LEGIONELLA AND LEGIONELLOSIS

Hazard and Control Points in Hotels

Basic Prevention Regulations

What does the Law say?
Royal Decree 865/2003
European regulations

Dr. Sebastián Crespí Rotger
From the very beginning, the Barceló Foundation has always directed its efforts to the achievement of objectives within three broad areas: Culture, Tourism and Health.

This publication, although under the auspices of the Foundation Health Commission, and promoted by it, has a direct bearing, as can be seen from its title, on the area of Tourism.

Effectively, although it is not confined exclusively to tourists, Legionnaire’s Disease has, since its discovery—the first known outbreak occurred in a Hotel in Pennsylvania in 1976, on the occasion of alegionnaires’ conference— been associated with tourism and with hotels. Periodically, and throughout the world, epidemic outbreaks flare up, often in hotel facilities, which are echoed far and wide by the media, which creates a certain degree of alarm, and one which is not always justified, in the travelling public, and causes financial prejudices, serious at times, to the tourism industry. This is why, in our opinion, this publication will be of great interest to the tourism sector and, most particularly, to the hotel subsector. Any effort that is directed at reducing, as far as possible, the risk of tourists finding themselves exposed to infectious or noxious agents, and thus contacting undesirable illnesses, must be welcomed and seconded. I know, from my profession, of the distress and anxiety felt, at times, by our professionals, arising from their lack of knowledge and the lack of available information on problems that are often not covered by their basic training as, for example, the one that occupies us here. This is the context in which this publication can be of great help. I believe that the information it contains is perfectly easily understood by any professional in the sector, and that the preventive measures that are proposed can and must be executed with strictness and seriousness. Only thus can we guarantee our visitors, to the best of our ability, the most precious commodity of the tourist on holiday –his or her own health.

Finally, I hope and wish that this felicitous initiative of the Health Commission has continuity. The Barceló Foundation will not spare any effort to ensure that it is so, to the benefit of health and all society.

Sebastián Barceló
President
Barceló Foundation
THE AUTHOR

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Dr. Crespí is an active member of the European Working Group on Legionella Infection, and he is a member of the Royal Institute of Public Health and Hygiene. He has served on the Executive Committee of the International Tourist Health Association. For more than 20 years, he has devoted part of his work to research into Legionnaires’ Disease, particularly its epidemiological and preventive and educational aspects. He is the author of numerous original works and those of scientific spreading, including several books, making a notable contribution to the knowledge on tourism-associated legionellosis.

He also has a wide experience in the field, having visited hundreds of hotels in different parts of the world, in many cases to investigate infectious outbreaks of diverse origin. The leading European tour operators and many hotel companies request his services as an independent advisor on subjects relating to hotel hygiene, and to legionellosis in particular. Fruit of this experience was the publication in 1993 of his opus on “Legionella and legionellosis: basic preventive and control regulations covering hotel facilities”, which –given its excellent reception– was reissued in 2000. Now, with the second edition also out of print, Dr. Crespí has made a further revision and updating.
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INTRODUCTION

This publication brings together and discusses the information that we currently possess on Legionellosis (and Legionnaires’ Disease), and places special emphasis on the preventive measures that can be taken in order to prevent or minimise its occurrence in hotels and similar buildings. In spite of the fact that it deals with current information, knowledge of the disease and its causes continues to progress. Apart from that, it is obviously summarised.

Additional and detailed information on any of the aspects noted in this document may be obtained from the Health Authorities, from specialist medical services, of companies specialising in the microbiological control of water, specialist water treatment companies, etc.
WHAT IS LEGIONELLOSIS?

2. Legionellosis is a generic term that is used to refer to the illness caused by the *Legionella pneumophila* bacterium and others in the same family. It includes Legionnaires’ disease and less well-known infections such as Pontiac Fever.

3. Legionnaires’ disease is a form of pneumonia caused by the inhalation of aerosols—extremely small droplets of water in contact with the air—that contain the bacteria. Although variable, the incubation period is generally from 2 to 10 days. The illness can affect healthy people but among those people most at risk are the elderly, smokers, alcoholics, patients with chronic respiratory and renal illnesses, and diabetics. The illness is generally serious. It requires hospitalisation, and may be fatal in a large number of cases.

4. The infection is attributed to the inhalation of bacteria found in contaminated aerosols. These aerosols can be formed in very many circumstances and, most particularly, in showers, cooling towers and evaporative condensers, sprinkler watering systems and spa or whirlpool-type baths operated by pressurised air.
LEGIONNELLOSIS AND TOURISM

5. The first outbreak of legionellosis to be identified as such occurred in a hotel in Pennsylvania (USA) in 1976 and affected the delegates at an American Legion conference. Since then, numerous epidemic outbreaks, in addition to isolated cases, have been detected all over the world, principally in hotels and other large buildings. At the present time, tourism and hotel stays are considered to be a very significant risk factor.

6. Epidemic outbreaks of legionellosis among tourists, even the occasional isolated cases, are generally aired extensively in the mass media creating alarm among the tourist population in general and causing serious damage to the tourism industry, and to determined companies in particular. In addition, lawsuits and legal claims for alleged responsibility are becoming increasingly common.

