

➤ The dairy probiotic bacterium *Propionibacterium freudenreichii* against colitis and mucositis: a key role of the surface layer protein SlpB

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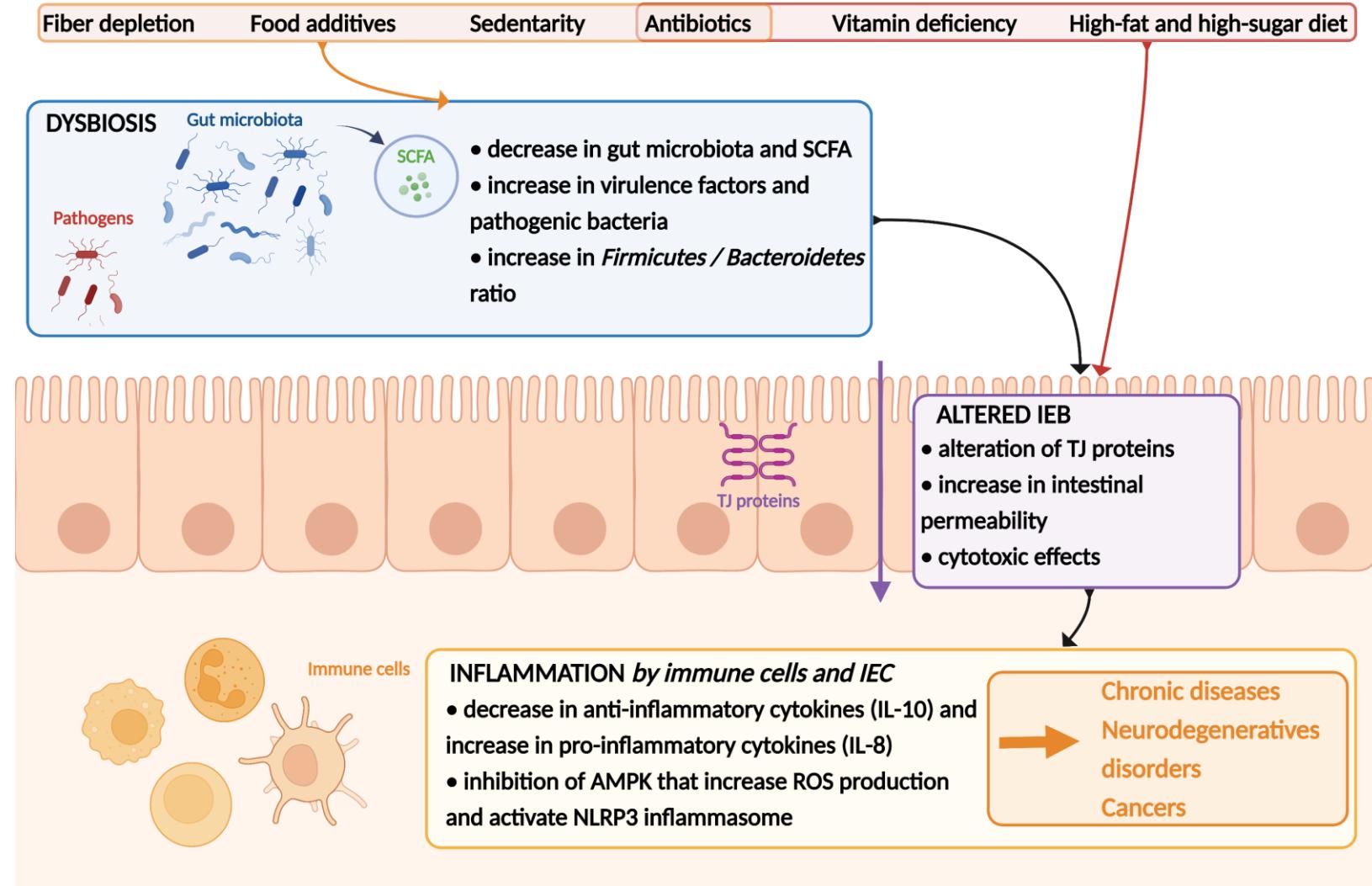
<https://www6.rennes.inrae.fr/stlo>



> Intestinal epithelial barrier: endangered...



> ... By modern lifestyle



> Examples of digestive inflammatory diseases

Colitis

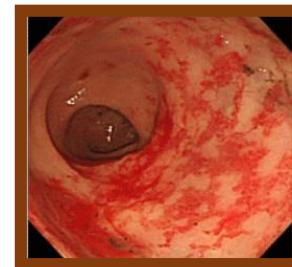
- GIT Chronic inflammation



Ulcerative Colitis



Mucositis



GI Mucositis

5-Fluoracil (5-FU)

- Head, neck and colon cancer.

