Epidemiology of Legionella in environments for recreational, tourism or physical activities

Vincenzo Romano Spica, Andrea Paparini

Dipartimento di Scienze del Movimento Umano e dello Sport - Igiene generale e applicata, Istituto Universitario di Scienze Motorie (IUSM), Roma, Italy

Correspondence to: Vincenzo Romano Spica, Dipartimento di Scienze del Movimento Umano e dello Sport - Igiene generale e applicata, Istituto Universitario di Scienze Motorie (IUSM), P.zza L. De Bosis 6, 00194 Roma, Italy. E-mail: vrs@iusm.it

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Abstract

Legionella is a waterborne microorganism responsible of severe pneumonia. Legionnaire's disease and Pontiac fever are clinical syndromes related to contaminated environments. Outbreak sources have been identified in sport facilities, thermal springs, spas, hotels, campsites, cruise ships and other structures for recreational or tourism purposes. Infection spreads by inhalation of contaminated aerosols from showers or whirlpool baths. Exposure to properly maintained swimming pools does not represent a major risk factor. Several prevention strategies and decontamination procedures are available.

Introduction

Legionella pneumophila is naturally found in fresh water. It can survive within protozoa such as amoeba, planctonically or in biofilms.[1] The most common transmission route seems to involve contaminated airborne droplets somehow released in the environment by mechanical devices such as cooling towers, evaporative condensers, Heating Ventilation Air Conditioning systems (HVAC), decorative fountains, humidifiers, whirlpool baths, and showers.[2-13] Inhalation of contaminated aerosols, may thus be responsible for the onset of illness, however, there is no evidence of infection transmission by person-to-person or by water ingestion.[14,15]

Susceptibility to Legionnaire's disease is still an unclear issue, involving several risk factors: genetic, environmental, life styles and health conditions.[16] Middle-aged and elderly people, immuno-impaired patients, cigarette smokers and people affected by chronic or severe lung diseases are at higher risk. Conversely, Pontiac fever affects children and healthy adults just as frequently as immuno-compromised individuals.[17-18] *Legionella* is recently arousing scientific and public attention, in light of its growing importance as an emerging pathogen. Facilities, buildings and structures involving recreational waters may represent a risk factor for exposure to *Legionella*.

Description of the project

Within the Italian Multicentric Research Group on Legionnaire's disease, several environmental risks have been considered both for nosocomial and community acquired infections.[19] The interaction between host and pathogen revealed a complex scenario and the presence of environments at risk. In particular, the social changes in industrialised countries increased the population exposure to recreational waters during sport, fitness and physical activities, tourism or travels. The EWGLI (European Working Group for Legionella Infections) network proposed a surveillance system to detect sporadic cases and outbreaks arisen during travelling and staying in hotels or other types of holiday accommodation. The use of heated water supplies represents a condition for harbouring *Legionella* in hotels or other buildings, ships and trains, where showers represent a widespread mechanical device for aerosol generation. Several reports describe outbreaks from other indoor environments including locker rooms in fitness or sport facilities, spas and thermal springs structures.[9,20-22] Several species of *Legionella* have been isolated from environmental samples and some of them seem to play a role in pathogenesis (Table 1). Molecular methods and bioinformatics provide a valuable approach for detection and typing of different strains for epidemiological studies and prevention actions.

Conclusions

Swimming pool waters do not represent a major risk for Legionnaire's disease when disinfection is performed following appropriate chlorination procedures. However, locker rooms of pools or other facilities for physical activities may represent

a contamination source mainly through showers.[23] Several decontamination procedures are available for heated water systems and HVAC systems. Monitoring *Legionella* represents an important tool for preventing infection and several laboratory protocols are available to improve sensitivity and specificity.[24,25] Bioinformatics provides an advanced approach to verify or exclude a suspected transmission route and control the outbreak spreading by supporting focused decontamination plans.

Table 1. Legionella species and serogroups. Species are listed in chronological order based on the date of isolation or identification; Serogroup 2 of L. erythra has been associated with human disease. (modified from [23]).

Species	No. of serogroups	No. associated with disease
L. pneumophila	15	15
L. bozemanii	2	2
L. dumoffii	1	1
L. micdadei	1	1
L. longbeachae	2	2
L. jordanis	1	1
L. wadsworthii	1	1
L hackeliae	2	2
L. feeleii	2	2
L .maceachernii	1	1
L. birminghamensis	1	1
L. cincinnatiensis	1	1
L. gormanii	1	1
L. sainthelensi	2	2
L. tucsonensis	1	1
L. anisa	1	1
L. lansingensis	1	1
L. erythra	2	1
L. parisiensis	1	1
L. oakridgensis	1	1
L. spiritensis	1	0
L. jamestowniensis	1	0
L. santicrucis	1	0
L. cherrii	1	0
L. steigerwaltii	1	0
L. rubrilucens	1	0
L. israelensis	1	0
L. quinlivanii	2	0
L. brunensis	1	0
L. moravica	1	0
L. gratiana	1	0
L. adelaidensis	1	0
L. fairfieldensis	1	0
L. shakespearei	1	0
L. waltersii	1	0
L. genomospecies	1	0
L. quateirensis	1	0
L. worsleiensis	1	0
L. geestiana	1	0
L. natarum	1	0
L. londoniensis	1	0
L. taurinensis	1	0
L. lytica	1	0
L. drozanskii	1	0
L. rowbothamii	1	0
L. fallonii	1	0
L. gresilensis	1	0
L. beliardensis	1	0

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