

Physico-chemical characteristics of Belgian artisanal cheeses and prevalence of *Listeria monocytogenes* in these products

Amaury GERARD¹, Georges DAUBE², Marianne SINDIC¹

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

Regulation (EC) N°2073/2005 demands the absence of *Listeria monocytogenes* in 25g of cheeses theoretically allowing the growth of the bacterium. It is assumed that *L. monocytogenes* cannot grow at pH < 4.4, water activity (a_w) < 0.92, or when a pH < 5 is combined with an a_w < 0.94. Cheeses are often considered as risky regarding the eventual transmission of *L. monocytogenes*. It is a known fact that pH varies between cores and rinds of ripened cheeses. It is thus important to take this factor into account while determining if a cheese is risky or not. However, it is expected that other factors, not taken into account by Regulation (EC) N°2073/2005, could also play an important role against *L. monocytogenes*, including endogenous microflora, ripening time or undissociated lactic acid concentrations. A study was carried out in Belgium to study the physico-chemistry of artisanal cheeses, as well as the prevalence of *L. monocytogenes*, leading to challenge-tests studies allowing to identify markers of growth/no growth of the pathogen in cheese.

MAIN OBJECTIVE

The main goal of this Belgian study, funded by Federal Agency for the Safety of the Food Chain (FASFC), was to collect data on the physico-chemical characteristics of artisanal cheeses, and to compare them with threshold values given by the European Commission.

SECONDARY OBJECTIVES

- Studying the composition of Belgian artisanal cheeses (fat, salt, dry matter)
- Assessing if some types of cheese can systematically be considered as “not suitable for the growth of *L. monocytogenes*”
- Investigating the occurrence of *L. monocytogenes* in Belgian artisanal cheese
- Studying the evolution of pH and a_w during storage

SAMPLING

- 65 artisanal cheeses among 425 identified during a survey
- Sampling based on type of milk, milk heat treatment and texture