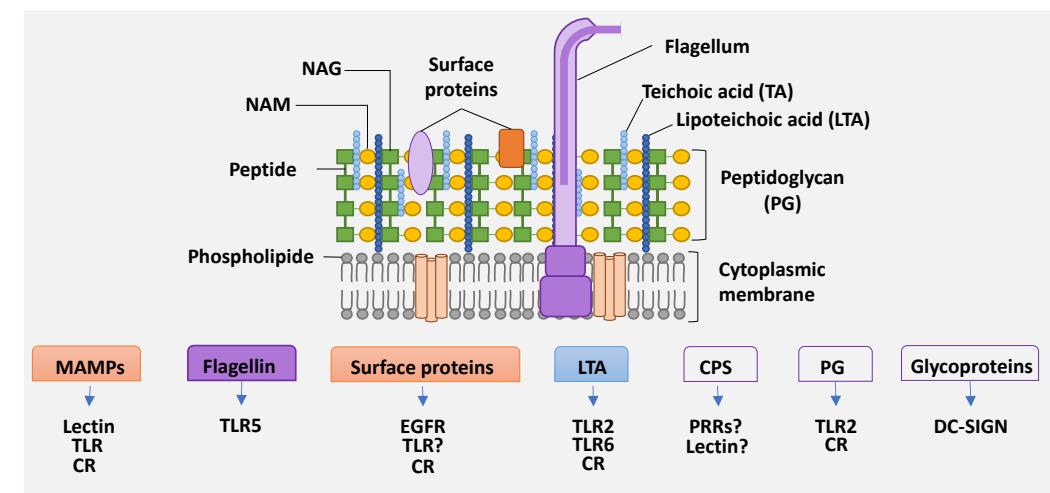
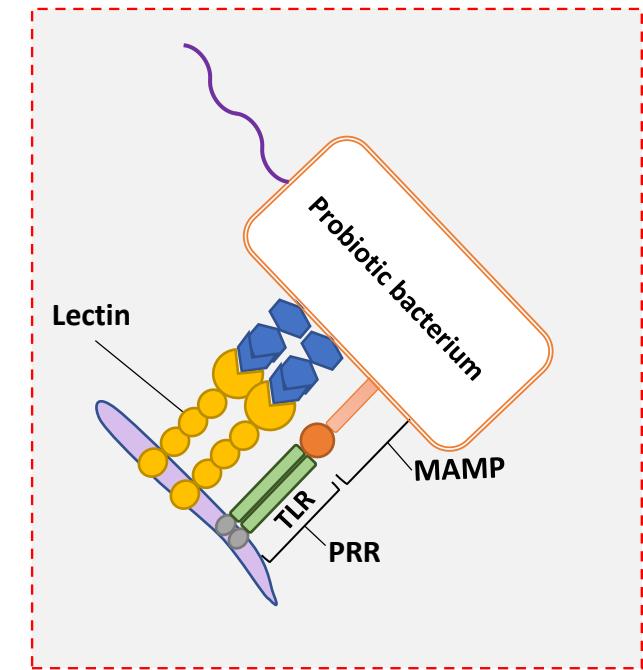
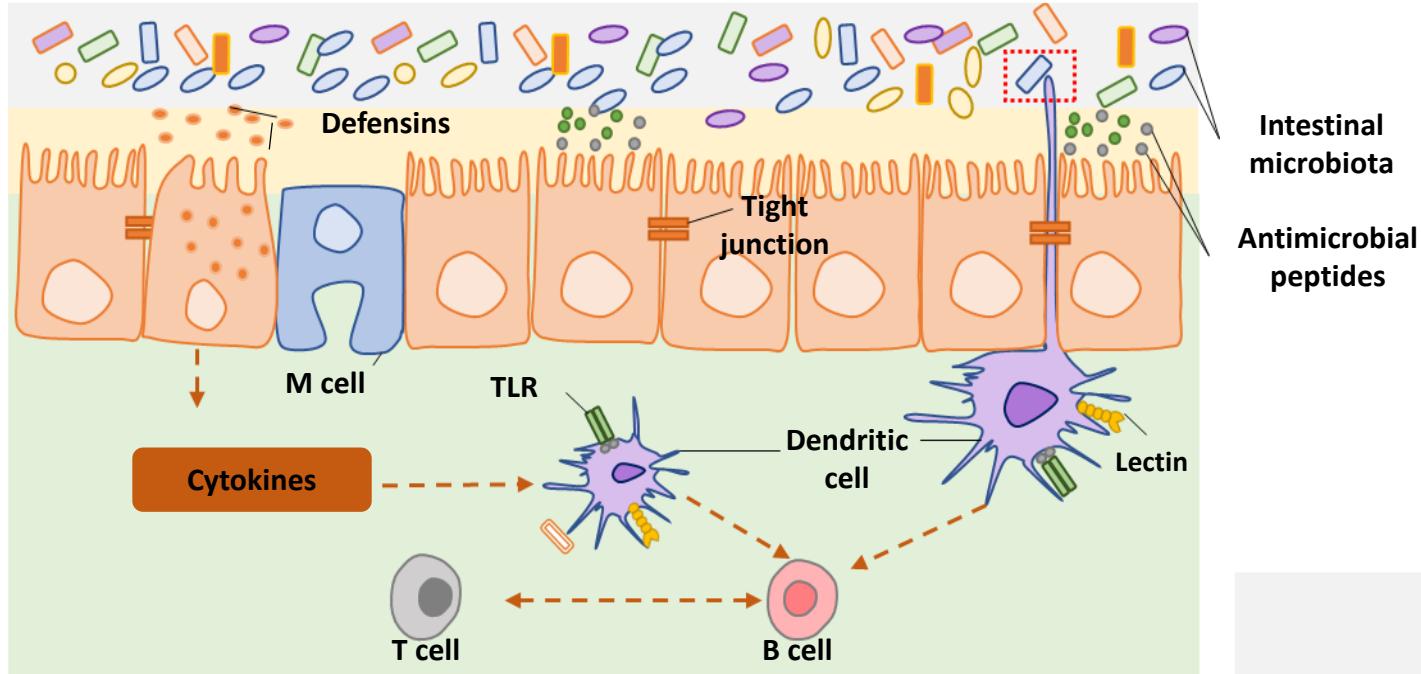
(Chang et al., 2012; Falvey et al., 2015)



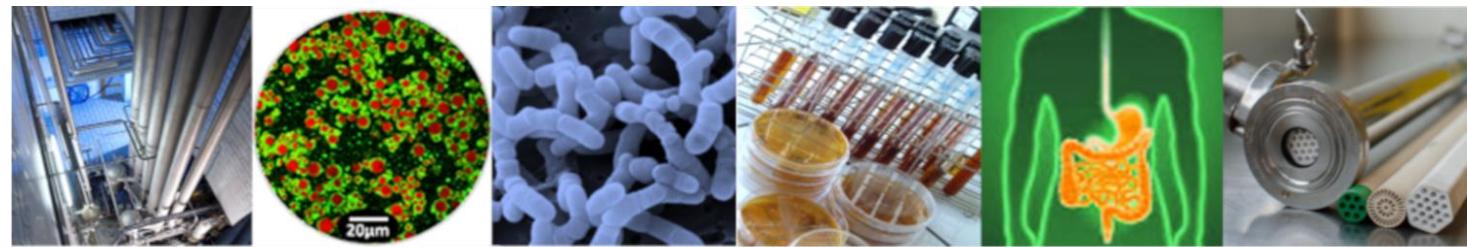
➤ A key role of resident and ingested microorganisms...



