

Looking deeper

THE JOURNAL OF THE WATER SAFETY FORUM

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Reflective learning

Looking Deeper Editor, **Susan Pearson**

As successful as the huge progress in adapting to the Sars-CoV-2 crisis has been, Covid-19 continues to hog the limelight and as a result important lessons learnt in other ongoing healthcare arenas remain overshadowed by the pandemic. Our interview with Belfast Estates Director George McCracken (pg 6-8) is a timely reminder that we must pay attention to past mistakes in order to correct our future performance.

George emphasises that we need a radical shift in thinking about how we plan new hospitals if we want to prevent repetition of some of the disastrous high profile design mistakes of several flagship facilities, which in some cases have led to infections and even mortality.

Simply, previous projects have failed to put the patient at the heart of the design concept. An acknowledgement is needed at the beginning of the commissioning process that rather than thinking about "building a hospital", the focus is changed to plan for "a centre to make patients better". Thinking this

way in order to deliver a safe water system, for example, by taking into account how a building will actually be from the start of the project will result in much more successful outcomes.

"Success does not consist in never making mistakes but in never making the same one a second time."
George Bernard Shaw

Picking up this theme in another arena, our article on water safety in care homes (pg 10-13) also considers lessons learned from legal prosecutions over major failings that resulted in tragic fatalities — from Legionnaires' disease in these instances. This review highlights the importance of adhering to guidance on mitigation and control, creating robust risk assessments for individual properties, choosing competent outside contractors and emphasises the importance of training duty holders — with

the Care Quality Commission also now specifically underlining the importance of greater *Legionella* awareness amongst its inspectors.

Our aim has always been to provide a forum for the exchange of ideas through engagement with our readers. We would really like to hear your opinions on our content — which is why we're offering the opportunity to win a Luxury Food Hamper from Fortnum and Mason for taking part in our readership survey — please check the back cover for details.

From transmission by splashing to hand washing to hospital design and much more, we're looking forward to hearing which articles you've liked best, whether we're covering useful areas of content and about anything else you'd like to see us discuss. We're also planning a 'readers' content page' in future issues — please write in to editorial@lookingdeeper.co.uk if you'd like to share your infection control problems, solutions and other thoughts.

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*Armitage
Shanks*

For commercial applications, Armitage Shanks, is the definitive British brand with pioneering solutions in washroom fixtures, fittings and water conservation. These solutions extend to bacteria sensitive healthcare environments, where the safe management and delivery of water is critical to infection control, controlling the spread of infectious diseases. Now leading the industry in safe water management, Armitage Shanks is committed to supporting the Water Safety Forum.

Editorial Contributions



Susan is an independent journalist and communications specialist with a background in biology, medical research, publishing and communications. She has been writing on medical issues for over 30 years and on waterborne infection and water management since 2010. She has been a frequent contributor to IHEEM's Health Estate Journal, WMSoc's Waterline and the Clinical Services Journal.

Susan Pearson



Elise is an independent consultant to the water and medical devices industries and a former Chair of the Water Management Society (WMSoc). She is a state-registered microbiologist, a BSI committee member and was on the steering group for Department of Health HTM 04-01: Safe water in healthcare premises. Elise is a Fellow of WMSoc, IBMS, IHEEM and also of the Royal Society of Public Health (RSPH), where she is an active member of the water special interest group. She chairs and presents at numerous international conferences.

Elise Maynard



George is the Director of Estates, Risk and Environment, Belfast Health and Social Care Trust, Northern Ireland. He is a Chartered Member of the Institute of Building and an associate member of the Institute of Healthcare Engineering and Estate Management. Currently George leads a Risk Team which provides a unique and innovative approach to the management of risk within an Estates Healthcare Environment. He is actively involved as a BSI committee member, latterly working on BS8680:2020, and is also involved in updating HTM 04-01 and creating other technical guidance for the management of water hygiene within healthcare.

George McCracken



Karina Jones is an IHEEM-registered Authorising Engineer for water at multidisciplinary engineering consultancy ETA Projects Ltd. She is a member of the Water Management Society and the Institute of Healthcare Engineering and Estate Management (IHEEM), recently becoming a member of the IHEEM Technical Platform (Water). Working closely with Infection Control Teams within healthcare water management structure, Karina ensures compliance with ACOP L8, HSG 274 and HSG 282 and the HTM Guidance Documents HTM:00 and HTM.04.

Karina Jones

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In the news...

'Pokemonas' game found out

Previously undescribed bacteria have been named 'Pokemonas' because they live in spherical amoebae similar to the Pokémon that are caught inside balls in the popular video game. Discovered by researchers in the University of Cologne's Department of Zoology, the Pokemonas bacteria belong to the order of *Legionellales*, which include the Legionnaires' disease-causing *Legionella* group, that often live as intracellular parasites of host organisms such as amoebae.

The team wanted to screen amoebae for *Legionellales* and chose the *Thecofilosea* group of amoebae, which is often overlooked by researchers and has no close relationship with previously studied hosts. The Cologne scientists detected several *Legionellales* species, including two previously undescribed genera, and one undescribed *Legionella* species, in *Thecofilosea* amoebae from environmental samples.

Dr Kenneth Dumack, who led the project noted: "The results show that the range of known host organisms of these bacteria is considerably wider than previously thought. In addition, these findings suggest that many more amoebae may serve as hosts for *Legionellales* — and thus potentially as vectors of disease."

These findings should help to better understand how *Legionellales* bacteria are related to each other and clarify their interactions with their hosts and their routes of infections in humans.



