

### Understanding the basics

Legionella bacteria are ubiquitous and can live in water or soil. In order to cause illness they have to enter the lungs, or in rare cases enter a wound in the skin, but breathing in an infected aerosol is the main cause.

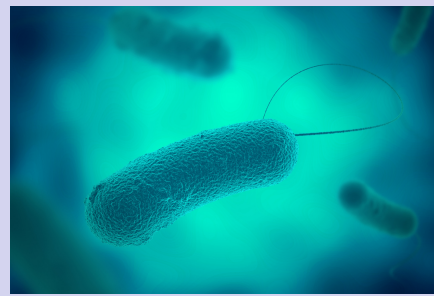
This leads to a pneumonia like illness which is confirmed by an x-ray showing pneumonia and a secondary test such as a urinary antigen test. Death occurs in about 10% of cases depending on the susceptibility of the individual. Susceptibility is increased by having other illnesses such as heart disease, lung disease, diabetes and renal problems.

Legionella bacteria enter a building in the mains water in small numbers and then grow and increase to larger numbers within man made water systems such as showers, cooling systems, hot and cold water, and a host of other engineered systems. The system has to create an aerosol for a person to catch Legionnaires' disease from the infected aerosol.

The aerosol needs to be very small, less than 5 microns, to be able to reach the area of your lungs called the alveoli where the Legionella bacteria cause Legionnaires' disease. There are about 60 species and serogroups of Legionella bacteria and only about 20 of these cause illnesses in humans.

In the water systems the Legionella bacteria find niches to live, hide and grow such as biofilms, deadlegs, in some of the materials of construction and in places where they can be undisturbed. In order to cause illness though they must also be found in the body of the water. So keeping the systems clean in the body of the water as well as system surfaces is important.

### Legionella bacteria



### Management Structure

In some countries, such as the UK, there is a requirement to prevent people catching Legionnaires' disease in the workplace. This workplace can include factories, offices, hotels, hospitals, leisure facilities and a host of other buildings and locations. In the UK the HSE produce the documents that help companies manage safety and with regards to Legionnaires' disease this includes an Approved Code of Practice, L8, and technical guidance, HSG 274, which comes in three parts.

L8 and HSG 274 describe how to manage Legionnaires' disease and start by describing how an organisation should be set up to minimise Legionella bacteria. This involves the business owner or manager (the Dutyholder) appointing somebody with sufficient authority, knowledge and competence to run the day to day management of Legionella (known as the Responsible Person).

The Responsible Person is the key person in managing Legionella as it is that person who should ensure the policies and processes for minimising Legionella are in place and are carried out.

In order to understand the issues on site a Legionella risk assessment should be carried out, though this should not be restricted to just Legionella issues as related problems such as other bacteria, for example Pseudomonas aeruginosa, or even scalding risks are important to consider.

### Control Scheme

Once the risk assessment is in place this will identify the risks on site which will lead to a series of works to be carried out. These works are split into on-going and remedial tasks. Knowing what the risks are and what works are required to be carried out leads to the creation of the control scheme. This control scheme is known as the "Written Scheme" or it can be called the "Water Safety Plan"

This scheme or plan details what should be carried out by the company and is managed by the Responsible Person. The detailed contents of this scheme for the UK are described in HSG 274.

Other countries may have their own guidance and the World Health Organisation also has a detailed document describing the schemes for controlling Legionella.

The UK written scheme guidance details the recommended actions to be taken on site, the records to be kept, staff competence and information the site needs to produce that describes the day to day safe operation of the water systems on site as well as what they should do in the event of an upset or cases of Legionnaires' disease.

This written scheme is therefore an important document that an organisation needs to create, whether it be a paper based or electronic system, that fully describes the policies, systems and operations carried out on site to minimise Legionella bacteria.

### Training

Key to successful management of Legionella bacteria is the training and competence of all staff involved in the process. Relevant training and competence is required based on the role fulfilled. For example toolbox talks may be sufficient if a person is just carrying out temperature checks but this is not sufficient for the Responsible Person who will require more detailed, indepth training.



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### Training (cont)

Training should be regularly updated, especially if there is a change in guidance and standards.

The Responsible Person should also ensure chosen contractors are competent and suitably trained for the tasks they are carrying out. For example water treatment companies should ensure their staff are suitably trained and experienced for the tasks they carry out on site. Contractors who carry out plumbing tasks on site should also understand the effect of their work on Legionella management.

Training and competence of all staff involved in managing Legionella is therefore an important component of managing Legionella on site.

### On-going monitoring

The risk assessment carried out will identify the risks on site and using this knowledge the control scheme is created. The control scheme will show the on-going tasks that are required to be carried out. In the UK the details of what is required can be found in HSG 274.

The three parts of HSG 274 offer guidance on the on-going tasks for managing cooling systems (Part 1), hot and cold water systems (Part 2) and "other risk" systems (Part 3). Similar advice can be found in the World Health Organisation document on managing Legionella.

On-going monitoring is a vital part of minimising Legionella as by carrying out various tests and activities you can determine whether the systems you are managing are under control or likely to be allowing Legionella to proliferate.

The results from the on-going monitoring should be regularly checked by the Responsible Person to look for non-conformances and trends which can identify increased risks and allow for actions to be taken before problems occur.

