

Research Q&A: Prevalence and concentration of *Cupriavidus* and other opportunistic premise plumbing pathogens (OPPPs) in healthcare water systems across Scotland and England.

Dr Teresa Inkster

NHS Scotland Assure Research Service

NHS Scotland Assure is adding to the knowledge base available to built environment projects. Building on this existing knowledge will reduce risks, increase quality and promote sharing research with key stakeholders.

Through working with external stakeholders and other NHS Scotland Assure services the research service will ensure information is based not only on best practice but best evidence and will benefit those who need it. The service will seek to ensure that the most up to date and robust research is translated into practice as new and emerging evidence become available.

Throughout 2020 and 2021 the NHS Scotland Assure Research service commissioned a number of research projects which address gaps in current evidence. These research topics relate to previous issues and lessons learned within previous NHS Scotland projects and are in line with the key themes identified by NHS Scotland Assure stakeholders.

Research Q&As

Our research Q&As are designed to talk about these research projects – why the research is needed, what it set out to achieve, what impact it will have on existing guidance and more.

Full research reports are also available by contacting Dr Teresa Inkster at Teresa.Inkster@ggc.scot.nhs.uk

Research Q&A with Dr Teresa Inkster

1. What is the research that was carried out?

The research has looked into the ‘prevalence and concentration of *Cupriavidus* and other opportunistic premise plumbing pathogens (OPPPs) in healthcare water systems across Scotland and England’.

2. Why is this research needed?

UK mains drinking water is supplied to premises at a high standard but does contain small numbers of organisms which may be a risk to susceptible hospitalised patients if allowed to multiply within a building’s water system.

To date the main organisms thought to pose a risk include *Legionella*, *Pseudomonas aeruginosa* and atypical mycobacteria and specific guidance and methods for testing for these organisms in water samples exist.

While *Cupriavidus* species (spp) are known to be present in small numbers in incoming mains water, the incident at Glasgow Queen Elizabeth University Hospital

(QEUH) where *Cupriavidus pauculus* was isolated both from the water system and patient blood cultures is the first report of an outbreak of healthcare acquired *Cupriavidus pauculus*.

3. Who were the team behind the research?

The Chief Investigator was Dr Teresa Inkster, Consultant Microbiologist (Diagnostics), NHS Greater Glasgow & Clyde.

Co- investigators were:

- Gareth Wilson, Biomedical Scientist, NHS Greater Glasgow & Clyde
- Julie Black, Biomedical Scientist, NHS Greater Glasgow & Clyde
- John Mallon, Technical Services Manager (Microbiology), NHS Greater Glasgow & Clyde
- Dr Martin Connor, Consultant Microbiologist and Clinical Director Diagnostics, NHS Dumfries & Galloway

4. What did the research set out to achieve?

The research sought to:

- ascertain whether the rare organism *Cupriavidus pauculus* described above, was unique to Glasgow or Scotland
- develop testing methodology for *Cupriavidus* spp. for laboratories
- look at where in the water system *Cupriavidus* spp. was likely to be found
- identify other potential pathogens present in hospital water systems

5. How was the research carried out?

The research was carried out in the microbiology lab in Glasgow Royal Infirmary.

We requested 15 water tests from various parts of the water system, for example outlets, tanks, expansion vessels, from 15 other UK hospitals.

Estates / infection control colleagues at those hospitals arranged for samples to be taken and they were transported to Glasgow for analysis. Samples were transported at low temperatures to prevent deterioration.

Hospitals were approached with the aim of ensuring geographical separation within the UK.

6. What challenges did you encounter?

The main challenge we encountered was with participation. The research was taking place during the COVID-19 pandemic and colleagues were busy and had other priorities as a result.

In the end, we concluded the research early with 10 out of the 15 planned centres participating. It was also challenging for samples to be taken from some difficult to access parts of the water system.

7. What were your main findings?

Our main findings were:

1. *Cupriavidus* was found in four out of ten other hospitals including others in Scotland and elsewhere in the UK.
2. The isolates of *Cupriavidus* detected were all from the periphery of the system (outlets).
3. The organism was identified fairly easily in the laboratory growing on Tryptone Soya Agar (TSA) commonly used for water testing. Notably in some instances it also grew on agar designed to detect *Pseudomonas*. As a result, it may be mistaken for *Pseudomonas* if not fully identified.
4. All hospitals had evidence of other environmental organisms, confirming that hospital water is not sterile and highlighting the importance of control measures.

8. How will the research be used?

The research will be used to highlight that *Cupriavidus pauculus* is an organism present in some hospital water systems.

It is a rare cause of human infection. Its presence should indicate a water source and consideration of water testing.

The methodology used in this study can be adopted by other labs in identifying this organism.

9. What are the next steps for study in this field?

The next steps in this field are to do a more detailed study developing laboratory methodology for the identification of other waterborne pathogens.

Little is currently known about the optimal culture media, incubation period and temperatures at which to isolate these organisms.

Work is being undertaken currently in NHS Greater Glasgow & Clyde in partnership with the UK Health Security Agency with NHS Scotland Assure funding.

10. Will this research have an impact on current guidance?

Yes, we hope that the findings will ensure that *Cupriavidus* spp. and other waterborne organisms are investigated by infection control teams in response to a case of clinical infection, and that water is considered as a source.

We hope that this initial work, and subsequent work on laboratory methodology, will translate into standardised guidance for diagnostic laboratories.