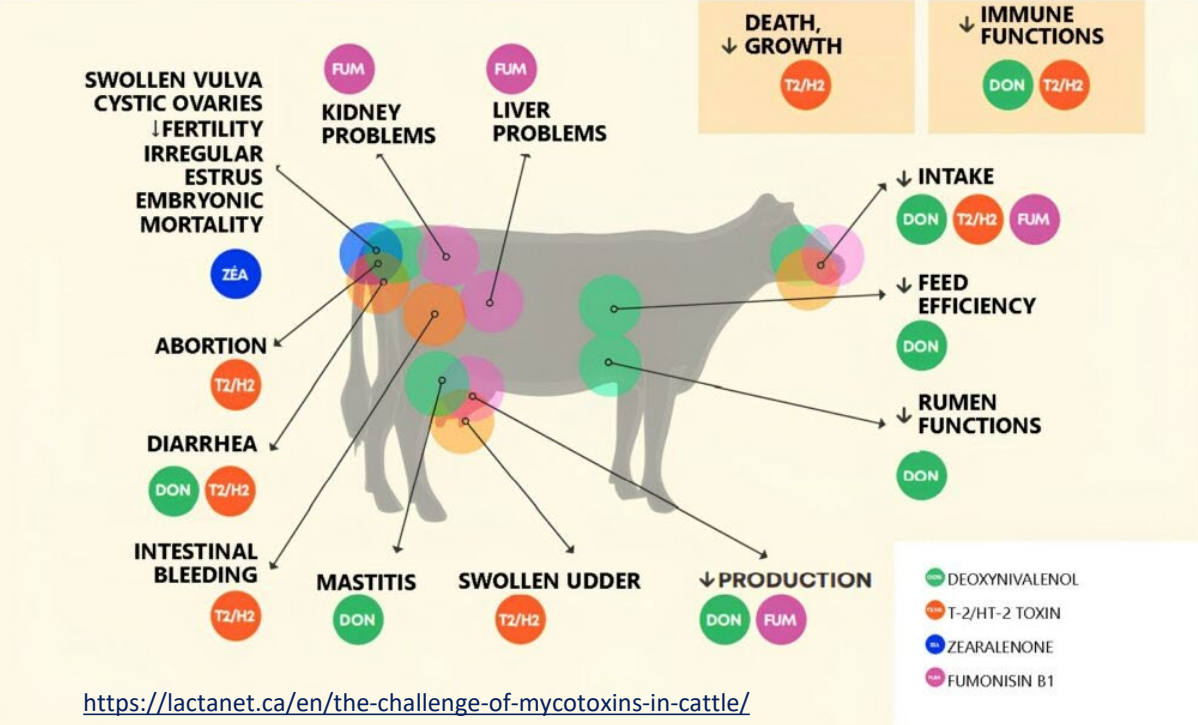
UNIVERSITÀ DEGLI STUDI DI MILANO
DIPARTIMENTO DI MEDICINA VETERINARIA
E SCIENZE ANIMALI

In vitro effects of mycotoxin Enniatin B on bovine PMNs immune function

S. Sandrini, G. Salvi, D. Ravanelli, V. Perricone, L. G. De Matos, C. Lecchi, F. Ceciliani, A. Agazzi

75th EAAP, Florence 2024

Fusarium Mycotoxins



https://lactanet.ca/en/the-challenge-of-mycotoxins-in-cattle/

Immunomodulatory effects on innate immune response

Chronic exposure of dairy ruminants

Rumen dysbiosis can promote inadequate mycotoxin biodegradation

Emerging mycotoxins

Emerging mycotoxins - Enniatin B

PROS

- Antibacterial activity
- Insecticidal activity
- Antifungal activity

CONS

- Cytotoxicity
- Oxidative stress
- Apoptosis/necrosis
- Impairment of cell cycle
- Mitochondrial membrane permeabilization

