

Investigating the composition of metal working fluid (MWF) mists.

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What are MWFs?

- **Complex mixtures of oils and other liquids.**

- 4 different types:

- Straight oils
- Soluble oils
- Semi-synthetic oils
- Synthetic oils

- **Additives**

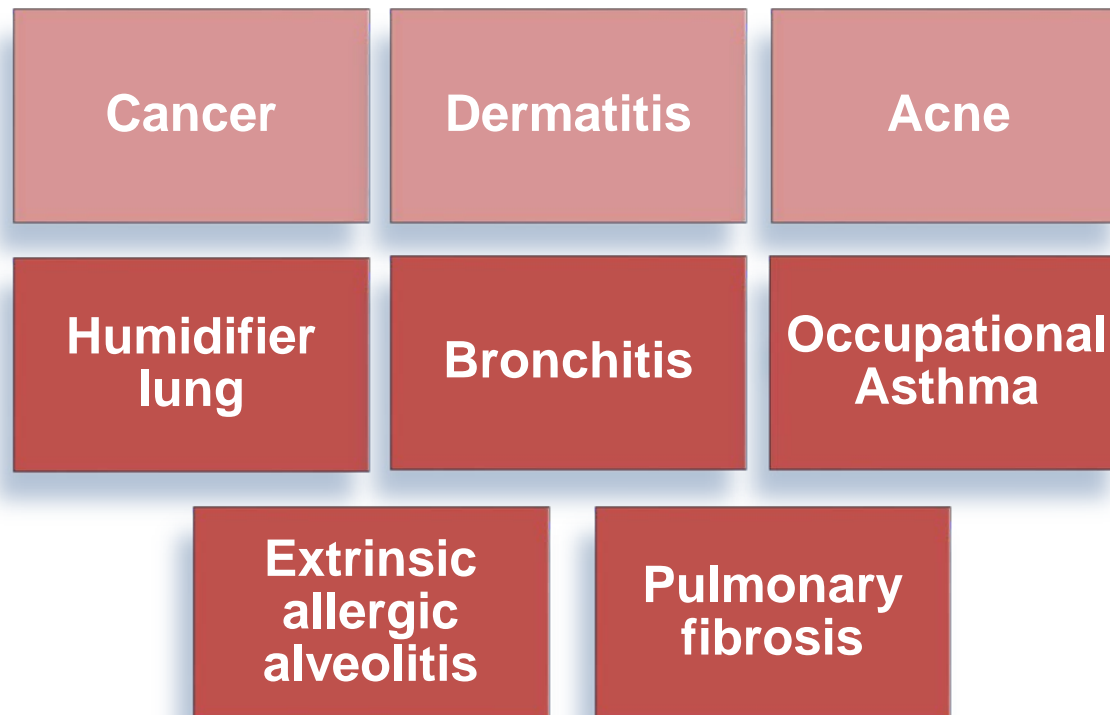
- Biocides
- Corrosion inhibitors
- Reoderants
- Anti-foaming agents.

- Repeatedly recycled



PhD Title – Identification of biological and chemical biohazards in water-mix MWFs and mists.

- Long established link between MWF exposure and adverse health effects.



- Constituents or contaminants within MWFs play an important part in causing or exacerbating symptoms of both EAA or OA.

Likely Hazards:

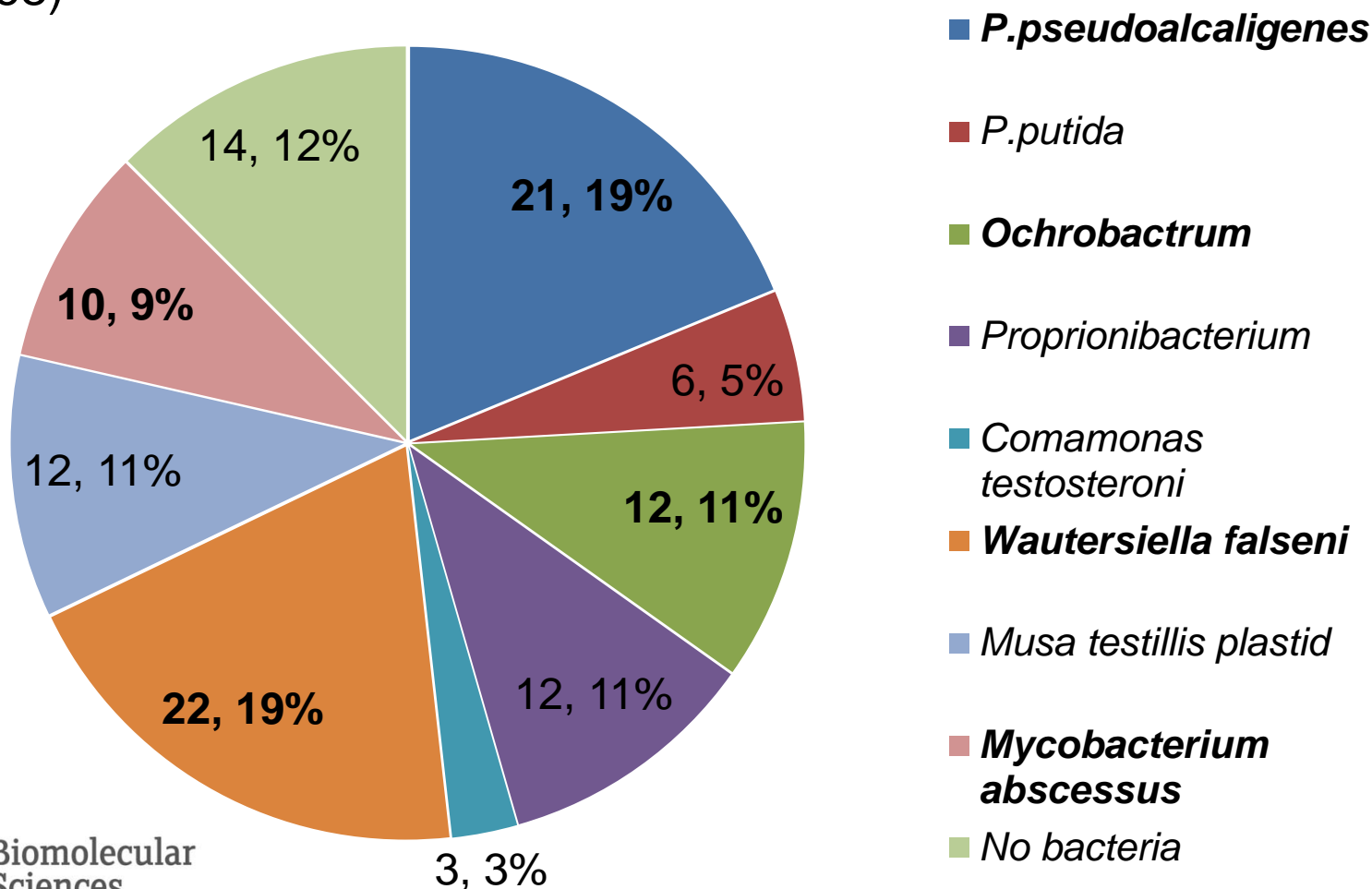
| Biological Contaminants | Chemical Contaminants |
|---|--|
| Mycobacteria | Metal particulates |
| Bacteria | Dissolved metals |
| Bacterial toxins: Endotoxins Bacterial proteases | Smaller inorganic compounds: Nitrosamines Caprylic acids Fatty acid sulphonates |
| Fungi | |

