

Legionnaires' Disease

Information Sheet

This information sheet provides a general overview of Legionnaires' disease and is aimed at employers and persons who have control of a place of work.

It will also be of interest to designers, suppliers, manufacturers and installers of water based systems, plant and equipment.

What is Legionnaires' disease ?

Legionnaires' disease is a potentially fatal form of pneumonia. People may get infected when they breathe in tiny water droplets (aerosols) or droplet nuclei (particles left after the water has evaporated) contaminated with elevated concentrations of *Legionella* bacteria. *Legionella* bacteria grow best between temperatures of 20°C – 45°C with optimum growth temperature being 35°C – 40°C. High temperatures (minimum 60°C) kill the bacteria.

Legionella bacteria are found in low numbers in natural aquatic environments, for instance, lakes, rivers and ground water. As a result it is virtually impossible to prevent *Legionella* bacteria entering man-made water systems.

In low numbers the bacteria are generally considered harmless. With the correct conditions, for example, warm water, the presence of micro-organisms and nutrients in the water or materials such as rust, the bacteria can grow and multiply to high levels which increase the risk of exposure. The bacteria tend to grow in biofilms (slime). Biofilms are likely to form on surfaces where there is low water flow or water is allowed to stagnate. However the growth of the bacteria can be controlled.

The likelihood of contracting Legionnaires' disease is related to:

- ▲ the level of contamination in the water source;
- ▲ the ability of the water source to generate aerosols and;
- ▲ the susceptibility of the person exposed to the contaminated water.

What are the symptoms of Legionnaires' disease?

The symptoms of the disease are similar to those for flu with initially high temperature, fever, chills, muscle pains and headaches. This may be followed by a dry cough and breathing difficulties leading eventually to pneumonia.

In some cases there may be diarrhoea, vomiting and / or mental confusion. Symptoms usually develop 2 to 10 days after infection. In some cases infection can be fatal. The disease is not contagious and cannot be transferred from person to person.

Who is at risk from Legionnaires' disease?

In general, anyone who encounters aerosols containing the bacteria may be susceptible to the disease but the risk is higher for males than females, if you are aged over 45, a smoker or if your immune system is impaired. Young people tend to be less susceptible to Legionnaires' disease.

Where may potential sources of aerosols be encountered?

The following is a non exhaustive list of potential sources of aerosols which may contain *Legionella* bacteria:

- ▲ Wet cooling systems for example, cooling towers and evaporative condensers;
- ▲ Spa pools;
- ▲ Hot and cold water systems including showers, eye washes and taps;

- ▲ Machine cooling systems for example, in lathes and plastic injection moulding machines;
- ▲ Spray booth water curtains;
- ▲ Humidifiers in food cabinets and factories;
- ▲ Ornamental fountains and water features;
- ▲ Dust suppression systems such as those used in cement and waste recycling industries;
- ▲ Horticultural misting systems, lawn sprinklers;
- ▲ Clinical humidifiers;
- ▲ Fire fighting systems for example, sprinklers and hose reels;
- ▲ Vehicle washes and power hoses.

A water system includes all plant / equipment and components associated with that system, for instance, all associated pipe work, pumps, feed tanks, valves, shower heads, heat exchangers, quench tanks and chillers. When assessing a water system consider the whole system and not, for example, the cooling tower in isolation.

What legislation is applicable to Legionnaires' disease?

Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005)

Under the Act, every employer must prepare a safety statement which is based on an identification of the hazards and an assessment of the risks to the Safety, Health and Welfare of his / her employees. In carrying out the risk assessment, consideration must be given to the risk of exposure to *Legionella* bacteria.

Where a risk is identified, the safety statement must specify the control measures in place to control or minimise the risk of exposure. The Act also requires those who have control to any extent of a place of work, for example, a management company which looks after water services, to carry out a risk assessment in relation to their duty to persons other than their employees. In doing so, they must consider the risk of exposure to *Legionella* bacteria.

