Study of the growth potential of *Listeria monocytogenes* in cheese made by Belgian farmers

Amaury GERARD[1], Georges DAUBE[2], Marianne SINDIC[1]

[1] Laboratory of Safety of Agro-Food Products, Gembloux Agro-Bio Tech – University of Liege – Passage des Déportés, 2, 5030 Gembloux, Belgium
[2] Faculty of Veterinary Medicine, Food Science Department, FARAH, University of Liege, Sart-Tilman, B43b, 4000 Liège, Belgium

INTRODUCTION

Listeria monocytogenes is a bacterium responsible for health problems, especially for sensitive people, i.e. newborns, pregnant women and elderly or immucompromized people [1]. For these people, hospitalization occurs in 90% of the cases, while 20 to 30% of these cases end with the death of the patient. Regarding the hazard, Regulation (EC) N°2073/2005 asks an absence of the bacterium in food suitable for its growth, including seafood, smoked fish, corn, butter or cheese [2,3]. A food is generally considered as suitable for *L.monocytogenes* growth if its pH is >4.4 or its water activity (a_w) >0.92. Combined effects of pH and a_w allow higher threshold values of 5 and 0.94, respectively. An alternative criterion allows the producers to demonstrate that the pathogen cannot grow up to 100 cfu/g during shelf-life [4]. Cheeses, made from raw or pasteurized milk, have already been responsible for listeriosis outbreaks [2,5]. However, the behaviour of *L.monoytogenes* seems to vary between the types of cheese.

MAIN OBJECTIVE

The main goal of this Belgian study, funded by Federal Agency for the Safety of the Food Chain (FASFC) is to determine the growth potential of *L.monocytogenes* in a panel of cheese representative of Belgian cheese production. Only cheese made by farmers are considered in this study.

SECONDARY OBJECTIVES

- Drawing the landscape of artisanal cheese production in Belgium
- Developing a classification tool for Belgian artisanal cheeses
- Investigating on the presence of *L.monocytogenes* in cheeses made by Belgian farmers
- Assessing if some types of cheese could be considered as "not suitable for *L. monocytogenes* growth", regarding Regulation (CE) 2073/2005

AREA OF STUDY

- 10 Belgium provinces
- According to FASFC, 246 artisanal cheesemakers (28% in Flanders, 72% in Wallonia)

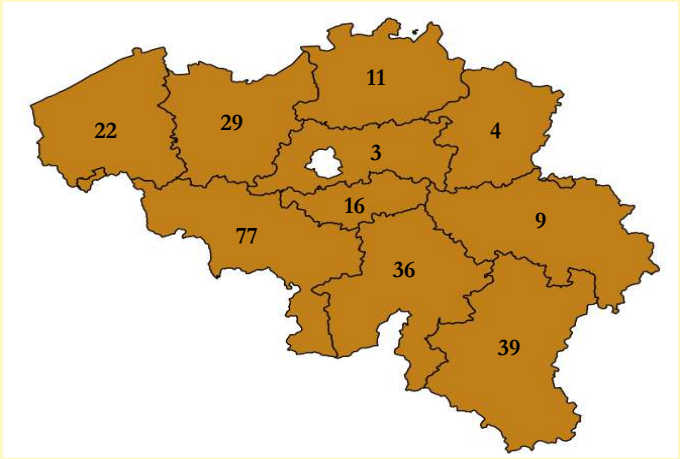

Fig. 1 – Number of artisanal cheese producers in each Belgian province

[1] Buchanan, R.L., Gorris, L.G.M., Hayman, M.M., Jackson, T.C., and Whiting, R.C. (2017). A review of *Listeria monocytogenes*: An uptdate on outbreaks, virulence, dose response, ecology, and risk assessments. Food Control, 75, 1-13.
[2] Aureli, P., Fiorucci, G.C., Caroli, D., Marchiaro, G., Novara, O., Leone, L., and Salmaso, S. (2000). An outbreak of febrile gastroenteritis associated with corn contaminated by *L. monocytogenes*. The New England Journal Of Medicine, 342, 1236-1241.
[3] Gaulin, C., Ramsay, D., and Bekal, S. (2012). Widespread listeriosis outbreak attributable to pasteurized cheese, which led to extensive cross-contamination affecting cheese retailers, Quebec, Canada, 2008. Journal of Food Protection, 75(1), 71-78.
[4] Commission Regulation (EC) n°2073/2005 of 15th November 2005 on microbiological criteria for foodstuffs. Official Journal of the European Union, L338, 1-26.
[5] Koch, J., Dworak, R., Prager, R., Becker, B., Brockmann, S., Wickke, A., … Stark, K. (2010). Large listeriosis outbreak linked to cheese made from a pasteurized milk, Germany, 2006-2007. Foodborne Pathogens and Disease, 7(12), 1581-1584.

LARGE-SCALE SURVEY

All identified producers were contacted by phone for a survey. The survey form focused on all aspects of cheesemaking, including milk, process, packaging and sales channels. The participation rate was 63%

FIRST CLUSTERING

Based on process-related qualitative data, a first clustering was performed in order to classify cheeses.

MANUFACTURE MONITORING AND SAMPLES ANALYSIS

65 producers have been sampled from the participants, respecting geographical dispersion and products diversity. Manufacture of each cheese is currently being monitored. Several analyses on the final products are also performed:

- pH and a_w on the surface and in the core at the day of marketing (J_0) and at the end of shel-life (J_{DLC})
- Presence and enumeration of *L.monoytogenes*
- Fat, salt and water content

SECOND CLUSTERING

A second clustering will be performed, based on physico-chemical and process-related data. This step will allow designing a classification tool for Belgian artisanal cheeses.

SHELF-LIFE AND INOCULATION STUDIES

From the second sampling plan, 32 cheeses will be selected for further studies. If a cheese is naturally contaminated, it will undergo a shelf-life study. It means that the levels of *L. monocytogenes* at J_0 and J_{DLC} will be compared in order to assess the growth potential of the bacterium. Otherwise, *L.monocytogenes* will be inoculated on the rind or in the core of the cheese, regarding which part is the most favourable to the growth of the pathogen. Inoculation dose should be calculated in order to reach a contamination around 100 cfu/g at J_0. Storage will be performed following guidelines from European Reference Laboratory for *L.monocytogenes*.