

LEGIONNAIRES` SYMPOSIUM

Policy Development: Environmental Health Perspective

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health

Department:
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What is Legionnaires' disease?

- Legionnaires' disease is a **lung infection** (pneumonia) caused by a bacterium named ***Legionella pneumophila***. The name *Legionella pneumophila* was derived from the original outbreak at the 1976 American Legion Convention in Philadelphia. *Pneumophila* means lung-loving in Greek.
- Legionnaires' disease is **not contagious**. No special precautions are necessary.
- The disease is **transmitted via recreational and drinking water droplets**. Not by infected persons. (*So it differs from SARS and influenza where masks must be worn*) Likewise, women who are pregnant and their fetuses have nothing to fear from patients with Legionnaires' disease.

What organism causes Legionnaires' disease?

- Legionnaires' disease is caused by bacteria that belong to the **family Legionellaceae**. This family now **includes 48 species and over 70 serogroups**. Approximately half of these species have been implicated in human disease. **Legionella pneumophila is responsible for approximately 90% of infections**. Most cases are caused by *L. pneumophila*, serogroup 1. *Legionella* species are small (**0.3 to 0.9 μm in width and approximately 2 μm in length**) faintly staining Gram-negative rods with polar flagella (except *L. oakridgensis*). They generally appear as small coccobacilli in infected tissue or secretions. They are distinguished from other saccharolytic bacteria by their requirement for L-cysteine and iron salts for primary isolation on solid media and by their unique cellular fatty acids and ubiquinones.

What is the natural habitat of Legionella bacteria?

- *Legionella* organisms are **readily found in natural aquatic bodies** including evaporative cooling towers, whirlpool spa baths and the like. and some species have been recovered from soil.
- The organisms can **survive in a wide range of conditions**, including temperatures of 0 to 63°C, pH of 5.0 to 8.5, and dissolved oxygen concentrations of 0.2 to 15 ppm in water. **Temperatures of 20-50 degrees Celsius are risky**
- Temperature is a critical determinant for *Legionella* proliferation. **Colonization of hot water tanks** is more likely if tank temperatures are between 40 and 50°C.
- *Legionella* and other microorganisms become **attached to surfaces in an aquatic environment forming a biofilm**.

The natural habitat

- Legionella has been shown to **attach to and colonize various materials found in water systems including plastics, rubber, and wood.**
- **Organic sediments, scale, and inorganic precipitates** provide Legionella with a surface for attachment and a protective barrier.
- Interestingly, **the growth of other environmental organisms is stimulated by organic sediment**, which in turn leads to the formation of **by-products that stimulate the growth of Legionella.**

Symptoms of Legionnaires' disease?

- The incubation period of Legionnaires' disease is from two to ten days; this is the time it takes before symptoms of the illness appear after being exposed to the bacteria.
- For several days, the patient may feel tired and weak. Most patients who are admitted to the hospital develop high fever often greater than 39.5°C (103°F).
- Cough can be the first sign of a lung infection. The cough may be sufficiently severe to cause sputum production (coughed up mucous).
- Gastrointestinal stomach symptoms are common with diarrhea being the most distinctive symptom. Many patients have nausea, vomiting, and stomach discomfort.
- Other common symptoms include headaches, muscle aches, chest pain, and shortness of breath.

What is the prognosis and outcome for patients who have contracted Legionnaires' disease?

- If the patient is treated with appropriate antibiotics near the onset of pneumonia, the outcome is excellent, especially if the patient has no underlying illness that compromises his/her immune system. **For patients whose immune systems are compromised, including transplant recipients, delay of appropriate therapy can result in prolonged hospitalization, complications, and death.**
- Most patients discharged from the hospital experience fatigue, loss of energy, and difficulty concentrating for several months after discharge from the hospital.
- Most patients will recover completely within one year. If the patients are cigarette smokers, the patients should discontinue smoking.

Common risk factors and Treatment for Legionnaires' disease?

- The most common risk factor is **heavy cigarette smoking**. However, **chronic lung disease** is also common. The most intense risk factor is **organ transplantation**; the medicines used to protect the new organ also compromise the patient's defense system against infection. Patients who take corticosteroid medicines are also at high risk.
- Many antibiotics are highly effective against Legionella bacteria. The two most potent classes of antibiotic are the **macrolides**, and the **quinolones**. Other agents that have been shown to be effective include tetracycline, doxycycline, minocycline, trimethoprim- sulfamethoxazole. Erythromycin, the former antibiotic of choice, has been replaced by more potent and less toxic antibiotics.