Also, under this legislation, whoever designs, manufactures, imports or supplies articles (which includes plant, machinery and appliances) for use at work, must so far as reasonably practicable:

- ▲ Ensure that the article is designed and constructed so that it will be safe and without risk to health when properly used at work;
- ▲ Provide or arrange for the provision of adequate information to the user about the article to ensure its safe use. This information should include details about the risk and the measures necessary to ensure that the article is operated and maintained correctly and safely.

Safety, Health and Welfare at Work (Biological Agents) Regulations 1994, as amended in 1998 (S.I. No. 146 of 1994 and S.I. 248 of 1998)

Under these regulations, *Legionella* spp. are classified as Group 2 biological agents. This means that *Legionella* bacteria can cause human disease and might be a hazard to employees but it is unlikely to spread to the community and there is usually effective prophylaxis or treatment available.

The regulations set out the duties of employers to prevent exposure to a biological agent or, if complete prevention is not possible, to minimise exposure. The regulations build on the requirements of the Safety, Health and Welfare at Work Act 2005, to carry out a written assessment of the risk of exposure of any employee to a biological agent such as *Legionella* bacteria.

The employer must also provide employees with information and training with respect to the risk posed by biological agents such as *Legionella* bacteria.

Safety, Health and Welfare at Work (General Application) Regulations, 2007 (S.I. No. 299 of 2007)

Part 2, Chapter 2 of these regulations specifically applies to work equipment (which includes machinery, appliances and installations). Under the regulations, where the safety of work equipment depends on the installation conditions, the employer must ensure that an initial inspection is carried out after the installation is completed and before the equipment is first put into service.

Furthermore, where work equipment is exposed to conditions causing deterioration liable to result in a danger to safety or health, for example water systems, the employer must ensure that periodic inspections and where appropriate testing are carried out.

The employer must ensure that special inspections are carried out when exceptional circumstances arise which are liable to make work equipment unsafe, for example after modification work or prolonged inactivity.

The employer must also ensure that equipment deterioration is detected and remedied in good time.

The results of the above inspections must be recorded and kept available for 5 years from the date of inspection and be available for examination by an Inspector from the Authority.

The employer must also ensure that employees have adequate information and where appropriate written instructions on work equipment which should address the normal conditions of use of the equipment and actions to identify and control foreseeable abnormal situations.

Note the above is not an exhaustive list of legislation that is applicable to Legionella bacteria and is not in any order of precedence. Other relevant legislation may also be applicable to your work activities.

As an employer what must I do?

Carry out a written risk assessment.

The level of risk assessment will depend upon the water system. Simple systems of very low risk may only require a simple assessment whilst complex, high risk systems, for example, water systems incorporating cooling towers, will require a very detailed assessment. Ensure that the risk assessment is carried out by a competent person and that employees are consulted during the risk assessment process. In carrying out the assessment:

1. Identify potential sources of risk.

- ▲ Identify and assess sources of risk, for example, identify any systems which contain water likely to be $>20^{\circ}\text{C}$ and $< 55^{\circ}\text{C}$ which may release a spray of water droplets.
- ▲ Identify the source and quality of the system supply water, for instance whether or not from mains water.
- ▲ Identify any possible sources of contamination of the supply water within the premises.
- ▲ Look at physical conditions, for example, the design and condition of the water system.
- ▲ Identify any infrequently used water outlets such as infrequently used showers and taps.

2. Decide who might be harmed and how.

- ▲ Identify any particularly susceptible or sensitive groups of employees.
- ▲ Take account of other people who may be affected by your operations, for example, members of the public.
- ▲ Consider the duration and frequency of personal exposure to the aerosol, for example how often a person may be exposed and for how long.

- ▲ Consider if there is potential for water droplets to be dispersed over a wide area.
- ▲ Take account of the normal operation of equipment and also reasonably foreseeable conditions, for instance, equipment breakdowns.

