Scottish Hospitals Inquiry

Post Oral Evidence Statement

Susanne Lee

This statement was produced by the process of sending the witness a questionnaire with an introduction followed by a series of questions and spaces for answers. The introduction, questions and answers are produced within the statement.

In relation to 'picks' and the sequencing report prepared by Professor Leanord and Derek Brown dated 18 January 2023, which can be found at Bundle 6, page 1195, in the course of carrying out a DNA analysis, particularly by whole genome sequencing, one or more colonies or 'picks' will be selected for that process.

1. Are you aware of any published material which discusses the number of such 'picks' which should be used to ensure reliable results or conclusions? If so, please identify any such publications, and if possible, attach copies or links to your reply.

A. I cannot access the original work that was done in the Public Health Laboratory Service (which became the Health Protection Agency and now is part of the UKHSA. The Standing Committee of Analysts document , I hope you will find useful is currently being updated and I have received a copy form the Committee chair, you can see the proposed changes as tracked. I will send as an attachment in the email with this document. Whilst the document is labelled as archived on the gov.uk website this is because the funding and status of the SCA has changed and it has not become a charitable organisation.

I will also send some supplementary information and papers which support the need to take multiple picks, including where there have been multiple species

involved in causing patient infection. The point is that to confirm a source, if you have multiple colonies on a plate, you should continue to pick until you have a match or picked them all if there are low numbers, the one you don't pick may well be the match, or at least 30 to have a 95% probability that the isolate is not present. My statistical ability is rusty but a statistician with an understanding of water microbiology would be better able to explain Poisson distribution and overdispersion of microorganisms in water. there is a very good statistician at the UKHSA (Andre Charlett) with expertise in water microbiology statistics (this is necessary to understand the issues of overdispersal of pathogens in water i.e. unlike chemical hazards they are not evenly distributed and may only be present intermittently depending on water usage, pressure etc. causing release from biofilms).

In outbreak situations determining whether a source is the cause of infection is fraught with difficulties. Water Microbiology as stated above is not an exact science as evidence should be taken in conjunction with epidemiology including opportunity and extent of exposure. A failure to isolate the target organism does not mean that the organism is not or was not present at the time of exposure. For several reasons inlcduding:- .

1. Sampling introduces the largest error in any water sampling event, the timing of the sample is critical, to be able to represent the worst case scenario, i.e. the time at which a patient is most likely to be infected directly or indirectly, is after the outlet has not been used for several hours. Even a short flush (period of usage) can remove biofilm from the outlet which means samples taken after even a very short period of use may give a false negative.
2. The conditions and timing of transport to the laboratory and the time between sampling and analysis can also adversely affect the ability to detect a target organism they may go into a viable but not culturable state or die if the conditions are not appropriate

3. In treated water systems the target organism may be in a viable but non cultural form and so would not be detected on laboratory media , (there is still debate about whether VBNC organisms can recover and become virulent).
4. Processing the sample is also likely to reduce the number of target organisms as some will attach to the equipment, and / or be damaged by concentration methods.
5. Bacteria in samples are not evenly distributed, and
6. Samples mixing, whilst intended to break up clumps , may still release bacteria attached to particulate surfaces
7. Depending on the media used, high nutrient media can result in nutrient shock and affect recovery, or the organism may just not be able to grow in the selected media.
8. Background flora may compete with and mask the target organism on the culture plate
9. Flow dynamics have an influence on the sheer stresses within the pipework which can impact on when and if microorganisms are released from biofilms, pressure and flow changes are dynamic in a water system, depending on whether a number of outlets are being flushed, used, or parts of systems drained for remedial work as examples.

A further consideration is that the strain isolated from the patient for typing may not match the strains from the samples is that it is possible that the infection was caused by multiple strains.

Declaration

I believe that the facts stated in this witness statement are true. I understand that proceedings for contempt of court may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief in its truth.

The witness was provided access to the following Scottish Hospital Inquiry bundles/documents for reference when they completed their questionnaire/ statement. (Appendix A)

The witness verbally introduced or provided the following documents to the Scottish Hospital Inquiry for reference when they completed their questionnaire statement (Appendix B)

Appendix A

A50071192 - Bacteraemia rates and Resistance Paediatric Haemato-oncology 2014-2018 - Bundle 27, Volume 6, page 107

A50071192 - Environmental Organisms, Antibiotic use and Antibiotic Resistance – (**Bundle 27, Volume 6, page 121)**

A42401483 Report- Application of Whole Genome Sequencing Alastair Leanord and Derek Brown **(Bundle 6 page 1195)**

Appendix B

A53734014 Multiple Types of Legionella Pneumophilia - Journal of Clinical Microbiology
(**Bundle 27 Volume 16 document 8)**

A53734016 The Microbiology of Waters and Associated Materials (2017) - Practices and procedures for laboratories **(bundle 27 Volume 16 document 9)**