The habitat and mode of transmission.

- *Legionella* are natural inhabitants of water and can be detected in **rivers, lakes, and streams**. One type of *Legionella* species (*L. longbeachae*) has been found in **potting soil**.
- The most popular theory is that the organism is **aerosolized** in water and people inhale the droplets containing *Legionella*. However, new evidence suggests that another way of contracting *Legionella* is more common.
- "**Aspiration**" is the most common way that bacteria enter into the lungs to cause pneumonia. Aspiration means choking such that **secretions in the mouth get past the choking reflexes and instead of going into the esophagus and stomach, mistakenly, enter the lung**. The protective mechanisms to prevent aspiration is defective in patients who smoke or have lung disease.

The habitat and mode of transmission.

- It can also enter by **inhalation of aerosols**, although this mode of transmission is overemphasized.
- Once the *Legionella* enters the mouth, for example, by drinking water contaminated by *Legionella*, the organism is prevented from going into the lung by cilia on the cells of the respiratory tract.
- In patients who smoke cigarettes or in ill patients, this process is impaired and it is easier for bacteria to bypass the gag reflex and the ciliary process and fall into the respiratory tract (aspiration).
- *Legionella* can **also stick (adhere) onto the cells of the respiratory tract**, and then enter and multiply within cells of the respiratory tract

The habitat and mode of transmission

- Once the *Legionella* enters into the lung, **white blood cells (neutrophils, macrophages) will migrate to the *Legionella*** in an attempt to engulf (phagocytose) and kill them. The alveolar (air sac) macrophage is the most important cell.
- The alveolar macrophages engulf *Legionella*, but the *Legionella* can **escape the killing mechanisms of the alveolar macrophage and multiply within the macrophage.**
- **Other white blood cells are recruited** from the blood. However, the *Legionella* can escape the killing effects of these other cells by **hiding in the respiratory tract** cells or alveolar macrophages. That is why *Legionella* is called an intracellular pathogen.
- The intracellular location of *Legionella* is also important in therapy. **Many antibiotics effective against pneumonia are ineffective against *Legionella*** because they do not penetrate the respiratory tract cells or alveolar macrophages

What have been the water sources for Legionnaires' disease?

- The major source is water distribution **systems of large buildings including hotels and hospitals.** Cooling towers have long been thought to be a major source for *Legionella*, but new data suggest that this is an overemphasized mode of transmission.
- Other sources include mist machines, humidifiers, whirlpool spas, and hot springs. **Air conditioners are not a source for Legionnaires' disease.** They were suspected to be the source in the original American Legion outbreak in a Philadelphia hotel, but new data now suggests that the water in the hotel was the actual culprit.

Policy on the Management of Legionella

- Policy guidelines to be developed for the management of the Disease at all stages within:
 - Facility level (*Hospitals, Clinics & other facilities*)
 - District/Metropolitan level (*for their jurisdiction*)
 - Provincial Level (*collaborate with Districts/Metros*)
 - National Level (*experts inputs from symposium*)
- A National framework of Legionella Policy to be developed with present stakeholders.
- All other Policies to be based on the framework.

Legionella Policy Framework

- Aims and Objectives of the Policy.
- Scope of the Policy Framework
- A guide to prevention.
- Responsibilities
- Responsibilities at a District Health, Local Government and facilities.
- General Provisions.
- Risk Management.
- Human Resource Capacity.

Aims and Objectives of the Policy

- The Policy should aim at achieving the following:
- To **ensure** that water **sources are safe** for use by the public.
- To enable relevant **Authorities to meet legal obligations** and achieve standards concerning the safety of water sources. To **ensure adequate and effective control of water systems** throughout the premises in order to minimise the risk of Legionellosis.
- To introduce to the relevant authorities, a **structured procedure and reporting schedule, for the management and control of legionellosis**, including Legionnaires Disease, in compliance with developed guidelines, legislation and current bye - laws, for minimizing the risk of Legionnaires ' Disease.

Scope of the Policy Framework.

- The Policy is applicable to all spheres of Government and private facilities that are likely to pose a risk to legionella infections or outbreaks.
- This policy encompasses the management of risks arising from legionella.