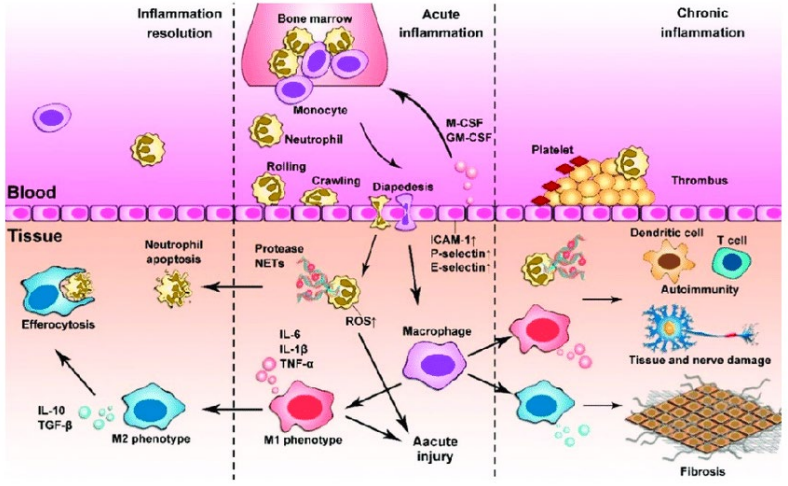
ENN B
most detected analog in unprocessed and processed grains in UE
(Beccari et al., 2018; Gauthier et al., 2013; Ivanova et al., 2006)

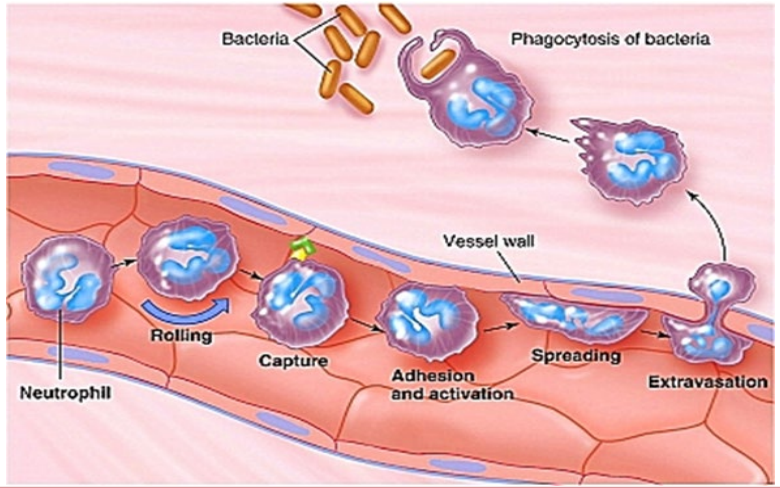
Cronic exposure risk
(EFSA 2014)

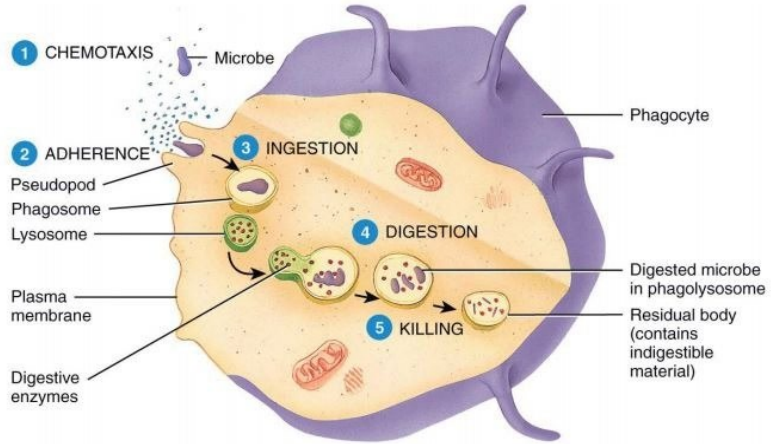
Emerging mycotoxins - Enniatin B

Central role of polymorphonuclear leukocytes (PMNs) against pathogens

- Cow's first line of defence against external agents
- Protection against infections by phagocyting and exposing pathogens to the destructive action of ROS and hydrolytic granule proteins (Roos et al., 2003).