7. In Europe, and according to the figures issued by the European Working Group for Legionella Infections (EWGLI), hundreds of cases of travel associated legionellosis have been communicated in the last few years. The number of cases has continued to rise, and are currently estimated to be approximately 20% of all the cases of legionellosis declared in Europe. In some countries, such as the United Kingdom, this percentage is close to 50%.

In the main, these are sporadic cases although there have also been numerous epidemic outbreaks in hotels. These cases have occurred in tourist areas all over the world. In Spain, one of the world’s leading tourist destinations, more than half of the outbreaks in the last few years were found to be associated with stays in tourist accommodation.

8. In this context, it is not surprising then that the health authorities and the tourism industry are concerned about this disease from their respective viewpoints. In many parts of the world, Legionellosis has been included among the compulsorily communicable diseases and the Authorities have embarked on informative and preventive campaigns. Some countries have passed specific preventive regulations. Numerous hotel companies have voluntarily installed preventive measures, and many seminars have been held on the subject. This publication itself, is the result of such concern.
WHERE LEGIONELLA LIVES AND HOW IT MULTIPLIES

9. *Legionella* lives and develops in both natural and artificial aquatic environments. In the latter, it has been found mainly in the domestic hot water systems of large buildings and in the recirculating waters of the cooling towers in air-conditioning systems.

10. Several studies indicate that more than 50% of Spanish hotels are colonised by *Legionella* in some part of their water system. These figures are similar to those detected in other areas of Europe and in the world, and they denote that these are extraordinarily ubiquitous bacteria with a worldwide distribution.

11. It is known that certain factors favour the proliferation of the bacteria in building water systems:

   a) Temperatures situated between 20 and 45 degrees centigrade.

   b) The presence of organic matter, iron oxides and salts, scale deposits and the presence of sludge and slime.

   c) The presence of certain rubbers, natural fibres —natural rubber, hemp— and such materials as uralite —utilised occasionally in the construction of water systems.

   d) The presence of algae, protozoa and other bacteria.

   e) The presence of biofilms —layers of micro-organisms adhering to the walls of the pipe work whose formation, is in its turn, encouraged among other causes by stagnation, dead legs and infrequently used pipe work or where there is intermittent flow.
12. Any contaminated water mass, and one liable to create aerosols that can be inhaled, is a potential source of infection and, therefore, capable of being controlled with the objective of minimising the risk of it causing legionellosis.

13. Exhaustive study of epidemic outbreaks has revealed that, in practice, the most frequent sources of infection are:

   a) The hot water systems, particularly those in large buildings, with a recirculating water supply and large accumulator tank. The temperatures, frequently situated between 40 and 45 degrees, and other factors such as corrosion and scale deposits, facilitate and favour the colonisation and subsequent proliferation of the bacteria in the system.

Schematic diagram of the generation of aerosols in two different models of wet cooling towers.
b) The cooling towers and the evaporative condensers of the air conditioning system or other industrial processes that generate large quantities of aerosols, liable to be inhaled.

In addition, the recirculating water in the cooling towers is heated to temperatures exceeding 25 degrees, and slime and sludge accumulate and act as nutrients for the bacteria.

c) Industrial humidification systems that operate by dispersing droplets of water into the surrounding air, with the objective of increasing its level of humidity.

d) Swimming pools, tubs and baths of the spa and whirlpool types, particularly when operating with hot water and a recirculating system, frequently harbour *Legionella* and create large quantities of aerosols that can be easily inhaled by their users.

14. As we have already said, there are other possible sources of infection that, once identified, must be taken into consideration when assessing the possible hazards and adopting preventive measures. Ones that we should mention are the cold water systems, sprinkler watering systems, ornamental fountains, saunas and Turkish baths and humidified food display units.
**GENERAL PREVENTIVE MEASURES**

15. Even if it is very difficult, if not impossible, to completely and permanently prevent colonisation by Legionella in the water systems of the building, the risk of infection can be minimised. Experience acquired in the handling of epidemic outbreaks has shown that carrying out certain control measures makes it possible to eliminate cases of legionellosis.

16. These or similar measures may be used preventively in hotels. In general, they must follow the principles listed below, wherever possible:

- Avoidance of water temperatures between 25 and 45 degrees centigrade. The temperature of the water is a particularly important factor in the control of risks. In general, distribution temperatures of at least 51 degrees centigrade are to be recommended, measured at points of use.
- Avoidance of stagnant water. Stagnation facilitates the formation of biofilm and, therefore, bacterial attachment and proliferation.
- Permanent maintenance of correct chlorination levels in the water system at all its points.
- Maintenance of all the hotel equipment and systems in good operational conditions and cleanliness.
- Correct design of the installations, taking into consideration the adequate hygienic-health criteria, in addition to other factors.
HAZARD AND CONTROL POINTS IN HOTELS

17. In accordance with the explanations given in the preceding pages, the principal hazard points and, therefore, the control points, in hotels are all those liable to be colonised by the bacteria and, in particular, those that by their specific characteristics favour the proliferation of *Legionella*. In the hot water system, we have:

a) Hot water tanks in whose interior sludge, rust and other products of corrosion accumulate, along with scale deposits that favour the attachment and subsequent growth of the bacteria, especially when the storage temperatures are inferior to 50 degrees.

b) Auxiliary tanks and storage deposits. In this case, proliferation takes place particularly in systems with a deficient state of maintenance and cleanliness and/or subject to direct insolation in which the bacteria find sufficient nutrients and an adequate temperature.

c) Dead ends and intermittently used pipes. Stagnant water, as we said, facilitates the formation of biofilm in which the bacteria can hide and find the nutrients needed to multiply.