### On-going monitoring (cont)

A well designed and managed set of on-going monitoring tasks is key to managing Legionella and reducing the risks that somebody may contract Legionnaires' disease.

### Keeping things clean

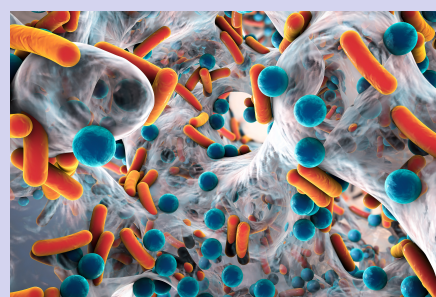
Legionella likes to live in biofilms, scale and sludges on surfaces as it is an ideal environment for the bacteria to seek protection and food. Consequently a system that has these deposits can encourage Legionella bacteria to proliferate.

In order to minimise the presence of Legionella it is therefore important to keep surfaces clean and free from deposits. In some cases it may be possible to achieve this by the use of chemicals, for example in the case of a cooling system or a spa pool. In other systems, such as hot and cold water, such chemicals should not be used and ensuring water flows and is not stagnant is one means of keeping surfaces clean.

Biocides can be used in all systems to minimise biofilms and so reduce Legionella's ability to survive inside a biofilm.

In all cases regular off-line cleaning techniques can be used to ensure systems are kept clean which will minimise Legionella bacteria.

### Biofilm



### Hot is hot, cold is cold

Temperature is a key tool in managing Legionella bacteria in hot and cold water systems. Legionella bacteria thrive in temperatures between 20°C and 45°C and so avoidance of these temperatures is important.

In hot water systems this means maintaining a minimum of 60°C in a calorifier (known as an Immersion heater in a home) and ensuring hot water comes out of the hot tap at a minimum of 50°C.

Note that 50°C is hot enough to scald some people and so in some circumstances a Thermostatic Mixing Valve or Thermostatic Mixing Tap is used to reduce the hot water to a safer temperature. If these are present then extra works will be required as part of the on-going monitoring to ensure they are kept clean and free from bacteria.

Cold water should be kept below 20°C in the UK (the WHO suggest below 25°C in hot countries) to reduce the growth of Legionella bacteria. Below 20°C Legionella bacteria will still live however they enter a state known as "Viable but non culturable" (VBNC) which means they don't grow into dangerous levels of bacteria.

Ways should therefore be found on site to ensure hot water is kept hot and cold water is kept cold to reduce risks.

### Biocides

In some systems, such as cooling systems, spa pools and process waters, it is permissible to use industrial biocides to kill or control bacteria, including Legionella. In hot and cold water, which is fit for human consumption, the choices of allowable biocides is much more restricted.

If biocides are to be used then they must be controlled carefully to ensure they are always present in the right quantity for the right amount of time to ensure biological control.



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### Biocides (cont)

The biocides most readily approved for use are chlorine and chlorine dioxide, which are known as "oxidising biocides" though there are other oxidising biocides which may be used. There are also "non-oxidising" biocides that can be used in some circumstances.

Biocides are hazardous as they are there to kill bacteria and other organisms so they must always be used with care with all relevant health and safety considerations being closely followed.

### Choose your support

It is unlikely that a Responsible Person has all of the skills and competences required to manage a site by themselves and so contractors are often used to help.

Using contractors does not absolve the Responsible Person of responsibility for managing Legionella on site so it is important contractors are chosen with care.

Contractors should be able to show experience, skill and competence relating to the task required of them. In the case of water treatment companies this means their staff should know how to carry out suitable and sufficient risk assessments, manage water systems, advise on the use of chemicals and how to competently clean water systems.

Seeking references for similar works carried out elsewhere, using an industry expert to audit the work of the contractor or seeking relevant accreditations are all suitable ways of managing contractors

Bearing in mind the seriousness of Legionnaires' disease it is worth taking time to choose the contractor you trust and will be happy working with to manage Legionella on site.

### Keep your eye on the ball

You now have a suitable and sufficient risk assessment identifying the risks on your site, from this you have identified the remedial tasks required to bring your systems up to a suitable standard, and have a list of on-going monitoring tasks.

Your control scheme is in place with management structures, training, a well chosen contractor all of which will generate large quantities of information.

Systems will change over time, bacteria, being living organisms, will grow some times faster than others, standards and rules will change from time to time.

All of this means it is very important to keep on top of what you have in place. You can do this by having regular audits of the systems and processes in place whether carried out by the Responsible Person or by an independent external audit.

Whatever means you choose you should learn from the information you have as this means you can reduce the risks on site. Look at trends and at how you remediated problems as these same issues may well reoccur.

Your risk assessment will need to be reviewed regularly so you can use this learning to inform your new risk assessment which should result in reduced risks on site.

All of this information, your systems, processes and learning will prove to someone like the HSE that you have Legionella under control. It may not be possible to eradicate Legionella but what is possible is to have a well managed system in place to control Legionella.

### External support

If after reading this you find that you need external help and support then take a look at the following websites:

[Collaton Consultancy](#)

[Legionella Risk Management](#)

[Legionella Blog](#)



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