



Verso lo zero zinco e la riduzione degli antimicrobici: screening di estratti e molecole bioattive per il controllo delle patologie enteriche suine

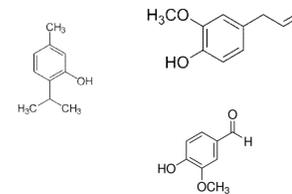
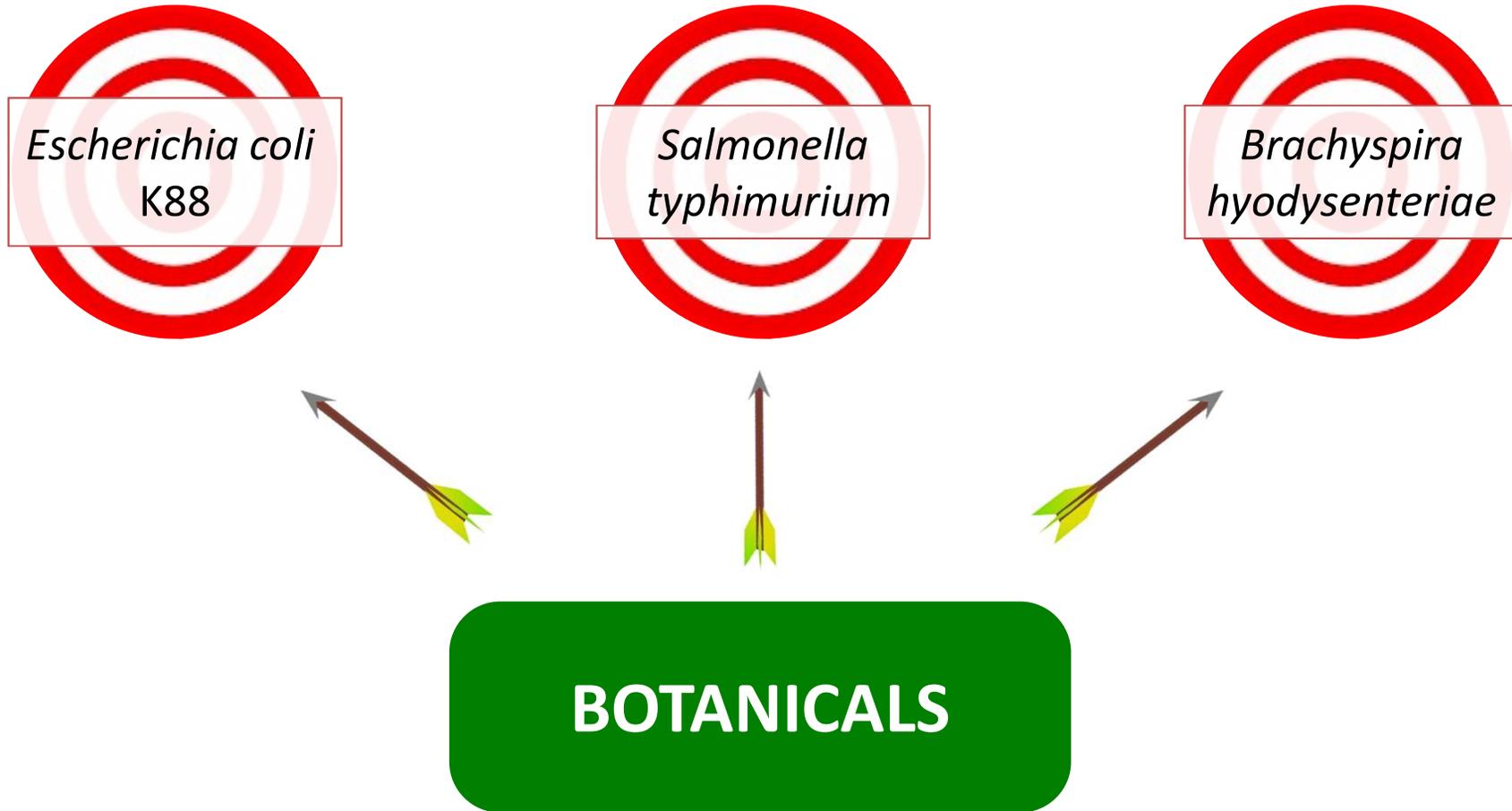
Benedetta Tugnoli, PhD

R&D

6 maggio 2021



Aim of the study



Botanicals classification



Botanicals

(also named phytonutrients, phytobiotics, plant-based feed additives, ...)

HERBS & SPICES



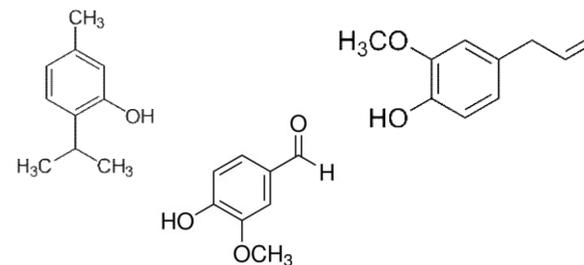
ESSENTIAL OILS

OLEORESINS

POWDER EXTRACT

- ❖ Plant extracts: products directly derived from raw material (dry or wet)
- ❖ Mixtures of plant-derived active molecules

NATURE IDENTICAL COMPOUNDS



- ❖ Synthetic, but chemically identical.
- ❖ No risk of contaminants.
- ❖ Known concentration.