A guide to prevention

- Policy should consider the following factors in order to develop accurate prevention programmes:
 - The habitat of the organism.
 - Legionellae bacteria are commonly found in water systems and in sufficient concentrations can cause illness.
 - In all instances of reported infection, it is considered to have been acquired by means of inhalation of small water droplets carrying the bacteria.
 - Increasing water temperatures can decrease the rate of multiplication of the bacteria. At 50oC the bacteria is destroyed over a number of hours and at 60oC within a minute. In order to reduce the risk of legionellae, **hot water systems shall be designed to store hot water at 60oC and circulate and return water at not less than 50oC**. However, increasing water temperatures creates a hazard from scalding.

A guide to prevention

- It is **exceptional** for a water supply, either public or private to be **entirely free from aquatic organisms**, and for this reason it is important that appropriate measures are taken to **guard against conditions which may encourage microbial multiplication**.
- Legionellae can **cause severe respiratory** illness when contaminated water droplets or aerosols are inhaled, for example from **showers or cooling towers**.
- The temperature of water in a healthcare environment is also crucial for safety. Legionellae **growth is favoured by temperatures between 20°C and 50°C**, and can multiply in areas such as water tanks, calorifiers, cooling towers, evaporative condensers and pipes.

Responsibilities

- Various spheres of Government, facilities and Departments have responsibilities towards the management of Legionella.
- The Primary responsibility is **prevention and control** which is the Public Health/Environmental Health responsibility;
- It is followed by **control and surveillance** which interlinks various professions such as EH, Lab, clinical and Health Promotion;
- **When prevention fails and infections occurs, treatment follows**, at this stage all coordinated Outbreak response activities will run concurrently.

Responsibilities

- The **National Minister of Health** is the custodian for the provision and monitoring of all types of health services by individuals, the public and private sectors.
- The **National Health Act** accords similar custodian roles and responsibilities to Members of the Executive Councils (MECs) for Provincial Departments of Health to oversee implementation and monitoring of health services by Provinces, Health Districts and Municipalities as reflected in Sections 27 (1) (ix), (x) and 31(3) (b).
- Section 76 also requires **Municipalities to report health information data to the provincial health department.**

Responsibilities

- National Department of Health
 - ❑ Take the lead in the development of policies, frameworks, strategies, guidelines, Norms and Standards, SOPs etc. on health services.
 - A **consultative process** either physically or electronically is crucial with relevant stakeholders.
 - A Legionella **policy framework requires similar attention** with experts submitting their inputs.
 - ❑ Create conditions that ensure success, namely **adequate resource allocation** to health services at all levels.
 - ❑ **Monitor** the implementation of Health Services

Responsibilities

- Provincial Department of Health
 - ❑ **Plan, coordinate and monitor programmes** towards the development & implementation of Legionella Disease Policies/frameworks, guidelines & control programmes.
 - Create conditions that ensure success, namely **adequate resource allocation** to health services at all levels.
 - **Support and Monitor all Municipalities and Facilities** on programmes aimed at establishing action on Legionella management systems.

Responsibilities

- District Health, Local Government and Facilities
 - ❑ They are **at a strategic point of exposure** and serves as the first line of defense against outbreaks.
 - ❑ They further **serve as point of action** for the implementation of all Policies, guidelines etc.
 - ❑ Contribute in policy development.
 - Implement such procedures as are necessary to **ensure**, as far as is reasonably practicable, **the safety of members of the public, patients, staff and visitors**.
 - The relevant **Department/unit will have a Procedure that defines responsibilities for the testing and maintenance of the water** and Air conditioning systems and the **actions to be taken following positive Legionella tests**.

Responsibilities at a District Health, Local Government and Facilities

The Policies should reflect the responsibilities of the District Health Manager/Mayor/Facility CEO including but not limited to:

- ❑ Ensuring that **individual staff are identified and given responsibility** for the development, implementation and subsequent monitoring of a comprehensive procedure to ensure that all systems comply with policy.
- ❑ Ensuring that, sufficient **resources are provided** to enable the policy to be implemented and to remain effective.
 - That the requirements of this policy are complied with . A suitably qualified and competent officer is identified to act as the 'responsible' officer and that the **recommendations and requirements identified by the 'responsible' officer are given adequate consideration and priority in the allocation of resources for the management**

Responsibilities at a District Health, Local Government and Facilities

- The Director of Medicine/Nursing or Clinical Manager, Infection Control Managers &/or Strategic Planning will be responsible for **ensuring that the operational requirements of the policy are complied with.**
 - In particular this requirement applies to the need to ensure all water outlets are regularly flushed and that water temperatures are checked as prescribed.
- A **'Responsible' Officer** shall be appointed to manage the implementation of this policy. He/She shall be **suitably qualified and competent to carry out the requirements outlined in this policy, other guidelines, relevant statutory regulations and/or codes of practice.**

