Metagenomic analysis as a tool to better characterize the bacterial flora of food and food products

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Metagenomics

Targeted analysis

Who is in there?

Functional analysis

What are they doing?
Targeted Metagenomics

High throughput sequencing

Bioinformatics
Assets

Culture independant

High throughput

High sensibility

Reproducible
Durability Assay for two meat based matrices

- White pudding
- Minced Meat
- Pork meat
- Cooked product
- > 1 ingredient

Microflora:
- Post cooking contamination
- Thermoduric population

- Pork meat
- Raw meat
- 1 ingredient

Microflora:
- Original contamination
- Handling contamination
MINCED MEAT: POPULATIONS >1%

MAP

12°C 4-8°C 4°C

AIR

12°C 4-8°C 4°C

Brochothrix
Lactobacillus
Leuconostoc
Pseudomonas
The results are reproducible!

**Leuconostoc**

![Graph showing population percentage of Leuconostoc under different conditions.]

**Pseudomonas**

![Graph showing population percentage of Pseudomonas under different conditions.]

Population percentage

- 70% O2 30% CO2
- air

Leuconostoc: $p = 4.40 \times 10^{-9}$

Pseudomonas: $p = 4.64 \times 10^{-6}$
Quality evaluation of vacuum packed beef meat in Belgium

- « Ready to be sliced » reconditioned in sell units
- Logistic asset for distributors

Marked difference between belgian blue meat and imported meat

<table>
<thead>
<tr>
<th></th>
<th>Belgian Blue</th>
<th>Australian beef meat</th>
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<tbody>
<tr>
<td>Shelf life</td>
<td>60 days</td>
<td>&gt; 120 days</td>
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</table>
Belgian Blue Meat

Day 0

Day 60

Proportions des populations >1% - blanc bleu belge

Lactobacillus concavus
Pantoea ananatis
Brochothrix thermosphacta
Pseudomonas uncultured
Dyella sp.
Carnobacterium uncultured
Cedecea neteri
Pseudomonas sp.
Lactobacillus sakei
Carnobacterium divergens
Yokenella regensburgei
Lactococcus piscium
Serratia sp.
Lactobacillus algidus
Leuconostoc uncultured
Enterobacter cloacae
Obesumbacterium proteus

Australian Meat

Day 80

Day 120

Beijerinckiaaceae_uncultured
Enterobacteriaceae_Halfnia sp.
Leuconostocaceae_Leuconostoc uncultured
Carnobacteriaceae_carnobacterium uncultured
Enterobacteriaceae_Serratia sp.
Lactobacillaceae_Lactobacillus algidus

Carnobacterium maltaromaticum
We investigated other matrices...

Which fish isn’t fresh ??!!

Smell this, my friends!
Large prospects

Food Matrices

- Spoiling flora
- Pathogens
- Technologic flora
- Shelf life
- ...

Gabriel Garcia Marquez
Chronicle of an Alteration foretold
Technical and analytical aspect

Microbiological interpretation

- Lack of knowledge on microbes
- Bright future for characterization of yet unknown bacteria
- Crucial need of specialists of the identified bacterial taxa
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Pedro Imazaki
Amélie Darcis
Pr Antoine Clinquart
Pr Georges Daube
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