Microbial approach

To screen antimicrobial activity

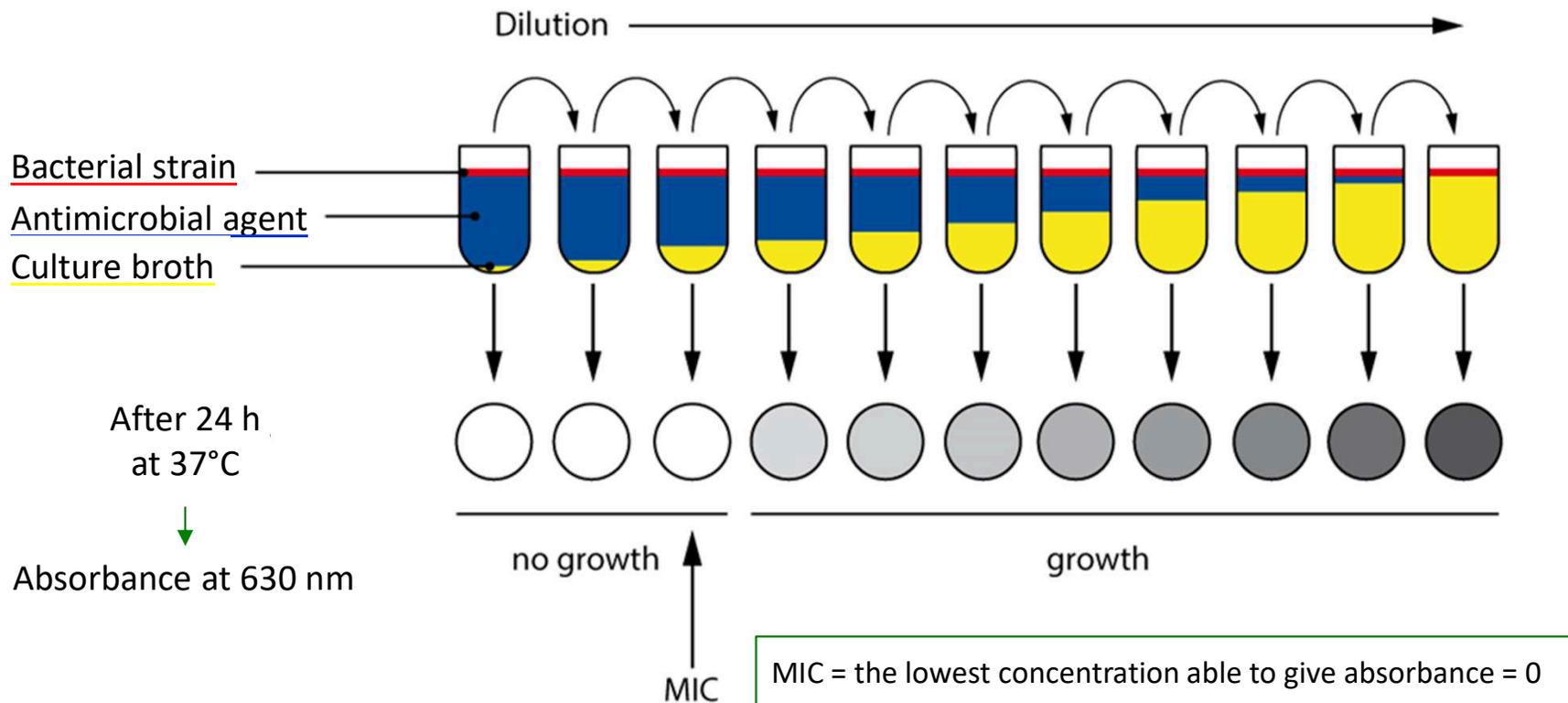
MIC test

VIRULENCE
GENE EXPRESSION

MIC test set-up

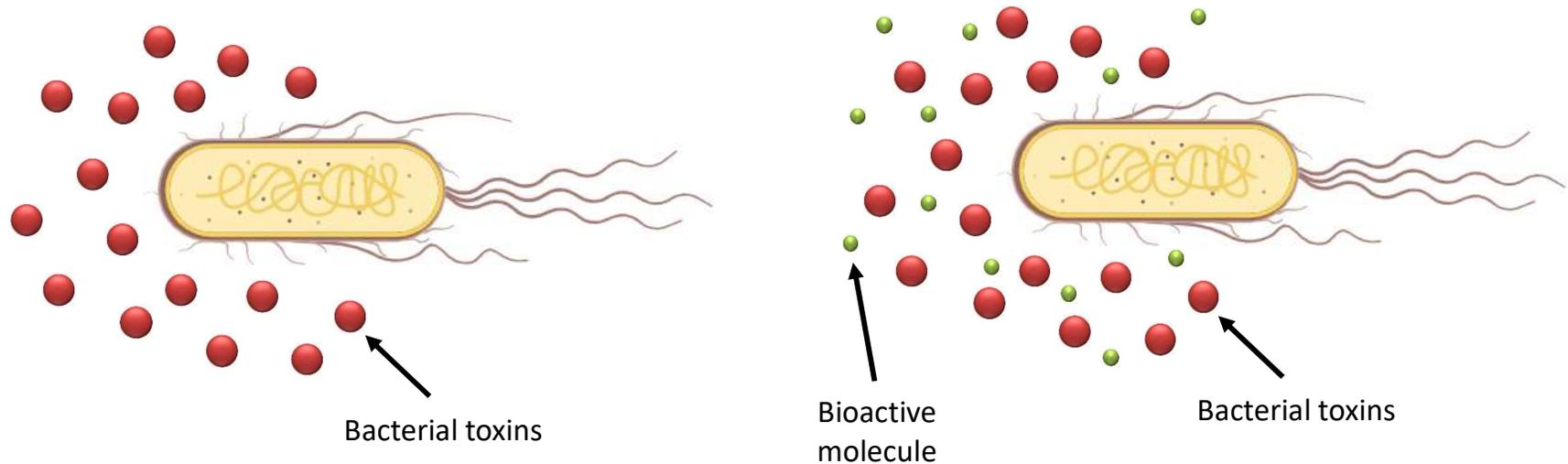


- ❖ Bacterial strains:
 - Reference ATCC strains
 - Field isolates (from clinical cases)
- ❖ MIC (Minimal Inhibitory Concentration) test
 - Broth dilution method

