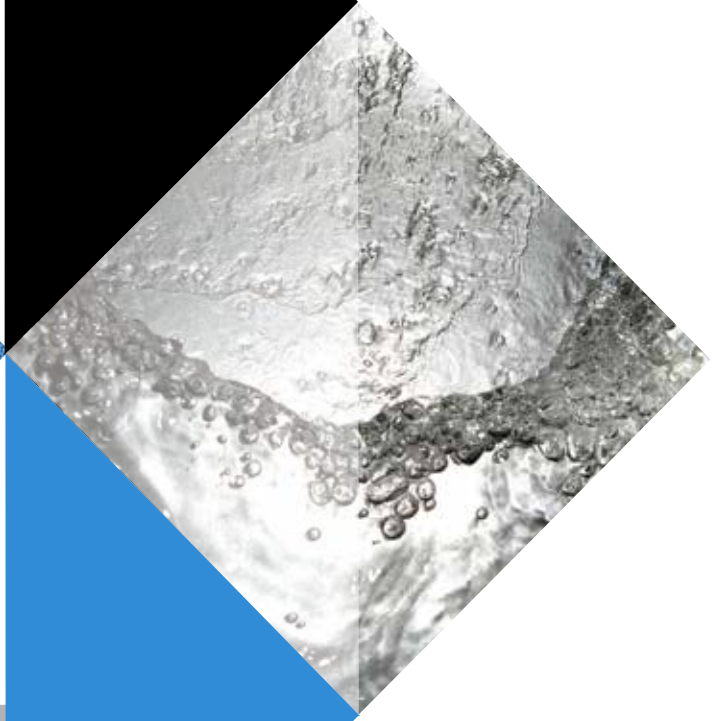


CONTROL OF **LEGIONELLA BACTERIA**

Maintenance and compliance advice for air conditioning and water systems

ECG FS
FACILITIES SERVICES

Status

Legionella bacteria in water systems and air conditioning present a health risk to employees and visitors alike in any premises affected.

Building owners, employers, managers and responsible individuals face prosecution if they fail to comply with current UK legislation on the subject. Essential to controlling Legionella and other water-borne hazards in air conditioning and water systems is having a recognisable maintenance plan. Many buildings, workplaces and public spaces are potentially at risk, and the health consequences, including possible fatality, increase in facilities such as hospitals and care homes where people may have impaired immunity.

It's crucial that facilities managers are aware of the dangers and have effective processes in place to ensure compliance with legislation, mitigating them and ensuring the health and wellbeing of building users.

Contents

Introduction:
How bacteria thrives

Legionellosis is a collective term for diseases caused by legionella bacteria including the most serious legionnaires' disease

Legionnaires' disease is a potentially fatal form of pneumonia and everyone is susceptible to infection. The bacterium Legionella pneumophila and related bacteria are common in natural water sources such as rivers, lakes and reservoirs, but usually in low numbers. They may also be found in purpose-built water systems, such as cooling towers, evaporative condensers, hot and cold water systems and spa pools. If conditions are favourable, the bacteria may multiply, increasing the risks of legionnaires' disease, and it is therefore important to control the risks by introducing appropriate measures.

Legionnaires' disease is normally contracted by inhaling small droplets of water (aerosols), suspended in the air, containing the bacteria. Certain conditions increase the risk from legionella if:

(a) the water temperature in all or some parts of the system may be between 20–45 °C, which is suitable for growth;
(b) it is possible for water droplets to be produced and if so, they can be dispersed;
(c) water is stored and/or re-circulated;
(d) there are deposits that can support bacterial growth, such as rust, sludge, scale, organic matter and biofilms.

It is important to control the risks by introducing measures which do not allow proliferation of the organisms in the water systems and reduce, so far as is reasonably practicable, exposure to water droplets and aerosol. This will reduce the possibility of creating conditions in which the risk from exposure to legionella bacteria is increased. In England and Wales, cases number around 300 annually, including infections contracted abroad.

