How are Microbial Interactions Acting toward Our Safety?

New Insights on the LAB - *Staphylococcus aureus* Interaction: A Transcriptomic Approach

Prof. Luís Augusto Nero, Prof. Luca Simone Cocolin, Gabriela Nogueira Viçosa

*Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil*

*Università Degli Studi di Torino, Turin, Italy*
Microbial ecology in foods
- Lactic acid bacteria
- Enterotoxigenic staphylococci

Microbial interactions
- Transcriptomic Approach

Case study
- *Enterococcus faecalis* vs *Staphylococcus aureus*

Trends and perspectives
Microbial ecology in foods

Solitary microbes

Complex microbial communities
Microbial ecology in foods

Food microbiota

nutrients, temperature, pH, $O_2$

ANTIBIOSIS – AMENSALISM – MUTUALISM – COMMENSALISM – PARASITISM – COMPETITION

LACTIC ACID BACTERIA
Microbial interactions

Lactic Acid Bacteria

Listeria monocytogenes

Enterotoxigenic staphylococci

1960s: First reports on inhibition of S. aureus in the presence of LAB

Iandolo et al., 1965; Kao & Frazier, 1966; McCoy & Faber, 1966

Genomic era: Microarray to study S. aureus and LAB interactions in controlled conditions

Charlier et al., 2008; Even et al., 2009; Cretenet et al., 2011
Inhibition of *Staphylococcus aureus* by specific lactic acid bacteria

Poorly known by molecular methods
Microbial interactions

- Genomics
- Transcriptomics
- Proteomics
- Phenomics
- Metabolomics

Synthetic microbial communities
Recreation of a naturally-occurring community in a more simplified way

Multi-Omics approaches
The information is portrayed at different stages of cell-processing messaging
Microbial interactions

- Enterotoxigenic *Staphylococcus aureus*
- Bacteriocinogenic *Enterococcus faecalis*

Different matrixes

- BHI, skim milk, cheese

Monitoring methodologies

- Phenotypical and RNA-sequencing
Case study

- **BHI and skim milk**
  - *E. faecalis* interference
    - *S. aureus* growth
    - Enterotoxin production
  - RNA-sequencing
    - Effects on *agr* and *luxS*
    - Effects on *S. aureus* virulence

- **Cheese**
  - *E. faecalis* interference
    - *S. aureus* growth
    - Enterotoxin production
What’s next?

RNA-sequencing
Deeper analysis
Association with phenotypical results > *Staphylococcus* virulence
Check expression in cheese systems

Challenge: proper comprehension of food ecology
Thank you
nero@ufv.br