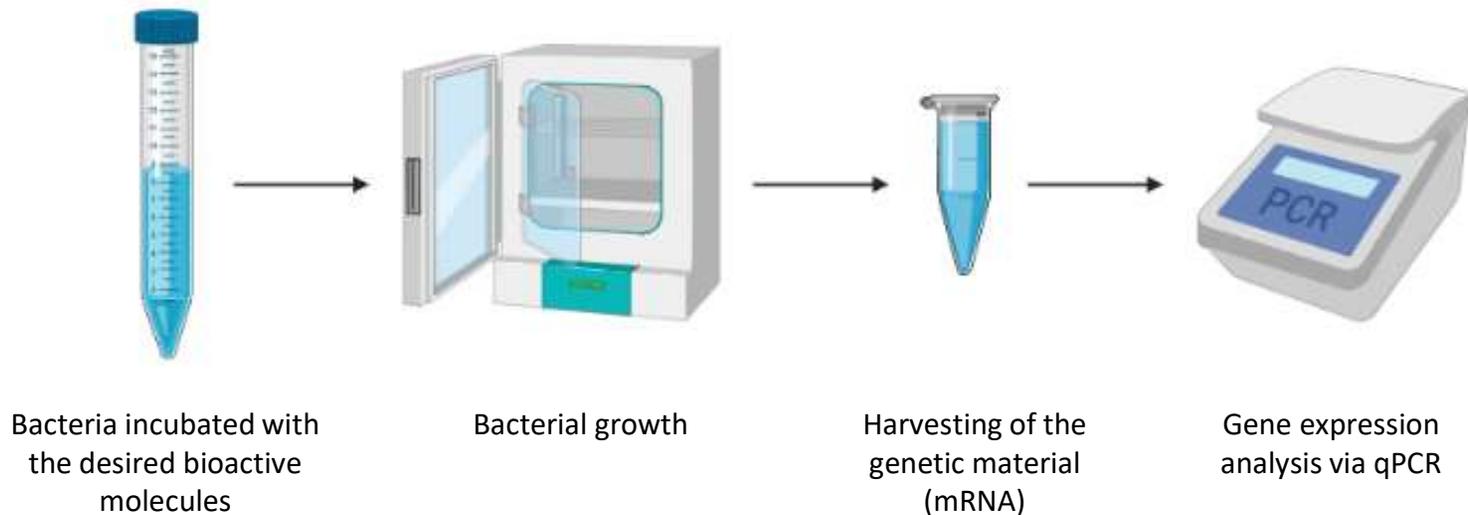


Microbial virulence gene expression

- ❖ Targeting virulence: a pioneering approach against bacterial pathogens

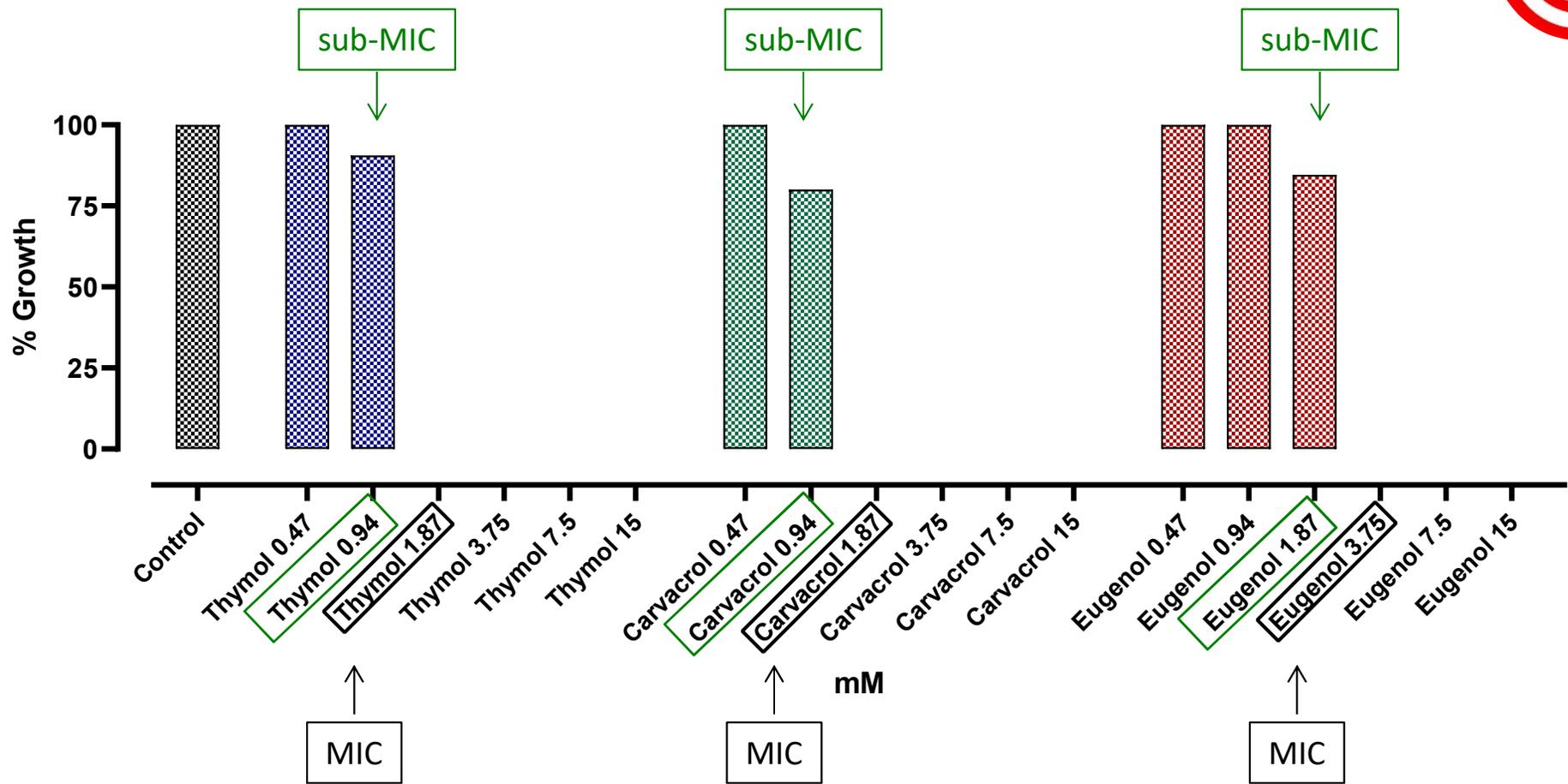


- ❖ How we investigate virulence modulation at a gene level:

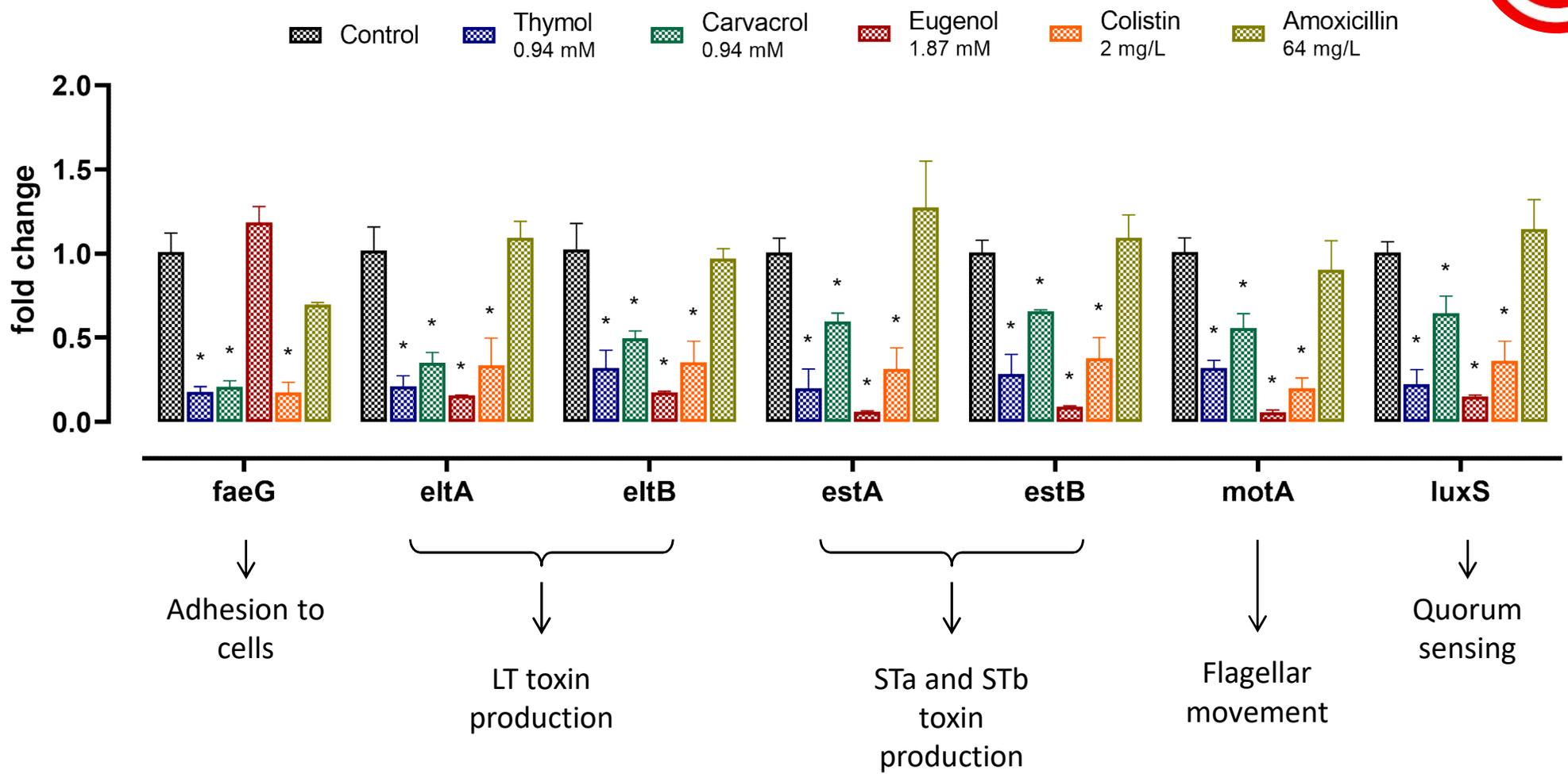




E. coli K88 – MIC test



E. coli K88 – virulence



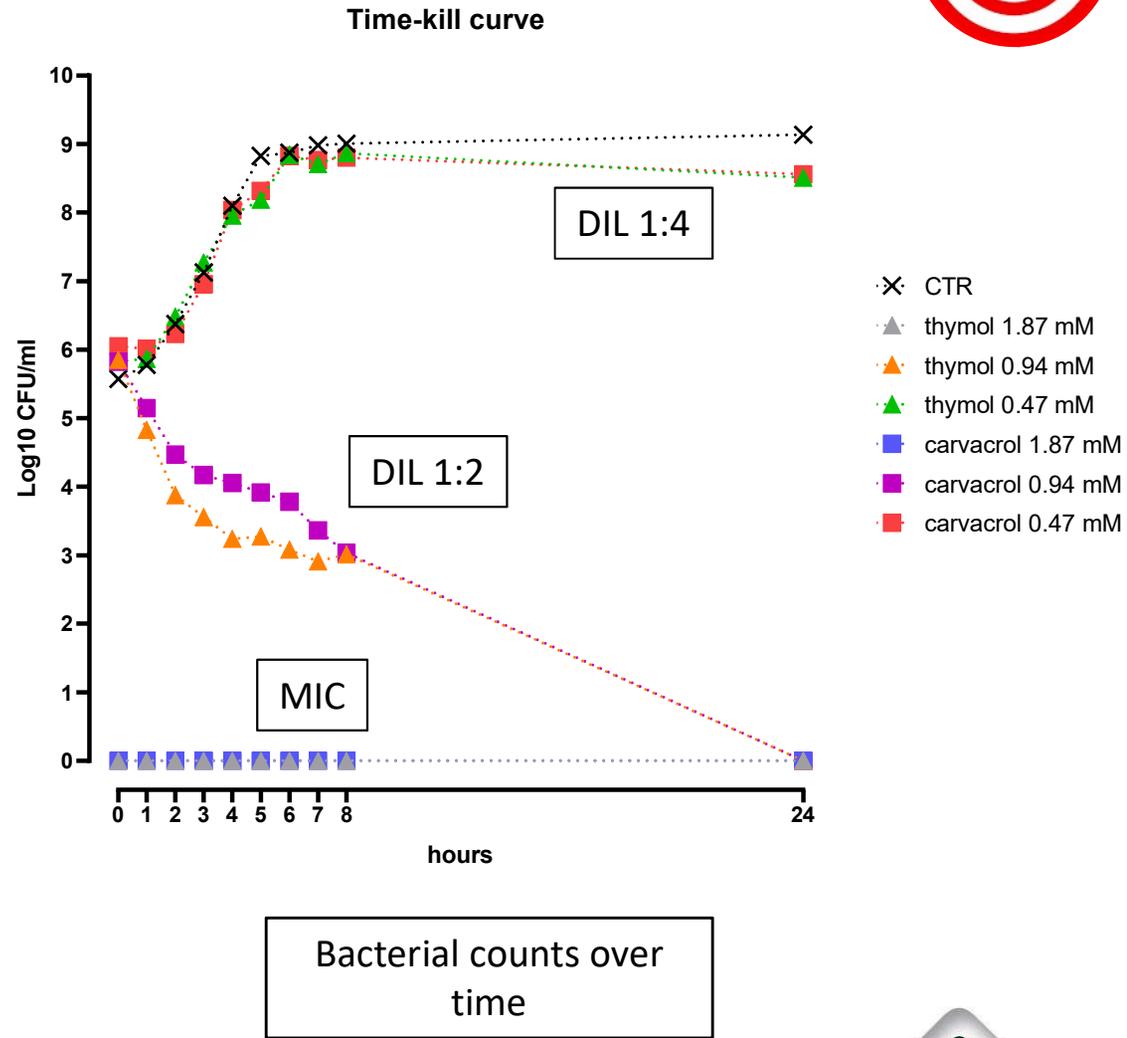
