THE INTERNATIONAL MOUNTAINEERING AND CLIMBING FEDERATION
UNION INTERNATIONALE DES ASSOCIATIONS D'ALPINISME

Office: Monbijoustrasse 61 • Postfach
CH-3000 Berne 23 • SWITZERLAND
Tel.: +41 (0)31 3701828 • Fax: +41 (0)31 3701838
e-mail: office@uiaa.ch

OFFICIAL STANDARDS

OF THE

UIAA MEDICAL COMMISSION

VOL: 19

Legionella in Mountain Huts
Recommendation for prevention and control of Legionella infections

Intended for persons who run mountain huts or who are responsible for hygiene in such huts

E. Donegani, C. Zotti, S. Ditommaso, M.V.Stefanetti
2010

Rationale

Last year, the CAI (Italian Alpine Club) was involved in a rare but important legal-medical issue involving the “health in the huts”. This was related to the death of a Spanish mountaineer who died in the Hospital of Aosta (Italy) because of a severe pneumonia due to a ‘*Legionella*’ infection. Generally speaking, the problem of possible infection by ‘*Legionella*’ in a mountain hut should be considered not only in Italy but also in all countries.

In Europe and Italy there are specific guidelines for tourist structures (such as the huts) for the prevention of this infection. In a similar manner very simple rules to prevent this problem were suggested to the CAI. The same should apply the to UIAA MedCom, by creating simple, pragmatic and easily applicable rules for the mountain structures everywhere.

Introduction

Legionnaires’ Disease or Legionellosis is the term used for infections caused by *Legionella pneumophila* and other related bacteria. *Legionella* bacteria are only dangerous in respirable form and generally only in susceptible individuals for whom inhalation of the bacteria in aerosols or water droplets (showers) may cause severe pneumonia and, in extreme cases, death.

Legionella bacteria are widespread and found in many aquatic environments, where they feed on algae and organic matter in sludge, sediment and silt, in a pH between 5 and 8. They tolerate a range of temperatures, although below 20°C and above 50°C they are dormant and above 60°C they do not survive.

When *Legionella* bacteria enter man-made systems they may proliferate under favourable conditions. If water droplets are created and dispersed into the atmosphere, people in the vicinity may be at risk of inhaling the bacteria. To eliminate or reduce the risk, control measures must be in place to prevent the proliferation of the organism in water systems, and to minimise the generation of water droplets and aerosols.

The European surveillance program EWGLI (European Working Group for Legionella Infections) started in 1986 and is coordinated from 1993 by the National Bacteriology Laboratory in Stockholm and the Public Health Laboratory Service (PHLS), Communicable Disease Surveillance Centre (CDSC) in London. The system allows interchange of information between EC Countries for epidemiological investigations and appropriate interventions.

European guidelines for Legionella prevention

There are agreements and disagreements on the prevention of Legionnaire’s disease (risk, possibility of environmental controls and decontaminations, occupational hazard) among the guidelines issued by several countries (see table 1).

Table 1: Procedures of Legionella control in some countries (examples)

Country	Monitoring programme	Sample	Sampling methods	Thresholds for Legionella concentration
France	Annually in all health-care facilities	Water	Faucets / showerheads: water samples Water (1L): a) pre-flushing samples; b) post-flushing (after running water 2-3 minutes to obtain water contained in the plumbing system)	$<10^3$ CFU/L* $<10^2$ CFU/L* <50 CFU /L*
U.K.	Weekly in system where temperature and biocide levels are not being achieved Monthly in water system treated with biocides Investigation of an outbreak	Water	Faucets and showerheads: water samples Water(1L): Pre-flushing samples	10^3 CFU/L*
Italy	Investigation of an outbreak Periodic sampling where people at high risk might be exposed Validation of the effectiveness of decontamination	Water and biofilm	Faucets and showerheads: biofilm samples and water samples Water (1L): a) pre-flushing samples; b) post-flushing (after running water 5-10 minutes to obtain water contained in the plumbing system)	$>10^4$ CFU/L*
Spain		Water and biofilm	Faucets and showerheads: water samples Water: a) pre-flushing sample with swab (100 ml); b) post-flushing (1L)	/
Switzerland	-Annually in all health-care facilities Six-monthly in health-care facilities where at-risk patients are hospitalized -Investigation of an outbreak	Water and biofilm	Faucets and showerheads: biofilm samples and water samples Water (1L): a) pre-flushing samples; b) post-flushing (after running water few minutes to obtain constant water temperature	30% of sample are culture-positive