Study objective

The aim of the present study was to evaluate the impact of ENN B on PMNs

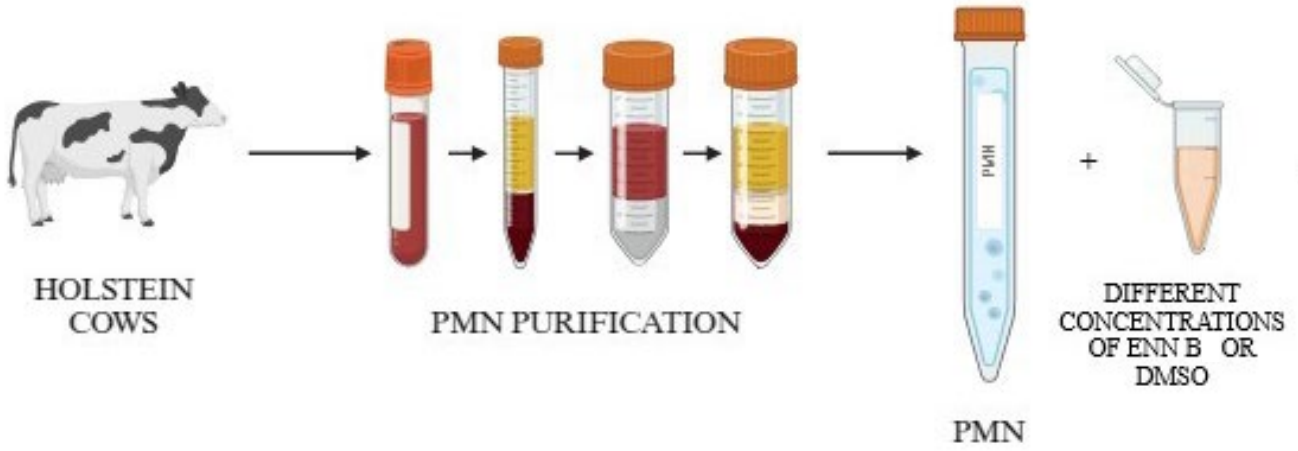
- **Viability**
- **Chemotactic** activity
- **Phagocytosis** of Gram + and Gram – bacteria
- **Extracellular ROS** production
  - Physiological condition
  - pro-inflammatory environment

Experimental design

ENNB 0.625, 1.25, 2.5, 5 e 10 µM

DMSO control vehicle

8 cows



- 1h 37°C - 5% CO2
- 2h 10% (v/v) WST-1

- 1h 37°C - 5% CO2

- 1h Fluorescein-labeled *E. coli* or *S. aureus*

- 150 min 37°C - 5% CO2
- Cyt c and PMA challenge

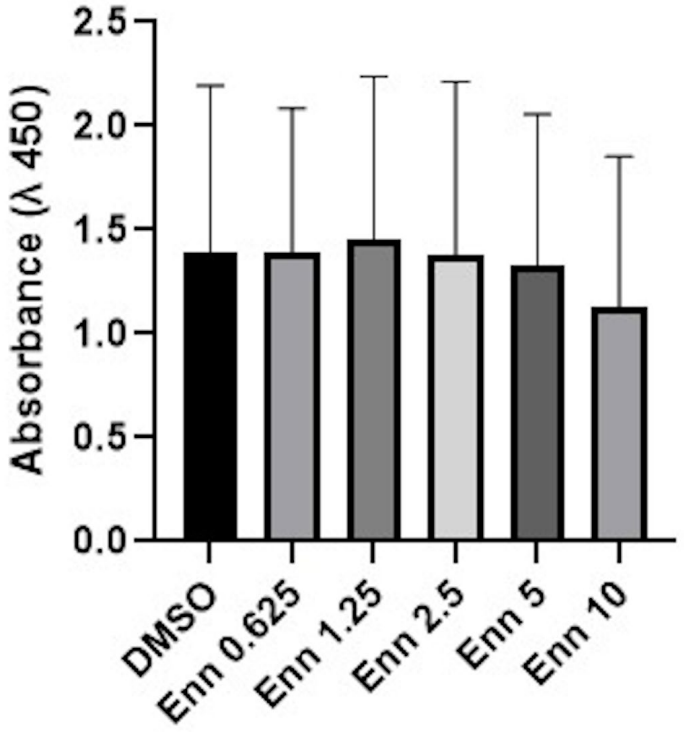
Statistic

Repeated measures of 1-way ANOVA

GraphPad Prism 8.0.2 (San Diego, CA)