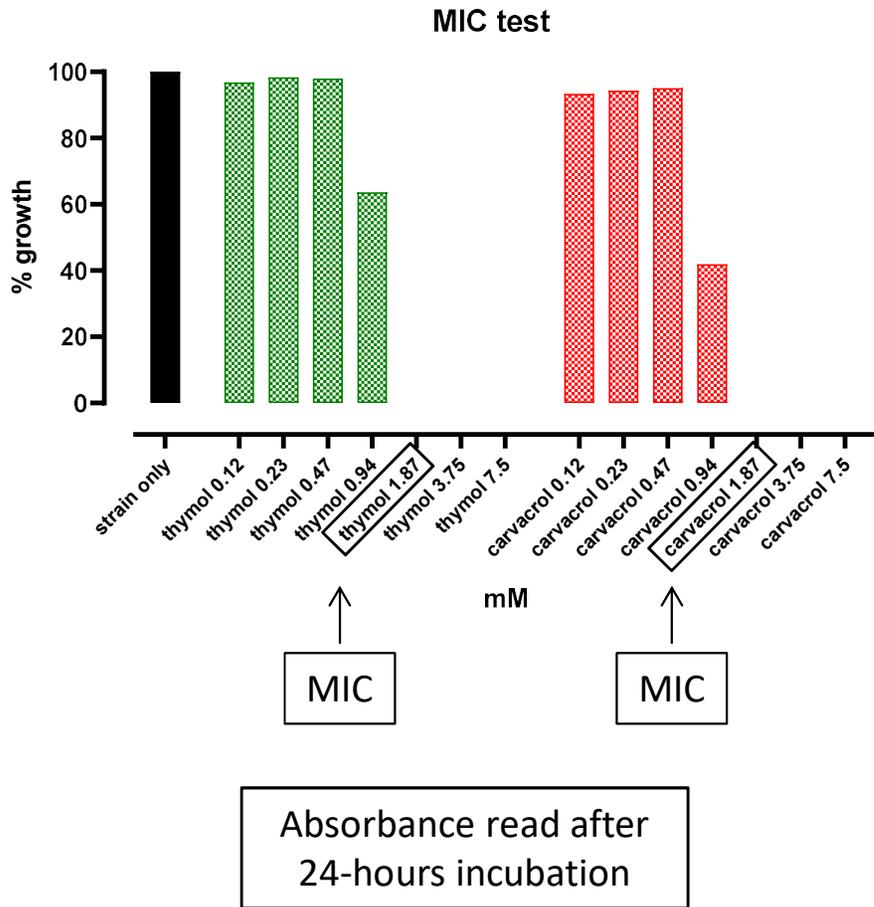
Bonetti et al. (2020). Toxins 2020, 12, 468.

Mean±SEM, n=3. Data analyzed with T test vs control (P<0.05).