18. In air conditioning systems, the main hazard points are:

The water cooling towers and the evaporative condensers in which the recirculating water reaches risk temperatures. The towers generate numerous aerosols during their operation and, therefore, they constitute a very particular hazard point.

19. Swimming pools, whirlpool tubs, spa baths and similar, especially when they operate with warm water and pressurised air. The concurrence of two risk factors —adequate temperature and the generation of aerosols— means that these systems must be particularly controlled.
20. Other hazard points are:

a) The humidifiers and air conditioners with trays in which water and nutrients accumulate which could support the growth of bacteria and which are liable to generate aerosols.

b) Ornamental fountains, sprinkler watering systems, certain kinds of water saving showers –ones that operate mixing air and water thereby generating more aerosols than the conventional ones– and fire fighting systems.

c) Other systems which although they may not generate aerosols may, if in a poorly maintained condition or if they are badly designed, contribute to facilitating contamination of the drinking water systems in hotels (softeners, reverse osmosis equipment, etc.)
21. The correct design of new installations—or when remodelling older ones—and the choice of the adequate materials and equipment are essential in minimising the risk of infection. General principles to be taken into consideration include the following:

a) All the systems must be designed and constructed in such a way that they are accessible for their correct cleaning and disinfecting, where necessary.

b) When designing and constructing water systems, no material that could support fungal or bacterial growth should be used. Wood, some rubbers—such as natural rubbers—jointing compounds made in natural fibres—such as hemp, flax, jute and tow—and materials such as uralite and lead are the most notable examples. Generally the materials chosen should be copper, stainless steel, polypropylene, PVC and other authorised synthetic materials.

c) In the domestic hot water systems, the following are particularly important: the entire system must be watertight to prevent the entry of water from external sources, the absence of insulation or the exchange of heat in the cold water systems, the absence of infrequently used secondary tanks and the absence of dead ends and areas of intermittent flow.

d) Any equipment that could generate aerosols of potentially contaminated water must be avoided as much as possible.

e) In the air conditioning systems, the cooling tower must be fitted with drift eliminators—aerosol traps and be easily accessible for cleaning and disinfecting. The condensation trays must have an adequate gradient and U-bend in order to prevent accumulation and back flows.
22. The domestic hot water system, including cisterns and storage tanks, must be cleaned and disinfected periodically. In general, it is recommended that this should be done annually, although similar cleaning and disinfecting operations should be carried out when the building has been closed for a prolonged period and when the system or any part of it has been altered or modified for whatever reason.

23. The disinfecting method to be employed is determined to a large extent by the type of installation and the circumstances. In our area, hyperchlorination of 20 ppm of chlorine (parts per million or mg/L) is frequently recommended for at least 3 hours although, depending on the circumstances, other equivalent concentrations and times may be used.

These tasks must be carried out by specialist personnel and, should the building be occupied, everybody must be duly advised. Once the disinfection is finished, the system must be completely drained and rinsed (see the box at the end of this section).

24. The water in the system must be kept permanently chlorinated at 0.2-1ppm of free residual chlorine –measured always at points of use. It is desirable that there should be an automatic chlorinator that guarantees adequate levels of chlorination.

25. In some countries (Spain, United Kingdom, Germany, France, etc.), there are specific regulations relating to the temperatures for the preparation and distribution of hot water in buildings, linked or otherwise to legionellosis preventive measures. In general, and from a preventive point of view, temperatures of 60 degrees centigrade are recommended for preparation and storage, and 51 degrees or more for its distribution. In installations associated with cases, they are absolutely essential, and maintaining and controlling them is, without any doubt, the most important preventive factor.
26. When thermal treatment (temperatures at points of use exceeding 50 degrees) is not possible for whatsoever reason—solar energy systems, old or inefficient installations, etc.—it is advisable to have another control barrier (such as permanent chlorination, metallic ionisation or others) in the hot water system. The choice of the specific prevention method will depend on the particular circumstances of each installation.

27. In the last few years, other alternative methods—or complementary—to the temperature for the treatment of hot water have been suggested and put into practice, in particular metallic ionisation.

The utilisation of this method, in determined circumstances, presents certain advantages and its utilisation may be adequate, very specially when it is employed in conjunction with another control barrier. Its principal advantages reside in the possibility of it operating completely automatically, its compatibility with any temperature range and the great capacity of diffusion and persistence presented by the metallic ions in the aquatic medium, including in little used pipes. Nevertheless, it is essential to make a careful selection from the suppliers of this equipment since assessments made show a wide variability in their preventive efficacy.