Illustration of a *Thecofilosea* amoeba with intracellular *Legionellales* bacteria.
Credit: Marcel Dominik Solbach, Michael Bonkowski & Kenneth Dumack

Genetic 'Swiss army knife' key driver of antibiotic resistance

Culture of *Pseudomonas aeruginosa*, bacterium used to study antibiotic resistance integrons.
Credit: Sean Booth (@ImDrBooth), University of Oxford

A key mechanism of antibiotic resistance driven by a sophisticated genetic system known as an integron has been discovered by a collaboration between University of Oxford and Universidad Complutense de Madrid scientists. The integron has been found to display a key role in accelerating resistance and gives bacteria an 'incredible opportunity' to evolve in response to antibiotic treatment.

Integrons are genetic platforms found inside bacteria that allow bacteria to 'shuffle' antibiotic resistance genes — useful integron genes can be placed in more prominent positions, optimising the levels of antibiotic resistance they provide, an ability hypothesised to generate an important evolutionary advantage.

In the first experimental probe of the role played in resistance by integrons, the researchers inserted a customised integron carrying several resistance genes into *Pseudomonas aeruginosa* bacteria. They found that, when confronted with antibiotics, the bacteria with functioning integrons were able to survive longer than those without. Integron functionality was altered within the bacteria by retaining or removing integrase — the enzyme responsible for gene shuffling.

Senior study author Professor Craig Maclean, of Oxford's Department of Zoology, said: "The integron is a remarkable genetic structure... unique to bacteria — it provides them with a kind of 'Swiss army knife' of antibiotic resistance genes that they can rapidly alter in response to our treatments."

The new study highlights both the danger posed by integrons and the need to develop tools to counter their influence — for example, new drugs given alongside antibiotics that could limit an integron's ability to accelerate bacterial evolution.

Plant xylem decontamination filters for drinking water

Engineers investigating the natural filtering ability of sapwood to demonstrate how it can filter bacteria effectively, have now fabricated new xylem filters that can filter out pathogens such as *E.coli* and rotavirus in lab tests.

Xylem is the vascular tissue in plants which conducts water and nutrients upwards from the root. Xylem conduits act as natural sieves, filtering out bubbles from water and sap.

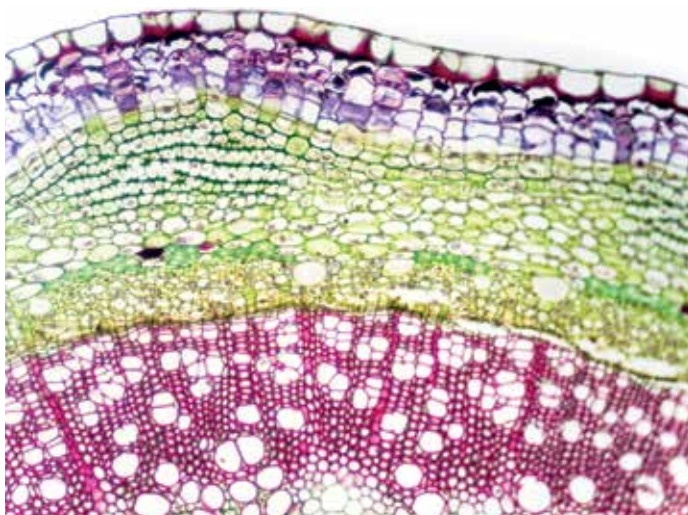
Having previously fabricated simple filters from peeled cross-sections of sapwood branches, the Massachusetts Institute of Technology (MIT) team took their techniques to India, where they made xylem filters from native trees and tested the filters with local users. Based on their feedback, the team developed a prototype of a simple filtration system fitted with replaceable xylem filters that purified water at a rate of one litre per hour.

They also developed simple techniques to extend the filters' shelf-life, enabling the woody disks to purify water after being stored in a dry form for at least two years.

Their research shows the potential use for xylem in community settings to remove bacteria and viruses from contaminated drinking water in springs, taps and ground water. Options to create large-scale availability are also being explored.

Rohit Karnik, MIT Professor of Mechanical Engineering and Associate Department Head for Education said:

"Xylem filters are made from inexpensive and abundantly available materials, which could be made available at local shops... For now, we've shown that xylem filters provide performance that's realistic...[in] places where the only option has been to drink unfiltered water."



Dates for diaries...

Legionella Control Association Autumn Conference
05/10/2021 Tamworth, UK
legionellacontrol.org.uk/

Environment Network 2021: Designing and building for infection prevention
08/10/2021 London, UK
wmsoc.org.uk/external-events/97/

Water Management Society AGM
11/10/2021 Online
wmsoc.org.uk/conferences.php?id=842

RSPH: New British standards on sampling methods for legionella: BS7592
13/10/2021 Online webinar
rspgh.org.uk/events.html?category=webinars

Healthcare Estates (IHEEM) Conference & Exhibition
19-20/10/2021 Manchester, UK
www.iheem.org.uk/events_old/healthcare-estates-conference-exhibition-2021/

RSPH: Understanding biocides in healthcare water systems
3/11/2021 Online webinar
rspgh.org.uk/events.html?category=webinars

Health Infection Society (HIS) Lowbury Lecture 2021: Tales of the unexpected in antibiotic resistance
5/11/2021 Manchester, UK
his.org.uk/training-events/events-diary/

Federation of Infection Societies (FIS) Conference 2021
5/8-9/11/2021 Manchester, UK / Online
fitwise.eventsair.com/fis-2021/

HIS DIPC development day: Influencing others and changing behaviours
3/12/2021 Online
his.org.uk/training-events/events-diary/

18th International Conference on Pseudomonas
18-23/04/2022 Atlanta, Georgia, USA
pseudomonasconference.com/

RSPH Water Webinars

The Royal Society of Public Health is running a series of 'Water Webinars' (see page 8). For further information on these and other events, visit:
rspgh.org.uk/events.html?category=webinars



'The patient must be at the heart'

Changing our thinking to prevent new hospital failures

Susan Pearson Talks to Estates Director George McCracken about the need for a radical shift in thinking to avoid past errors in delivery of new hospitals.