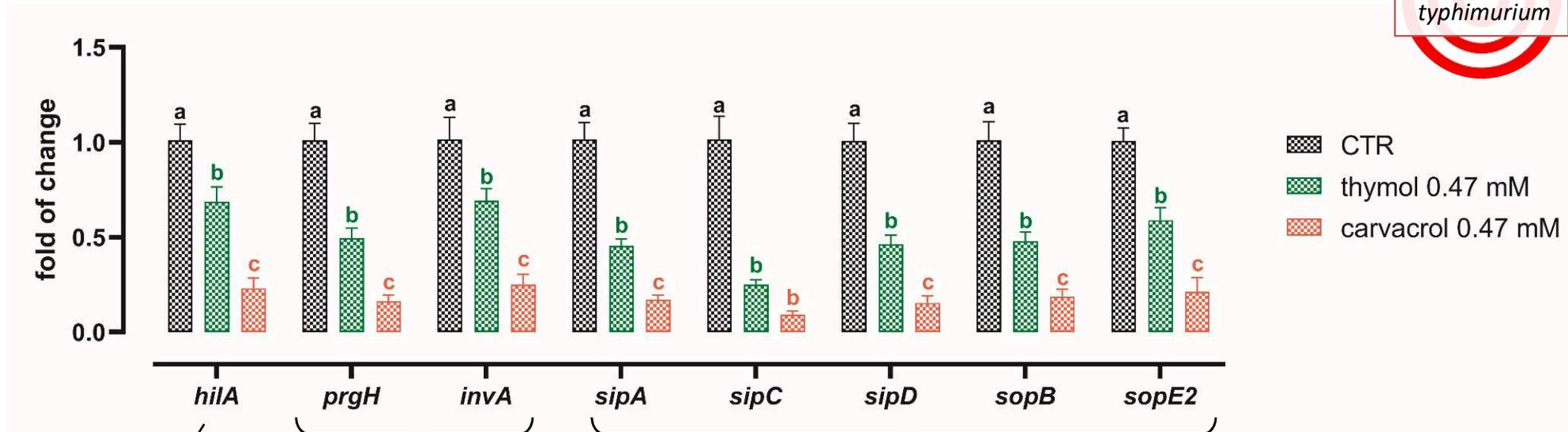


S. typhimurium – MIC test



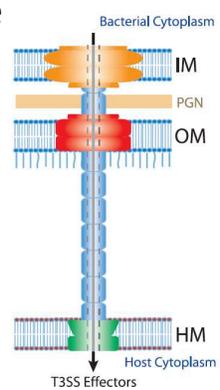
Giovagnoni et al. (2020). Microorganisms 2020, 8, 862.

S. typhimurium – virulence



Transcriptional activator of invasion

Responsible of the T3SS assembly



Translocator and effector proteins

Diarrhea

Bacteremia

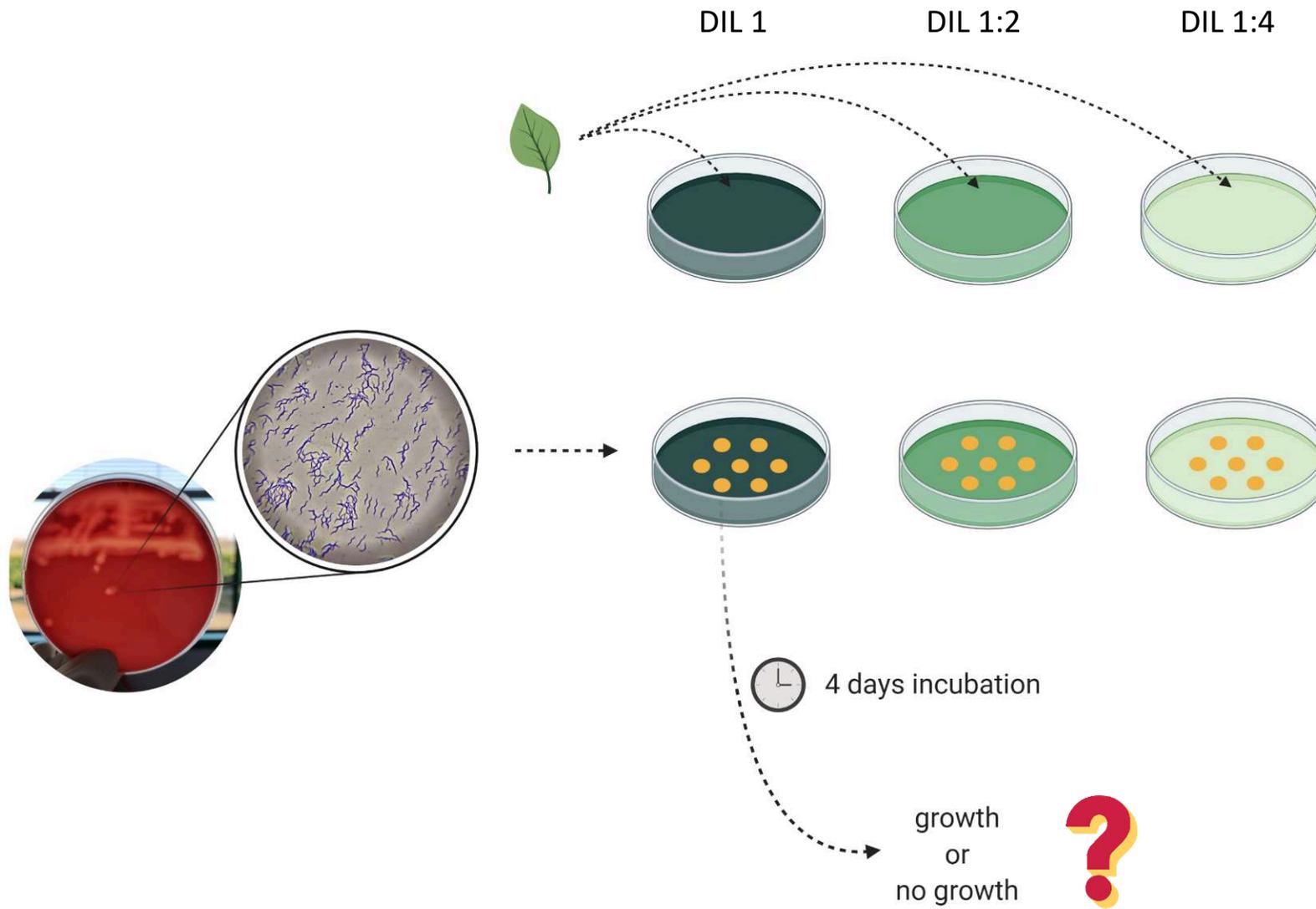
Giovagnoni et al. (2020). Microorganisms 2020, 8, 862.