28. Hot water storage units must be drained, cleaned and disinfected periodically so that it is advisable for them to have an inspection hatch and drainage valve in the bottom. In general, an annual cleaning and disinfecting is recommended, with a short weekly flush (from 30 seconds to one minute).

Examples of chlorine concentrations and the necessary contact times to carry out disinfections of the water system, reaching a minimum CT factor (concentration in mg/L x contact time in minutes) of 3,600, and free residual chlorine typically encountered after the contact period.

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<td>As chlorine (mg/L or ppm)</td>
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DISINFECTION AND MAINTENANCE OF AIR CONDITIONING SYSTEMS

29. Cooling towers must be scrupulously cleaned and subsequently disinfected at regular intervals, and always at the beginning of each season.

The methods adopted for cleaning and disinfecting will depend to a large extent on the system in question (metallic towers, fibreglass ones, etc.), although disinfecting by hyperchlorination is often recommended.

30. The recirculating water must be permanently treated with the adequate descaling agents, corrosion inhibitors, dispersal agents and biocides that kill or inhibit bacterial multiplication. The choice of biocide — chlorine as a biocide is not always recommended — must be made carefully and it is a good idea to take advice from specialist personnel having taking into account the possible adverse effects of certain chemical compounds on the action of others.

31. The panels and condensation trays in air conditioners and fancoils must be similarly cleaned, including the U-bend, ensuring correct drainage in addition.

In order to prevent its contamination, the regular use of slow dissolving biocide tablets is recommended, as they inhibit biological growth for several months.

32. Of particular importance are the drift eliminators, whose use is imperative in all towers. It is obvious that these separators, whose objective is to eliminate the droplets of water and aerosols of water propelled towards the exterior by the tower fans, be of high efficiency and must be always kept in a perfectly maintained condition.

33. It is recommended that the wet cooling towers be located at the furthest possible distance from areas of public access and away from the air conditioning or ventilation intakes. In addition, they should be placed to leeward in relation to the prevailing winds in the area as an added protection. The aim of all these measures is to make it difficult for potentially contaminated aerosols to reach the public.
MAINTENANCE OF WHIRLPOOL BATHS AND SIMILAR

34. Spa pools of the Jacuzzi kind or similar are characterised by having a high pressure water propulsion system towards the interior of the tub. There are different types: with or without recirculation, with or without water heating systems, with or without filtration, filling and emptying or with permanent water, with impulsion of air, etc. In whatsoever case, irrespective of type, these are always high risk units as they generate aerosols that could be inhaled by the users. Consequently, the correct treatment of the water will be fundamental in guaranteeing the safety of the users.

35. The treatment of the water and the operating conditions will depend to a large extent on the kind of pool in question. Thus, in pools that fill and empty, if they operate with correctly chlorinated water from the system, no additional treatment would generally be necessary. With recirculating systems, on the other hand, automatic chlorination –or bromination in the hot water system– is always advisable wherever possible, in addition to control, –also automatic– of the pH. In whatever case, it will also be necessary to maintain a scrupulous hygiene in the system, by disinfecting it regularly, and always with recently installed pools or after a significant period of inactivity.

36. Although there is no unanimity on the levels of chlorination necessary, it is generally recommended that concentrations of chlorine or bromine slightly higher than that of a conventional swimming pool be permanently maintained. In the case of the chlorine, concentrations of 2-3 ppm are desirable, and from 3 to 5 ppm for the bromine. It is important to take into consideration that, in these systems, the pH has a tendency to be unstable so that its regular adjustment, preferably automatically, is imperative. The chlorine and the pH should be monitored manually, with the appropriate equipment, a minimum of three times a day.

37. In every case, the water must be renewed periodically and always in a continuous way in pools that lack filtration systems and in those of collective use. The frequency of the renovation will depend on several factors (size, carrying capacity, type, etc.). As for their maintenance –cleaning filters, inspecting pumps, etc.– either the manufacturer’s instruction should be followed or current legislation, as the case may be.
38. Legionella can be detected in water samples through complex microbiological analysis. Although in hotels there is no scientific evidence whatsoever that demonstrates that awareness of the presence or absence of Legionella in the water is of any utility when predicting the appearance of the disease, some regulations make it obligatory to carry out periodic analyses for Legionella in installations at risk. There is also a wide variability in respect of the necessary regularity of such inspections and with reference to the characterisation of the risk level according to the concentration found.

39. In spite of this, the analytical controls for Legionella may be useful in suspect installations or those associated with epidemic outbreaks or when checking the efficacy of the control measures. In addition, they are essential in the investigation and study of outbreaks and, in some cases, act to demonstrate credibly the origin of the illness.

