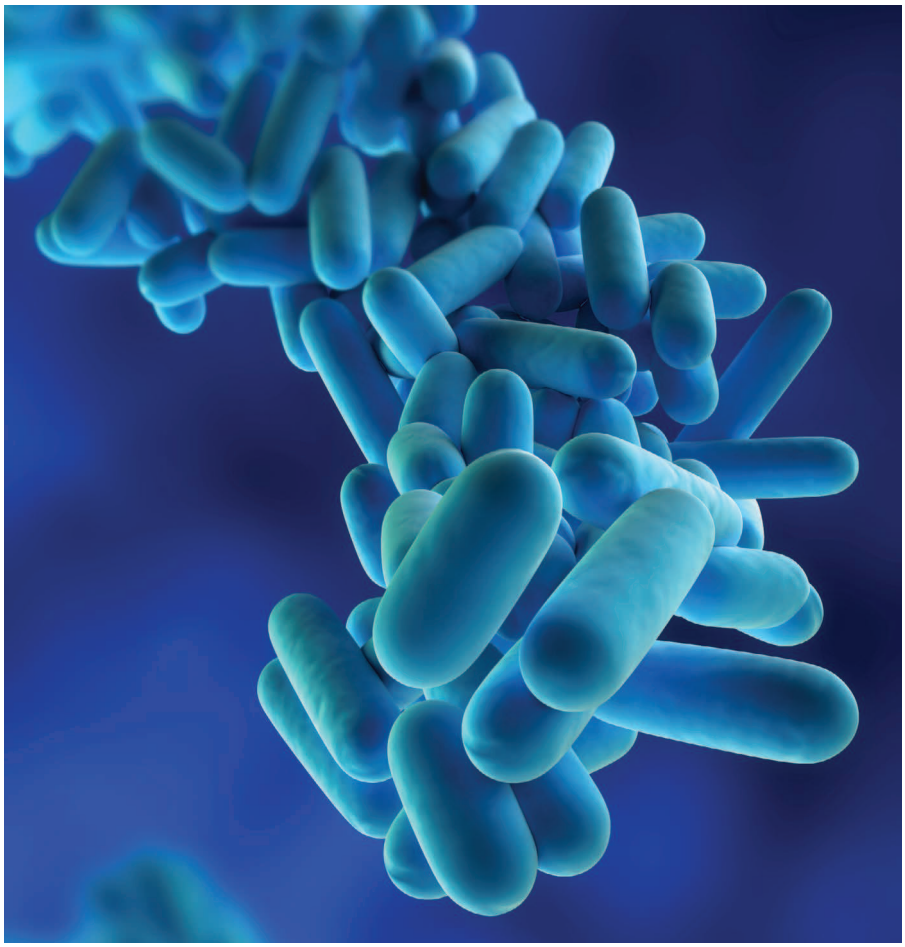
‘In-house’ testing can boost the speed of response

Leading microbiologist, Dr Paul McDermott, highlights the importance of effective systems for monitoring water hygiene in hospitals and other healthcare premises to minimise the risk of growth and proliferation of harmful waterborne bacteria. Such, he argues, are the abilities of the rapid testing technologies now available – he focuses in particular on the workings and benefits of the microbiological testing systems developed by IDEXX – that comprehensive ‘in-house’ microbiological monitoring and testing of hospital water systems should be within the compass of many sufficiently resourced and equipped ‘in-house’ NHS healthcare engineering teams, saving them considerable time and expense.

It is often said that a holistic approach to managing water safety is required in the healthcare setting, and, in order to ensure safe water provision across a hospital Trust, a panoply of control measures must be put in place. To show how effectively these control measures are performing, a whole range of monitoring activities is required, and microbiological monitoring has an important role to play in this. Microbiological monitoring can be applied to a number of potential waterborne pathogens, but the most widely tested for are *Legionella* and *Pseudomonas aeruginosa*. Both of these bacteria are capable of causing life-threatening infections in hospital patients with weakened or naive immune systems, so effective management of the risks is essential for their continued safe care. Experience has shown us that water outlets can often provide the source of healthcare-acquired infections caused by these bacteria, so meticulous attention must be paid to managing risks.

Guidelines are in place within Health Technical Memorandum (HTM) 04-01 for managing the risks posed by *Legionella* and *Pseudomonas aeruginosa*. These offer a framework around testing frequencies at outlets; for *P. aeruginosa* routine testing is recommended every six months in augmented care areas, and for *Legionella*, the frequency of testing and the location of testing points is based on risk assessment.

Routine microbiological monitoring, alongside other monitoring activities, can provide essential information on the safety of individual water outlets, and provide an indication that a particular outlet is colonised with harmful bacteria that present a risk to patients. In such circumstances, remedial work will need to be undertaken to clear the contamination, and a decision might be made to take the outlet out of use until it can be shown that this action has been effective and that the outlet is safe to be used again. Assurance that this is the case usually involves several further rounds of reactive microbiological monitoring until the outlet can be shown to be clear of the pathogen.