George McCracken is the Director of Estates, Risk and Environment for the Belfast Health and Social Care Trust, Northern Ireland. He currently leads a Risk Team that has, and continues to provide, a unique and innovative approach to the management of risk within an Estates Healthcare Environment.

George explains how a failure in the way we think around commissioning and planning of new-build healthcare facilities has contributed to some high profile failures. What is needed, he says, is a radical re-think around commissioning — to put the patients at the heart of every discussion.

Why do we need to “think differently” to deliver truly safe new healthcare buildings?

For everyone involved in delivering healthcare the prospect of brand new buildings to replace an old estate that will deliver a higher standard modern clinical service in a better built environment is always a very welcome plan.

However, delivering new hospital buildings comes with challenges. Despite the fanfare accompanying new major healthcare construction projects, several have been associated with some remarkable failures. In Birmingham and Liverpool,^{1,2} the PFI funding contracts collapsed, while in Glasgow, Edinburgh and Belfast^{3,4,5} new flagship hospitals all had serious problems with their water and ventilation systems.

The Government claims it will invest £3.7 billion to build 40 new hospitals across the UK by 2030 — but how do we ensure the new built environment really does deliver better patient care?

The reality is that failure happens before work has even commenced on a project. The public enquiries and reports are not really telling us what we could have done differently — so to avoid these failures we will need to innovate in our thinking on how we deliver projects.

To prevent failure we have to work backwards and go back to the very beginning of our process for delivering new healthcare projects.

How is the Government structuring its plans for new hospitals to deliver better outcomes?

The Department of Health and Social Care has published a new healthcare infrastructure plan that sets out an overview for the planned new hospitals and multi-billion pound spend. The plan recognises that a new strategy is needed to make the NHS fit for the future and includes sections on delivery, governance and a continued delivery of reform at a local level. It notes that health infrastructure “is more than just bricks and mortar” — if the bricks and mortar are not right then the care won’t be safe or as effective as initially intended. Also, that it’s “time for an upgrade” — recognising that there is a demand for capital new build and that although there is a system of capital to provide funding, this system is outdated.⁶



“The patient has to be at the centre of the project from the beginning.”
George McCracken

However, while this plan contains many great aspirations and guidance, the new strategy does not go far enough. Because projects are not considered likely to fail, failure hasn’t been considered — nothing has been set out about the avoidance of failure, about learning the lessons from existing failures or questioning whether engineering design capabilities are sufficient and good enough to deliver new hospitals that will perform safely for patients.

To consider the challenges in delivering safe water and ventilation systems, for example, we need to look below the surface — because in a building it may not be what you can see that is the cause of a problem. What is visible may only be “the tip of the iceberg”. “When we come to new builds, have all the elements and history of the site been considered?”

Taking a hypothetical example, a new building could be constructed on a site that’s been providing healthcare for over 100 years. Its buildings of varying ages may have been adapted and renovated over the years and the site will have had water and ventilation services pulled around over many decades. What impact does this have on the new project? What are the known risks before design is commenced?

So how do we build a new water system safely? Despite a huge amount of excellent documentation and guidance, we have still ended up with the outcomes above.

What “different thinking” is needed?

To prevent failure we have to look at things differently — to work backwards and go back to the very beginning of our process for delivering new healthcare projects.

But what is “the beginning” of a project? Is it when the diggers and bulldozers first arrive on site? When the design team start on the design? The approval of a project’s finance? The original conceptual ideas? Or is it when we realise we can’t maintain the existing services of the building that we’re in?

Taking a forensic look at current project guidance brings up a host of further considerations:

- *That the building will function safely (be compliant):* But compliant to what? 100% compliant? 90% compliant, with 10% derogations and a risk assessment (RA) for the remaining 10%?
- *That the project will not overrun the budget:* Who sets the budget? Is it sufficient for the outcome we want? Was the initial budget too tight because it was set several years previously?
- *That the project will be on time:* Will the deadline set by the client and design team work for the contractor?
- *That the quality of the built environment will be high (will significantly improve on the previous facility):* What does a ‘high quality’ environment actually look like? The definition of ‘high quality’ should be ‘a building that does not fail’. Are we referring to the architectural space? The engineering services? Or both?
- *That it will be better and safer for patient care:* What is the metric for this? Can we determine from water systems, for example, before patients are admitted, that the facility is going to be better and safer for patient care?



A remarkable aspect of this list is that ‘the ‘patient’ doesn’t feature until the fifth point. Yet “if you don’t have the patient in mind when you’re starting to design a new project then you’ll fail to deliver for the patient...because [in your mind] you’re building for something else...The patient has to be at the centre of the project from the beginning.”

So we need a change in how we think — and to do this we need to look at the construction process. Rather than believing that “we’re building a hospital”, would it not be better that the design team and contractors instead acknowledge that they’re building a centre to make patients better?