➤ ... Modulating the immune response



> Introducing *Propionibacterium freudenreichii*...



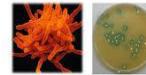
> ... A sort of Swiss army knife



*Propionibacterium
freudenreichii*



→ Actinobacterium



→ Vitamin producer
B9, B12



→ Probiotic



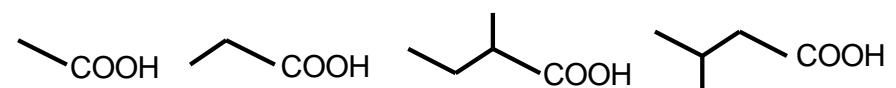
→ Food bio-preserved



→ Ripening starter



→ Short chain fatty acids

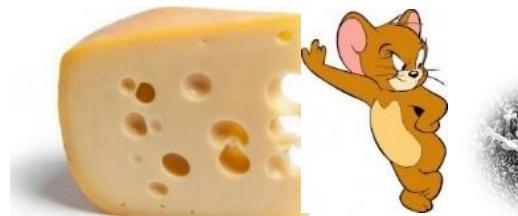


**Short Chain Fatty Acids
(SCFA)
Known effect on health**

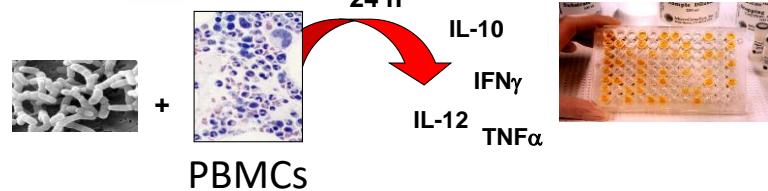
> Immunomodulatory properties



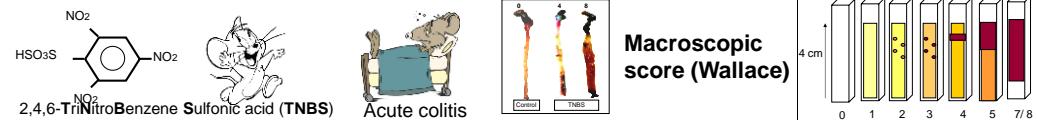
> ... *In vitro* and *in vivo*



◆ *In vitro*



◆ *In vivo*



INRAE

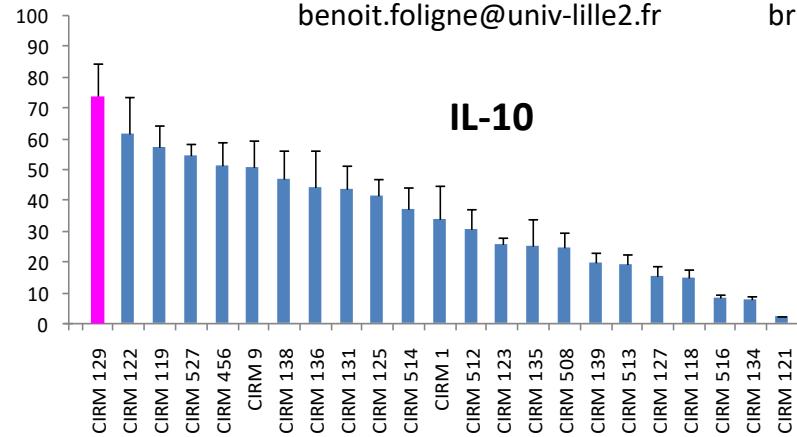
Propionibacteria, Inflammation & SlpB
FoodMicro 2022. G. Jan



