



# LEGIONELLA CONTROL IN COOLING WATER SYSTEMS

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Government  
of South Australia

SA Health

# OVERVIEW

- *Legionella* ecology
- Legionellosis (clinical features and outbreaks)
- Regulatory framework for prevention of Legionellosis in South Australia
- Key Takeaways
- Future Directions
- Question Time (to be held over until the conclusion of the presentations)



# Legionella ecology

- > First identified in 1977 following an outbreak of fatal pneumonia at an American Legion conference in 1976 (34 deaths, 220 illnesses)
- > Initially some scepticism. The US National Enquirer referred to it as a hoax.
- > Over 70 species of which less than 20 cause disease
- > The most significant species is *Legionella pneumophila* although *L.longbeachae* an issue in Sth Aust
- > There 16 serogroups of *L.pneumophila*. Serogroup 1 causes over 90 % of waterborne cases of LD (pontiac strain causes >90% of Lp1 infections)

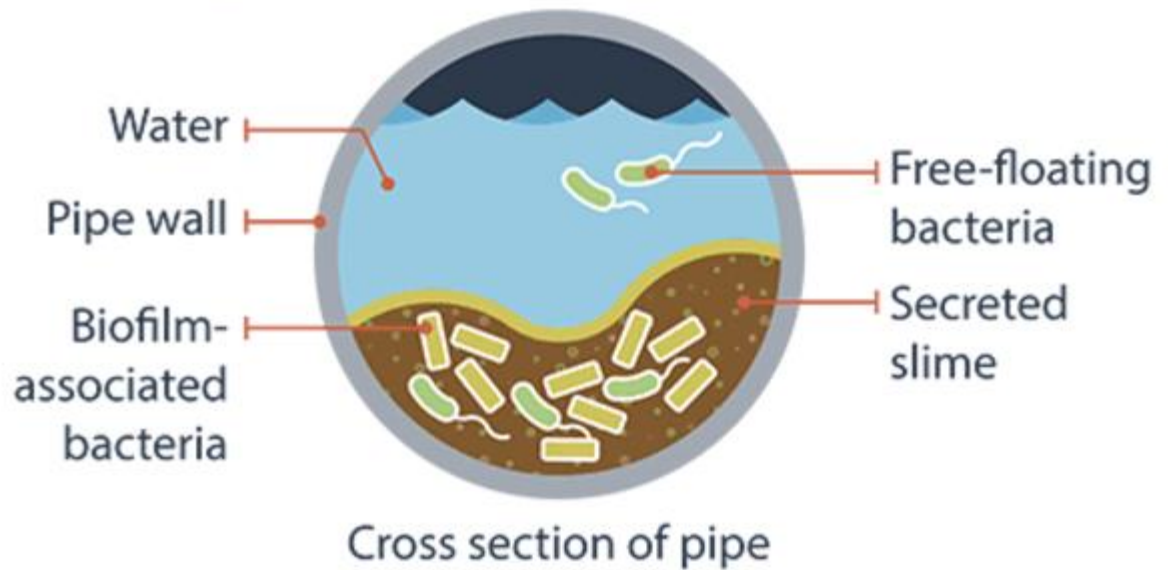


# Legionella ecology

- > *Legionella* is a slime bacterium that grows best in the presence of dirt, slimes, sludges and deposits. Multiplies within amoebae
- > Grows in warm water (20-45°C). Generally needs to be released in aerosols to cause infection. (> 50°C dies slowly; >60°C dies quickly)
- > Killed easily by chlorine and other disinfectants when suspended in water
- > The organism is extremely common in water environments but infections are uncommon