If the thinking changes, the rationale for the contractor and everyone else involved on site will change — jobs will not just be jobs that need doing, they will be jobs carried out for the good of the patients.

How do we improve planning for a new facility?

Failures can be avoided if they are understood and contemplated as a risk at a very early stage. Specifications are much easier to change on the page than when construction is already underway.

The top five challenges that face project construction managers are:

budget constraints, poorly defined objectives, time management, unrealistic expectations and hazard management.

If the project hasn’t been properly planned in the first place, then what is actually delivered won’t meet expectations.

Much of the best practice structure for planning a project is outlined in BSRIA's eight-stage project process:



Courtesy of BSRIA: from BSRIA BG 1/2009 Building Services Job Book

However, although projects may be following the BSRIA guidelines, we still need to ask where water safety fits into a project plan.

Compliance is risk averse. In practice, this can mean that even when buildings are built to comply with British Standards, Health Technical Memoranda etc, there still needs to be an understanding about how to manage risk rather than assuming the risks posed by water systems are not there as compliance has been adhered to. For example, is there a plan specifically to prevent a patient becoming sick because of an unsafe water system? "There is no point in having a compliant system if we don't know if it is actually safe."

These risks need to be identified early on in the construction process with a clear identification of what building is planned and what the impact on patients of risks from the water system might be. In order to deliver a safe outcome, there should be a detailed project water RA that considers the following at the start of any new project:

- **Commissioners:**
Have the commissioners been presented with possible risks from the water system?
- **Responsibility hierarchy:**
Where does water safety fit into the responsibility hierarchy? The project board needs to be set up to consider these questions.
- **Experience and expertise:**
Do the design teams and contractors fully understand water safety? Teams should be appointed based on their understanding of the risks. Architects need to factor in design of a water system that is not just 'compliant', but that is not going to create any risks — and should present as part of their design brief how the new facility can be maintained as well as operated in a safe manner for patients. How are the water and ventilation systems going to be commissioned, installed and handed over to ensure that no harm is caused to the patient?

• **Clear and precise specification:**

A design RA should involve expert advice and the RA should be used to inform the specification before the contractor is appointed so that the appointed contractor understands the expectations for good water safety practices before the bid is tendered. The contractor should understand that there will be good supervision on site and work with a specification that sets out, for example, how pipe work should be stored and treated.

• **Quality management:**

How will the quality of water safety be controlled on the ground? Who will oversee: communication with plumbers and chemical contractors; when the system will be filled with water; how the ingress of waterborne pathogens will be managed; how the water system will be managed from filling to usage?

This approach can be designated the project RA — or 'water safety plan' — based on how the building will be used, which is put in place **before** the design and building is started. This project RA is there effectively to risk assess the project RAs! "If the mitigation that emerges from this first RA is not acted upon, there is a possibility of failure before the first spade goes into the ground."

Conclusion

Ultimately the biggest change needed in how we approach new build projects is cultural. "When you bring the patient and the family into meetings on engineering safety and detail what has happened with past failures — it changes the room."

Although Department of Health guidance documents are excellent, some simple work is needed on patient safety engineering rather than just compliance that 'hopes' to deliver safe systems. Early risk identification is needed on how to mitigate these risks through good design, good specification and good construction processes, all as part of the strategic direction on patient safety.

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This article is partly based on a recent RSPH 'water webinar' (see pg 3)

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Opinion: Human behaviour

Should old habits remain?

Lessons learned for the post-pandemic healthcare environment



By Karina Jones

The experiences and lessons learnt over many months of the Covid 19 pandemic and the adjustments we have all made have provided valuable insights. So as life returns to some degree of normality,* it seems a good time to ask ourselves the question “*should old habits remain?*”

Lifestyle adjustments forced from necessity often provide us with strategies for improvement and a safer future as our strong inherent instinct for survival encourages us to adapt to the situation we find ourselves in. With this in mind, the remarkably fast development of the Covid-19 vaccines and the rapid NHS roll-out of the vaccination programme across the UK makes this a good time to review our next course of action to ensure the country’s recovery — and most importantly, the health and wellbeing of our key healthcare workers to whom we owe so much — by stopping to analyse the impact of our attitudes and behaviour in the clinical environment.

Having visited many hospitals in my line of work and observing the degree of human traffic through them, it seems clear that wearing a face mask should in future remain as a standard requirement in the post-Covid 19 pandemic environment. Alongside, this should be complemented with hand hygiene protocols to eliminate the spread of pathogenic viruses and bacteria.



Protecting the vulnerable

It is crucial that we particularly ensure the continued protection of the most vulnerable patients, such as those that are immuno-suppressed. We must continue to advocate the importance of hygiene and correct behaviour especially in healthcare environments. It is not necessarily the obvious dangers that may kill or make us ill, it is often our behaviour, misunderstanding or oversight that can present the most danger, especially

when we are dealing with pathogenic microorganisms.

Therefore:

- We need to continue to emphasise and educate those who attend hospitals (both patients and visitors) to recognise that clinical areas are designed to receive and

treat vulnerable people — so that there is instinctive recognition of the importance of wearing a face mask to protect themselves and others

- Likewise, the importance of strict hand hygiene when entering clinical facilities should continue to be highlighted. Adherence to infection prevention by maintaining hygiene control practices is essential in providing safe and high-quality patient care across all settings. Pathogenic organisms carried on hands are easily eliminated by carrying out correct hand washing with soap and water.^{1,2,3} Where hand washing is not possible an alcohol-based hand sanitiser is an acceptable method for cleaning hands that are not visibly dirty.