40. Nevertheless, the most essential controls of all are those that involve good installation maintenance practices.

The frequency of the controls and the levels of compliance demanded vary from one system to another, and will depend on the situation and risk of each case. As a general principle, the Official Technical Regulations and legally binding legislation of each region must be scrupulously respected.
41. The following control measures are among those that must be implemented in all hotels:

e) Annual revision of the condition of the drinking water system, including the cisterns and accumulator tanks.

a) Measuring and registering daily the chlorination level of the water in the system at different terminal points, and measuring the return temperatures in the hot water system.

b) Measuring and recording daily—at least three times a day— the level of chlorination and pH levels in whirlpool spa baths.

c) Measuring and recording, at least monthly, the water temperatures at a significant number of exit points.

d) Revising weekly the correct operation of the cooling towers, analysing monthly the quality of the recirculating water: pH, conductivity, solids in suspension, organic matter and total count of microorganisms.

e) Annual revision of the condition of the drinking water system, including the cisterns and accumulator tanks.

f) Annual revision of the condensation trays in the air conditioners and fan coils.

g) Other: see appendix

Slides with culture medium for microbiological analysis of water.
PROTECTION OF PERSONNEL DURING CLEANING AND DISINFECTING TASKS

42. All the cleaning, disinfecting and maintenance tasks must be carried out ensuring the correct measures of safety and hygiene in order to minimise the risk of infection and accidents. In practice, the most notable are:

a) Prior to their cleaning, the cooling towers must be completely hyperchlorinated.

b) It is advisable that maintenance personnel are equipped with protective masks during cleaning tasks, particularly when using pressurised water or steam equipment.

c) The instructions –as supplied by the manufacturers– on the use of the different chemicals being employed must be scrupulously respected.

d) In a general way, it may be said that the legislation on hygiene and safety in the workplace of each country is applicable. It must be taken into account that European legislation makes a risk assessment compulsory when exposure to toxic or dangerous substances cannot be totally and reasonably avoided.

43. The protection of other personnel –guests, for example– is also important. Whenever possible, cleaning and disinfecting operations should be carried out when the building is unoccupied.

44. In the case of buildings permanently occupied, it is also necessary to take further precautions.

a) During hyperchlorination, all hotel personnel and guests must be duly advised when hyperchlorination is taking place. The same precautions should be taken when carrying out a thermal disinfection of the hot water system at high temperatures, if the safety valves are not fitted with thermostats, with the objective of preventing scalding.

b) When cleaning the cooling towers, such methods as pulverisation or atomisation of pressurised water should not be used, and the nearest potential air intakes should be kept closed.
What does the law say?

Royal Decree 865/2003

45. Everything we have said up to now is valid within general terms. Nevertheless, in those countries, as is the case with Spain, that have specific legislation for the prevention and control of legionellosis, it is unnecessary to say that this legislation, which also affects tourist establishments, must be complied with in a scrupulous way. For hotels, there are also the European Guidelines for the Prevention and Control of Travel Associated Legionnaires' Disease, whose recommendations have been accepted by the majority of the European countries.

46. In Spain, the regulations on the prevention and control of legionellosis are contained in a Royal Decree, the RD 865/2003, which is applicable to the whole of Spain. There are also other regional provisions and even local ones, which must be complied with in their respective territories. There are also other related regulations that, although without having been promulgated specifically for the prevention of legionellosis, regulate aspects that also have great importance within the context of the prevention of infections by Legionella. Among those we should mention are the regulations on the quality of water for consumption, the regulations on thermal installations in buildings, and the regulations on the safety and hygiene in the workplace.

47. The RD 865/2003 establishes, among other things, the obligatory nature of notifying the health authorities of the siting and technical characteristics of cooling towers and evaporative condensers, as well as that of having a Register for the maintenance operations, and which must always be available to the Health Authorities. In all risk installations, there must be a Maintenance Programme that includes the preventive operations to be carried out, their frequency, the water treatment method and the frequency of the cleaning and disinfecting operations.

48. New installations, as well as those modified or reformed, must comply with all the technical characteristics given in the Royal Decree. Briefly, and looking at those that concern the temperature, the domestic hot water system must enable the water to reach temperatures of 70º centigrade and must be capable of maintaining temperatures exceeding 50ºC at the most unfavourable points on the system. In the cold water system, a temperature of 20ºC should be maintained and, if the water tanks are outside, they must be thermally insulated. Thermal exchanges between hot and cold water systems must be avoided, as must exchanges between them and the outside environment.

49. The Royal Decree permits the existence of thermal efficiency systems (solar energy, energy recovery) but makes it obligatory to maintain temperatures of 60ºC in the final storage tank before the hot water goes to the points of consumption. In practice, in the majority of cases, this will involve the existence of a complementary conventional thermal treatment system (with the consequent loss of some of the advantages gained).

50. Companies engaged in carrying out preventive or control treatments (cleaning and disinfecting, for example), must be specially authorised to do this work.
Moreover, the personnel who work in maintenance-hygiene-sanitary operations in hotels, be they employed or contracted from outside, must have taken a special course organised by an authorised company. This, in practice, makes it compulsory for at least one member of staff to have taken the corresponding training course.

51. The above explanations summarise those aspects that we believe are the most relevant in the RD 865/2003. Nevertheless, it is essential for all owners and those responsible for the installations at risk to know them in detail. In particular, the different Annexes are of interest as they specify the actions to be taken in accordance with the type of installation. These include the obligatory nature of carrying out an analysis for Legionella at least once a year in all hotels, and at least quarterly in all the cooling towers and evaporative condensers.