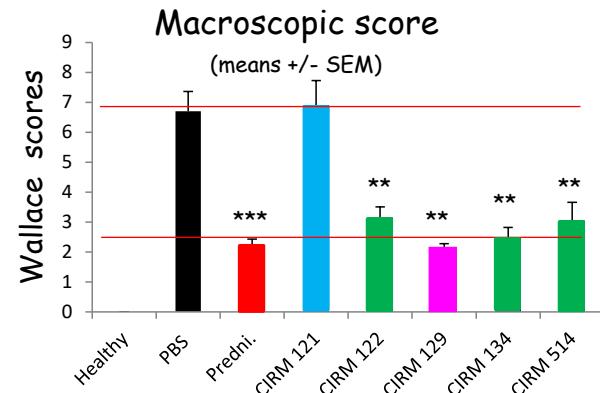
benoit.foligne@univ-lille2.fr

bruno.pot1@telenet.be

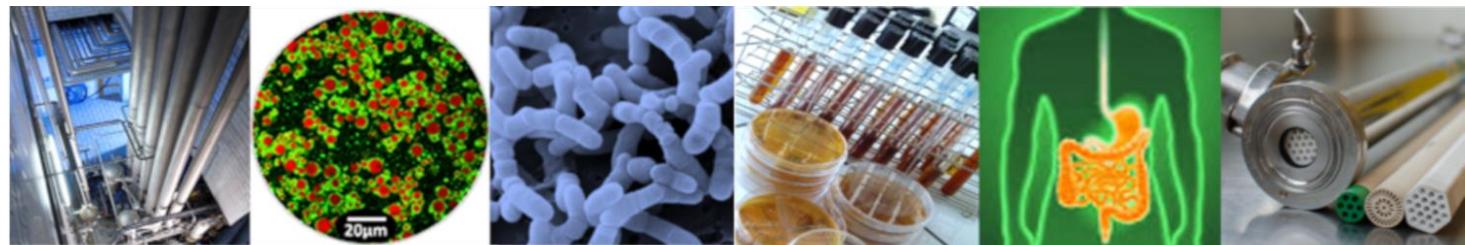
IL-10



Macroscopic score

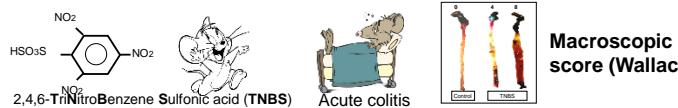
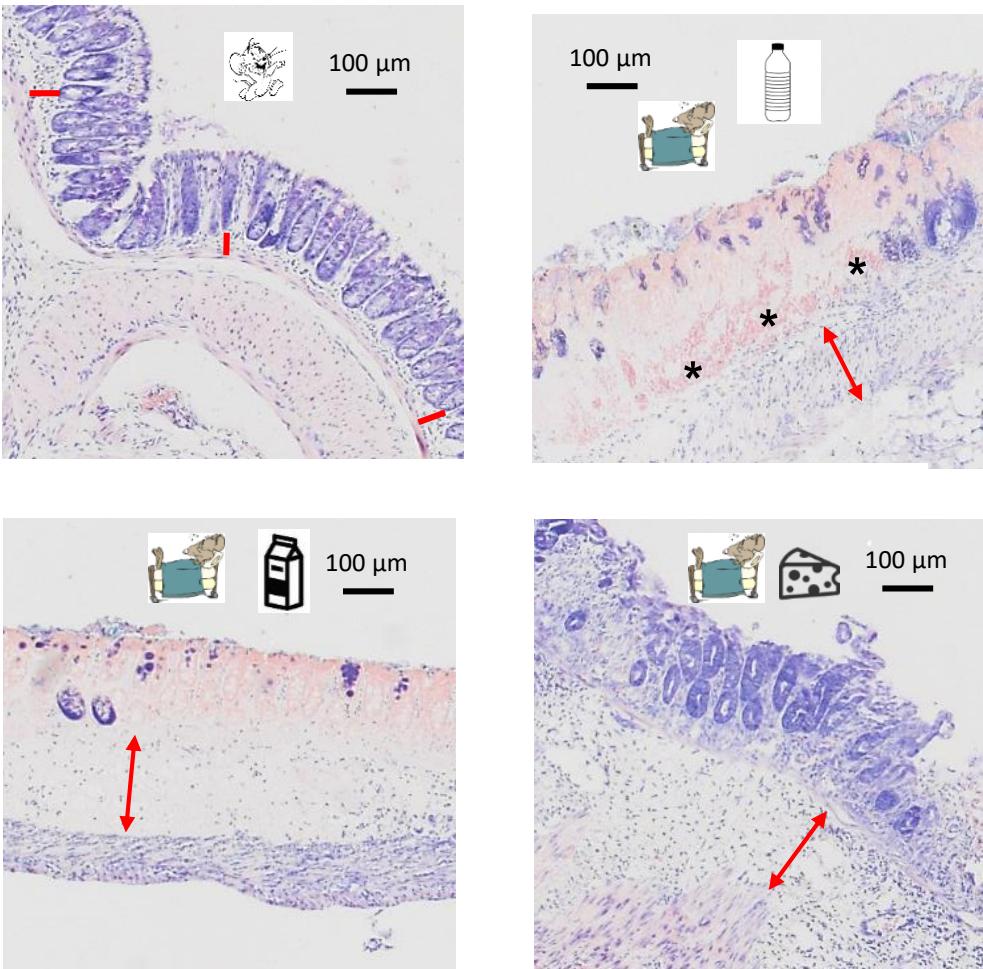


➤ The healing effect of *Propionibacterium freudenreichii*

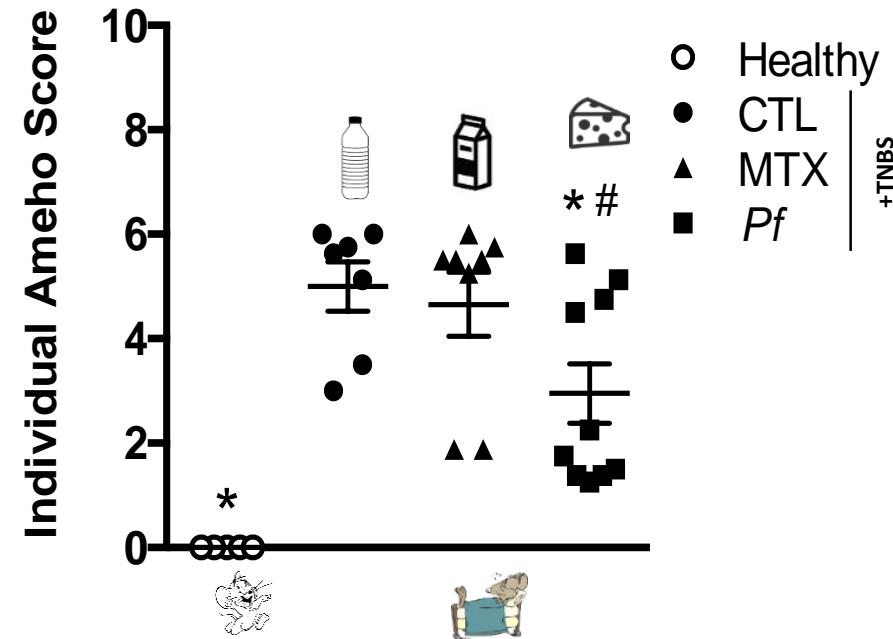
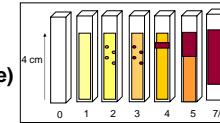


