Ovotransferrin: a multifunctional protein involved in the passive immunity of egg white

Julie LEGROS

Ph.D. fellowship

•

2020-2023

UMR L'Institut Agro Rennes-Angers-INRAE

Science et technologie du lait et de l'œuf

MicroBio team

Microbiology of milk and egg sectors

University of Reading

School of Biological Sciences

Keywords

Salmonella Enteritidis
Egg white
Ovotransferrin
Antimicrobial activity

Socio-economic context

- Hen's eggs are consumed all over the world, with an annual production of about 70 million tonnes (Zaheer *et al.*, 2015)
- *Salmonella* spp. is the second most important pathogen involved in food-borne diseases
- Six hundred and ninety-four outbreaks involving salmonellosis were due to egg consumption in 2020 in the EU, of which 67% were due to *Salmonella enterica* serovar Enteritidis

Scientific context

- Egg white is composed of several antimicrobial proteins of which ovotransferrin is the first representative (13 g/L)
- Ovotransferrin is involved in the antimicrobial activity of egg white due to its iron-chelating activity (Baron *et al.*, 1997)
- Ovotransferrin is also able to induce membrane damage in *E. coli* (Aguilera *et al.*, 2003)
- Egg white induces bacterial membrane damage in *S.* Enteritidis (Huang *et al.*, 2019)

Research question

What is the mechanism of action of ovotransferrin against *S.* Enteritidis under egg white conditions (alkalinity, high viscosity, specific ionic composition, and presence of other egg white antimicrobial proteins)?

Expected results

- Development of a synthetic medium mimicking egg white condition (same ionic composition and pH)
- Better understanding of the iron-chelating activity of ovotransferrin in egg white
- Better understanding of the impact of ovotransferrin on *S.* Enteritidis membranes under egg white conditions
    - Permeabilisation of the outer and inner membranes?
    - Depolarisation of the inner membrane?
    - Membrane damage
    - Release of the lipopolysaccharides (LPS) from the outer membrane?
    - Change in phage shock protein (*psp*) gene expression?

Perspectives

- There remains a need to clarify the role of ovotransferrin in egg white defense against bacteria and the impact of storage and technological practices on ovotransferrin degradation and activity
- A more complete understanding of ovotransferrin activity in egg white may suggest modifications of hen diet and egg-storage practices that could improve the antimicrobial activity of ovotransferrin in egg white and thus reduce the risk of microbial contamination and food poisoning

Funding