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Editorial

Focusing on the Main Morphological and Physiological Characteristics of the Food-Borne Pathogen *Listeria monocytogenes*

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The genus Listeria spp includes fifteen species, i.e. *L. monocytogenes*, *L. ivanovii, L. innocua, L. welshimeri, L. seeligeri, L. grayi, L. marthii, L. rocourtiae, L. fleichmannii, L. weihenstephanensis, L. floridensis, L. aquatic, L. cornellensis, L. riparia and L. grandensis*. Members of the genus Listeria are small Gram-positive rods sometimes arranged in short chains, ranging between 0.5 and 4 µm in diameter and between 0.5 and 2 µm in length. They are non-spore-forming and facultative anaerobic. Peritrichous flagella give them a typical tumbling motility, occurring at room temperature (20-25°C), but not at 37°C. Out of the fifteen species, *L. monocytogenes* is the major pathogen for humans. Very rare cases of infections due to *L. ivanovii and L. seeligeri* have been described. Conventional methods for the identification of *L. monocytogenes* among other Listeria species rely on the results of fermentation of sugars and haemolytic activity on sheep blood agar. *L. monocytogenes* expresses a characteristic small zone of haemolysis which can be observed around and under colonies. *L. monocytogenes* is catalase positive and oxidase negative and is able to survive at a wide range of temperature (between 0 and 45°C) both under aerobic and anaerobic conditions. The optimum growth temperature of *L. monocytogenes* is around 30–37°C, but it can grow at temperatures between 1 and 45°C. The pathogen is not able to grow and multiply at sub-zero temperatures. *L. monocytogenes* is able to resist to thermal stresses, suffering minor damage and overcoming the traditional hurdles of the food preservation process. The thermal tolerance of *L. monocytogenes* is greater than that of other non-spore-forming bacteria and can increase after exposure to several stressful environmental conditions such as heating temperatures or the presence of sub-lethal osmotic shocks. *L. monocytogenes* can grow at pH ranges between 4.5 and 9.0 with an optimum pH between 6 and 8. The exposition to pH values ranging between 5.0 and 5.5 should cause an increase in tolerance to acidity and lower the sensitivity of the pathogen to less pH values. The adaptation to acidity should cause cross-protection against osmotic stress. On the other hand, sub-lethal osmotic or thermal stress does not affect the tolerance of *L. monocytogenes* to acidity. *L. monocytogenes* is able to multiply in food matrices with $a_w \geq 0.97$, but can grow also at aw values of 0.92 generally lethal to other microorganisms. *L. monocytogenes* can grow in NaCl concentrations of 12%, even if the highest multiplication rate is showed at values of nearly 6.5%. *L. monocytogenes* can grow and multiply in presence of CO_2 at low temperatures until at a concentration of 70% of CO_2 and a temperature <7°C. Under the same conditions, a concentration of 5% of oxygen allows *L. monocytogenes* to grow and multiply. Because *L. monocytogenes* as a psychrotrophic bacterium can multiply in little temperatures and both under aerobic and anaerobic conditions, is widespread in the environment, as well as on the farm and in food processing facilities. *L. monocytogenes* has been isolated from different processing environments and once introduced in the processing plants, is able to survive for long times under adverse conditions and persist over time necessitating control along the food chain. *L. monocytogenes* is also the etiologic agent of listeriosis and the majority of the infections caused by *L. monocytogenes* are thought to be food-borne. Two forms of listerioris have been described in humans: febrile gastroenteritis in healthy people and life-threatening invasive infections in risk groups such as young, old, pregnant and immune-compromised. Listeriosis is the fifth most common zoonotic disease in Europe and it has an annual incidence of 3.3 cases per 1.000.000 population. Listeriosis is the third leading cause of death among food-borne pathogens with an estimated case fatality rate of 20 up to 30% exceeding even *Salmonella* spp. and *C. botulinum*. Moreover, it has the highest hospitalization rate (90%) of all food-borne

pathogens with supplementary long term sequelae. The morphological and physiological characteristics of L. onocytogenes, together with the severity of human listeriosis infections, make *L. monocytogenes* of particular concern for manufacturers of cold stored "Ready To Eat" (RTE) foods. The pathogen has been isolated from a wide variety of RTE products capable of supporting its growth and is responsible for several outbreaks associated with the consumption of RTE meat, poultry, dairy, fish and vegetable products.