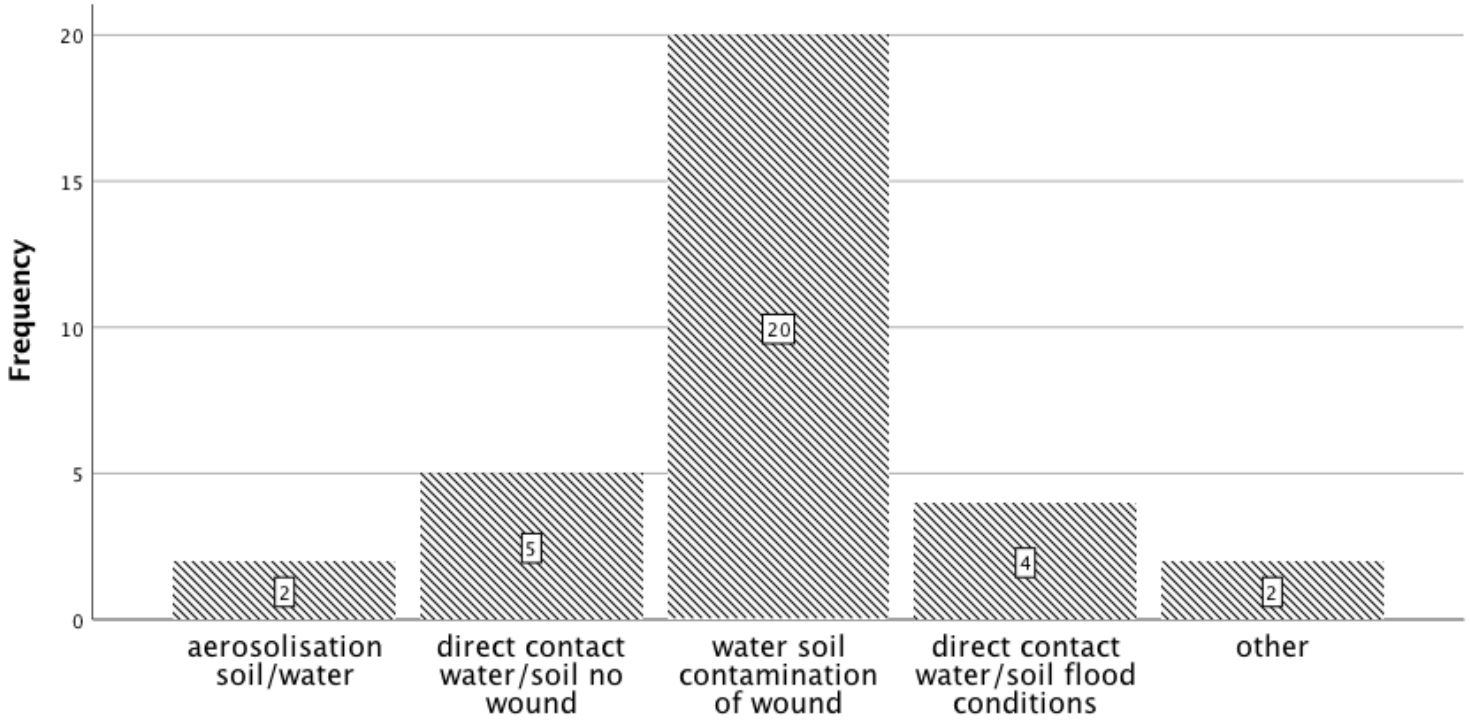
- In the work related inoculating event group the most common occupations were:
  - Miscellaneous labourers 11.5% (6),
  - personal service and travel workers 7.7% (4),
  - horticultural trade workers 9.6% (5) and
  - Plumbers 5.8% (3).
  - mobile plant operators 5.8% (3)
  - engineering professionals 5.8% (3)
  - automotive technicians 5.8% (3)

