

Health Risks Associated with the Occurrence and Persistence of *Listeria monocytogenes* in Dairy Plants

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Editorial

Listeria monocytogenes is a rod-shaped Gram-positive, non-spore pathogen that can be widely distributed in the environment, including soil and surface water used for agricultural purposes, wastewater, surfaces of materials used in food industries, and food products [1]. The distribution of *L. monocytogenes* in several habitats is associated to its great survival capacity in wide ranges of pH (4.0-9.5), temperature (1-45°C), and water activity as low as 0.92 [2]. The disease caused by *L. monocytogenes*, or Listeriosis, primarily affects pregnant women, newborns and immunocompromised adults may cause sepsis, abortion and infection of the central nervous system and resulting in high morbidity and mortality [3]. Although having a low incidence compared to other foodborne diseases, such as salmonellosis or campylobacteriosis, Listeriosis is considered as a major public health issue due to its high hospitalization rate (94%), and high case-fatality proportion (12.8 to 17% of cases) [4].

In dairy industries, *L. monocytogenes* strains have been isolated worldwide from raw milk samples [5], dairy products [6] and its processing environments [6,7]. Temporal breakdowns in hygiene barrier efficiency, poor hygiene practices and unhygienic design of equipment may trigger *L. monocytogenes* food plant contamination. Importantly, the presence of *L. monocytogenes* in the environment of dairy plants can be a potential source of contamination of the final product, especially when it is protected by milk solids and spread from the processing environment through the ventilation system, dripping and splashing, or by workers [8].

Although pasteurization efficiently eliminates *L. monocytogenes* from raw milk, further risks of contamination may occur at several stages of dairy products manufacture, especially during cheese production. The contamination can originate from multiple sources, including starter cultures, brine, drains, floor, packaging material, cheese vat, shelves, cheesecloth, curd cutting knife, brushes and coolers [6]. Cheeses are ready to eat products, which do not have any step of thermal treatment before consumption and are usually conserved at refrigeration temperatures that allow the survival and growth of psychrotrophic bacteria, such as *L. monocytogenes* [2]. Moreover, different *L. monocytogenes* strains have been recurrently found on surfaces of food industry equipment despite regular cleaning and disinfection practices [6].

Notably, many *L. monocytogenes* strains are capable of adhering to various both biotic (e.g. animal tissues) and abiotic (e.g. stainless steel, plastic) surfaces and produce biofilm [9]. Attachment to surfaces is believed to be important for survival and persistence of this pathogen in food processing environments, with some strains being able to

remain on equipment surfaces even for several years [10]. Therefore, stringent cleaning and disinfection strategies are of major importance to control the pathogen implantation on either industrial equipment or the products themselves. The effective control of biofilms can be achieved by understanding the type and nature of the contaminating residue materials (carbohydrates, fat, proteins, mineral salts) and the microorganisms to be removed from the surfaces. However, there is no consensus on the efficacy of disinfectants regularly used in dairy plants, such as peracetic acid or sodium hypochlorite, against biofilms formed by *L. monocytogenes*. Thus, routine tracking of *L. monocytogenes* sources of contamination and possible distribution routes in the environment should be considered as a main strategy to prevent this microbiological hazard in the environment of dairy plants and dairy products.

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