> In TNBS-induced colitis

A model cheese

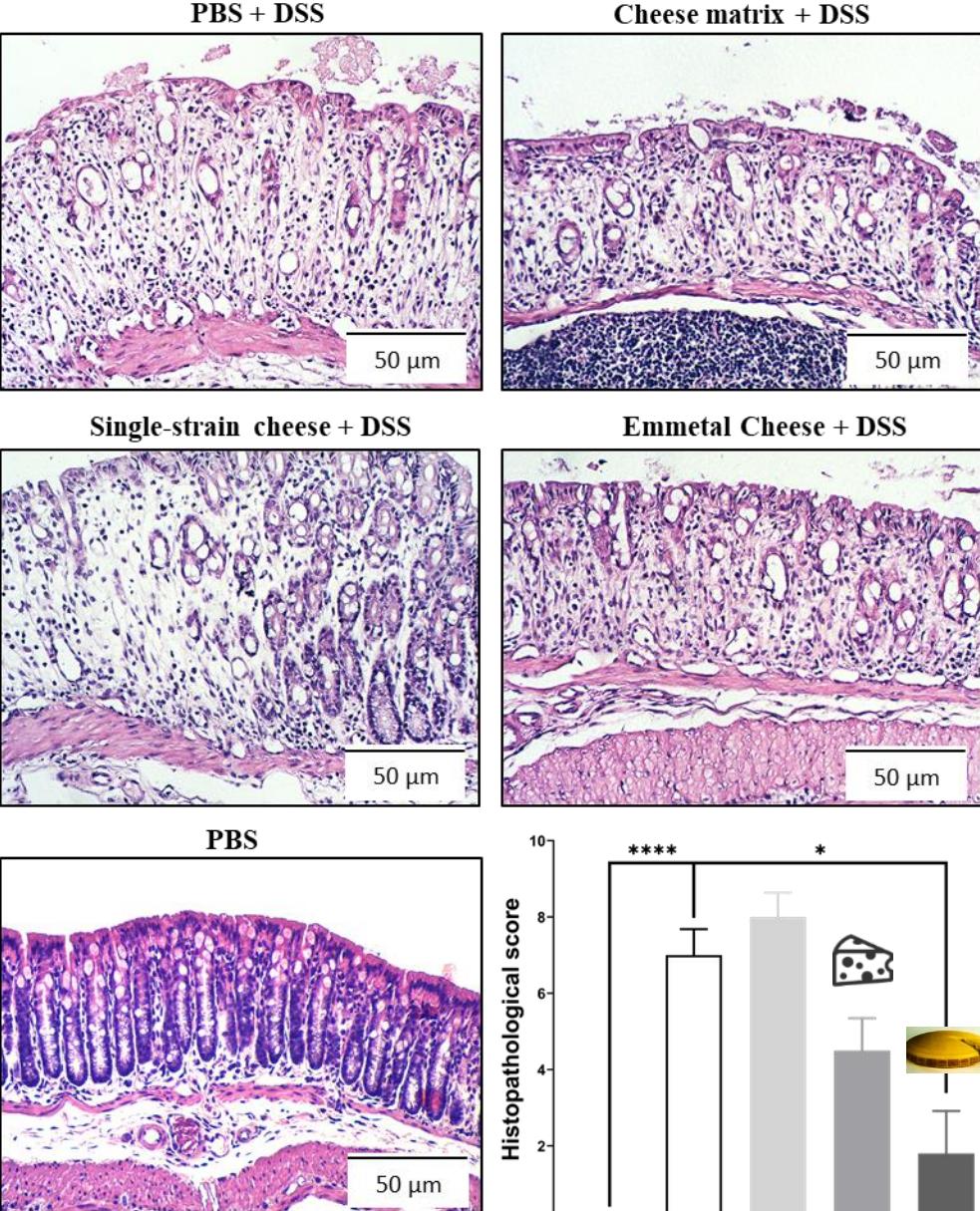
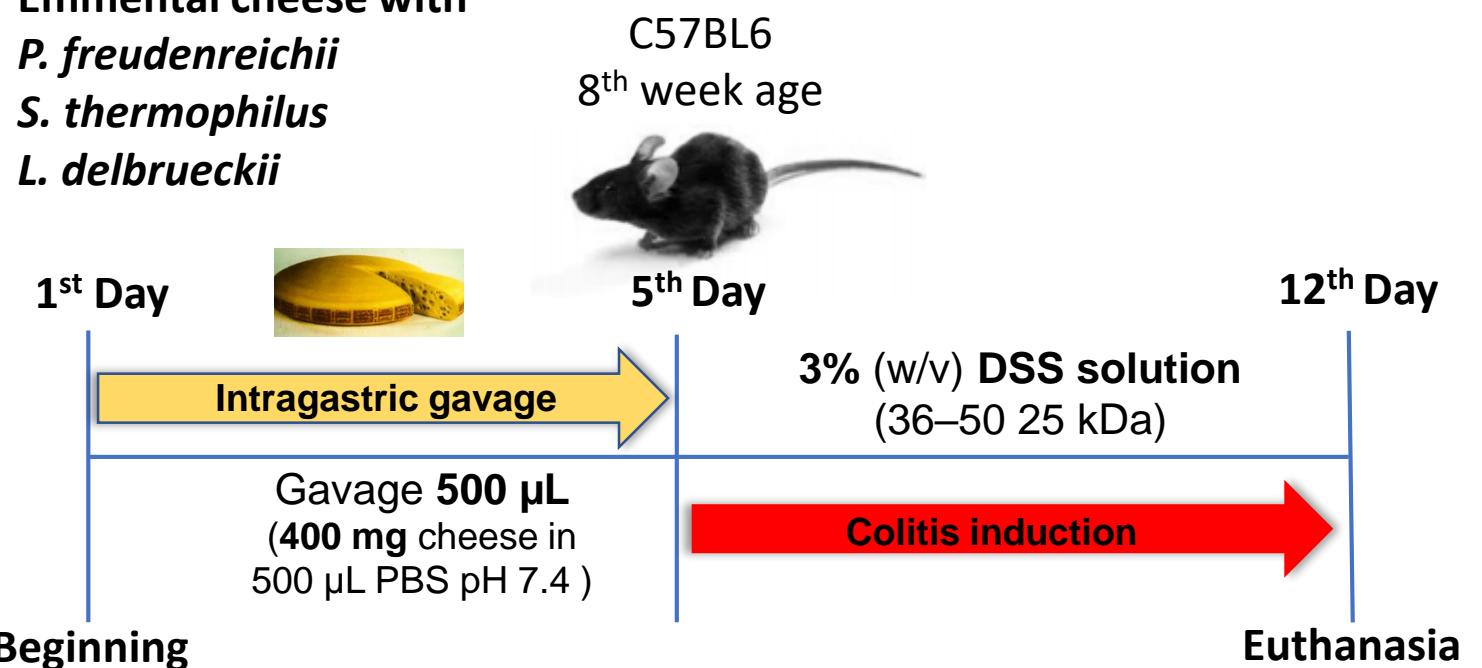