# Legionella & biofilm

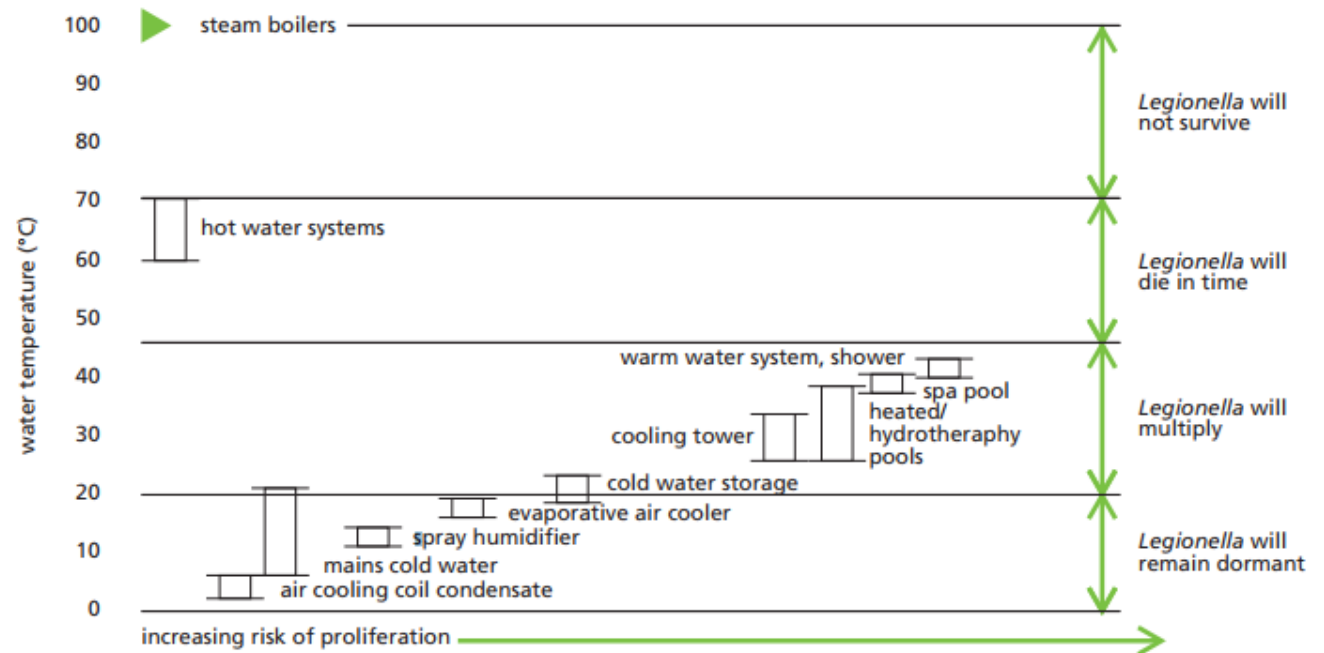
*Legionella* can live and grow in biofilm



# Legionella & protozoa



# Water temperature and Legionella proliferation



**Figure 1**

Water temperature & increasing risk of *Legionella* proliferation

(Modified from: New South Wales Health Department, Code of Practice for the Control of Legionnaires' disease.)



# Legionnaires' disease

- > Legionnaires' disease is a severe pneumonia with a mortality rate of 10-20 %. Incubation period 2-10 days (usually 5-6 days). Symptoms can include headache, fever, sore muscles, non-productive cough
- > Pontiac Fever has flu-like non-pneumonic symptoms. Incubation period 5-65 hours. Self limited.
- > South Australia records about 8 cases of waterborne LD per year and has had two outbreaks. One in the 1980s associated with a cooling tower and a second in the 1990s associated with a spa