**European regulations**

52. The European Guidelines for the Control and Prevention of Travel Associated Legionnaires’ Disease entered into force in the middle of 2002. Drawn up by the European Working Group for Legionella Infections (EWGLI), it was endorsed by the European Commission and adopted by numerous countries, including Spain. A complete copy of the Guidelines can be obtained online, free of charge from www.ewgli.org.

53. The European Guidelines lists standardised procedures for the prevention, detection and response to infections by Legionella associated with travelling. The European Guidelines do not pretend to replace national legislation but are applicable in all those spheres not contemplated in state regulations. In any case, their importance arises from the fact that the Guidelines have been specially designed for the prevention and control in the tourism sector.

54. The European Guidelines define legionellosis cases associated with a specific hotel as those affecting guests who have stayed overnight in the same, in the 10 days prior to the onset of the illness. These are known as single cases, if no new cases associated with the establishment are detected in the two years following it. Outbreaks or clusters are those when there are two or more cases associated with the same establishment within a period of two years. It is assumed in principle that when there are cases associated with the same establishment, it is very probable that this is the source of contagion.

55. In Europe, all travel associated legionellosis cases are communicated to a coordinating centre located in London. In the event of outbreaks, the coordinating centre sends an alert with the name of the hotel involved to the Health Authorities in every country that is a member of the European Surveillance Scheme for Travel Associated Legionnaires’ Disease (EWGLINET), and asks the health authorities of the country concerned for a preliminary report on the hygiene-sanitary state of the implicated hotel: if this report is not sent within two weeks or the hotel has not implemented the preventive measures ordered by the local health authorities, the name of the hotel associated with the disease is made public, and the health authorities of all the member countries advised of the fact. Finally the definitive report on the outbreak must be sent to the coordinating centre within a period of 6 weeks and, if not sent, the above procedures are put into action.
56. Unfortunately, cases of hotel associated legionellosis occur sporadically even in those that have acceptable prevention methods in force. In Spain and in other parts of the world, legionellosis is a compulsorily communicable disease. This means that doctors are obliged by law to notify the health authorities of any demonstrable or reasonably suspected case. When it is an outbreak, notification must be made urgently.

57. As already explained, the European Surveillance Scheme is responsible for identifying outbreaks and alerting the health authorities in the participant countries. The hotels involved are immediately inspected by the inspection services, which follow the procedure laid out in the European Guidelines. In parallel, the health authorities of some countries also send information on the outbreak to the tour operators, with the objective of their taking the measures they consider necessary to protect the health of their clients.

58. When there are sporadic cases of legionellosis in a hotel installation, in general, special preventive measures are not normally recommended, it being considered that there is no sufficiently close connection between the incident and the hotel. In spite of this, the practice of investigating isolated cases is becoming more and more common and, in our opinion, is compulsory when it concerns hotels that have already been associated with cases of legionellosis.

59. The Tour Operators, legally responsible for the health of their clients, are increasing more sensitive to these problems. Although their mode of action varies according to the circumstances, and without prejudice to what may be decided by the health authorities, in general, they follow the following scheme: 1) Prior to the appearance of a first case, a formal request is made to the hotel for verification of the correct execution of the programmed preventive measures, in some cases similarly requesting inspection of the installations by an expert in the field. 2) If there are two cases related to the same hotel, they require an expert examination of the cases, and a risk assessment, which implies a conscientious inspection of the technical installations and a microbiological analysis of water samples from the hotel, in addition to other studies of an epidemiological nature. 3) If there are three or more cases in a short period, some Tour Operators recommend evacuating the facilities until new reasonable guarantees of safety can be furnished.

60. Not surprisingly, the appearance of cases of legionellosis in a hotel generally produces unease and concern among the professionals in the tourism sector. Nevertheless, and fortunately, we have extensive experience in the investigation and handling of legionellosis cases at all levels which indubitably facilitates the correct solution to the problem. Good assessment is fundamental, as measures of a general nature are not always sufficient, and of course, the correct execution of the recommended measures.
6.1. By way of a summary, we must remember that the methodology employed to prevent cases of legionellosis in buildings destined as tourist accommodation rests basically on six points. With the objective that these can be easily memorised and taught, we have called our mnemonic the “e-micro”. Let us see what it comprises:
62. E : EDUCATION. All the personnel involved, and in particular the maintenance staff and the hotel management, must be appropriately educated in the issues that affect the hygiene of the air conditioning and the water system in general. This should not cause surprise to anybody in view of the necessity for food handlers, for example, to obligatorily and regularly take their appropriate hygiene-health courses.

63. M : MAINTENANCE. Good maintenance practices are essential in maintaining the installations not only in a good operational condition but also in a perfect hygienic state. Experience indicates that cases of legionellosis generally occur in poorly maintained or deteriorated installations.

64. I : INSPECTION. The installations must be regularly inspected by specialist personnel. The inspection must be sufficiently in-depth to identify and assess the potential risks and, in addition, enable the appropriate decisions to be taken to correct deficiencies.