***Legionella pneumophila* is the primary cause of Legionnaire’s disease, which is fatal for about 1 in 10 people who contract it.**

A potentially lengthy process

One of the frustrations of microbiological monitoring, whether as part of a routine programme, or in response to other triggers, such as clinical surveillance data, is the length of time that the process takes. There are inevitable delays between sending somebody, often a third-party contractor, to take the water sample, and the return of the test results. Transportation, and the time taken to undertake the laboratory analysis, can also contribute to the delay.

National guidance is available to provide advice on how water samples should be taken, stored, and then

transported, to the testing laboratory. If this is not done properly, then test results become difficult to interpret, and their validity and value is highly questionable.

When testing for legionellae, water samples must be transported to the testing laboratory in a manner that protects them from heat gain, with separation of hot and cold water samples. Processing of the samples should ideally be conducted within 24 hours, and not longer than 48 hours from the time of sampling. There then follows a prolonged incubation period, usually of around 12 days for a confirmed quantitative result, although most laboratories are able to provide an indicative (presumptive) count in around four days. For *P. aeruginosa*, sample care is even more elaborate, and samples should be processed at the laboratory within two hours of taking them, but, where this is not possible, the samples must be refrigerated within two hours, kept cool, and processed within 24 hours. Confirmed quantitative results for *P. aeruginosa* are likely to take anywhere from 48 to 72 hours.

Delays in receiving results

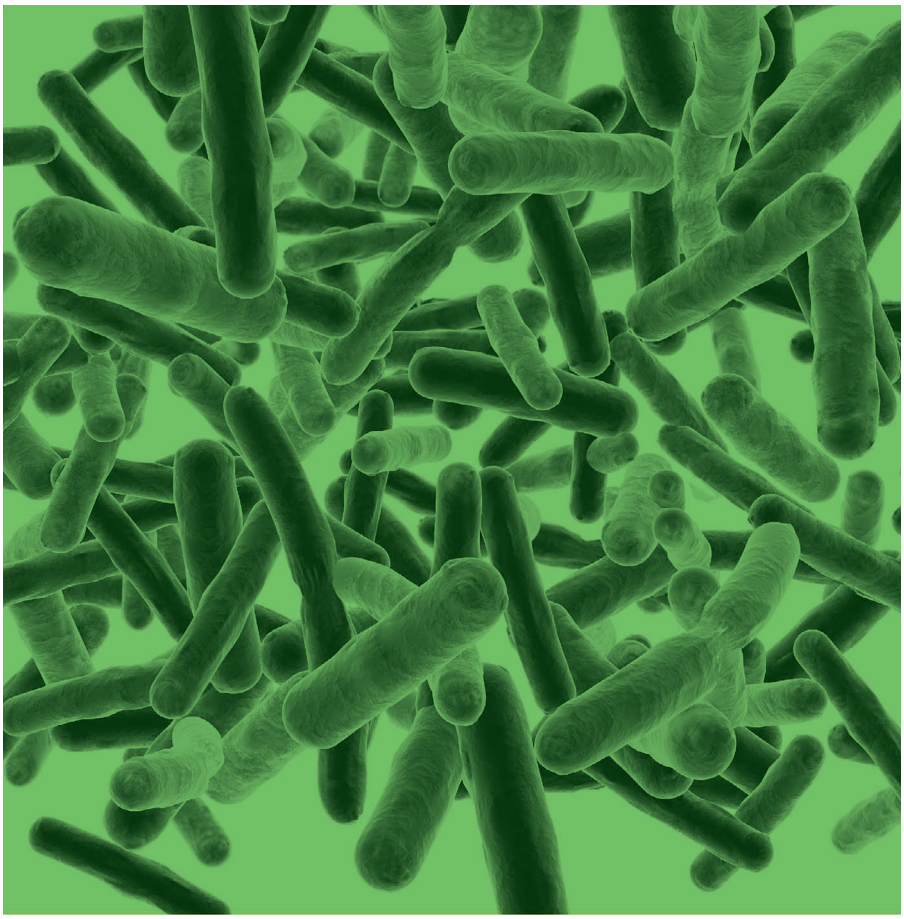
For both types of testing, add to this the time taken to interpret results, prepare reports, and return them to the Trust, and you can see that a significant period can elapse between taking samples and receiving the results that can then be acted upon. This extended time period can have implications for a hospital, potentially directly impacting patient safety and care and prolonging the period for which any outlets are taken out of use. For facilities managers, taking some of the delays out of the sampling and testing process would enable hospitals to ensure that remedial work can be undertaken swiftly if necessary, and provide them with the confidence that the actions are being effective.

It is for these reasons that some hospital Trusts are looking to carry out some of the functions of water monitoring – including sampling and testing – 'in-house', Obviously, this can only be done once planning, risk assessment, and suitable training, have been carried out, and it can bring significant advantages over using a wholly outsourced model.

Staff resources

Considerations around the cost of implementing in-house testing are largely around the availability of resources and staff who can undertake the work. Having the staff available to take samples as and when necessary clearly alleviates the potential delays in relying on off-site contractors to undertake the process. However, it is essential that appropriate training is then given to personnel to ensure their competence in taking and processing samples in line with the guidance mentioned above, and then interpreting the results. The Water Management Society has developed a City & Guilds-accredited training course for such personnel, ensuring awareness and competence throughout the sampling and analysis procedures.