Legionnaires' Disease is serious in elderly and infirm patients; pneumonia is a common cause of death in people over 70 who contract Legionnaires' Disease

Any source of a mist—spas, shower heads, faucet aerators, fountains, cooling towers—is a source of potential exposure. In addition, Legionella contaminated water or ice can be aspirated into the lungs by susceptible individuals, such as people over 45, smokers and heavy drinkers, people suffering from chronic respiratory or kidney disease, diabetes, lung and heart disease or anyone with an impaired immune system.

Exposure to Legionella bacteria can cause two diseases: Pontiac Fever or Legionnaires Disease. Pontiac Fever is not serious. Symptoms usually last for two to five days and may include fever, headaches, and muscle aches; however, there is no pneumonia. Symptoms subside on their own without treatment and without causing further health issues. Outbreaks can occur, but isolated cases may go unreported because the symptoms are the same as common influenza.

Fact

The World Health Organisation have identified risk factors that can promote the proliferation of legionellae as:

- DESIGN
- TEMPERATURE
- WATER QUALITY
- MATERIAL USED IN CONSTRUCTION
- PRESENCE OF BIOFILMS

Fact

Facilities at high risk

Healthcare facilities: Pre-existing medical conditions increase the chances of contracting, and dying from, Legionnaires' disease with up to 40 per cent mortality. Piped hot and cold water systems have been responsible for many incidents, as well as cooling towers.

Hotels & Universities: Large, complex and subject to seasonal use, the piped water systems of hotels are prone to legionellae.

Housing associations: With self-contained systems where airborne infections may spread.

Spas, hot tubs and swimming pools: With their warm water and concentrated numbers of human users, hot tubs are fertile breeding grounds for legionellae and, along with natural spas, have been responsible for numerous outbreaks. Showers near pools also present a risk.

The bacteria grows best at warm temperatures. It thrives at water temperatures between 25° and 45°C (77 and 113°F), with an optimum temperature of 35°C (95°F). Temperatures above 60°C (140°F) kill it. Biofilms, thin layers of microorganisms that cling to surfaces in water systems, also help the bacteria to thrive.

For business owners and managers as well as responsible individuals, you have a duty to understand and manage legionella risks. Failing to comply with health and safety legislation related to the control of legionella could result in substantial penalties, including unlimited fines, court costs, compensation claims, disqualification and up to two years' in prison. Even if poor housekeeping has not resulted in an infection, organisations face prosecution if they fail to adequately maintain systems to prevent the risk.

A water system includes all plant/equipment and components associated with that system, eg all associated pipework, pumps, feed tanks, valves, showers, heat exchangers, quench tanks, water softeners, chillers etc.

It is important to consider the system as a whole and not, eg the cooling tower, in isolation. Deadlegs and parts of the system used intermittently, eg test loops in engineering factories and injection moulding machines, also need to be included as part of the system, because they can create particular problems with microbial growth going unnoticed. Once brought back online they can cause heavy contamination, which could disrupt the efficacy of the water treatment regime.

Confirmed Cases of Legionnaires' disease in England and Wales

2010 : 357
2011 : 235
2012 : 306
2013 : 285
2014 : 331

Legionella:
Problems in cooling and water systems maintenance

In their natural freshwater environments, the legionellae group of bacteria would present little risk to humans. In artificial aquatic environments however, where the water temperature rises above ambient, it is a different story.

Experience has shown that cooling towers, evaporative condensers and hot and cold water systems in a wide variety of workplaces present a risk of exposure to legionella bacteria. Legionnaires' disease is considered preventable by controlling the causal bacteria in the locations where they could otherwise thrive.

The opportunity to impact on health and the risk of culpability for an outbreak heightens its significance for public health professionals and anyone involved in, or responsible for, maintaining water systems in buildings. Internationally, the World Health Organisation (WHO) has published guidelines, as have the Health and Safety Executive in the UK.

