

Legionella Risks and Management

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A Townsville based, NATA -certified,
Consulting Laboratory that provides services
to Queensland Mining, Industrial and
Municipal Clients with:

- Rapid, certified laboratory test results
- Site –Based Legionella Risk Management
- Hygiene and Compliance Audits

In cooperation with
the Queensland
Mining and
Refining Industries
and Regulators

A Recent Legionella Safety Alert in Queensland

Safety alert

Mining and quarrying

Mines Inspectorate

Safety Alert No. 151
11 January 2007

Legionnaires' disease



Queensland Government
Department of **Mines and Energy**

A Recent Legionella Safety Alert in Queensland

Incident: Outbreak of Legionnaires' disease

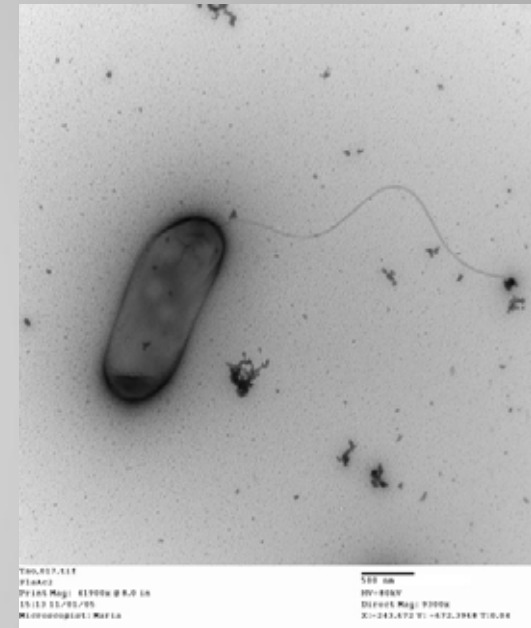
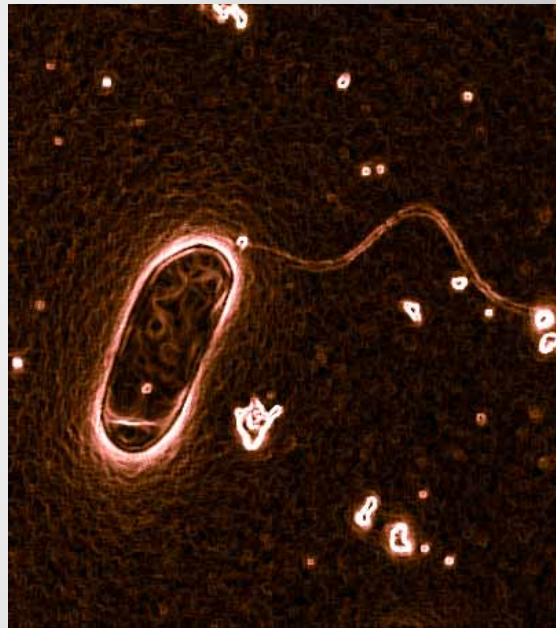
Equipment: Cooling towers/standing water/water accumulations

Hazard: Biological (inhalation of contaminated water 'mist')

Cause: Aeration of contaminated water

Comments: Two mine workers were recently diagnosed with Legionnaires' disease, which may have been contracted in the Central West Coal mining area.

Legionella Bacteria



- Rod-shaped fresh water bacteria present in small quantities in most water sources
- 35 species known, most common is "*Legionella pneumophila*"
- Optimum temperatures between 30 – 45°C
- Dies in temperatures >60°C

Legionella Symptoms

The early symptoms are similar to the flu: fever, aches and chills (about 2 to 10 days after exposure to the bacteria). Also dry cough, diarrhea, vomiting and stomach cramps.

People who are treated early with antibiotics will usually begin to recover within a few days.

Left untreated, the illness can progress rapidly, with infected people experiencing pneumonia-like symptoms, high fever, shortness of breath and chest pain.

Unlikely Legionella Infection

Legionnaires' disease is usually not transmitted from person to person!

Drinking and washing in water containing Legionella is not likely to result in infection!

Legionella Sources

Legionnaires' disease is a type of pneumonia caused by the inhalation of tiny droplets of moisture (mists or aerosols) that contain the *Legionella* bacteria.