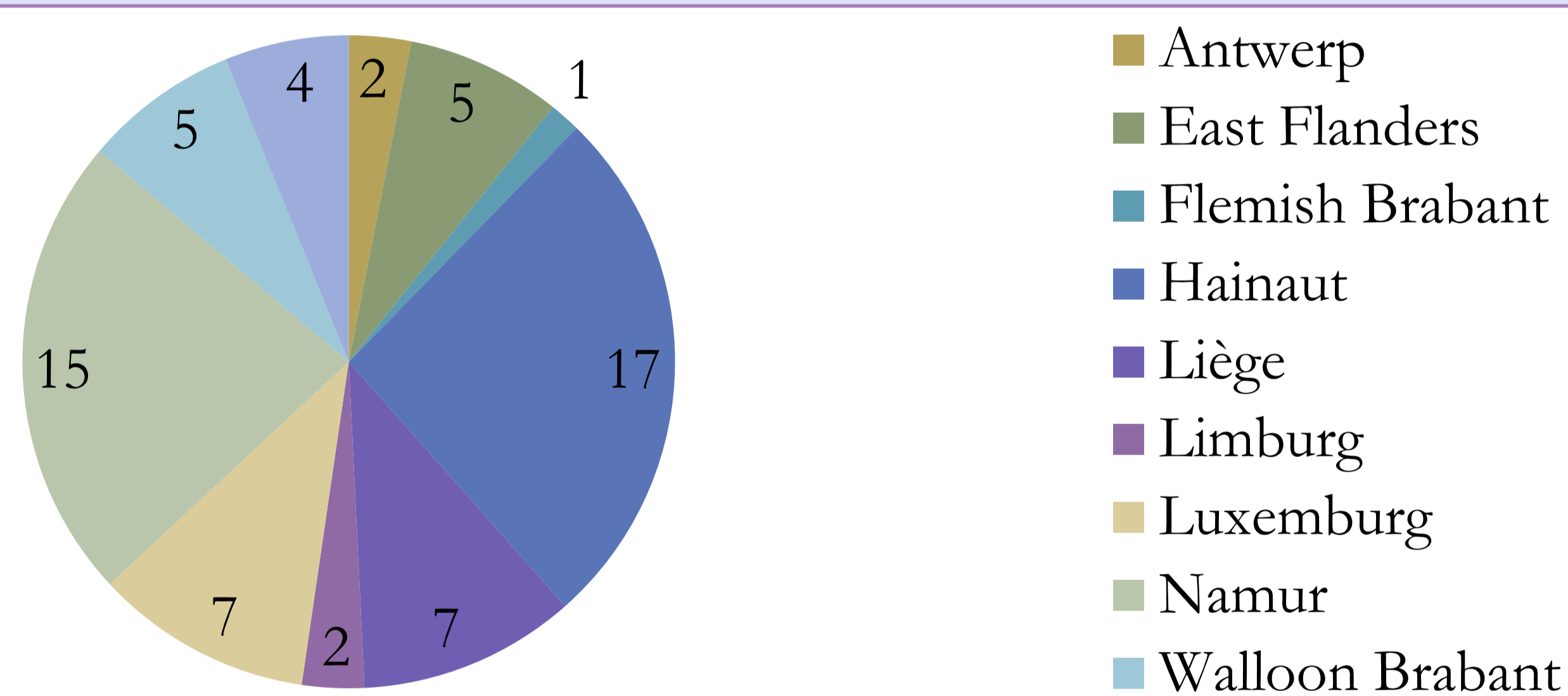


Fig. 1 – Number of samples from each Belgian province

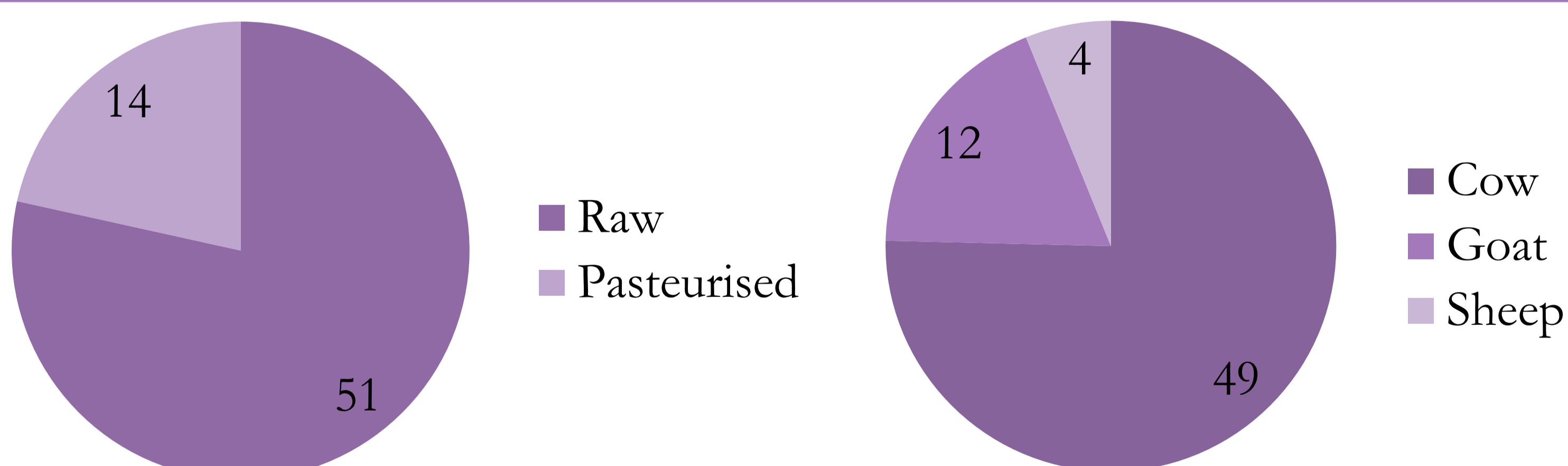


Fig. 2 – Type of milk used to produce sampled cheeses

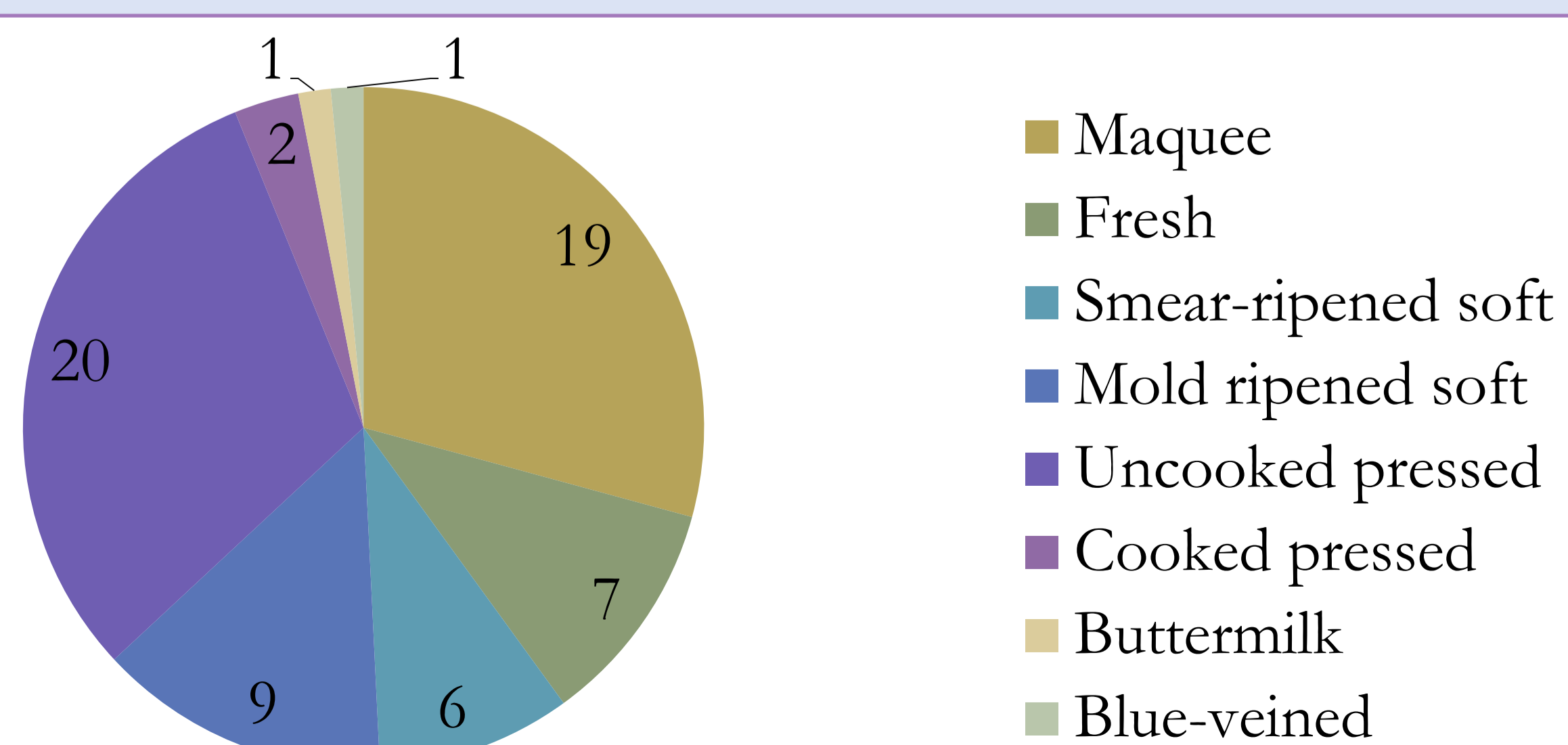


Fig. 3 – Types of cheese which were sampled

PHYSICO-CHEMISTRY OF BELGIAN ARTISANAL CHEESE

Type of cheese	pH core ^a	pH surface ^a	a_w ^b	%Salt ^c	%Dry Matter ^d	%Fat ^e
Pressed (n=23)	5.5 (±0.3)	6.9 (±0.9)	0.96 (±0.02)	1.8 (±0.7)	58.7 (±9.4)	32.6 (±5.9)
Soft (n=15)	5.3 (±0.6)	6.9 (±1.0)	0.97 (±0.01)	2.0 (±0.6)	48.0 (±5.4)	25.0 (±4.0)
Fresh (n=27)	4.6 (±0.4)	/	0.99 (±0.01)	0.4 (±0.4)	27.7 (±10.6)	12.3 (±8.6)

^aelectrode, ^bchilled mirror dew point electrode, ^cISO5943, ^dISO5534, ^eISO3433