Nevertheless, it is still uncertain exactly how outbreaks occur.

The known factors are:

- The bacteria are present in an aquatic environment
- They grow to a level that is infectious (though it is not known what that level is)
- They are carried via aerosol to a human host that is susceptible to infection.

The World Health Organisation recommends focusing on preventing both proliferation and exposure with control measures.

- Source water quality
- Treatment of source water
- Design of systems to prevent stagnation
- Control of temperature to minimise proliferation.

Fact

Major outbreaks of legionellosis

• 2014–2015, Michigan, USA: 87 cases with 10 deaths. McLaren Regional Medical Center and the Michigan Department of Environmental Quality is being sued for $100 million in regards to the outbreak

• 2015, Bronx, New York: 113 people infected. 12 deaths. This outbreak is currently being investigated by the New York City Health Department. Out of 17 buildings with cooling towers, five tested positive to the disease, including cooling towers in the Concourse Plaza Hotel and Lincoln Hospital. The Opera House Hotel in the South Bronx is also considered a source of the outbreak.

• 2014, Portugal: A widespread outbreak in Vila Franca de Xira district, which is one of the world's largest outbreaks with more than 375 suspected cases. 12 die.

• 2012, Edinburgh, Scotland: 56 confirmed cases, with a further 36 suspected cases, bringing the total number of people affected to 92. Four people are known to have died from the outbreak suspected as originating at cooling towers.

LACK OF KNOWLEDGE

A lack of appreciation of the real risk presented along with carelessness and Imperfect procedures, may all contribute to a failed maintenance programme. Where systems are complex or where they are a peripheral responsibility for individuals, a lack of knowledge of the risks and the causal processes involved would also appear to be a likely cause of problems.

For example, individuals may form the opinion that cleaning a system once a year may be sufficient to eliminate risk, without realising that other factors such as water temperature and system design can also be very significant contributors to the proliferation of the bacteria.

Although the risk of Legionnaires' disease being spread by large-scale water systems cannot be eliminated, it can be greatly reduced by writing and enforcing a highly detailed, systematic water safety plan appropriate for the specific type of facility involved.

It is worth noting that the bacteria and the disease present difficulties to scientists and medical professionals as well as those involved in, or responsible for, buildings and water systems maintenance. In one incident, first culture results were negative, which is not unusual, as Legionella pneumophila is a fastidious bacterium and cannot grow without specific nutrients and living conditions.

10 reasons Legionella develops in air conditioning and water systems

_1. Inadequate maintenance & servicing of equipment

_2. Lack of knowledge of the causes and treatment

_3. Overly-complex distribution systems with dead ends etc.

_4. Failure to keep temperatures in water systems outside the 20-50^{O}C range

_5. Failure to periodically disinfect cold water systems

_6. Cold water systems not chlorinated

_7. In new installations, poor design or installation

_8. Inadequate cleaning and monitoring

_9. Disconnect between individuals responsible for systems

_10. No comprehensive, up-to-date risk assessment

Strategic prevention of legionella
in air conditioning and water systems

To quote the World Health Organisation:

"The major risk factor for legionellae proliferation appears to be neglect or insufficient maintenance."

It has been established that there are complex reasons for outbreaks of legionellosis, including the potentially deadly Legionnaire's Disease.

However, it is also clearly understood that the single most effective strategy to prevent bacteria developing is a programme of proper maintenance of water systems.

Periodic major eruptions of the disease, such as the NYC 2015 outbreak, gain worldwide publicity, so it might be expected that building managers would be fully aware of the threat and have programmes in place to deal with them. This is especially true in the health sector where there is heightened awareness of hygiene risks following high profile incidences of MRSA and other bacterial infections.