Often these droplets may contain small fragments of “bio-film” and/or other microscopic organisms called “amoebae”, which can harbor a large number of concentrated Legionella organisms.

Amoeboid Hosts



Regulated Legionella Sources

Typical maximum count range of 10^1 - 10^2 cfu/ml for :

- Cooling towers
- Evaporative condensers
- Hot water systems and showers
- Mining camp hot-spas

Non- Regulated Legionella Sources

Typical maximum count range of 10^1 - 10^3 cfu/ml for :

- Water-based Cutting Fluids
- Stagnant Bodies of Water (particularly underground)
- Large Pipe Networks – Particularly in “Dead Legs”
- Safety Showers
- Sprinkler Systems (including irrigation and dust-suppression)
- Wash-Bays and Fire Water Systems

Aerosol Sources



Crusher
Dust-
Suppression

Spray-Nozzles



Haulroad
Dust-
Suppression

Aerosol Sources



Wash-bays



Evaporative Coolers

Legionella Risk Management

Under the Qld. Health Act, **Legionella infection** is classed as a **reportable incidence**

- requires notification of government regulatory agencies such as State Health, Dept of Mines and Energy and others
- usually followed by a government audit
 - service documents
 - monitoring reports and corrective actions.

However, mere **detection of Legionella** in a system or source water **does not require notification**

But

- ❖ established internal systems should be invoked to:
 - Review all aspects – action plans, treatment, monitoring etc
 - Risk assessment and
 - Australian Standard compliant corrective actions.

Performance-Based Risk Management of regulated Cooling Water Systems

Microbial control of air-handling and water systems is outlined in a legislative Australian Standard series (AS/NZS 3666: 2000-2003; AS/NZS 5059 : 2006)

It follows the Risk-Assessment principles including:

- ▣ Risk event/source identification and assessment
- ▣ Risk Control
- ▣ Monitoring and Corrective Actions

Site Based Legionella Risk Management

Risk Assessments should be conducted on all water usages where inhalable aerosol is generated! They should be reviewed annually or when conditions change.

Risk Factors that require attention include:

- ▣ **Baseline and seasonal track record of Legionella counts in source waters, supply infrastructure and point of use**
- ▣ **Location, access and exposure**
- ▣ **Nutrients, temperature , bio-film formation potential**
- ▣ **Deficiencies in aerosol formation control**
- ▣ **Prolonged periods of stagnant conditions**

Site Based Legionella Risk Management

Risk Control Measures include:

- ▣ Alternative water sources and redundancies for high risk usage
- ▣ Water treatment (storage, distribution or point of use)
- ▣ Physical barriers (drift-eliminators, drift-barricades, P2 masks)
- ▣ Controlled, authorized and restricted access
- ▣ Monitoring legionella levels and applying prescribed cooling tower standards and corrective actions were possible (e.g. AS/NZS 3666:3 appendix B and C)

Site Based Legionella Risk Management

Trigger Levels and Corrective Actions include on-line disinfection and decontamination:

- ▣ Seasonal or monthly monitoring for Legionella
- ▣ If detected $>10\text{cfu/ml}$ but $<1000\text{ cfu/ml}$ a treatment review and on-line disinfection is implemented. Relevant personnel are notified. PPE and restricted access should be applied.
- ▣ If detected $>1000\text{cfu/ml}$ a treatment review and on-line decontamination is implemented. Relevant personnel are notified. PPE and restricted access should be applied.

AS/NZS 3666-3 Appendix B

- ▣ Add bio-dispersant (to break up biofilm)
- ▣ Add disinfectant (if currently treated add different biocide or increase dosage).
- ▣ Re-test twice (3 and 6 days) after disinfection

AS/NZS 3666-Appendix C

- ▣ Dose with 5mg/L free residual chlorine for at least one hour at pH 7.0-7.6
- ▣ Re-test twice (3 and 6 days) after system decontamination