Mean±SEM, n=5. Data analyzed with ANOVA (P<0.05).



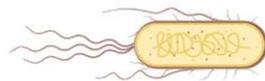


B. hyodysenteriae – MBC test

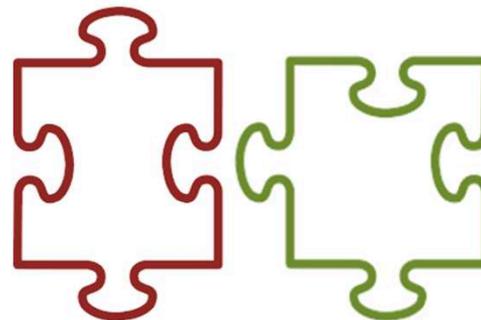




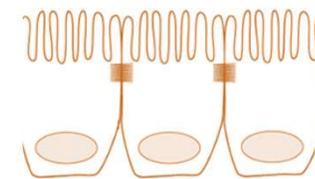
Bacterial challenge models



BACTERIA



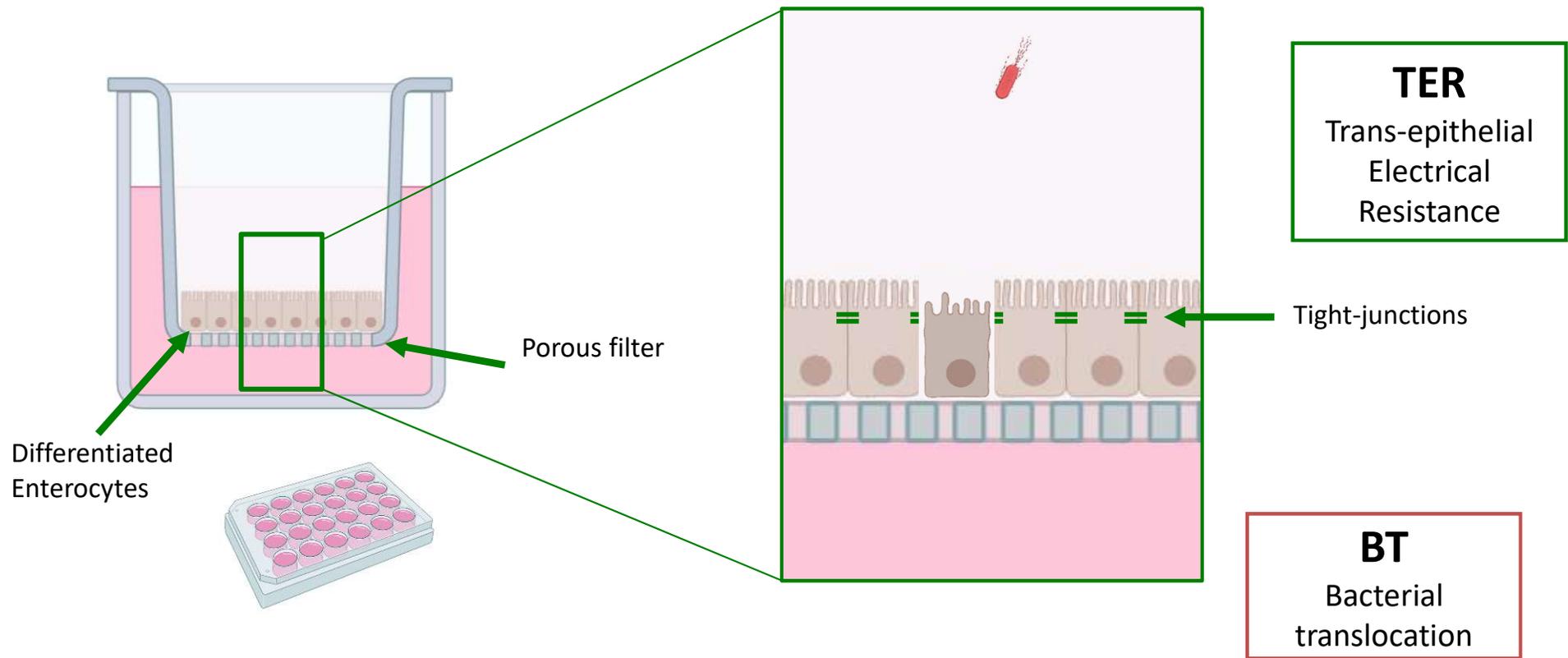
INTESTINAL CELLS



Bacterial challenge models



- ❖ Direct challenge with bacteria
 - *Escherichia coli* K88
 - *Salmonella typhimurium*

