Risk information – Liability

Legionella

Introduction

Legionella species are intracellular bacteria whose natural habitats include soil, lakes, rivers, creeks and other bodies of fresh water.

Man made sources such as, showers, spa pools, fountains, nebulisers and cooling towers can provide a reservoir for Legionella sp. growth.

Legionnaires' disease is contracted by the inhalation of aerosols containing certain Legionella bacteria. The predominant human pathogen is *Legionella pneumophila* with other species also providing clinical relevance in susceptible hosts.

The majority of people exposed to Legionella sp. do not become infected; the risk of disease is however increased among certain individuals. Those most at risk from disease are men over the age of fifty, heavy smokers, heavy drinkers, diabetics and immunocompromised individuals.[1]

Legionnaires' disease

The initial symptoms can occur anywhere from 2 to 10 days post exposure and can include anorexia, malaise, a non-productive cough, abdominal pain, vomiting and diarrhoea. The disease can further develop into Legionnaires' disease, a rare form of pneumonia that if left untreated can result in death. The most effective treatment of the disease is the administration of Erythromycin.

Outbreak-statistics

Notifications of Legionnaires' disease nationally have been relatively constant over the past five years, from 310 in 2001 to 308 in 2007[2].

Between 1979 and 1999, 82 people died from Legionnaires' disease in Victoria, over the same time period 422 people were diagnosed with the disease and recovered, in addition a further number of cases undoubtedly went undiagnosed.[2]

Cooling towers

Cooling towers involve mechanisms containing heat rejection or exchange devices that use outdoor air to cool water; this cooled water is subsequently used in air conditioning systems. The by-product of this process, the warm humid air is discharged from the cooling tower.

Inadequately maintained cooling tower systems can become contaminated with dust and other pollutants from the environment that may contain the Legionella bacteria. Once contaminated into the system the cooling tower operating temperature is conducive to rapid Legionella sp. growth.

Legionella risk management strategy

Legionella in cooling tower systems can be managed like any other risk, through a process of risk identification, evaluation and control.

In an endeavour to reduce the opportunity for Legionella multiplication the following should be considered in a risk management plan.[3]

- Removal of all 'dead ends' in the pipe work as they can provide reservoirs for bacterial growth and biofilm formation.
- The installation of a circulating pump to agitate water when the system is not in operation. This reduces the risk of sludge, nutrient and biofilm build up.
- Limit system exposure to external environmental contamination as this can lead to increased bacterial growth and contamination.
- Sunlight protection of system openings, failure can result in the production of algal blooms.
- Biodispersant utilisation as an aid in the breakdown of biofilms.
- Anti-corrosion chemicals and corrosion levels should be frequently monitored, as the release of iron from corroding pipes is a growth factor for Legionella species.

1. Toratora G, An Introduction to Microbiology 6th Ed, 1998
2. www.health.gov.au
3. A guide to developing Risk Management Plans for Cooling Tower Systems, Department of Human Services, Victoria.

vero.com.au

- Control and monitor the quality of water that is introduced to the system.
- The physical design, maintenance and operating performance should be analysed on an ongoing basis.
- System size - undersized systems can have increased operating temperatures, which increases the risk of rapid bacterial growth. The biocide also needs to be matched to the water volume.
- Installation of drift eliminators to reduce aerosol distribution.
- Continual monitoring of tower and water condition.
- Consider the positioning of towers away from building air intakes and populated areas.
- Maintaining the system in a clean and sound condition.

Biocide treatment

A vital aspect of Legionella control in cooling tower systems is a continual biocide treatment.

When selecting a biocide for cooling tower treatment many factors should be considered.

Biocide suppliers should provide advice on the suitability of application and statistical evidence supporting effectiveness.

When establishing whether to use a chemical or physical biocide, it is often useful to consider the benefits and disadvantages of each.

Chemical biocides

Chemical agents disperse through the system and remain there for some time. However the disadvantages are that continual application is required to maintain effectiveness which is often lost through activity.

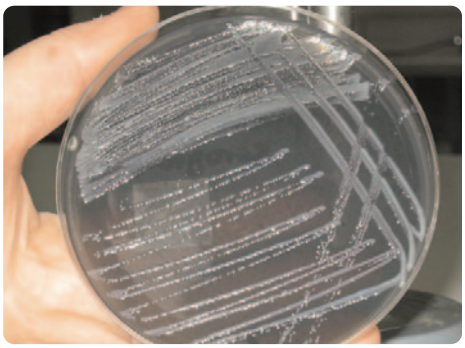
Chemical agents can have different effects on the cooling equipment. Oxidising biocides can have a corrosive effect on pipework and other components; therefore it is essential to be informed as to the active chemical agent. Oxidising agents however are much easier to monitor than non-oxidising agents are, as they can be measured on site. Monitoring can be conducted via an automated feedback system or through routine testing. Ensure the biocide is chemically compatible with the biodispersant, anti-corrosive agent and water pH as these can interfere with the effectiveness of the biocide.

Chemical dosing systems

A range of dosing systems exist and the type of system chosen alone can aid in reducing the risk posed by the cooling tower system.

Manual dosing systems can provide a continual dose to the cooling tower system if maintained correctly however there exists substantial room for error with these systems. If the time frame between manual doses is too great then the system will not contain a continual level of biocide. Also the use of drip feeding devices may become blocked leaving the cooling tower system untreated and residual levels dissipate relatively quickly.

Feedback controlled dosing systems are a reliable and effective means of dosing cooling towers, these systems use sophisticated chemical dosing devices and sensors to monitor the level of oxidising chlorine or bromine in the water. When the sensor detects the bromine level below the required level, it injects biocide into the system.



Physical agents

Physical agents include, heat, ultra-violet radiation and electro-magnetic radiation. They are effective only if particulate matter in the source water is low and as these agents have no residual capabilities contamination after this process will not be eliminated. These systems also have a higher initial cost as opposed to chemically operated systems.[3]

Legislation in brief

In recent years there has been an upgrade of legislation with regard to Cooling Tower Systems nationally. In general these upgrades have focussed on the following:

- State registers of cooling tower systems.
- Continual upgrade and maintenance of cooling tower systems.
- Ongoing inspections or audits of the system and accompanying documentation undertaken by Local Government.
- Ongoing testing program for microbiological indicators such as hetrotrophic plate count and Legionella sp..
- Educational programs targeted at installers, owners, operators and servicing companies.

It is crucial that risk management strategies are implemented to reduce the possibility of a Legionella outbreak. At present owners and land occupiers may face prosecution for not complying with the Building and Occupational Health and Safety Acts. There is also the possibility of legal action for damages suffered by individuals resulting from exposure, not to mention the impairment of operations during the course of an outbreak and subsequent investigation.