Fig. 4 – Average values of physico-chemical characteristics of the 3 main types of cheese at the beginning of storage

Type of cheese	Δ pH core	Δ pH surface	Δa_w
Pressed (n=23)	+0.07 (±0.18)	-0.90 (±0.72)	-0.006 (±0.010)
Soft (n=15)	+0.88 (±0.90)	+0.03 (±0.42)	-0.006 (±0.419)
Fresh (n=27)	0.00 (±0.28)	/	-0.002 (±0.282)

Fig. 5 – Differences in pH and a_w after storage at 7°C

PREVALENCE OF *L. MONOCYTOGENES*

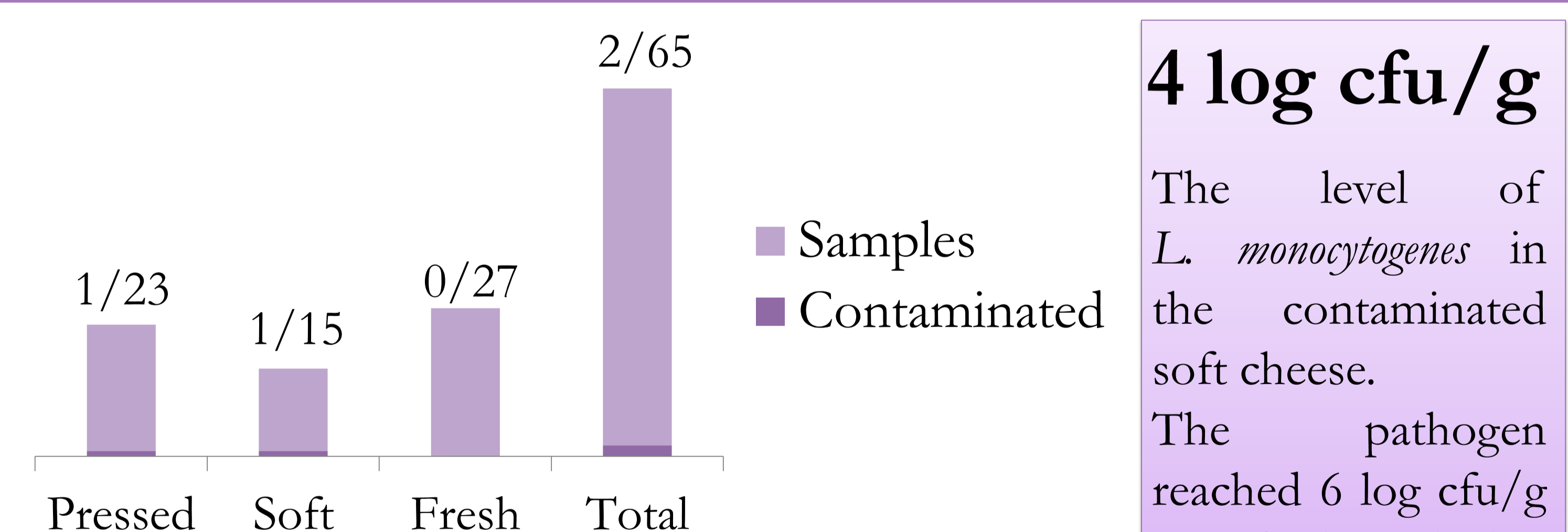


Fig. 6 – Prevalence of *L. monocytogenes* in the major families of cheese

CONCLUSIONS AND PERSPECTIVES

Regarding pH and a_w , all families presenting favorable conditions for the survival or the growth of *L. monocytogenes*. The study also enlightens the importance of taking into account the differences between core and surface. pH on the surface is indeed often much more favorable, sometimes up to more than 7.5. While pH and a_w seem homogeneous within a given cheese family, their evolution during storage is much more variable. This study will now allow us to develop a classification tool for Belgian artisanal cheese, and to select 32 cheeses using the tool in order to perform 32 challenge-tests. It will maybe be possible to show that *L. monocytogenes* cannot grow, despite the pH and a_w values. Regarding the prevalence of *L. monocytogenes* during the survey, 3.1% of cheeses were contaminated. This ratio is comparable to studies performed in other countries. Nevertheless, a bigger sample size could be interesting.