Responsibilities at a District Health, Local Government and Facilities

- A 'Responsible' Officer shall in collaboration with all relevant stakeholders:
 - **Produce detailed procedure guides** for the management of safe water and Air Conditioning systems.
 - **Develop a record of all cisterns, humidifiers, cooling towers and other water systems** which may present a Legionellosis hazard.
 - Generate a **record** of any *thermostatic valves fitted to baths, bidets, showers and hot water taps and the location of those without protection.*
 - Manage the agreed **programme of planned preventative maintenance.**
 - **Complete a risk assessment** following each Legionella **positive result.**
 - The **Infection Control Team/Outbreak response Team** shall provide **specialist advice to the 'responsible' officer** and shall assist in the assessment of risk and recommendation for upgrading and maintaining the systems.

Responsibilities at a District Health, Local Government and Facilities

- The Policy should **guide on how to ensure that all staff also ensure that they are fully conversant with the policy and procedures.**
- It should guide in ensuring that all **staff follow the guidance and procedures that may be set down for particular risks that have been identified but not yet rectified or where risks cannot be removed by physical alteration or improvement.**
 - Specifically, **managers** shall ensure that all staff working with clients are aware of the hazards arising from water services and shall carefully **control access to and use of appliances that do not have safe water temperatures.**

Risk Management

- The purpose of Risk Assessment is **to establish risk of infection from *Legionella sp.* and to enable a valid decision to be made about:**
 - The **risk to health**, i.e. whether the potential for harm to health from exposure is reasonably foreseeable unless adequate precautionary measures are taken.
 - The **measures for prevention**, or adequate control to minimise the risk from exposure to legionellae.
- The risk assessment is to be carried out in two parts:
 - A **preliminary** risk assessment (desk top); and
 - A **Site/walk through** Survey where required.

Risk Management

- **Contributory factors** in outbreaks of Legionnaires' Disease are **inadequate management, lack of training and poor communications**
- A **Risk Management Adviser on Legionella (an EHP)** is to advise on Risk Management and Health and safety issues related to Legionella policy and its implementation.
- **Based on the results of a proposed risk assessment a written operational plan should be devised.**
 - This should clearly identify **who has overall accountability** for the premises and **who is responsible for devising and carrying out procedures.**

Risk Management

- The Risk Management Adviser or an EHP in that area of jurisdiction shall inform the Management responsible for assets in those facilities each year, whether the property:
 - Contains cooling towers, whirlpools, spa's, fountains, evaporative coolers, showers or other devices likely to generate significant water mists in non-domestic parts of the property.
 - Is used by people who are vulnerable to infection; e.g. people of pensionable age, persons who are ill or undergoing treatment for TB, cancer, or HIV infection.
- These are to be recorded in a "legionella register."
- Where these are present in a property, the EHP will:
 - In consultation with Management conduct a site inspection of the systems, and for a risk assessment to be produced for the property unless one has previously been carried out within the last 5 years.

Risk Management

- The risk assessment shall take account of the following:
 - The potential for aerosol formation, Water temperature, Means of preventing or controlling the risk, the likely risk to those who will inhale water droplets.
- For health care organisations, the susceptibility to the population exposed to Legionella can be divided into three categories:-
 - **High Risk** – Speciality Departments concerned with the treatment of susceptible patients with:-
 - Head/Neck Cancer, Bone Marrow Transplant, Renal Dialysis, Leukaemia, Organ Transplant, AIDS/HIV, Immuno Suppression
 - **Moderate Risk** – Other health care premises
 - **Low Risk** – Non-Health care premises, e.g office blocks, accommodations etc.

General Provisions.

- The Policy and procedures should be **audited and reviewed in about three years** in the light of new legislation or guidance.
- Requirement for **Identifying and removal** of facilities or items no longer in use or out of order e.g. staff showers, etc. should also be reflected.
- The Policy to reflect the need for facilities to ensure compliance to the relevant maintenance standards and guidelines.
 - Liaise with Managers to **ensure that areas which are closed for whatever reasons** are receiving **regular flushing of the water system**.
 - Maintain records of water management functions carried out during periods of ward/department closure.
 - All **designated water outlets** [public areas – corridors, staff / visitors toilets, changing rooms etc.] **are maintained**.
 - All **facilities staff are trained in the background to the Control of Legionellosis**, the requirements of the developed policy and the relevant operating procedures.

THANK YOU



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