Macroscopic score (Wallace)



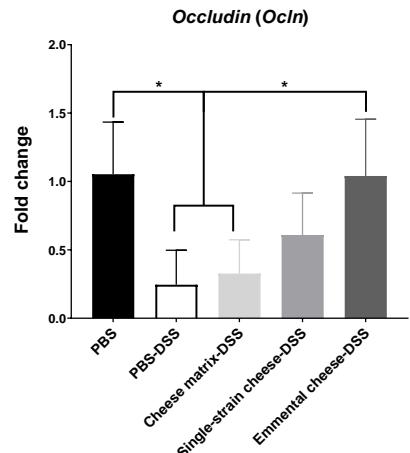
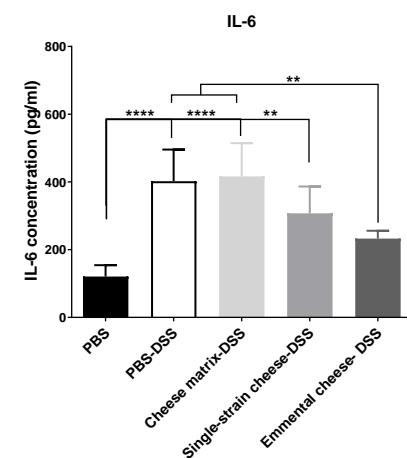
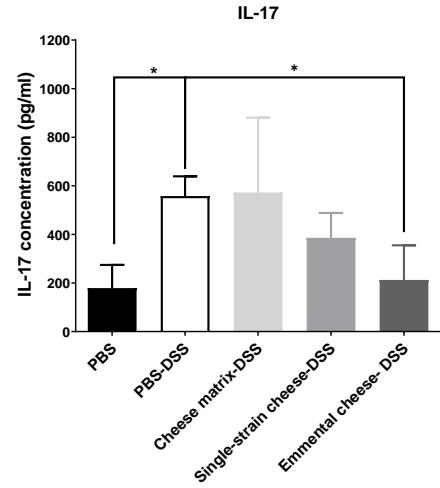
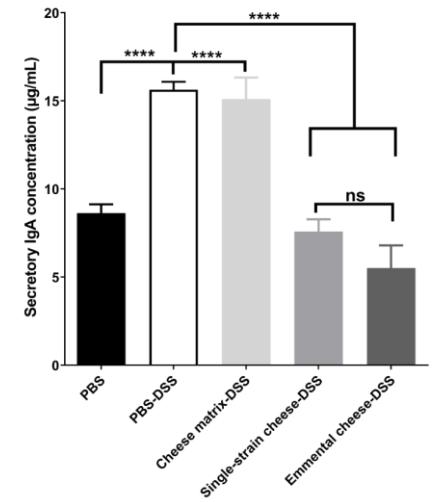
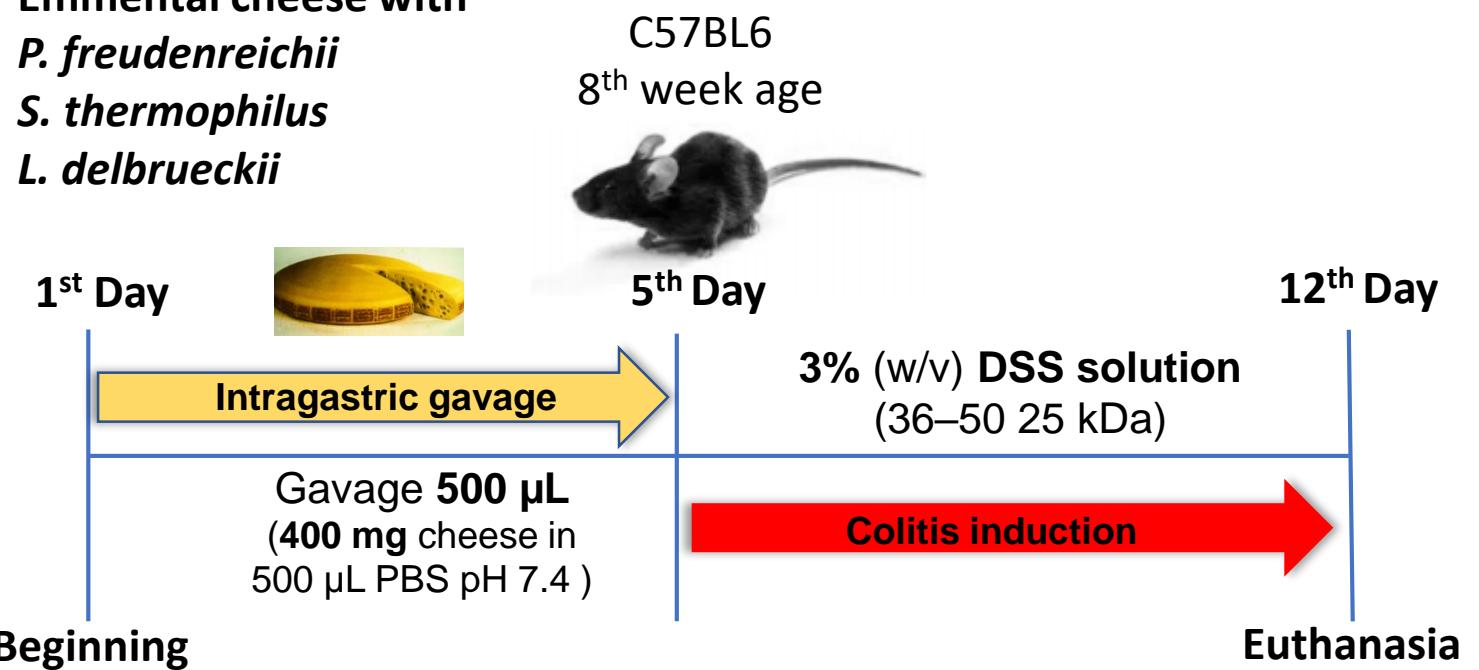
> In DSS-induced colitis