While the SARS-CoV-2 coronavirus pandemic has infected at least 67 million people and killed 1.5 million worldwide, a positive unexpected consequence of the responses intended to fight the pandemic — from temporary lockdowns to mask wearing, social distancing, enhanced personal hygiene and reduced travel — has been a major reduction in levels of many common seasonal infections. A particular example is the observation of a relatively low number of flu cases⁴ — and there has also been a huge impact on other common respiratory illnesses.

This fact alone should encourage a change in our behaviour to adopt a different outlook on healthcare environments.

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*Situation at time of going to press.

The shape of safe water:

Taking the hazards out of care home water systems

As care homes continue to tackle the changing restrictions and requirements for Covid-19 safety for their residents it remains crucial not to lose sight of other potential infection threats to vulnerable residents, Legionnaires' disease remains a potential killer that may rear its head in what appear to be otherwise safe, clean, well run care settings.



In November 2020 a South West care home provider was fined £150,000 after a resident died from Legionnaires' disease in a Wiltshire care home. In this case, the Care Quality Commission (CQC) had launched a criminal investigation against Sentinel Healthcare Ltd* who ran the Fordingbridge Care Home where the 50-year-old resident died in 2017. In the March 2019 inquest, the jury concluded that Andy Clegg had died as a result of Legionnaires' disease caused by the presence of vast quantities of *Legionella* bacteria in his bathroom taps and shower.¹

In another high profile case where the care home operator was prosecuted in 2018 after a resident died from Legionnaires' disease, failure to adequately ensure the safety of the water supply also attracted a huge fine for the care provider. The corporate group was prosecuted and fined a massive £1.5 million (after appeal) by the Health and Safety Executive (HSE) over a series of management failings that caused the death of an 86-year-old man at the company's residential home in Essex. The victim was believed to have been infected via the hot water tap in his room. The company was also ordered to pay legal costs of just over £150,000.

Guidance to mitigate the risks from waterborne pathogens is clearly laid out in health and safety control strategies

(see opposite), with compliance a legally required responsibility that requires competent monitoring of hot and cold water systems. The consequences of failures in compliance that lead to disease and mortality must be highly distressing for any care provider and, as illustrated here, can also lead to substantial financial penalties and reputational damage.

Both these cases were the result of multiple failings and serve as (extreme) examples of what can go wrong when water safety is not properly understood or overseen.

What went wrong that led to prosecutions?

The failings cited in court that led to the proliferation of *Legionella* in the water supply at the Fordingbridge care home included lower than ideal water temperatures in little used rooms at the end of long pipe runs. In addition, a commendable concern for the environment unfortunately translated into hot water heated by solar panels being fed into a large hot water tank at temperatures ideal for *Legionella* growth. While Sentinel had employed an outside contractor to look after water safety at Fordingbridge, nonetheless, there were clear failures to prevent bacterial contamination of the home's water system.

Sentinel were found guilty of failing to provide safe care and treatment, resulting in avoidable harm to the victim, and also exposing other service users to a significant risk of avoidable harm.

In the Essex case, investigations showed that the care home manager lacked sufficient training in *Legionella* risk management, warnings had been ignored and records had even been faked. Concerns about the residential home were first raised as far back as 2012 over failures to monitor the home's water system and flush it when necessary, which allowed *Legionella* to flourish in the home's water system. However, no action was taken until 2015 — too late to prevent the resident's death.

This case highlighted that no-one working in the home understood either how the hot water system

worked or what factors in that water system created risks for Legionnaires' disease. The HSE demanded that all care homes have systems in place to train their managers effectively on all aspects of the Legionnaires' risk management process including *Legionella* risk assessment, record keeping and monitoring.

The company running the Essex home has since made changes to ensure that all members of staff have adequate training in the management and control of *Legionella* risks.

Legionnaires' disease and *Legionella* proliferation in water systems

Legionnaires' disease is a specific, serious pneumonia caused by inhalation of pathogenic *Legionella* bacteria – most commonly *L. pneumophila* – in contaminated water droplets and aerosols (in a similar way to infection with respiratory aerosols in Covid-19). While healthy individuals who encounter *Legionella* may not become ill at all, certain groups – who include the typical residents of care and nursing homes – are particularly at risk, namely the elderly and those with compromised immune systems.

Legionella species are common in natural water sources and can enter purpose-built hot and cold water (HCW) systems via mains water, despite mains water in the UK – and across most of Europe (see pg 14-15) – being well managed and of a very high quality. However, certain conditions within a HCW system can lead to proliferation if the system itself is not well supervised and preventative mitigations are inadequate.

What do care homes need to do to keep their water systems safe?

Legislation

A raft of guidance from the HSE and CQC provide thorough information on how to manage and control the risks from waterborne pathogens in residential care homes – see 'Guidance' section at the end of the article.



Compliance with the mitigation strategies laid out in these documents is legally enforceable under several pieces of legislation – see 'box':

Legislation governing compliance with HSE and CQC guidance

- Health and Safety at Work Act 1974
- Control of Substances Hazardous to Health Regulations 2002
- Management of Health and Safety at Work Regulations 1999
- Health and Social Care Act 2008 (Regulated Activities) Regulations 2014: Regulation 12.

Regulation 12 of the Health and Social Care Act is intended "to prevent people from receiving unsafe care and treatment and prevent avoidable harm or risk of harm."