Strategy

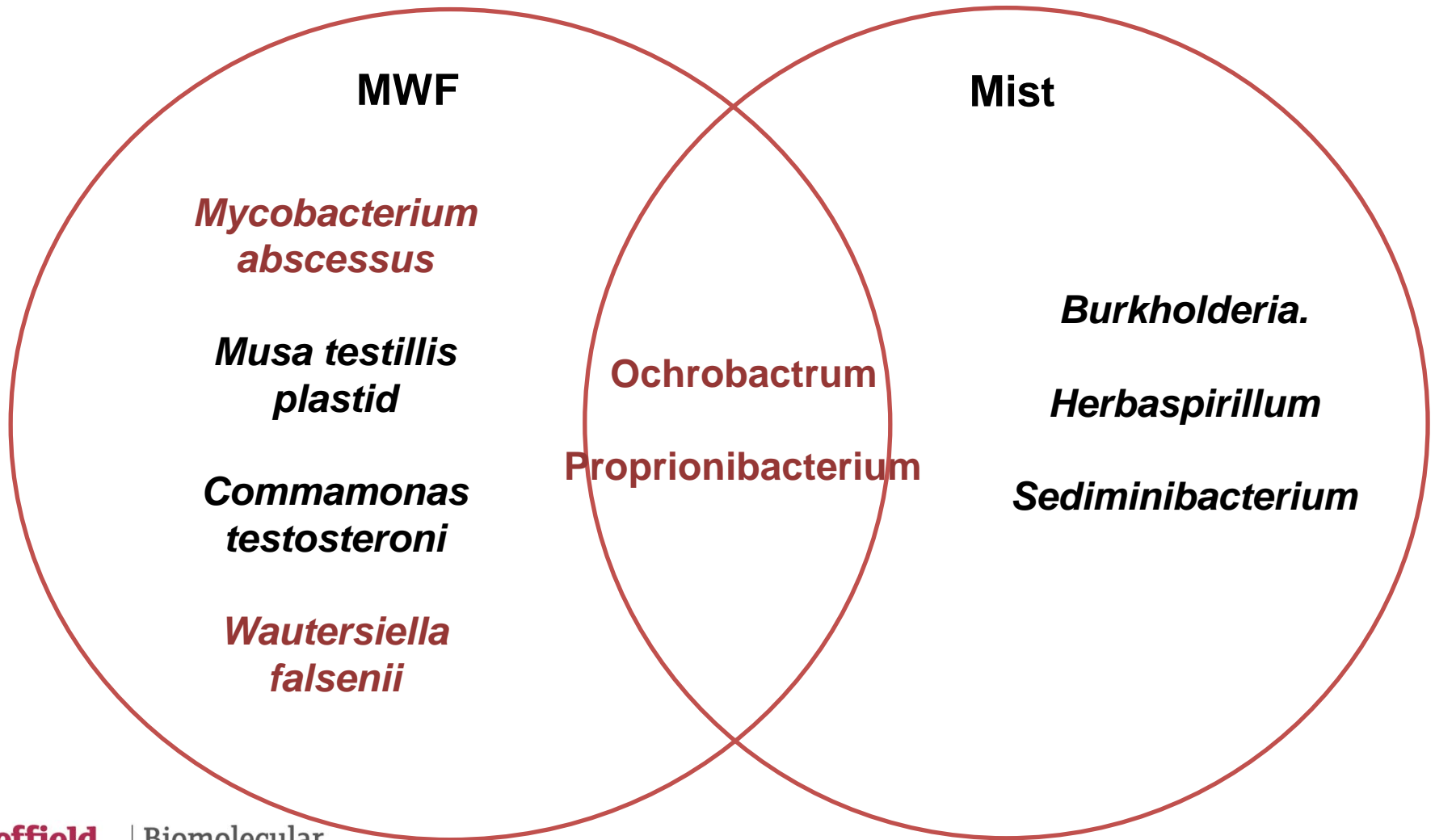
- In collaboration with the UKLA, work place sampling around the UK.
- Determine what makes it into the air from the MWF
 - If so, at what quantities
 - If not, is this a true representation? or methodological error?
- Samples collected were analysed with molecular biology and bioanalytical techniques.
- Emphasis on sampling air surrounding the machining tools.
- Compare sampling techniques for individual components.