Emmental cheese with
P. freudenreichii
S. thermophilus
L. delbrueckii

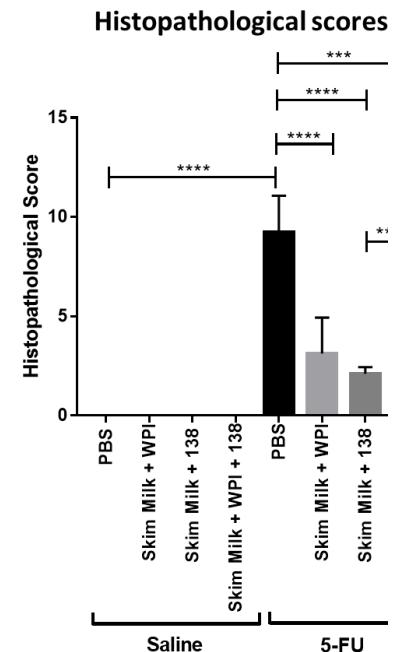
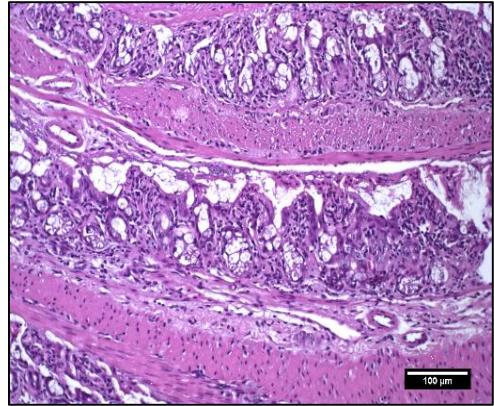
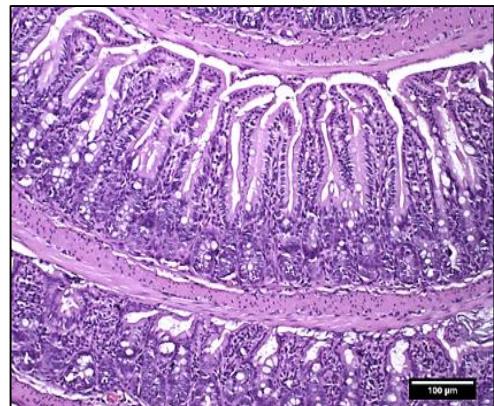
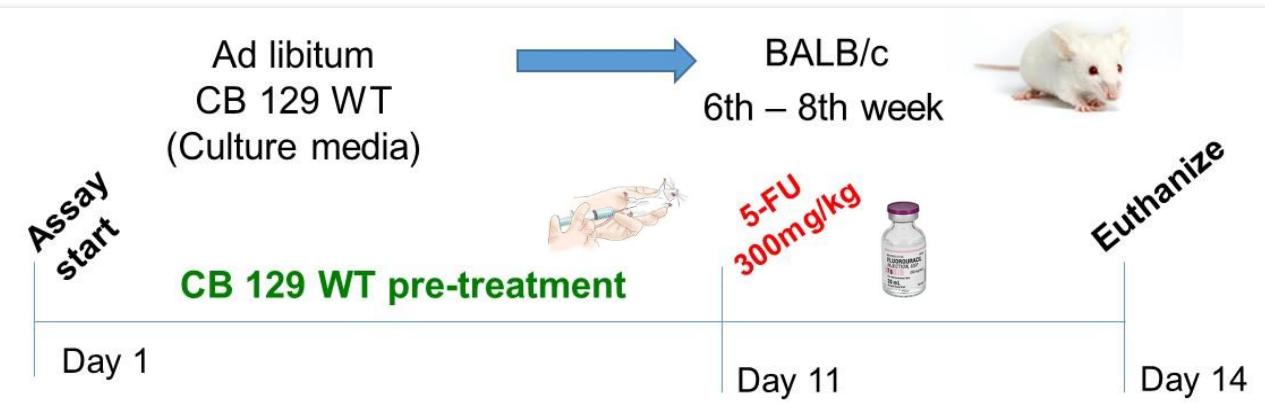