The 2014 Regulations took effect on 1 April 2015 and coincided with a transfer of enforcement responsibility for health and safety incidents in the health and social care sector from the Health and Safety Executive and local authorities to CQC.

The Fordingbridge case was the first time the CQC has used its prosecution powers against a provider in a case where a person has contracted Legionnaire's disease.

A regulation 28 report from the coroner, Nicholas Rheinberg, noted that although in recent years there has been a duty for CQC inspectors to check water safety, expert evidence at the inquest suggested that inspectors lacked training to help them identify risks relating to potential *Legionella* infection.

In response, the CQC confirmed:

"that water safety is considered by CQC inspectors prior to every inspection we conduct... The guidance for inspectors suggests their evidence should include checking there are Legionella risk assessments and checks in place, and also checking Provider/Manager arrangements for checking, identifying and rectifying premises issues."

They noted that their inspectors:

"are not technically qualified in water safety or water systems generally (where these issues are known to develop) and therefore are unable to hold themselves out to be experts in the field."

The CQC's role is as a regulator but:

"it is the CQC's responsibility to draw the providers' attention to the expected compliance with [the HSE] guidelines, it is not the CQC's role to make technical examinations of water systems on registered provider sites"



during inspections. It is the responsibility of the provider running the location to ensure they comply with the water safety guidelines and provide a safe environment for their service users."

However, the CQC has "taken significant learning" from the above sad case and has suggested that the CQC Academy develops a tailored training course in *Legionella* awareness that is "cascaded down to all inspectors nationwide to improve the inspectorate knowledge generally in this area of risk."²

Control and mitigation

Issues in a care home HCW system that must be avoided in order to prevent proliferation of *Legionella* and other pathogenic waterborne bacteria include:

- Keeping hot water hot — above 55°C — and cold water cold — below 20°C as *Legionella* bacteria proliferate rapidly between these temperatures
- Ensuring there is no heat exchange between hot and cold pipes running too close together without insulation to prevent 'Legionella-friendly' temperatures
- Ensuring that water storage tanks are kept at the correct temperatures
- Avoiding long pipe runs that will allow hot water to have cooled by the 'end of the line'
- Avoiding potential areas of water stagnation such as plumbing 'dead legs' in pipes as stagnant water favours the formation of protective 'biofilm', an intricate colony of organisms that can glue itself to inanimate surfaces, in which *Legionella* proliferate
- Carrying out regular flushing to keep water moving through the system, especially where there are under-used taps and showers, for example, in rooms/areas with low occupancy
- Ensuring there is a rigorous cleaning regime
- Testing water in line with an individual properties' risk assessment.

Fixtures and fittings

The choice of fixtures and fittings such as taps, wash hand basins and toilets can also contribute to reducing the scope for bacterial growth — and can also prove to be a worthwhile investment by reducing control and mitigation costs. For example:

- Well chosen taps that are easily stripped down for cleaning — with spouts that can be removed and autoclaved and that contain materials less likely to attract bacterial growth
- Hand wash basins that are designed to: reduce splashing that can spread contaminated aerosols that may be inhaled; drain well to prevent stagnation in pipework
- Toilets that are designed to be easier to clean and to reduce aerosol production on flushing. For example, one highly innovative model has been designed without an overhanging rim so that the bowl is completely cleaned with an advanced jet wash that eliminates splashing.

Although stored warm water in care homes should be kept very hot to prevent *Legionella* growth, residents are particularly vulnerable to scalding. The solution is to utilise taps with thermostatic mixing valves (TMVs) that blend hot and cold water to provide constant temperatures and these should be used for taps accessed by residents.

Where TMVs are installed, they need to be risk assessed appropriately as the lower temperatures to prevent scalding and be comfortable for hand washing have been argued as being more conducive for bacterial proliferation, as is the complex design of some TMVs, with components made from potentially 'bacteria-friendly' polymers.

Some innovative manufacturers have approached these issues by creating simpler tap units; these contain fewer plastic components and more brass, which is naturally antimicrobial.





All taps, whether manual or thermostatic must be risk assessed for infection and scald risk and be well maintained. Ranges are available that have been specifically designed for healthcare settings.**

Choosing the right contractor

The responsibility for water safety lies with the Duty holder, although utilising outside expertise can be a viable option for certain tasks — but, as illustrated above, it is essential to choose a competent contractor. Advice on choosing a contractor is available from the *Legionella* Control Association³ and the Water Management Society.⁴

Providers' strategies in action

The HSE's Approved Code of Practice (ACoP) L8 lays out the requirement for every premises to keep records for at least five years and to appoint a competent 'responsible' person to handle *Legionella* compliance and processes.

Under the 2008 Health and Social Care Act ACoP, there is a requirement for water in care homes to be overseen by a water safety group (WSG), which should create a water safety plan (WSP). This should include a *Legionella* risk assessment (RA) and it is a legal requirement to apply the controls, monitoring and maintenance identified in the RA.

*How might a competent care home WSP look? The following gives an example of the approach utilised in practice by a major care provider:****

"[We implement] a consistent approach to managing water safety risks across the estate: a two yearly water RA of each residential facility is undertaken by a specialist independent water safety contractor with recommendations arising acted on by the home manager and/or the relevant estates professional(s). Water samples are also taken during these visits and lab tested. The estates team manages concerns as and when they arise and is responsible for the whole estate, with each site having its own management scheme in line with [the] requirements of ACoP L8. A written

scheme of control is in place for each residential facility with property log books in each residential site to record all monitoring on various aspects of the water systems to provide assurance. WSGs are being established which will assume responsibility for water safety arrangements across the whole estate.

