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Research of *Legionella* sp. in the water supply of a hospital in northern Portugal

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INTRODUCTION:

The distribution systems of drinking water have characteristics that allow the growth of microorganisms that may be pathogenic to humans, such as *Legionella*. The *Legionella* sp. (aerobic gram-negative bacilli) are widely distributed in aquatic environments, but it is in artificial environments that they hit higher levels due the characteristics propitious (like temperature, pH and biofilms presence) to their development. Human intervention was crucial for the presence of *Legionella* that has become common in building networks of water supply, cooling towers, air conditioning systems, swimming pools, tanks, humidifiers, condensers, ornamental fountains, among others^{1,2,3}.

The *Legionella* spp. is a fastidious bacteria that require special isolation techniques. Among the species of *Legionella*, the *Legionella pneumophila* is the most commonly identified specie that causes human disease and the deterioration of health conditions. In Portugal, since 1999 to 2008, 522 cases of legionellosis were reported, predominantly associated with hotel units. It is considered the second leading cause of pneumonia, which have a mortality rate of 40% in the hospital environment⁴.

Initially, it was thought that cooling towers was the main source of contamination in hospitals, but many cases were associated with conduct hot and cold water systems. Therefore, the inhalation of contaminated aerosols is the most likely form of contamination, which may be originated from tanks / cooling towers, air conditioning systems, water heating systems, showers, swimming pools, nebulizers and humidifiers systems. So it is important to monitorize these water systems, through physico-chemical and microbiological characterization, in order to reduce and control the number of infections caused by these bacteria³.

OBJECTIVES:

This work aimed to identify possible sites contaminated by *Legionella* sp. in hospital distribution network and evaluating the distribution system based on some of the physico-chemical parameters (temperature, pH and dissolved oxygen concentration) that are important for the development of *Legionella* sp.

MATERIALS AND METHODS:

Samples were collected in hot water tanks, showers, entry and end of the cold domestic water supply, kitchen and pool area network. At each point were collected two bottles of 1000ml, one of them with a sterile sodium thiosulphate concentration of 80 mg/L for microbiological parameters (*Legionella* sp), and one without additives, for physico-chemical parameters (pH, conductivity and dissolved O₂), each being properly identified. After sampling the temperature measurement was made. These determinations were carried out by potentiometry, thermometry and electrometry, respectively. For *Legionella* sp research we used all materials and procedures recommended by ISO 11 731⁵.

RESULTS AND DISCUSSION:

In this study, 16 water samples and 2 controls were analyzed. The results of each sample and each parameters analyzed are presented in Table 1.

Have been identified some favorable sites of growth the *Legionella sp.* Those sites exhibit characteristics as temperature < 50 °C and slightly alkaline pH. Although the pH values are within the reference values, these values do not guarantee that *Legionella sp.* does not show growth in the distribution system of the hospital⁴. But different values of these reference values can damage the distribution system⁴. The results of temperature in samples of cold domestic water are in accordance with recommendations by the Portuguese Institute of Quality. While the temperature in the hot water samples were lower than recommended, does not prevent the installation of these bacteria, since it resists these temperatures⁴. Regarding the concentration of dissolved O₂, which is slightly increased, it is contributive to the development of *Legionella sp* in the water network, since large concentrations of dissolved O₂ increases the ability of developing biofilm. For microbiological results, there was no growth of *Legionella sp* in the analyzed samples. Todos os procedimentos utilizados seguiram a norma permitindo garantindo a qualidade dos resultados. All procedures used followed the rule allowing ensuring quality results.

Table 1 - Physico-chemical parameters and research of *Legionella sp*

Local	Water Type	Temperature	pH	O ₂ dissolved (mg/L O ₂)	Presence of <i>Legionella spp.</i>
Unit B tank	HOT	52,4	7,29	5,75	Negative
Unit B shower	HOT	46,8	7,05	5,93	Negative
Unit C tank	HOT	55,7	7,33	5,44	Negative
Unit C shower	HOT	49,6	7,00	5,70	Negative
Unit D tank	HOT	52,4	7,71	5,79	Negative
Unit D shower	HOT	50,1	6,93	5,72	Negative
Unit E tank	HOT	47,0	7,34	5,41	Negative
Unit E shower	HOT	41,3	7,21	5,22	Negative
Pool tank	HOT	44,0	7,38	5,37	Negative
Pool shower	MIXED	37,4	7,40	5,51	Negative
Unit SII Tank	HOT	53,8	7,20	5,67	Negative
Unit SII shower	HOT	30,2	7,41	5,49	Negative
Ordinance (mains input)	COLD	15,1	7,61	6,41	Negative
Kitchen	COLD	17,3	7,48	6,27	Negative
Pool	COLD	16,7	7,76	6,29	Negative
Unit mains output	COLD	16,2	7,58	6,42	Negative
Positive control					Positive
Negative control					Negative

CONCLUSION:

Maintaining the quality of water used in hospitals and the research of *L. pneumophila* is essential to ensure safety in the hospital environment. Currently only the hot water and the cooling systems for buildings have legislation that requires the research of *Legionella sp* with others parameters for the evaluation of water quality. However, there are several guidelines and protocols with parameters for controlling other types of environments and water, as well as their limits³. These protocols have preventive measures that should be adopted, as the continuous monitoring of water circuits through physico-chemical and microbiological characterization, maintaining the temperatures of the tanks outside the optimum temperature for the bacteria (> 60 ° C <20 ° C), performing regular maintenance, including cleaning and disinfection of the

circuit. This way, can be possible minimize the risk of bacteria development in the network system, since their elimination is difficult³.

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