IAFP's 12th European Symposium on Food Safety
Athens, Greece 11-13 May 2016

ASSOCIATION OF TARGETED METAGENOMIC ANALYSIS AND CLASSICAL MICROBIOLOGY FOR CLOSTRIDIUM DIFFICILE DETECTION AND MICROBIAL ECOSYSTEM MAPPING OF SURFACES HANDS AND FOODSTUFFS IN A MEAT PROCESING PLANT

C. Rodriguez*[1], M. Oukbir[1], B. Taminiau[1], G. Daube[1]
[1]University of Liege, Faculty of Veterinary Medicine, Department of Food Science & FARAH, Liège, Belgium
*c.rodriguez@ulg.ac.be

INTRODUCTION

Proper hygiene practices in meat processing plants are essential for prevention of foodborne disease outbreaks. **Metagenetics** is a **culture independent based strategy** allowing for the **identification of bacterial populations** and **their proportions** present in a large panel of samples, including foods and surfaces. Such an approach permits detection of **foodborne pathogens and hygiene indicators** without the time-consuming step of culturing individual bacterial species for identification, with a **high resolution taxonomic information**.

PURPOSE

The aim of this study was **to evaluate the hygienic level of a meat processing plant** and to identify possible **sources of cross contamination.** A **microbiological detection scheme** was performed along with an **overall microbial biodiversity study** of the samples by **16S metagenetic analysis**. Detection of the pathogenic bacterium *C. difficile* was also performed.

METHODS

- ✓ The **production line** of two Belgian meat products (pork tomato sauce and white pudding) **was monitored.**
- ✓ Samples from **operator hands** (n=8), **surfaces** (n=9) and **meat products** (n=11) were collected at different production points.
- ✓ All samples were analysed by **classical microbiology** to determine the levels of **total aerobic viable counts, *Enterobacteriaceae***, ***Escherichia coli, Staphylococcus aureus*** and to detect the presence of ***C. difficile***.
- ✓ **Metagenetic analysis** was targeted on **the V1-V3 hyper-variable region of 16S rDNA.**
- ✓ The taxonomical assignment of the populations was performed with **Mothur** and **Blast algorithms.**