(to be continued on page 4)

(continuedfrom page 3)				
Germany	Annually for any facility which provides drinking water fort he public (§ 18 TrinkwV)	Water, (250 ml, taken after some seconds of flow)	Especially warm water of showers and warm water systems of any kind. Culture from 1 ml of sample or membrane filtration with 100ml	For high risk facilities (e.g. hospitals, clinics, etc.): acceptable result: 0 CFU/100 ml; alarm when ≥1 CFU/100 ml. For other facilities: acceptable result: <100 CFU/100 ml; to be checked at ≥100 CFU/100 ml; action mandantory at >1.000 CFU/100 ml; high risk range: >10.000 CFU/100 ml

(modified from Ditommaso et al. Am J Infect Control. 2010 Jun;38(5):344-349)

*: CFU: colony forming units

Table 2: Recommended disinfection procedure when the limit threshold exceeded (procedures for disinfecting water supply, showerheads, taps and hoses)

Country	**Recommended procedures**
France	run hot water > 70°C for 30 min Chlorine dioxide Hydrogen peroxide + Ag ions
Italy	run hot water 70°-80°C for 30 min/day, for 3 consecutive days Chlorine dioxide Hydrogen peroxide + Ag ions UV light
Switzerland	run hot water >70°C for 30 min Chlorine dioxide UV
Spain	run hot water >70° for 12 hours Chlorine dioxide
U.K.	run hot water >60°C for 5 min Chlorine dioxide UV Ozone

Recommendations for mountain huts

The following is practical advice for the prevention of Legionella infection in mountain huts, keeping in mind the problems and the difficulties existing in these structures, but also referring to the existing international guidelines (EWGLI adapted).

If the sanitary water is heated at the moment of the use (gas boiler), the problem does not exist as the bacteria do not proliferate in cold water.

If sanitary warm water is already present because it is heated by electric boiler, solar panel, etc, and therefore “stagnates” in water storage containers, then the following is required:

Action on the **water container**:

- Once a year, for the reopening season, clean and disinfect the water container with 50mg/l chlorine for 2-4 hours.

Action on the **water**:

- Once a year, for the reopening season disinfect the water supply by:
    - **Thermal shock** treatment at 70-80ºC for relatively short periods has been used both for emergency disinfection, and also for periodic disinfection of systems, as part of long-term control programmes. Thermal disinfection is carried out by raising the temperature of the whole of the contents of the hot water storage heater to 70-80°C then circulating this water throughout the system for up to three days. To be effective, the temperature at the hot water storage heater should be high enough to ensure that the temperatures at the taps and appliances do not fall below 65°C. Each tap and appliance should be run sequentially for at least five minutes at the full temperature, and this should be measured.

      In practice: periodically, during the opening season, the water is heated at 70°-80°C for 30 min/day for 3 consecutive days.

or

    - **Constant maintenance of the temperature between 55-60°C**: At 60°C it takes approximately two minutes to inactivate 90% of a population of L. pneumophila. The effectiveness of maintaining the circulating temperature at 60ºC has been demonstrated both in hospitals and in hotels. Hot water installations maintained at temperatures above 50°C are less frequently colonised by Legionella. Circulating water at 60°C, such that the temperature at each outlet reaches at least 50ºC and preferably 55ºC within one minute of opening the outlet, is the method most commonly used to cont Legionella in hot water distribution systems.

      In practice: the water is always maintained >60°C.

or

    - **Sodium hypochlorite shock**: Chlorine has also been used for the treatment of hot water systems. As the bactericidal action of the chlorine is pH sensitive and decreases rapidly at values above 7 the pH of the water will have to be monitored and may need adjustment.

      This must be carried out in water at a temperature below 30°C, with a single addition of chlorine to the water to obtain concentrations of free residual chlorine of 20-50 mg/l throughout the installation, including distal points.

      After a contact period of at least two hours with 20 mg/l of chlorine or at least one hour with 50 mg/l of chlorine, the water is drained. Fresh water is then let into the installation until the level of chlorine returns to the concentration of 0.5-1 mg/l.

      In practice: periodically the concentration in the water is maintained up to 50 mg/l for 1 hour or up to 20mg/l for 2 hour.

or

- **Continuous chlorination**: This is achieved by the continuous addition of chlorine, usually in the form of calcium hypochlorite or sodium hypochlorite. Residual levels of chlorine can vary depending on the quality of the water, the flow, and the amount of the biofilm in the system. However the residual disinfectant must be between 1 and 2 mg/l. Where there are stagnant areas or circulation problems in the water distribution system, the chlorine will not inactivate Legionella in these areas.