Occupations – Work Related Inoculating event

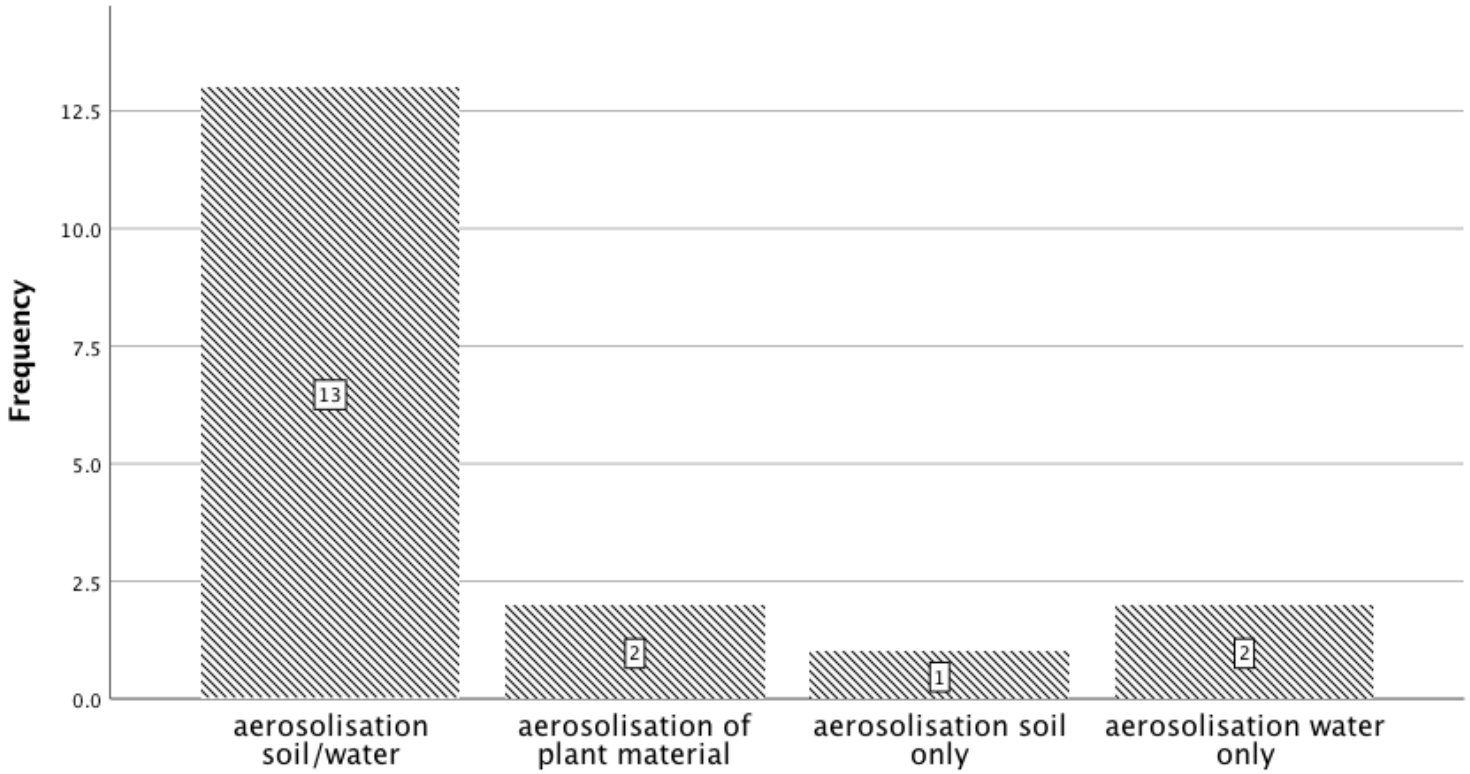
Inoculating Events Routes of Exposure



Inoculating Events – Mechanisms of Dermal Exposure



Mechanisms of inhalational exposure in work related inoculating events



Discussion

- People with occupationally acquired melioidosis tended to be healthier than those without occupationally acquired melioidosis however diabetes remained a significant risk factor.
- Those with work related melioidosis were more likely to have cutaneous melioidosis and had lower mortality rates.
- Less frequently female and of indigenous ethnicity
- Occupations were generally trade based occupations and or low skill based occupations.
- The most frequent mechanism of inoculation was through contamination of a wound with soil and or water, with the second most common mechanism of inoculation as aerosolisation of soil and or water.
- Melioidosis is a potentially significant workplace hazard in the Northern Territory and by identifying the mechanisms of exposure in the workplace it allows the implementation of controls to try and reduce the risk of contracting melioidosis through workplace exposures.

Questions?

References

1. Currie BJ, Ward L, Cheng AC. The epidemiology and clinical spectrum of melioidosis: 540 cases from the 20 year Darwin prospective study. PLoS Neglected Tropical Diseases [electronic resource]. 2010;4(11):e900.

2. Cheng AC, Currie BJ. Melioidosis: epidemiology, pathophysiology, and management. Clinical microbiology reviews. 2005;18(2):383-416.

3. Cheng AC, Currie BJ, Dance DA, Funnell SG, Limmathurotsakul D, Simpson AJ, et al. Clinical definitions of melioidosis. American Journal of Tropical Medicine & Hygiene. 2013;88(3):411-3.

4. Chen P-S, Chen Y-S, Lin H-H, Liu P-J, Ni W-F, Hsueh P-T, et al. Airborne Transmission of Melioidosis to Humans from Environmental Aerosols Contaminated with B. pseudomallei. Plos Neglected Tropical Diseases. 2015;9(6):e0003834-e.

Thankyou

Construction of Street Art Darwin Northern Territory – portrait of Dr G. Yunupingu

Thanks to:

Dr. Bart Currie, Linda Ward and Mark Mayo at the Menzies School of Health

The RACP Foundation