"The manager of each home, estates and maintenance workers are required to undertake Legionella-related training sessions."

In relation to the Covid pandemic and specific ECSMID/ESGLI guidance:

"Whilst every effort was made during the pandemic to limit the numbers of contractors allowed into our sites, in order to reduce the risk of Covid transmission, water related risks (including those of Legionella) were recognised as a risk that required on-going management and attention, and the programme of water risk assessments, sampling and follow-up as appropriate, has therefore continued uninterrupted over the last 18 months."

Guidance for management of water safety in care settings

- HSE: Approved Code of Practice ACOP L8: "Legionnaires' disease: The control of *Legionella* bacteria in water systems"
- HSE: HSG274: Legionnaires' disease: Technical guidance Parts 1, 2 and 3
- HSE: HSG220 Health and Safety in Care Homes
- ECSMID/ESGLI Guidance for managing *Legionella* in nursing
- Department of Health: Health Technical Memorandum 04-01: Safe water in healthcare premises (HTM 04-01).

References

1. [irwinmitchell.com/news-and-insights/newsandmedia/2019/june/settlement-for-family-of-hampshire-care-home-resident-following-legionnaires-death](https://www.irwinmitchell.com/news-and-insights/newsandmedia/2019/june/settlement-for-family-of-hampshire-care-home-resident-following-legionnaires-death)
2. Legal communication.
3. legionellacontrol.org.uk/_data/pdf/Competence-guidance-204.19-07-21.pdf page 3
4. www.wmsoc.org.uk/competence.php"wmsoc.org.uk/competence.php

**Sentinel Healthcare have now been taken over by Allegra Care.*

***Further information on the dangers and prevention of Legionella risks in care homes can be found in the Looking Deeper 'Back to Basics' supplement on Legionnaires' disease. The supplement is available on request from editorial@lookingdeeper.co.uk and on-line at idealspec.co.uk/resources/whitepapers.html*

****This providers' details cannot be named for legal reasons.*

Brexit — the watery way ahead

As the world continues to reel from the Covid pandemic, the UK also faces another huge upheaval on top of the public health crisis — our exit from the European Union. Much more than a simple existential shift, 'Brexit' is presenting us with a slew of major challenges, representing perhaps the biggest adjustment in British life since our entry nearly 50 years ago.

Will Brexit have any practical impact on the UK water safety sector?

Interestingly, the UK's departure from Europe has coincided with the release of the new European Drinking Water Directive (EU 2020/2184). Coming into force on 21 January 2021, this overhauls and updates the 20-year-old previous 98/83/EC legislation and reinforces the importance of water quality standards and harmonisation among the member states.

The four nations

In the UK, responsibility for water quality is devolved across the four nations, making each administration separately responsible for its approach to adoption — or not — of EU legislation.

England

In England and Wales, the regulator for drinking water quality is the Drinking Water Inspectorate (DWI) — however, the DWI is not the policymaker — that responsibility lies with Defra (the Department for Environment, Food and Rural Affairs).

According to Ann Bunting, the DWI's Principal Inspector for Stakeholder Engagement, EU Exit and Communications, no decisions have yet been made in England and Wales: "These [decisions] will be made by [Defra] ministers in the national interest. However, the Government line is that we wouldn't necessarily follow Europe because we're an independent sovereign state."

However, "we are very keen that our legislation keeps up, it can't deteriorate, we've got good legislation [and] we've got good drinking water quality that we want to maintain. That will inevitably mean changing some standards over time, doing new research....things do evolve.

"We tend to follow the WHO guidelines (the WHO drinking water framework influenced the direction of the new

directive) for parameters in drinking water so that would be a good point of reference that we might make use of — and that's the Defra line. [While]... we've got the freedom to do things differently... the ambition is to do them well.... "We've already got in our legislation quite a lot of the elements of water safety planning (outlined in the new directive)."

However, the Defra approach to the new directive currently (at the time of going to press) appears confusing.

A Defra spokesperson said: "We have been clear that we will not weaken any of our world-leading environmental standards. Now we have left the EU, where possible, we will look to enhance these standards even further."

*"There is existing secondary legislation that has transposed the EU's Drinking Water Directive in all four regions of the UK, covering public and private supplies of drinking water."*¹

But then proceeded to cite legislation that only covers England:

"Drinking water policy is devolved, so we have the details for England's regulations. These are the Water Supply (Water Quality) Regulations 2016 (as amended) (S.I. 2016/614) and the Private Water Supplies (England) Regulations 2016 (as amended) (S.I. 2016/618)."



Scotland's devolvement means it will continue to follow EU legislation.

Scotland

In fact, the situation in Scotland is completely devolved. Scottish ministers have made it clear that they want to keep up with European legislation, putting forward the Continuity Act 2021 to replace the old European Community powers to facilitate transposition of legislation.

Rosemary Greenhill, Senior Policy Advisor for the Scottish Government's Drinking Water Quality Division, who works on transposing the new directive confirms:

"Irrespective of what Defra decides, Scotland can do what it wants, it can follow the risk assessments and bring in new parameters (outlined in the new directive).. but problems can crop up where we share things such as products and materials... There are lots of issues that relate to the internal market...[we're still working out] about what to do about that."