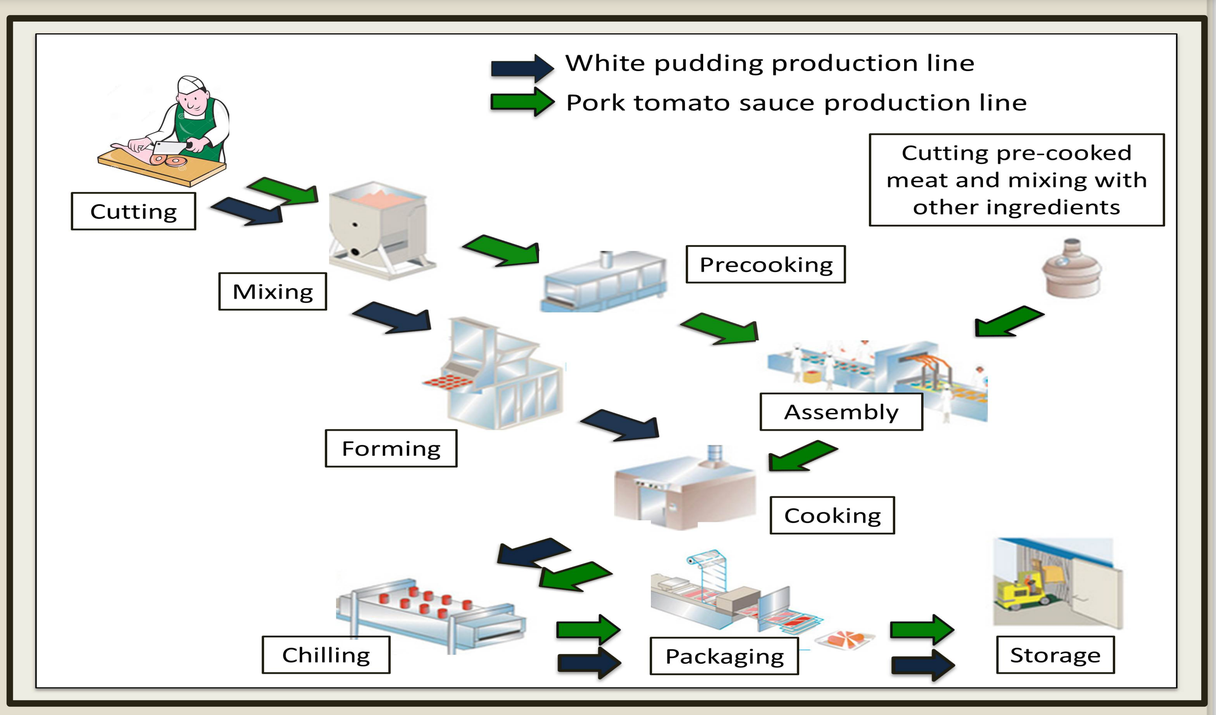


Figure 1. Production lines of **pork tomato sauce** and **white pudding**

RESULTS

Classical microbiological analysis

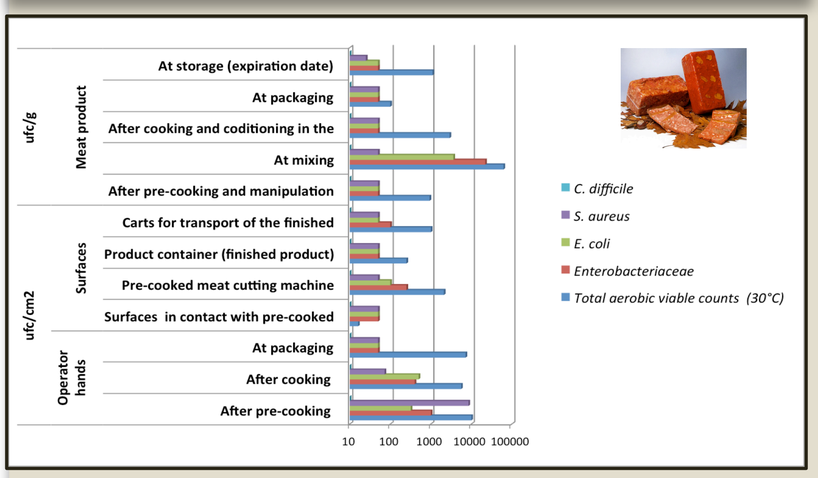


Figure 2. Results of classical microbiological testing of operator hands, surfaces and meat products in the production line of **pork tomato sauce**.

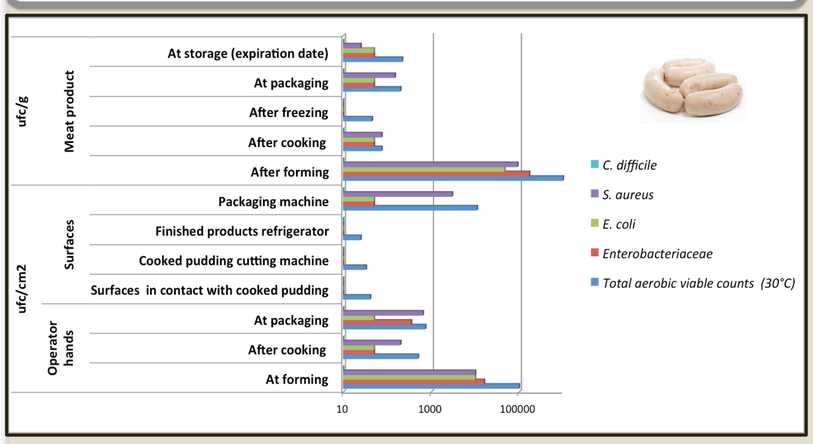
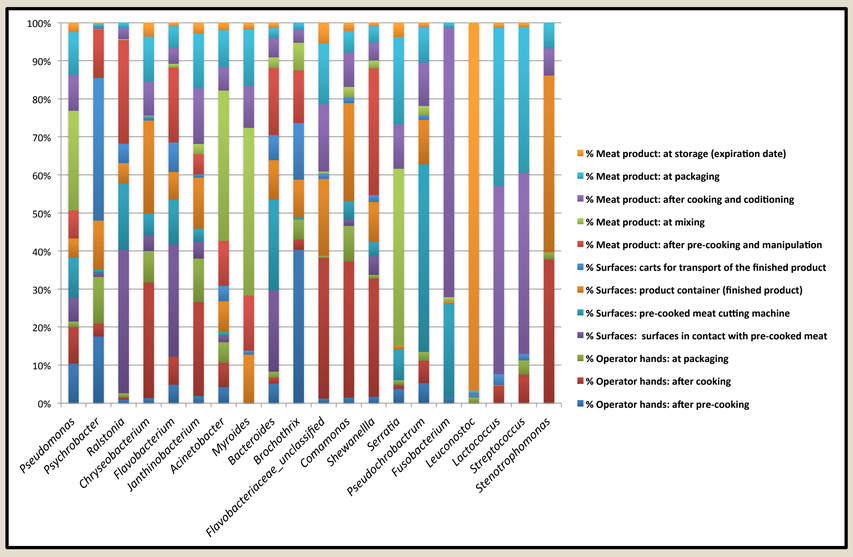


Figure 3. Results of classical microbiological testing of operator hands, surfaces and meat products in the production line of **white pudding.**

None of the samples were **positive for *C. difficile***, which indicates that surfaces, operators and meat products are unlikely **to serve as vectors of bacterium transmission.** Furthermore, using international standards, **all of the samples contained acceptable levels of the other bacteria studied**.