Return to AS3666 Compliance

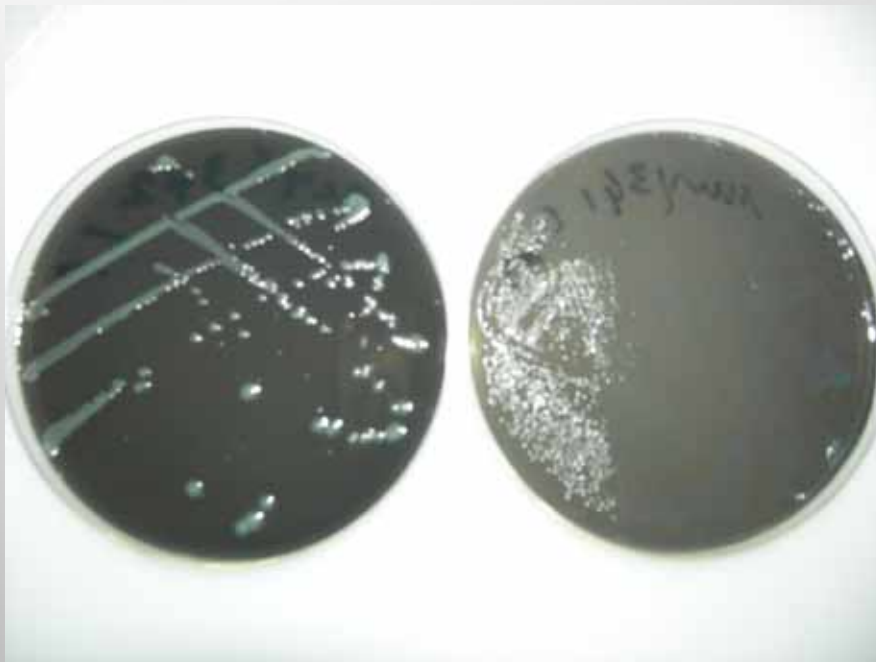
- ▣ When two consecutive samples exhibit a Legionella plate count of less than 10 cfu/ml !
- ▣ System is compliant to AS 3666:3 standard.

Why do Legionella Tests Require 7-10 days to reporting?

- ▣ NATA certified testing follows the AS/NZS 3896:1998 standard (currently under review)
- ▣ 10ul and 100ul of the sample (non-treated, acid treated and heat-treated) are plated to highly specialised bacteriological medium (4-7days)
- ▣ Legionella like organisms are sub-cultured on to other selective media for **confirmatory tests**
- ▣ Colonies which grow on the selective medium but not on blood-agar are tested with Legionella **antibodies and gram stained**

Legionella Laboratory Tests

Selective Medium (4-7days)



Antibody - Testing



Benefits of Site-Based Legionella Risk Management Systems

- ▣ Demonstrates a pro-active approach to control Legionella risks
- ▣ Assists with clearly defined guidelines to hazard identification, hazard control and incident management
- ▣ Maximizes the owner/ company's "duty of care and due diligence"

Protection against “Murphy’s Law”

Example: Staff infected at a worksite-unrelated source returning to work and reporting an illness.

- ▣ Confidence via a solid track record of compliant, well documented Legionella monitoring and corrective action data will significantly **reduce business risks** in preventing an often unnecessary shut-down and evacuation of the work-force.

“Last but not Least” Effective Workforce Communication

- ❑ **Closed book versus open book policies?**
- ❑ **Educating the workforce at tool-box and/or OHS-meetings, routine newsletters**
- ❑ **Job-safety analyses may include Legionella**
- ❑ **Trend routine monitoring data**
- ❑ **Clearly explain corrective actions and incidence management steps**

Step by Step Guide

- ▣ **Summarize regulatory requirements; site policies for raw, treated and recycled water policies;**
- ▣ **List intended uses and sources of recycled water, raw and treated waters used in aerosol generating processes**
- ▣ **Assess or establish baseline water quality data of these waters**
- ▣ **Conduct a formal hazard identification and risk assessment**
- ▣ **Document current and existing preventative measures and barriers to manage risks to human health**

Step by Step Guide

- ▣ **Identify critical control points**
- ▣ **Discuss current and proposed operational monitoring, procedures and process control**
- ▣ **Describe corrective actions (current; proposed) with regards to aerosol exposure and human health**
- ▣ **Review current equipment capabilities and maintenance schedules**
- ▣ **Document past, current and proposed verification data**

Step by Step Guide

- ▣ **Trend and document operational performance compliance data, exceedances, incidence management**

- ▣ **Review and maintain continuous improvement strategies (especially if conditions change)**

“QUESTIONS? Or COMMENTS?”