

## The use of nanomaterials in the control and prevention of Legionella bacteria

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**Abstract** - In this investigation we intend to perform innovative work to reduce or even tackle a serious problem affecting people's health, air contamination by Legionella.

Legionnaires' disease or legionellosis arose due to human alteration of the environment, Legionella species can be found in aquatic environments, water warm and hot, and humid places, such as cooling towers, spas, among others. This is an infectious disease caused by bacteria belonging to the genus Legionella. The mode of transmission varies with the variety of bacteria but the disease is usually transmitted through inhalation of aerosols as carriers of small bacteria to the lungs, allowing its deposition in the alveoli. The infection caused by Legionella pneumophila is known to have two different forms, the legionnaire's disease is a form of pneumonia caused by an acute bacterial infection and Pontiac fever is a less severe form of the disease, causes a flu-like acute pain. The rate of infection is increases in people with impaired (insufficient) immune systems. This means that healthy young people are rarely infected with Legionella. Factors that increase the likelihood(probability) of infection by disease are: tobacco, certain cancers, excessive alcohol consumption, age over 50 years, among others.

To reduce the multiplication of Legionella pneumophila and the associated risk of Legionnaires' disease should be taken measures to prevent and control physical, chemical and microbiological, in order to promote and maintain clean surfaces of water systems and air. One of the systems used for purification of air filtration consists in the separation and capture of particles of any kind. The filters need technical requirements that are a balance between three key parameters: the filter efficiency, pressure drop and the durability of the filter. The level of filtration efficiency is determined by the field of application, or with the ability to obtain clean air. The fibrous filtration media is the most used in air filtration, these media may be cellulosic or non-synthetic fabrics. Textiles are used in a variety of filtration processes, wet and dry, allowing both increase the purity of the filtered material and the recovery of solids.

The aim of this work is develop an air purification system by producing anti-microbial agents to fight Legionella assets. For the development of this project will be used new materials (nano-materials) and textile structures (nonwovens) bioactive so as to control or prevent the action of these microbial agents.

### References

- [1] Infections, T.E. European Guidelines for Control and Preservation of Travel Associated Legionnaires' disease (2005) .
- [2] The determination of Legionella bacteria in waters and others Environmental Samples - Part 1 – Rationale of Surveying and Sampling. ( Environment Agency , 2005).
- [3] A. Mavridou, E. Smeti, G. Mandilara, O. Pappa, S. Plakadonaki, E. Grispou, et.al.. Prevalence Study of Legionella spp. Contamination in Greek hospitals. International Journal of Environmental Health Research, 18, 295-304, 2008.
- [4] P. Borella, M.T. Montagna, V. Romano-Spica, S. Stampi, G. Stancanelli, M. Triassi, et al.. Legionella Infection Risk from Domestic Hot Water. Emerging Infectious Diseases, 10, 2004.
- [5] C. F. Health. Code of Practice and Control of Legionnaires' disease (2010).
- [6] Luftfilterbau. (s.d.). Obtained from on March 03, 2011, <http://www.luftfilterbau.de>.
- [7] S. Duquesne, C. Magniez, G. Camino. Multifunctional Barriers for Flexible Structure. Spring Series in Materials Science, 1997.