Metagenetic analysis

PORK TOMATO SAUCE



WHITE PUDDING

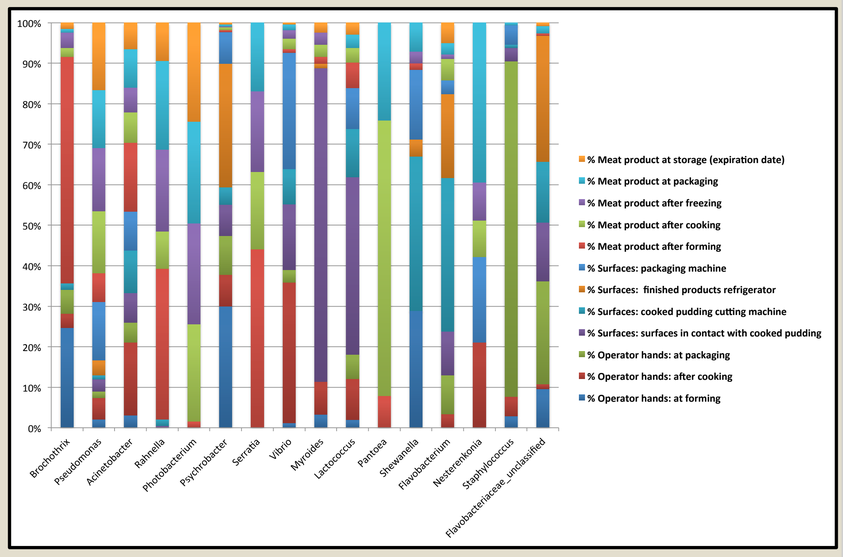


Figure 4. Microbiota composition at genus level (cumulated mean relative abundance >4 % in at least one type of sample). *The unclassified populations correspond to defined groups of the genus level for which a taxonomical classification assignation to the genus cannot be attributed.*

Figure 5. Microbiota composition at genus level (cumulated mean relative abundance > 0,5% in at least one type of sample). *The unclassified populations correspond to defined groups of the genus level for which a taxonomical classification assignation to the genus cannot be attributed.*

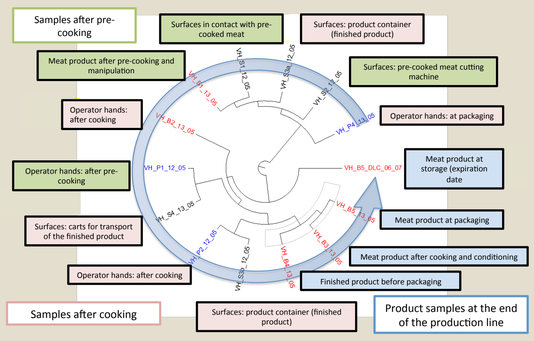


Figure 6. Samples classification based on the presence/absence of different taxa at genus level

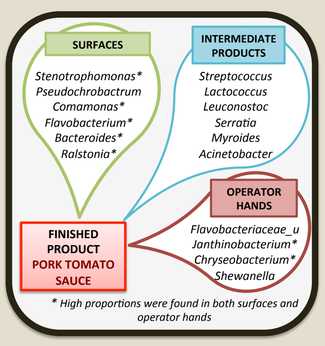


Figure 7. Possible sources of cross-contamination

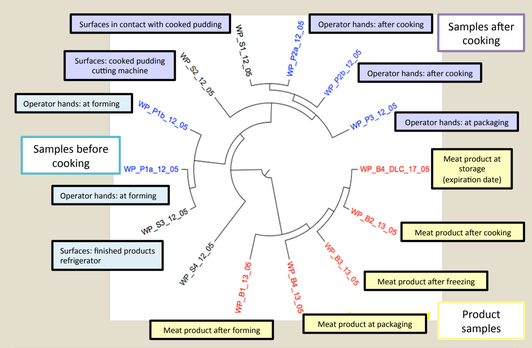


Figure 8. Samples classification based on the presence/absence of different taxa at genus level

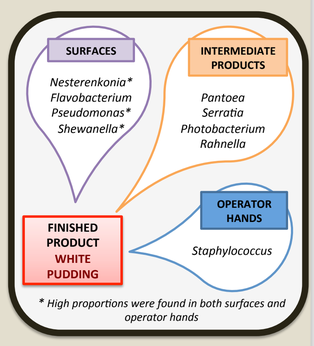


Figure 9. Possible sources of cross-contamination

CONCLUSIONS

Metagenetic analysis revealed **the presence of some taxa** on **surfaces** and **operator hands** that were found in **high abundance** in **the finished product**, indicating that **cross contaminations may occur**. Results also revealed that **operator hands** are a **probably vehicle** for **bacterial dissemination** in the meat processing plant studied.