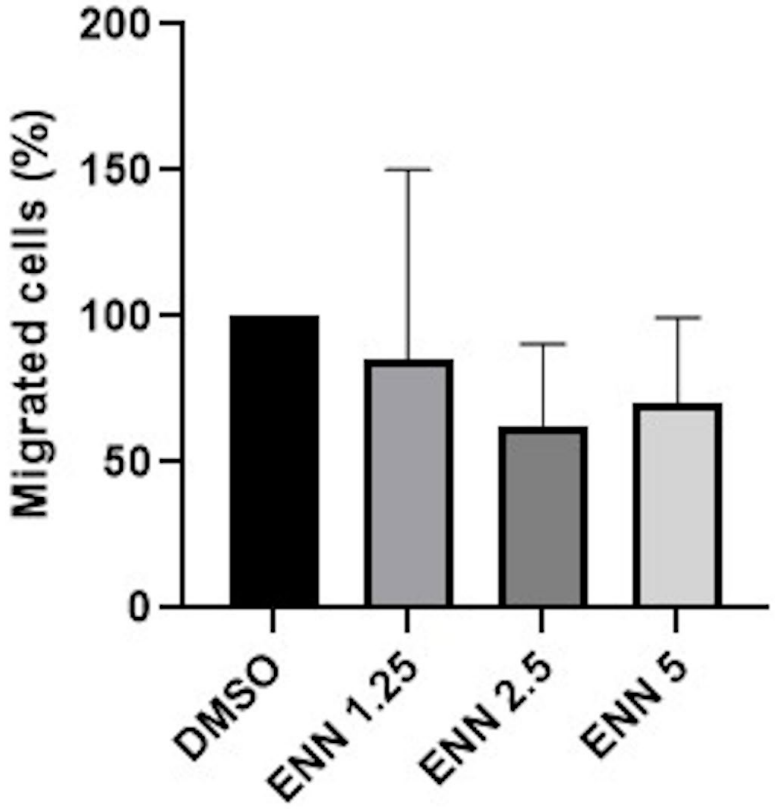
Results

PMNs viability



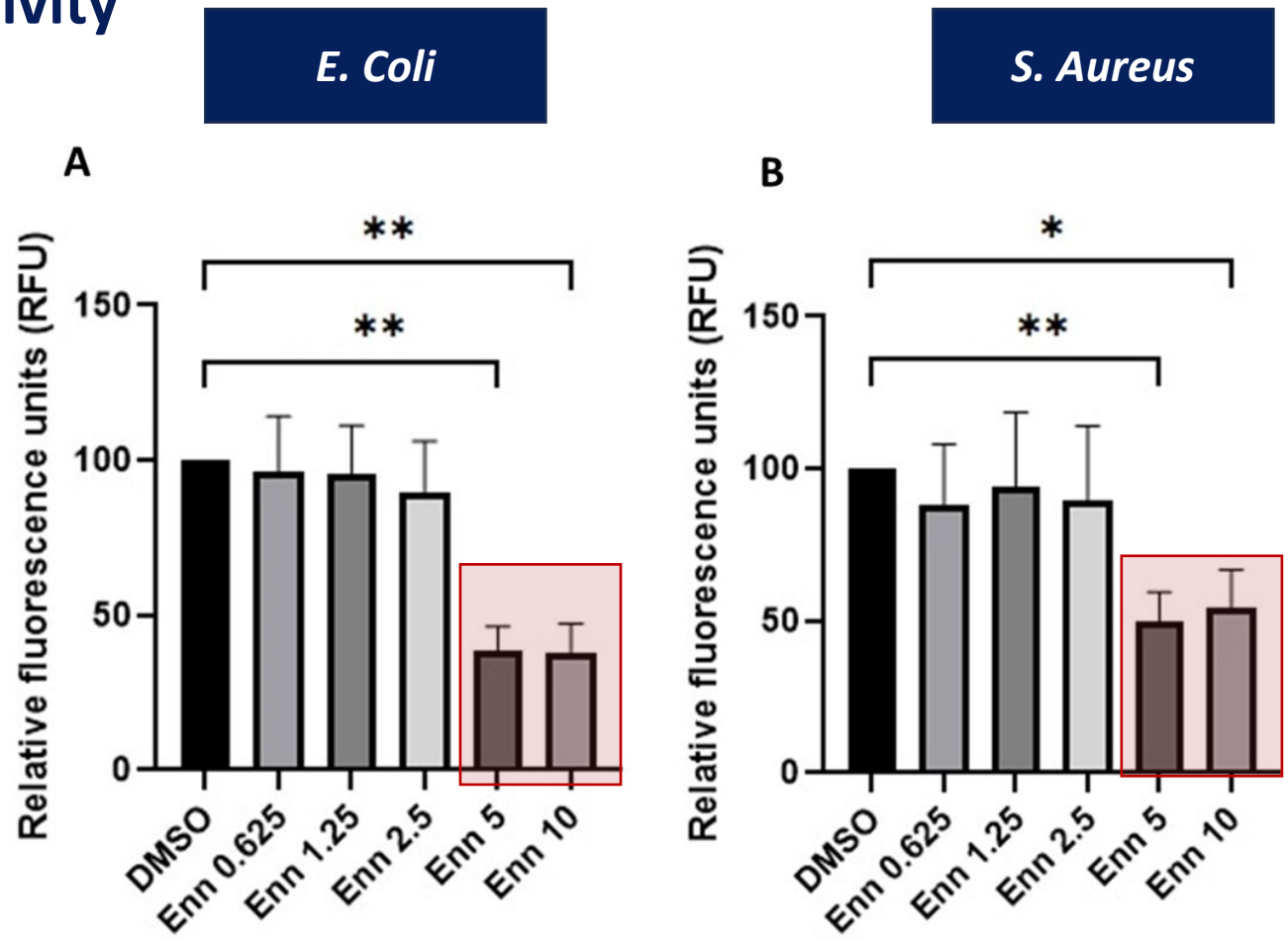
Not affected

PMNs chemotaxis



Results

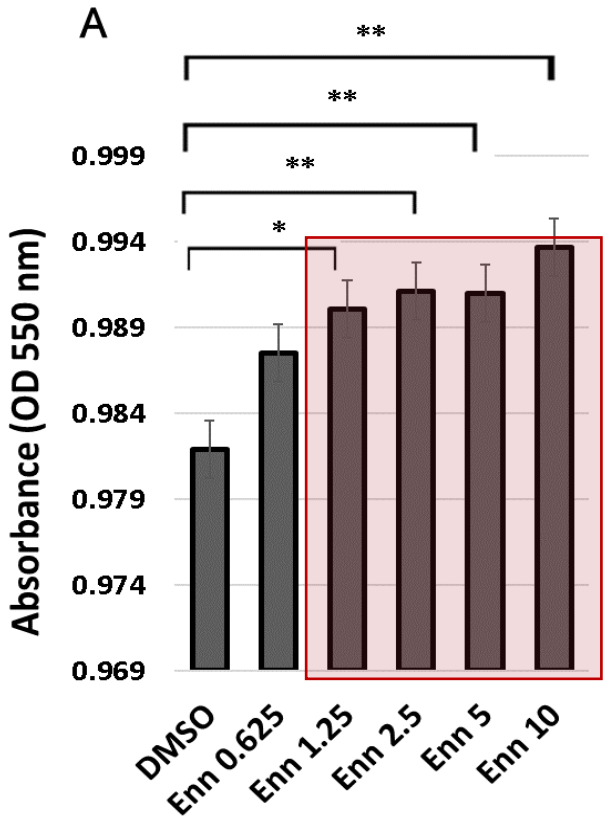
PMNs phagocytotic activity



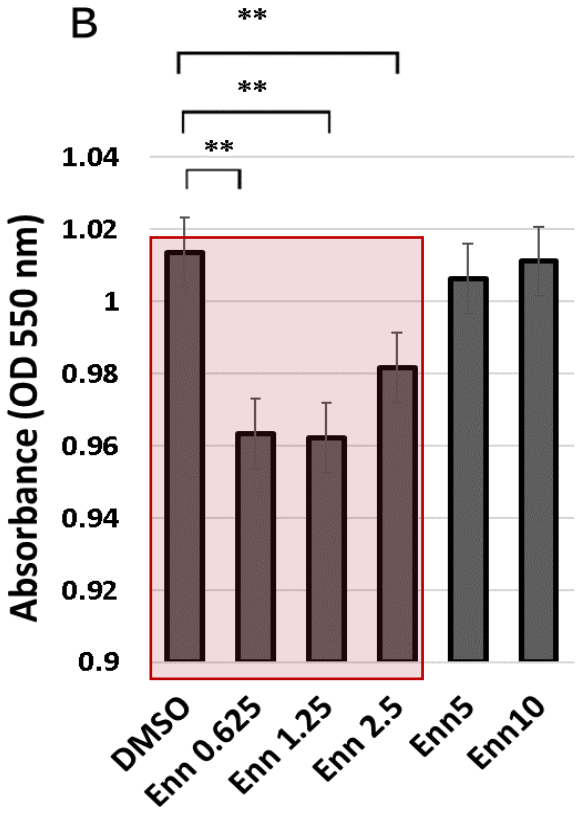
Results

PMNs extracellular ROS production

Physiological condition



Pro-inflammatory environment (PMA)



Take home message

ENNB has no effect on PMNs viability and chemotaxis

ENNB alteres phagocytotic activity

ENNB increases extracellular ROS production in physiological condition and decreases extracellular ROS production in proinflammatory conditions

In-vivo impact

Reduction of immune function

Increase of **animal susceptibility to infection diseases**

Intramammary infections (*E. coli* and *S. aureus*)

Thanks for the attention

Prof Matias Pasquali
Department of Food, Nutrition and Environment Sciences

Prof Alessandro Agazzi
Prof Cristina Lecchi
Department of Veterinary Medicine and Animal Sciences

This research was funded by the Italian Ministry of University and Research (MUR), PRIN2020 project "Role of enniatins as emerging mycotoxins and their association with deoxyni-valenol in the plant, insect, animal and human systems (MYCENDEA)", grant number 2020ZAYHK.