  In practice: Addition of SODIUM HYPOCHLORITE in the water, with a residual concentration of 1-2 mg/l.

In these two last cases, label all outlets with appropriate warning signs: "**chlorined sanitary warm water, not drinkable"**

Action on **flushing outlets** (taps, showerheads):

- Keep shower heads and taps clean and free from scale.
- Once a year, for the reopening season, clean the flushing outlets using a product for descaling (e.g. acetic acid or vinegar!), then disinfect them soaking for a night in a sodium hypochlorite solution (bleach!) and rinse before reinstalling.
- Run all taps and showers in guestrooms for several minutes at least once a week if they are unoccupied and always prior to occupation.

References

"European Guidelines for Control and Prevention of Travel Associated Legionnaires'Disease." European Working Group for Legionella Infections – UK, 2005.

"Legionella and the prevention of Legionellosis". World Health Organization – 2007

"Outbreak of legionnaires disease among cruise ship passengers exposed to a contaminated whirpool spa". Lancet 1996; 347: 494-499.

Circulaire DGS/SD1D/92 n°513 du 20 juillet 1992 relative à la qualité des eaux minérales dans les établissements thermaux. www.sante.gouv.fr

Gestion du risque lié aux legionelles. Conseil superieur d'hygiene publique de France 2001. www.sante.gouv.fr

The control of Legionella bacteria in water-system – Approved code of practice & guidance. Her majesty's Stationary Office. Health & Safety Executive 2000.

Legionnaires' Disease: the control of *Legionella* bacteria in water systems. University Policy Statement S7/07 – University Safety Office – University of Oxford. 2007.

Linee guida per la prevenzione ed il controllo della legionellosi. Conferenza permanente per i rapporti tra lo Stato, le Regioni e le Province autonome di Trento e Bolzano. G.U. della Repubblica Italiana n° 103, 5 maggio 2000.

Real Decreto 909/2001, de 27 de julio por el que se establecen los criterios higienico-sanitarios para la prevenciòn y control de la legionelosis. Ministerio de Sanidad y Consumo. BOE n° 180, 28 julio 2001.

Légionelles et légionellose: particularités biologiques, épidémiologie, aspects cliniques, enquêtes environnementales, prévention et mesures de lutte. Office Fédéral de la Santé Publique. 3003 Berne (Suisse), Aoŭt, 1999.

Effective environmental sampling strategies for monitoring Legionella spp contamination in hot water systems. Am J Infect Control. 2010;38:344-9.

N.N. Empfehlung des Umweltbundesamtes (2000)

N.N. DVGW-Arbeitsblatt W 551, 2004

Members of UIAA MedCom (in alphabetical order)

C. Angelini (Italy), B. Basnyat (Nepal), J. Bogg (Sweden), A.R. Chiocconi (Argentina), N. Dikic (Serbia), W. Domej (Austria), P. Dobbelaar (Netherlands), E. Donegani (Italy), S. Ferrandis (Spain), U. Gieseler (Germany), U. Hefti (Switzerland), D. Hillebrandt (U.K.), J. Holmgren (Sweden), M. Horii (Japan), D. Jean (France), A. Koukoutsi (Greece), A. Kokrin (Russia), J. Kubalova (Czech Republic), T. Kuepper (Germany), J. McCall (Canada), H. Meijer (Netherlands), J. Milledge (U.K.), A. Morrison (U.K.), H. Mosaedian (Iran), R. Naeije (Belgium), M. Nakashima (Japan), S. Omori (Japan), P. Peters (Luxembourg), I. Rotman (Czech Republic), V. Schoeffl (Germany), J. Shahbazi (Iran), J.C. Skaiaa (Norway), J. Venables (New Zealand), J. Windsor (U.K.)

Guest authors Microbiology

C. Zotti, S. Ditommaso (Public Health and Microbiology Dept., University of Turin, Italy)

M.V. Stefanetti ("Legionella Regional Reference Laboratory of Legionellosis" – Region Agency of Environment Protection (A.R.P.A.) of Piemonte, Novara, Italy)

History of this recommendation paper

The version presented here was approved at the UIAA MedCom by written consent in lieu of a live meeting at July 31th 2010.