Nevertheless, perhaps because it is some years since a major incident in the UK, it seems reasonable to suggest that management in many organisations are less aware of the risk and the steps required to mitigate it than they should be. In smaller organisations where there is no dedicated health and safety officer, that possibility is increased since premises management and health and safety as a whole will both be peripheral to the main management function of running the business. Under financial pressure, there is an increased likelihood for corner cutting.

Education is important, and to this end the UK government Health & Safety Executive publishes guidance for businesses and landlords on the subject and also publicises cases where it has brought prosecutions in both the private and public sector.

In organisations where management are ignorant or wilfully neglectful, there will be little appetite for solutions to the problem. In organisations that are concerned about the issue and wish to be sure that they take adequate steps to prevent an occurrence in their premises, maintenance is vital. Studies of the causes of accidents have highlighted inappropriate systems of work, poor maintenance, use of defective materials, and poor supervision and training as key contributors. Inadequately trained operators have also been identified as a major reason for the prevalence of water quality incidents and disease outbreaks. Error management techniques put forward as solutions to the problem include selection, training, licensing and certification.

It is clear that addressing these issues with appropriate management and technician training is imperative for building managers and anyone with a duty of care for at-risk premises.

To ensure adequate systems for maintenance and monitoring are in place, and to ensure compliance with legal responsibilities, it is necessary to implement procedures and documentation, and carry out a full risk assessment of the hot and cold water systems and thereafter, ensure adequate measures are in place to control the risks.

The primary method used to control the risk from Legionella is water temperature control. Water services should be operated at temperatures that prevent Legionella growth:

- Hot water storage cylinders (calorifiers) should store water at 60°C or higher
- Hot water should be distributed at 50°C or higher (thermostatic mixer valves need to be fitted as close as possible to outlets, where a scald risk is identified).
- Cold water should be stored and distributed below 20°C.
- A competent person should routinely check, inspect and clean the system, in accordance with the risk assessment.

You must identify ‘sentinel’ outlets (furthest and closest to each tank or cylinder) for monthly checking of the distribution temperatures. You should also check the hot water storage cylinder temperatures every month and cold water tank temperatures at least every six months.

Stagnant water favours Legionella growth. To reduce the risk you should remove dead legs/dead ends in pipe-work, flush out infrequently used outlets (including showerheads and taps) at least weekly and clean and de-scale shower heads and hoses at least quarterly. Cold-water storage tanks should be cleaned periodically and water should be drained from hot water cylinders to check for debris or signs of corrosion.

Design systems to minimise Legionella growth, by:

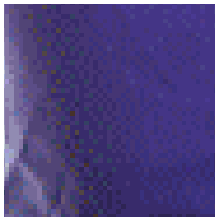
- keeping pipe work as short and direct as possible;
- adequately insulating pipes and tanks;
- using materials that do not encourage the growth of Legionella;
- preventing contamination, eg by fitting tanks with lids and insect screens.

Business benefits of Water Hygiene preventative maintenance **with ECGFS**

Assessing the potential for a Legionnaires' disease outbreak in your business is an important consideration. The business owes a duty of care to protect staff and members of the public from a potential Legionella infection. Additionally, organisations in the UK that fail to have appropriate risk management and maintenance procedures in place are at risk of prosecution. So it is imperative that you undertake a risk assessment for Legionella management, and implement suitable controls eg. flushing through the systems on a regular basis.

Effective maintenance is proven to substantially reduce the risk of legionellosis in premises and equipment. Effective maintenance also delivers real and measurable business benefits with more efficient operation and longer system life of systems and equipment. It also protects organisations and individuals with a duty of care from prosecution or civil claims.

- **Health and safety of staff and visitors**
- **More efficient operation of systems and equipment**
- **Modern maintenance techniques for more cost effective hygiene**
- **Compliance with health and safety legislation**
- **Longer system life**
- **Quality assurance**
- **Avoidance of prosecution and/or civil claims**
- **Flexibility of delivery and location for cost effectiveness**
- **Online tracking for effective, ongoing delivery**



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