65. C : CONTROL. It is essential for controls of the most important factors that could contribute to the proliferation of bacteria to be carried out on a daily basis. In particular, the most crucial of these are monitoring the daily hot water temperatures, the chlorination and pH levels of the entire water system in some cases, as well as the whirlpool tubs and cooling towers. Other factors must also be controlled at longer intervals but, in the case of those given above, the control must be a minimum of once a day.

66. R : RECORD. It is necessary to record all the most relevant work and controls that are being carried out in the appropriate register and, in particular, those relating to chlorination and temperatures. These records will underline any assessment of the work done and in making the pertinent corrections, and will be fundamental when facing any claim that may one day be made.

67. O : OBLIGATION. Finally, all the above must be enframed within a context of obligation, be it at an internal level, as an obligatory regulation of the company or as a legal requisite of a country or self-governing region. The coercive and persuasive environment of the regulation together with all the rest will undoubtedly assist in its scrupulous compliance and give the necessary authority to those responsible for its effective execution.
If the results for the analysis of Legionella in water are negative, does this mean there is no risk in the installations?

Not necessarily. For a start, when we have the results, several days have passed since the sampling and the current situation could be different. In addition, the results are valid only for the samples analysed so that the Legionella could be in another area of the installation. On the other hand, not even the very best of laboratories is capable of isolating 100% the bacteria present in water. But even if this were so, the bacteria could still be present in the biofilm. In any case, it is always advisable that the results are interpreted by experts.

If the analyses are positive, how do we proceed?

For the cooling towers, the RD 865/2003 establishes the route to be followed in respect of the microbiological analyses. For the drinking water system, the European Guidelines similarly propose the steps to be taken. But, it is always advisable, to consult specialist personnel.

After having been informed that two of our guests had Legionnaires’ disease, the results of the water analyses from the hotel system came back negative from the Health Authorities. Does this mean the hotel was not the source of contagion?

Do not discard this possibility. It is relatively common that, in hotels associated with cases, the bacteria is not detected in the water samples.

If we are informed that a hotel guest has had Legionnaires’ Disease, how should we proceed?

If the information is reliable, the most normal procedure is to receive a visit from the health inspectors. In parallel, or in a complementary fashion, the hotel could be assessed by an independent consultant.

In systems where the water is heated by solar energy, are they safe? Can they be installed in hotels? And energy recovery systems?

Well maintained and installed solar energy and energy recovery systems are safe and may be installed in hotels. Nevertheless, the RD 865/2003 makes it obligatory for there to be a temperature of 60ºC in the final storage tank prior to distribution. Specialist companies in the sector are fully aware of the different existing systems.

A guest informed us that his family doctor had diagnosed him with an infection from Legionella. Can a legionellosis be detected by a doctor without any kind of laboratory analysis?

A doctor can diagnose the existence of a pneumonia but confirmation of Legionnaires’ Disease can only be made after analysis by a laboratory.

In the event of an outbreak, can the Tour Operators decide unilaterally to evacuate a hotel? Do they generally do so?

The tour operators are legally responsible for their clients and can recommend the evacuation of a hotel on safety grounds. At the same time, in specific critical situations, it is normal for the tour operators to consult with the health authorities of their country and to follow their advice. In practice, only when there are three or more cases of legionellosis within a very short period do the tour operators consider evacuation.
What companies can be engaged to carry out maintenance or preventive treatments with biocides in our hotel?

From a legal point of view, the companies engaged in this kind of work must be entered in the Official Registry of Biocide Establishments and Services and their operators must have taken the relevant authorised course. Logically, of course, other criteria must be assessed, such as their experience, professionalism and the quality of the service they provide.

Is it obligatory for the hotel maintenance staff to have to take an authorised course in the prevention of Legionellosis?

In almost all hotels, it is normally the maintenance staff that carry out the legionellosis preventive maintenance tasks (periodic cleaning, controls, inspections, etc.), so that is obligatory for them to have taken the authorised course established in the Order SCO-317-2003.

Is it obligatory to have a Maintenance Operations Register in the hotel? Is there any suitable register for hotels available on the market?

Yes. According to the RD 865/2003, it is compulsory for each establishment to have a Maintenance Operations Register. A Register especially designed for tourist establishments is published annually. To acquire a copy, see the ‘To Learn More’ section.

If the hotel maintenance staff has taken the authorised course on the prevention of legionellosis, can they carry out the annual cleaning and disinfection of the hotel water system?

The annual cleaning and disinfecting of the water system is a complex task. Taking the authorised course legally permits staff to carry out preventive maintenance. However, the course does not confer specific professional competence on a particular kind of task and even less so on those tasks that are particularly complicated and which should, logically, be entrusted to personnel or companies specialising in this work.

In our hotel, the installations are very old and do not reach 50ºC either in the return circuit or at the terminal points of the system. What should we do?

In this case, the system does not comply with the RD 865/2003 and the situation must be remedied as soon as possible.

We would like our maintenance staff to take the authorised course on the prevention of Legionellosis. Whom should we contact?

The health authorities in each Autonomous Region will provide you with the information necessary to take the course. In addition, you could contact one of the different Hotel Associations which, without a doubt, will have the information on this.