Wales

The decision on how to manage drinking water quality in Wales is ultimately in the hands of the Welsh Government, whose current focus is on water catchment. The Control of Agricultural Pollution Regulations to improve the health and quality of Welsh rivers, lakes and streams were introduced on 1 April 2021.

Northern Ireland

The position in Northern Ireland, where the DWI is in charge of guidance on safe potable water, also remains unclear, with the Northern Ireland Protocol causing numerous complications. George McCracken, Director of Estates, Risk and Environment for the Belfast Health and Social Care Trust comments that there is unlikely to be a "move into a position where it's going to change radically...Whatever happens with Brexit you can't see a situation where the UK is going to diverge with something as fundamental as water quality."

What changes are the new EU drinking water guidance bringing in?

The main thrust of the new directive² is the introduction of a risk assessment approach for source (catchment) to tap control to identify hazards. Observation of specific microbial parameters has also been updated with new parameters added, some parameters removed, lists of 'new' environmental contaminants and the introduction of a 'watch' list.

Most noteworthy, *Legionella*, which has come to be considered a considerable health burden in Europe, has now been added as a new significant risk from the domestic drinking water systems. The directive states that appropriate measures must be taken to eliminate or reduce the risk of non-compliance with the parametric

values set out — of 1000 CFU/L *Legionella* spp. — and that "those measures shall at least target priority premises."

In relation to *Legionella*, the directive also encourages member states to promote training for plumbers and other professionals dealing with domestic distribution systems.

What happens next?

While Defra holds back on making a decision on where to go next, there are still a lot of questions and the whole area remains murky — despite the UK's significant contribution to the new directive while still a core member of the EU. Given the amount of work that's gone into the new directive, will England, Wales and NI be re-inventing the wheel?



Credit: Dr Sebastian Crespi, Biolinea

Independent microbiology consultant Paul McDermott, a former HSE inspector on *Legionella*, thinks not: "[Although] there's more on *Legionella*... an additional sampling requirement in practice ...this was already being done for healthcare." However, he notes that there could be implications for lower risk healthcare settings, such as walk-in clinics, if the new directive were to be fully taken up — although this seems unlikely.

The internal market issue in relation to fixtures and fittings also remains uncertain. Terry Moss, Leader NPD UK Brassware at sanitaryware manufacturer Armitage Shanks says: "So far changes in regulations have not materialised for our industry, we will still be working to the same product norms and requirement as before. However in the future this could change as we are now free to choose our own path with guidance from government bodies such as DEFRA and DWI."

References and notes

1. www.legislation.gov.uk/eudr/2020/2184/body
2. The European Union (Withdrawal) Act 2018 has ensured that, following the UK's exit from the EU, the current levels of protection in the DWD are in place in the UK and laws still function effectively.

J Hosp Infect.

2021 May;111:162-168. doi: 10.1016/j.jhin.2021.01.020.

Pseudomonas aeruginosa infection in augmented care: the molecular ecology and transmission dynamics in four large UK hospitals.

Halstead FD et al.

Molecular typing in *Pseudomonas aeruginosa* outbreaks has linked patient acquisition to contaminated hospital water systems. This study aimed to elucidate the role of *P. aeruginosa* transmission rates in non-outbreak UK augmented care settings. Over 16 weeks all water outlets in augmented care units of four hospitals were sampled for *P. aeruginosa* and clinical isolates were collected. All isolates underwent whole-genome sequencing (WGS), which with epidemiological data identified acquisition from water as definite (level 1), probable (level 2), possible (level 3), and no evidence (level 4). Outlets were found positive in each hospital on all three occasions: W (16%), X (2.5%), Y (0.9%) and Z (2%); and there were 51 persistently positive outlets in total. WGS identified likely transmission (at levels 1, 2 and 3) from outlets to patients in three hospitals for *P. aeruginosa* positive patients: W (63%), X (54.5%) and Z (26%). According to the criteria (intimate epidemiological link and no phylogenetic distance), approximately 5% of patients in the study 'definitely' acquired their *P. aeruginosa* from their water outlets in the intensive care unit. This study found extensive evidence of transmission from the outlet to the patients (W).

Biofouling.

2021 Jul 1:1-16. doi:

10.1080/08927014.2021.1915998. Epub ahead of print. PMID: 34210218.

Supplemental nutrients stimulate the amplification of carbapenemase-producing *Klebsiella pneumoniae* (CPKP) in a sink drain *in vitro* biofilm reactor model.

Burgos-Garay ML et al.

Liquid wastes (LW) disposed in hospital hand washing sinks may affect colonisation of sink P-traps by carbapenemase-producing *Klebsiella pneumoniae* (CPKP), causing CPKP dispersal into the patient care environment. This study aimed to determine the effect of LW on biofilm formation and CPKP colonisation in a P-Trap model (PTM). PTMs containing polymicrobial biofilms grown in autoclaved municipal tap water (ATW) supplemented with 5% dextrose in water (D5W), nutritional shake (Shake), sugar-based soft drink (Soda) or ATW were inoculated with *K. pneumoniae* ST258 KPC+ (ST258) or *K. pneumoniae* CAV1016 (CAV1016) and sampled after 7, 14, and 21 days. Biofilm bio-volume, mean thickness and heterotrophic plate counts were significantly reduced and roughness coefficient significantly increased by Soda compared with D5W, Shake, or ATW. CPKP were significantly reduced by Soda but significantly amplified by D5W (ST258; CAV1016, 7 d) and Shake (ST258) suggesting that reducing LW disposal in sinks may reduce CPKP dispersal into patient care environments.

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