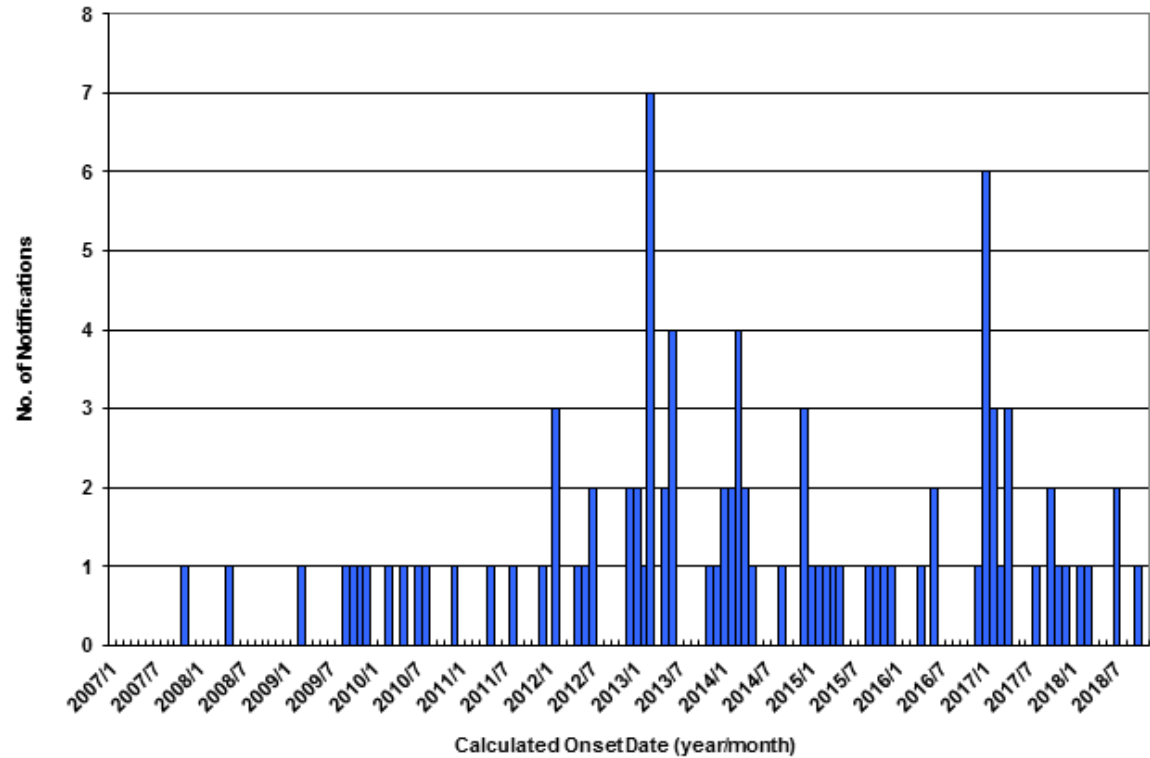


# Legionnaires' disease

- > Originates from water bodies that are colonised with *Legionella* (spa pools, cooling towers, nebulisers, CPAP machines, medical devices)
- > Transmission through inhalation of aerosols OR aspiration
- > Risk of illness increased by being:
  - immunocompromised
  - over 45 and a male
  - a smoker
  - a heavy drinker
  - underlying respiratory illness

# LP1 Infections in SA

Legionella pneumophila Serogroup 1 cases notified,  
1st Jan 2007 - 5th Nov 2018, SA






# Investigation Protocol - SA

- > All Legionellosis infections reportable to SA Health
- > Each case is investigated as though it is a sentinel in an outbreak
- > Case/case representative interviewed to track movements in 10 days prior to onset
- > Referral to local councils
- > Desktop investigations and sampling as appropriate
- > Home water system tested
- > Focus on precautionary action

# Legionnaires' disease outbreak Adelaide 2017

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SA Health is urging all businesses in metropolitan Adelaide to decontaminate airconditioning cooling towers.

NEWS

## Four men hit by legionnaires' disease in past week prompts alert for all businesses in metropolitan Adelaide



# Legionnaires' disease outbreak Adelaide 2017

## Legionnaires' disease cases reported in Adelaide

Posted 12 May 2017, 4:49pm

**Three Legionnaires' disease cases in Adelaide have prompted health authorities to urge businesses to decontaminate air-conditioning and industrial cooling towers.**

RELATED STORY: [Two more cases of legionnaires' disease reported in SA](#)

SA Health's director of health protection, Chris Lease, said three cases of the disease had been reported recently in two males and one female.

He said all three people, aged 58 to 77, had been hospitalised.

"While there is no source identified for the recent cases which may or may not be related, the investigation into the cases is continuing and precautionary work to address the identified areas of risk is already underway," Dr Lease said.

He said when a cluster of cases with locations in common were found the health authority would work with local councils to identify areas of risk.

Dr Lease said the cases were an important reminder to all cooling tower operators to maintain their systems.

SA Health has called on cooling towers operators in the southern metropolitan area to decontaminate systems.

The new cases follow a cluster of nine cases in January, which were suspected to have been contracted within the Adelaide CBD, although the source was not identified.

# Legionnaires' disease outbreak Sydney 2018

## Fifth case of legionnaires' disease reported in western Sydney

By Perry Duffin  
25 September 2018 – 5:24pm

f t e | A A A

Western Sydney's legionnaires' disease outbreak is continuing with a fifth case reported to health authorities.


NSW Health on Tuesday confirmed an interstate resident had contracted the infection after visiting the Lidcombe area earlier this month.



All five cases contracted the infection from breathing in Legionella pneumophila bacteria.

A water cooling system in a Lidcombe building was decontaminated on September 17 after it was found to contain the disease earlier this month.