Bacterial Analysis of MWF

- Analysis of a range of MWFs taken from multiple sites within the UK (n=68)



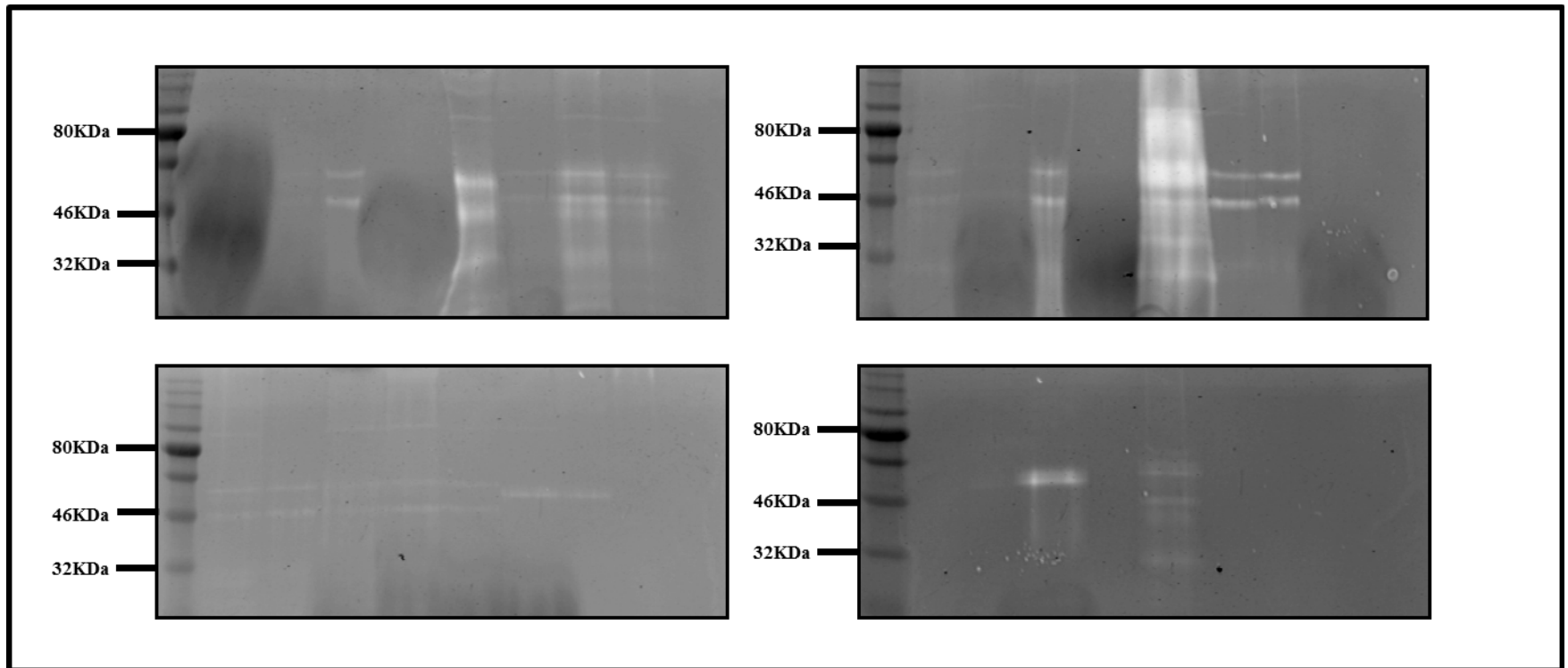
Do bacteria get into the mist?



Bacterial Proteases - MWF

46/60 (76%) Samples revealed proteolytic activity

- 22 revealed multiple bands



- Inhibition experiments revealed likely serine proteases.

Bacterial proteases - Mist

- Bacterial proteases were detected within mist samples.
- A series of inhibition experiments revealed - likely serine proteases.
- Bands were excised and analysed using NanoLC-ESI-MS^e.

Further Work

- Comparison of air sampling techniques for endotoxins.
 - IOM personal samplers vs. liquid impingers and CIP10 M samplers.
- Identification of fungi
- Analysis of metals using ICP-MS
- Work place studies.

Summary

Can we detect bacteria and mycobacteria in mist?

- Yes we can detect bacteria
- Mycobacteria has not been detected in mist samples so far.
- Further work required to ensure that these are representative levels.

Can we detect bacterial proteases?

- Yes, for the first time we can detect bacterial proteases.
- These are likely to be serine proteases.

Future work required to determine the best sampling methods for individual contaminants of interest.

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Thank You

Any Questions?