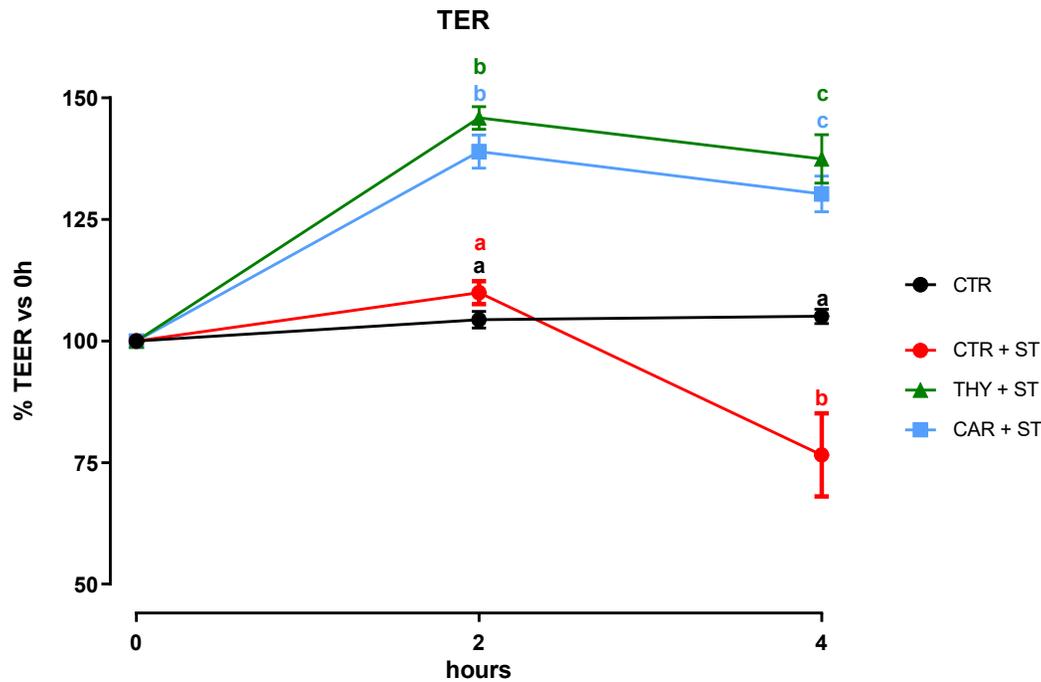


S. typhimurium – intestinal challenge

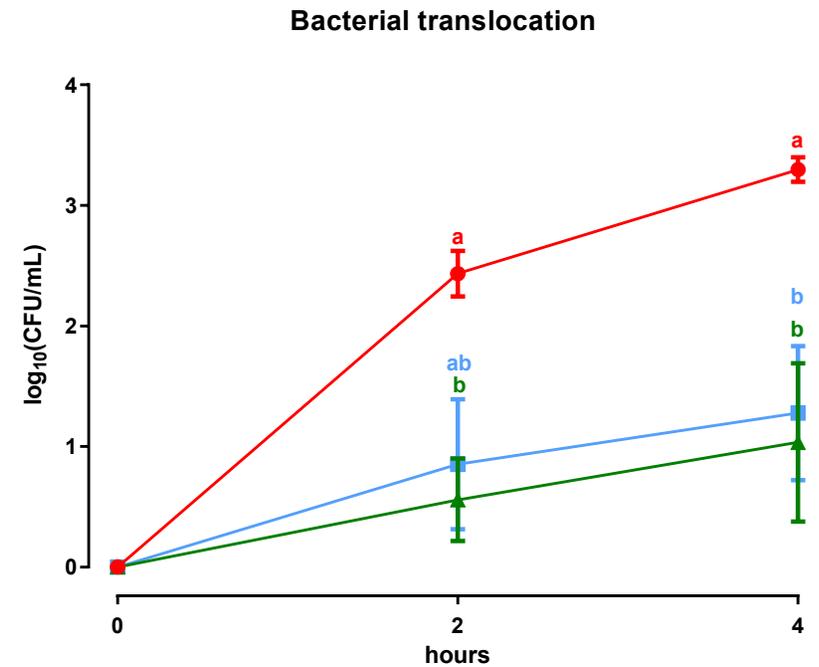


Thymol and carvacrol in Caco-2 cells challenged with ST

Low doses (< MIC)



↑ TER



↓ BT

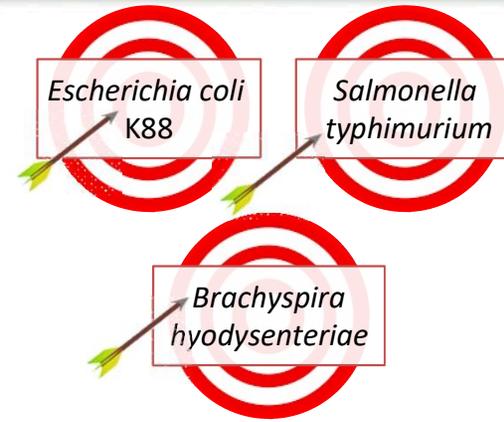
Giovagnoni et al. (2020). *Microorganisms* 2020, 8, 862.

Mean±SEM, n=5. Data analyzed with ANOVA (P<0.05).

Conclusions

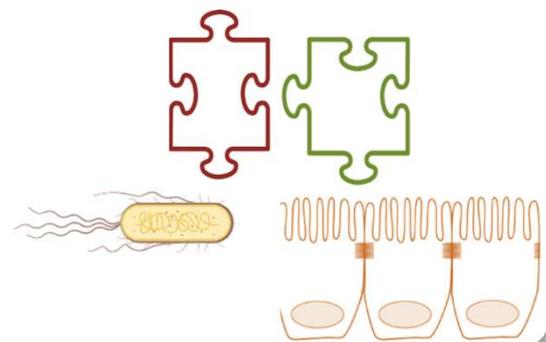


- ❖ Botanicals (and organic acids) can target bacterial pathogens
- ❖ Direct antimicrobial action
- ❖ Reduction of virulence (even at low doses)
- ❖ Microbial approach + host-response



ANTIMICROBIAL

VIRULENCE





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