For our heated swimming pool, we have been offered a system of disinfecting the water that operates with chlorine dioxide as an alternative to the conventional chlorination. Is it acceptable?

Chlorine dioxide is effective against Legionella and other pathogens potentially present in bathing water. It is therefore a perfectly acceptable system.
TO LEARN MORE

APPROPRIATE LEGISLATION


WEBS OF INTEREST

2. www.biolinea.com (web on health, safety and the environment in tourism: it provides on-line courses on the prevention of legionellosis in hotels).
3. www.hcinfo.com (web with general and bibliographical information of interest on Legionella, including shop).
4. www.q-net.net.au/legion/ (entertaining web with vast amount of information on legionellosis, some of interest to hotels).

MATERIAL OF INTEREST

1. Maintenance Operations Register. Programme for the Prevention of Legionellosis in Tourist Stay Establishments. S. Crespi, J. Ferrer. Biolinea Internet S.L. A very useful book in which it lists all the preventive tasks that must be carried out daily in hotels and in which, in addition, these can be easily recorded. It can be obtained from: info@biolinea.com
ANNEX

REGULARITY OF THE TREATMENT AND CONTROL MEASURES

The control measures and their frequency, which are given below, are merely indicative ones and must be considered to be the “minimum” ones. The frequency of the controls may vary in accordance with different factors, in particular: a) the results obtained in earlier controls. b) the risk level of each installation. The frequency of the inspections must be increased when: 1) Any deficiency is detected. 2) Any part of the installation is replaced or repaired. 3) The analyses reveal contamination. In addition, it is compulsory to clean and disinfect the entire hotel water system (or the parts involved) always before opening the hotel, after a period of closure, after a period of significant inactivity in any of its parts (storage tank, cisterns, a building wing, etc.), and after any significant reform or technical work on the same.

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>TASK</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling tower</td>
<td>Chlorine and pH</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Other chemical treatments</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>General inspection</td>
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<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
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<tr>
<td>Hotel water system</td>
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</tr>
<tr>
<td></td>
<td>Temperature in return</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>All the taps in the hotel</td>
<td>Annually</td>
</tr>
<tr>
<td></td>
<td>Increasing Temp. 70 degrees 2h</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Disinfection of the system</td>
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</tr>
<tr>
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<tr>
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<tr>
<td></td>
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<td></td>
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</tr>
<tr>
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<td></td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Taps used sporadically</td>
<td>Bleed minimum 2 minutes</td>
<td>Weekly</td>
</tr>
<tr>
<td>Unoccupied rooms</td>
<td>Bleed minimum 2 minutes</td>
<td>Weekly</td>
</tr>
<tr>
<td>Descalers</td>
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<td>According to the recommendations of the manufacturer</td>
</tr>
<tr>
<td>Fire fighting system</td>
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</tr>
<tr>
<td>Spa and whirlpool baths</td>
<td>Chlorine and pH</td>
<td>Three times a day</td>
</tr>
<tr>
<td></td>
<td>Filters and conduits</td>
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</tr>
<tr>
<td></td>
<td>Cleaning and disinfecting routine/complete</td>
<td>Daily/half-yearly</td>
</tr>
<tr>
<td>Installation</td>
<td>Cleaning and Disinfecting Method</td>
<td>Frequency</td>
</tr>
<tr>
<td>---------------------------------------</td>
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<tr>
<td>Hot water swimming pool</td>
<td>Chlorine and pH</td>
<td>Three times a day</td>
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<tr>
<td></td>
<td>Filters (backwash)</td>
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</tr>
<tr>
<td></td>
<td>Filters (cleaning and disinfecting)</td>
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</tr>
<tr>
<td>Watering system</td>
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<td>Annually</td>
</tr>
<tr>
<td>Ornamental fountains (high risk)</td>
<td>Chlorine and pH</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Cleaning and disinfecting</td>
<td>Half-yearly</td>
</tr>
<tr>
<td>Ornamental fountains (low risk)</td>
<td>Cleaning and disinfecting</td>
<td>Half-yearly</td>
</tr>
<tr>
<td>Air conditioners</td>
<td>Clean tray and biocide tablets</td>
<td>Half-yearly</td>
</tr>
<tr>
<td>Air conditioner filtrines</td>
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<td>Monthly</td>
</tr>
<tr>
<td>Fan-coils trays</td>
<td>Cleaning and biocide tablets</td>
<td>Half-yearly</td>
</tr>
</tbody>
</table>

**Cleaning and disinfecting** – prevention and control – in water systems and installations at risk in accordance with the R.D. 865/2003.

**Metallic ionisation**: distributors for the Spanish market of Tarn-Pure®, the European leader in copper-silver ionisation.

**Biocide tablets** Biocid® officially authorised for anti-Legionella treatment in condensations trays and air conditioners.

**Liquid chlorine dioxide** for whirlpool baths and swimming pools. Prevention of Cryptosporidium.
- Analyses for Legionella in water system samples and from other sources.
- Design and implementation of legionellosis prevention programmes in tourist establishments.