3. Evaluate the risks and decide on precautions.

If a risk is identified consider whether or not the risk can be avoided, for example can a wet cooling system be substituted with a dry air cooling system.

- ▲ Eliminate stagnation in the water system – for example, where possible remove dead legs (sections of pipe leading to a fitting through which water only passes when there is a draw off from the fitting) and blind ends (pipe work that has been altered or capped such that water cannot flow through it).
- ▲ Control the release of water spray / aerosols, for example, use drift eliminators on cooling towers in order to limit aerosol dispersal.

If the risks can be eliminated and the appropriate action is taken, then the assessment is complete but the assessment must still be regularly reviewed.

If the risk cannot be eliminated then adequate control measures must be put in place.

- ▲ Appoint someone to manage the control measures. Ensure that roles and responsibilities are clearly defined, for instance for employees and contractors. Ensure that any service providers working for you are competent.
- ▲ Inhibit growth physically, chemically or by other suitable methods. For example, insulate pipe work so that cold water is kept cold and hot water is kept hot; keep cold pipes well separated from hot pipes and other sources of heat, avoid temperatures that support growth of the bacteria. Use biocides or other suitable treatment strategies if appropriate.
- ▲ Manage and monitor your control measures. Maintain equipment to ensure that it operates safely and correctly. For example, keep equipment clean, control scale and corrosion and protect water storage vessels from contamination and thermal gain.
- ▲ Provide appropriate training and instructions to employees.

4. Record your findings and implement them.

- ▲ Record the results of the risk assessment. Cross reference any relevant health and safety documentation in the assessment.
- ▲ Document the written scheme for preventing or controlling the risk for example, what biocide concentration is being used, temperature measurements and the checks that are to be carried out. Document what remedial action is to be taken if controls fail.
- ▲ Describe the safe and correct operation of plant and equipment, prepare documented procedures.
- ▲ Keep an up to date schematic diagram of your systems. The diagram should show any dead legs, all system control valves, standby valves, water treatment plant, dosing points, drain valves and make up water supply.
- ▲ Retain any documentation and records. Records of operation and maintenance of the system should include when the plant and equipment has been or not been in operation, when parts have been isolated, results of any inspection, tests or remedial action. All test and inspection records must be kept for 5 years from the date of the inspection and be available for inspection by an Inspector from the Authority.

5. Review your risk assessment and update if necessary.

- ▲ Review your risk assessment at regular intervals and especially if significant changes are made for example, changes to plant and equipment design or operation, changes to the building or water treatment, if personnel change or if lack of control is evident.

As a designer / supplier / manufacturer / installer of water systems, plant and equipment what must I do?

Correct design and selection of plant and equipment can play an important role in reducing the risk of Legionnaires' disease. For example:

- ▲ Choose materials that do not support growth of the bacteria. Note that rubber, silicone and plastic may serve as growth substrates for the bacteria and may not always be appropriate to use;
- ▲ Locate and install plant and equipment safely and correctly, for example, ensure adequate space around cooling towers for inspection and site the tower so the discharge air stream does not enter air intakes of ventilation equipment;
- ▲ Design plant and equipment to make cleaning easy;
- ▲ Avoid dead legs when installing equipment to prevent stagnation;
- ▲ Keep pipe runs as short and direct as possible;
- ▲ Provide adequate information to the user so that they can operate and maintain the plant and equipment safely and correctly and also dismantle and dispose of any plant and equipment safely;
- ▲ Ensure that personnel installing any plant and equipment are competent and have adequate instruction, information and training.

Where can I get further information?

Further information about Legionnaires' disease can be obtained from:

[The Health Protection Surveillance Centre.](#)

[The Health and Safety Executive:](#) Code of Practice for the control of Legionnaires' disease (L8).

[The Health Protection Agency and Health and Safety Executive:](#) Management of Spa Pools: Controlling the risks of infection.

Further information on safety and health in the workplace is available on our website at www.hsa.ie or by contacting the Workplace Contact Unit at 1890 289 389.