Western Sydney Local Health District warned anyone who recently visited the suburb to be vigilant of symptoms including fever, chills, a cough and shortness of breath.



# Legionnaires' disease outbreak Melbourne Aquarium 2000

- > Australia's largest outbreak
- > 125 confirmed cases
- > 76% hospitalised
- > 4 deaths (3.2%)
- > Aquarium towers contaminated with LP1
- > Rapid response resulted in increased testing and rapid treatment of cases
- > Studies confirm association between cases and poorly disinfected cooling towers



# Legionnaires' disease outbreak Murcia, Spain 2011

- > 449 confirmed cases
- > More than 800 suspected cases
- > Case fatality rate 1%
- > Large number of potential sources of infection
- > 10/11 cooling towers contained Legionella
- > 2 colonies indistinguishable from patient isolates
- > Concurrent nosocomial outbreak





# Legionella detections in cooling water systems

Year	Notifications	Range (cfu/mL)
2009	9	1000 - 19000
2010	14	1000 - 21400
2011	18	1280 - 21400
2012	13	1200 - 28400
2013	10	1000 - 19200
2014	21	1200 - 45000
2015	9	1100 - 8200
2016	13	1000 - 13000
2017	13	1100 - 14000
2018*	12	1100 - 8700
* to 06/11/2018		



## A note about the limitations of Legionella testing

- > Culture is the gold standard
- > 7-10 days to get a result
- > Legionella exists in viable but non-culturable forms
- > Legionella lives in biofilms – absence of evidence is not evidence of absence
- > Important in case investigations
- > Detections are evidence you have a problem – take action, investigate, review



## *Legionella longbeachae*

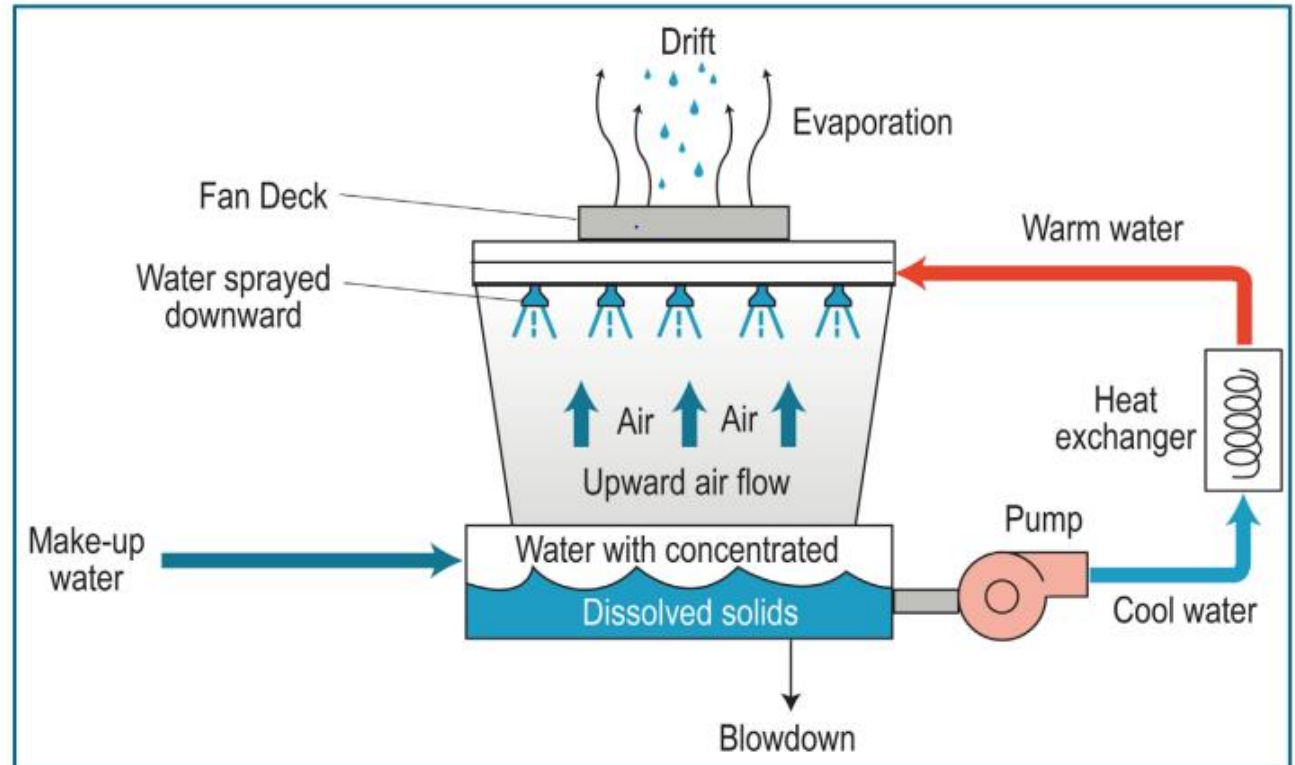
- > Similar symptoms to waterborne LD. Caused primarily by *L.longbeachae*.
- > South Australia records about 50 cases of *L.longbeachae* per year.
- > Route of transmission not established. Like Lp1 risk of illness is influenced by host factors (age, being male etc)
- > Distribution from potting mix/soils limited. No evidence of outbreaks



