Control of Listeria monocytogenes present on surfaces by managing the Relative Humidity of the air

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Cleaning and disinfection operations are essential to control hygiene in the food industry. However, these operations have environmental impacts because they require large amounts of water, biocides and energy. The drying of the food processing rooms is an essential prerequisite for restarting the production lines once the cleaning and disinfection stages have been completed. Since the processing rooms are generally equipped with systems allowing the management of the Relative Humidity of the air (RH), the control of the RH appeared as an interesting approach to fight against pathogens present on the different surfaces (floors, walls, machine surfaces).

The main objective of this study was to propose a complementary approach to cleaning and disinfection procedures, used daily as a control measure on the surfaces of food processing rooms, via the implementation of a drying process to reduce the environmental impacts of these procedures. *Listeria monocytogenes* was used as a model pathogen.

Thirty strains of different origin were subjected to drying at 75% RH for 3 h at 25°C. The resistance of strains to drying was not explained by their origin, virulence and genotype. Four strains were selected based on their resistance and virulence. They were exposed to RH levels from 75% to 11% for 30 min to 960 min. Cultivability measurements mainly showed that drying at 68% RH proved to be potentially interesting to effectively destroy *L. monocytogenes*. Additional results have shown that the solution in which the bacteria are dried and then rehydrated influenced the cultivability measured in fine. The application of dehydration and rehydration cycles has shown the effectiveness of this approach to optimize the bacterial destruction. The different approaches to study the effects of drying on the physiology (flow cytometry and forced atomic microscopy) of *L. monocytogenes* have shown that membrane permeability and the cell wall integrity were significantly altered during drying at 68% RH followed by a rapid rehydration phase.

This work showed that RH offers an interesting potential to fight against pathogens and more particularly against *L. monocytogenes* present on surfaces. The cell wall seemed to be an interesting target to optimize this approach.