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Laboratory for Food Safety  
Maisons-Alfort location



***EURL Lm***

European Union Reference Laboratory for  
*Listeria monocytogenes*  
<http://eurl-listeria.anses.fr>

# Typing and persistence of *Listeria monocytogenes* in food processing plant environment

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# Need of genetic studies from non-controlled environment strains

**“Experiments in controlled environments cannot represent all forces contributing to evolution in non-controlled natural environments.” (Orsi et al. 2008 BMC)**

- (i) Population sizes greater in experimental populations
- (ii) generation times shorter
- (iii) absence of donors of genetic materials,
- (iv) selective pressures that are usually low in number but high in intensity, while natural populations encounter many selective pressures

**In this study we will focus on food processing environment strains**

# Environmental factors and characteristics of the strains

## Environmental factors

- Porous surfaces (e.g. expended ceramic carrel)
- Hard- or impossible-to-clean sites
- Holes from bubbles in resins
- Crevices or cracks in flooring

## Strains characteristics

- Global resistance to environmental stresses
- Resistance to cleaning disinfection measures
- Colonization of niches
- Collaborate within biofilm

**These factors made *Lm* omnipresent in all food production environment**



# Aims and actors

Aims:

- Identification of specific locus related to persistence

Anses (SEL unit)

Master degree student: Aurélien Maillet

7 months project (february-september 2015)

In close collaboration with:

- ✓ French pork institute (IFIP) : Carole Feurer
- ✓ Modeling and risk assessment unit (Anses) : Laurent Guillier
- ✓ Anses national WGS platform (Anses Ploufragan) : Yannick Blanchard



# Definition of the persistence

Several studies defined “persistent” and “non-persistent” strains

1) Persistent strains :

- Same typing characteristics
- Found regularly in the same food processing plant
- During a long period of time (several years)
- Absence in raw products

2) Non-persistent strains

- Get through food processing environment without settlement
- Observed punctually in the processing environment (one detection) over years

**“We must admit that “persistence” is a loosely defined concept, but nevertheless we will accept the definition of persistence [...] cited.”**

(Carpentier & Cerf 2011)

# Experimental design

- 1) A panel of French persistent and non-persistent strains coming from IFIP.
  - Two persistent strains per production site with same typing characters
  - At least one non-persistent strain per production site
  - 3 strains from pork– 7 from “ready to eat” processing environments
- 2) Genetic analysis of the selected strains among the French NRL database (20 years, all productions)
- 3) Sequencing of the strains genomic material (plasmids and chromosome)

## Focus

### Genomic comparative study:

- Between persistent strains over the years
- Between non-persistent and persistent strains
- Screening of selected locus among all genome available (approx. 300 at FR NRL + online genomes)
- Allele specific comparison study

- **Project submitted to a National call for tender, in January 2015, response June 2015**

Are you interested to take part to this project :

- Providing strains of interest
- Collaborating in the data processing
- Collaborating in this genetic prospective study



# Conclusion – expected results

## Identification of factors involve in persistence

- Regulation element,
- Identification of persistence specific allelic profiles





# Introduction

*Listeria monocytogenes* (Lm)

Major public health concern and major cause of economic losses

Ecology: Saprotrophic and ubiquitous bacteria

Primary contamination sources: animal/human feces, decaying organic matter, earth

Economical impact :

- 1) Persistence of the strains in processing environment
- 2) Recall of contaminated batches
- 3) Involves heavy control plan in the industry
- 4) Risk of sanitary crisis
- 5) Requires national and European surveillance