# South Australian Public Health (Legionella) Regulations 2013

- > Commenced in 2008
- > High risk manufactured water systems
  - Cooling water systems
  - Warm water systems
- > Supported by the Guidelines for the Control of Legionella in Manufactured Water Systems in South Australia
- > Administered by SA Health and local councils (as relevant public health authorities for their areas)

# Cooling water systems





# General regulatory requirements

- > Registration with local council
- > Systems to be managed by competent person
- > Plans and manuals to be maintained
- > Maintenance programs
  - ASNZS 3666.2, or
  - ASNZA 3666.3, or
  - Alternate program (as approved by Minister)
- > Annual inspection and microbiological sampling
- > \*\* Access to systems is essential in ensuring and demonstrating compliance



# Automatic biocide dosing devices

- > Mandatory on all systems (no exemptions)
- > Must operate at all times while the system is in operation
- > Dual biocide (incorporating a halogen based disinfectant) best practice
- > Require active monitoring during periods of hot weather / high evaporation where make up water is being added (dilution) OR where total dissolved solids are high and blow down rates are up (disinfectant loss)



# Drift eliminators

- > **Drift eliminators** (mandatory unless otherwise approved by the Minister)
  - Must cover full exhaust air stream to prevent air by-pass
  - Performance criteria (4.4 of AZ/NZS 3666.1)
  - Must be able to be cleaned *in situ* or removable without damage





# Commissioning

- > Essential prior to bringing a system into service
- > 4.7 AS/NZS 3666.1
- > Disinfection/cleaning and pre-inspection vital to ensure
- > SA Repat Hospital 1986 – new towers that were poorly commissioned and disinfected likely source of outbreak



## Competent persons

- > All HRMWS to be operated and maintained by a competent person
- > Competent to ensure compliance with the Regulations
- > Clarity on roles / responsibilities and clear communication pathways essential to ensure compliance (eg: notification of *Legionella* detections in systems)



## Log books

- > Must be kept up to date
- > As per Clause 2.6.2 3666.2
- > Must contain ALL micro results
- > Details of disinfection protocols (type/quantity etc)
- > Must be readily accessible
- > Must be available for inspection
- > Maintain for 5 yrs after date of last entry



## Annual inspection

- > Minimum of once per year
- > Local council EHO or via independent inspection
- > Micro testing a feature of the annual inspection



## Legionella testing

- > Can be required where the relevant authority is investigating a case/outbreak
- > Authority (council) can collect samples or require collection of samples
- > Any sampling that identifies 1000 or more cfu/mL must be reported to authority
- > Systems must be shut down and decontaminated in accordance with prescribed (or otherwise approved) method



## False or misleading statements / hindering an officer

- > Both offences under Regulations or *South Australian Public Health Act 2011*



## Key takeaways

- > Cooling water systems amplify *Legionella*
- > Proactive monitoring to ensure compliance and effective risk management is essential
- > Be clear about roles and responsibilities
- > Document as much as possible (including communication pathways)
- > Safe and sufficient access is essential in facilitating and demonstrating compliance
- > Refer SA Health / SafeWork SA factsheet



## Future directions

- > Regulations and Guidelines to be reviewed by SA Health
- > Scoping underway
- > Extensive consultation will occur
- > Participation is welcome and encouraged
- > Local councils, system owners/operators/water treatment service providers and facilities managers key stakeholders





# SA Health Contacts

- > Health Protection Programs
- > Tel 8226 7100
- > [www.sahealth.sa.gov.au](http://www.sahealth.sa.gov.au)



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