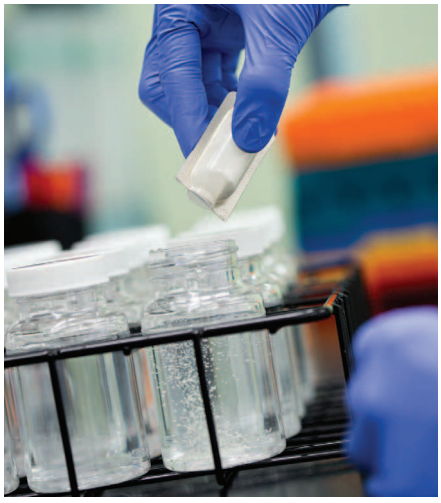
Testing has traditionally taken place in laboratories by highly trained microbiologists. Bringing testing in-house would be challenging to do were it not for the advancement in testing methods. The Pseudalert and Legiolert microbiological test systems from IDEXX have been designed to allow for easy, rapid testing, and comply with the appropriate UK guidelines, as well as having been the subject of extensive independent scientific studies to compare against standard agar plate-based methods.



***Pseudomonas aeruginosa* is responsible for approximately 10% of all hospital-acquired infections, and is particularly dangerous for vulnerable patient populations.**

Little space required

The set-up for running the IDEXX tests needs very little space and equipment. A user can process a sample in less than a minute, and the interpretation of results is



IDEXX test reagents come pre-weighed, and sample preparation takes less than one minute.

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The IDEXX Legiolert test indicates samples contaminated with *Legionella pneumophila* by turning a caramel brown colour after seven days' incubation.

The IDEXX Pseudalert test shows positive indication for *Pseudomonas aeruginosa* (fluorescence under UV light on right) after 24-hour incubation in a presence/absence test.

as simple as observing a colour change. It goes without saying that any test that is used must be accurate and reliable, so that the Water Safety Group can have the confidence to make decisions that can affect patient safety. There is no justification in making operational changes and investing in staff and equipment to save time unless it can be seen to actually reduce the risk to patients.

There are some other 'hidden' potential risks to bringing procedures in-house, such as possible cross-contamination between areas of the hospital with vulnerable patients when sampling, and also the correct handling of waste. However, with the correct staff training, these too can be minimised.

Any change in procedure must be carried out with patient safety as the number one priority. What is clear to me is that the Trusts that have established 'Water safety teams' internally, and implemented a level of in-house testing alongside external testing with contract testing laboratories, are very much leading the way in water monitoring. What we have seen historically is that a change in mindset generally only comes in response to an emergency or a tragedy. I believe that we are at a point now where the options available to Trusts and facilities managers allow a rethink in practices, and if these are implemented with due consideration, they can and will result in cost-effective solutions that have measurable advantages.

Favourable feedback

For hospitals that employ or have trialled Pseudalert for the detection of *P. aeruginosa* as part of an in-house testing strategy, the feedback on the convenience of this method has been very favourable. In particular, the increased flexibility and agility has reduced the time taken to complete the 'remediation and resampling cycle' that Trusts find themselves in once routine testing has indicated that an outlet is contaminated. The ability to significantly compress this cycle – often by a matter of weeks – by bringing the process in-house and removing the need to schedule visits from third-party contractors to take, transport, and process samples, has meant that outlets can be confirmed as being safe to return to use well within the time that it would normally take. In addition, because most hospital Trusts currently contract these services out to third parties, bringing at least some of the work in-house has resulted in tangible cost savings too.

Of course, any decision on how and when to conduct microbiological sampling and testing, along with all other monitoring activities, should be made by the Trust's Water Safety Group, and be reflected in its Water Safety Plan.

In summary, I would encourage hospital Water Safety Groups to consider whether in-house testing is suitable for some – if not all – of their microbiological monitoring. I understand that there are pressures in resourcing and investment for projects, but if one can assess these against the potential improvement to hospital efficiency, and ultimately the safety and well-being of patients, then the benefits can outweigh the costs. By testing in-house, and having access to accurate and timely data and information, estates and facilities teams can take back control of testing, and provide a cost-effective and more responsive approach to monitoring the control of water-related risks. hej

Paul McDermott

Dr Paul McDermott has an honours degree and PhD in microbiology, and spent the first 11 years of his career in microbiology research and as a university lecturer. He previously worked as a specialist inspector in the Health and Safety Executive's Biological Agents Unit. In his role as a regulator, much of his time was spent working in the field of occupational *Legionella* risk control. He was an active member of HSE's *Legionella* Committee and its *Legionella* Technical Working Group, and has facilitated the development and delivery of past and current HSE intervention strategies for the control of *Legionella* risks in workplaces.

He has also acted as an expert witness in a number of *Legionella* enforcement cases, and has contributed to the production of numerous *Legionella*-related guidance documents.

Dr McDermott is also a technical assessor for the United Kingdom Accreditation Service, a role which sees him conduct assessments of companies seeking UKAS accreditation for *Legionella* risk assessment services.