> In DSS-induced colitis

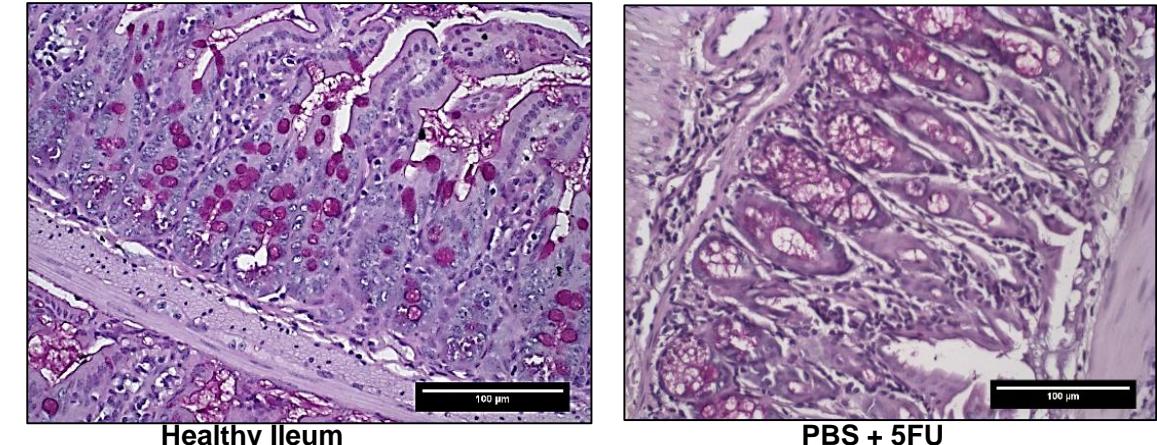
Emmental cheese with
P. freudenreichii
S. thermophilus
L. delbrueckii



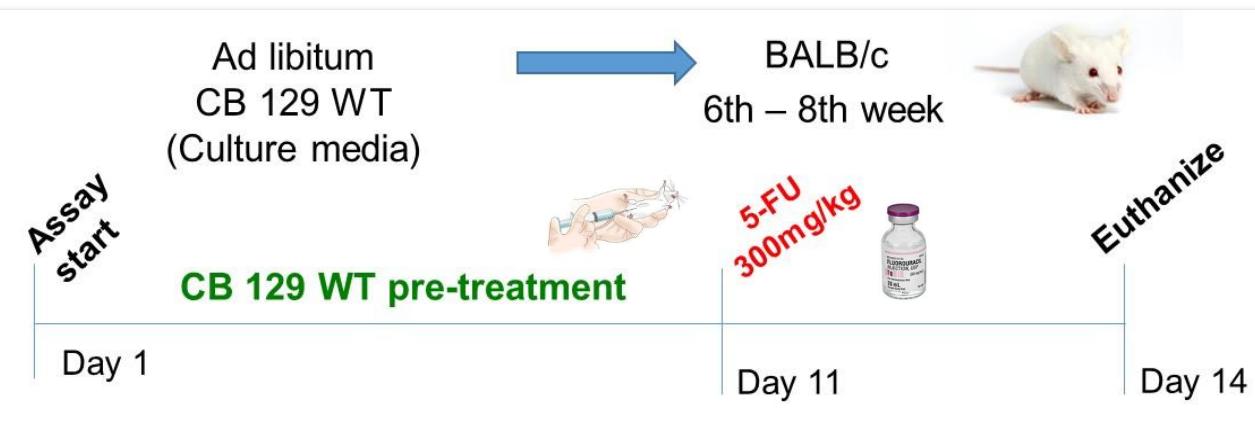
> In 5FU-induced mucositis



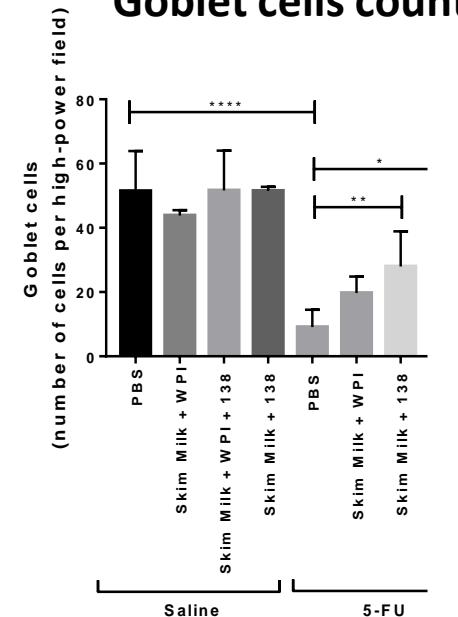
Representative images of stained goblet cells (PAS)



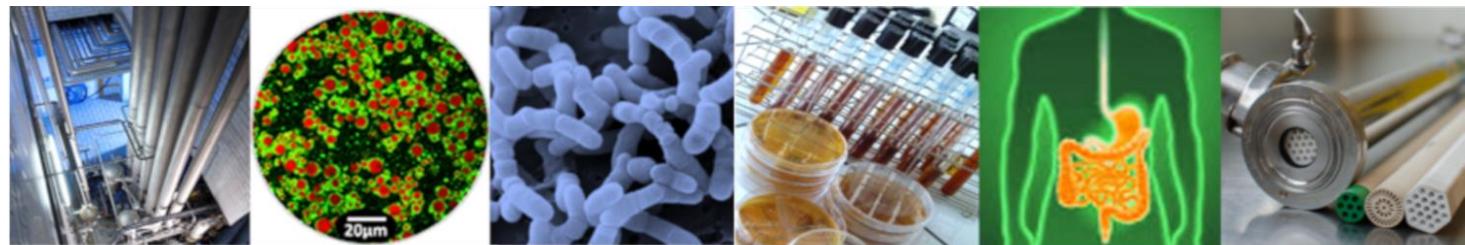
In 5FU-induced mucositis



Goblet cells counts



> How does it work?



> If we remove surface proteins: PBMC assay

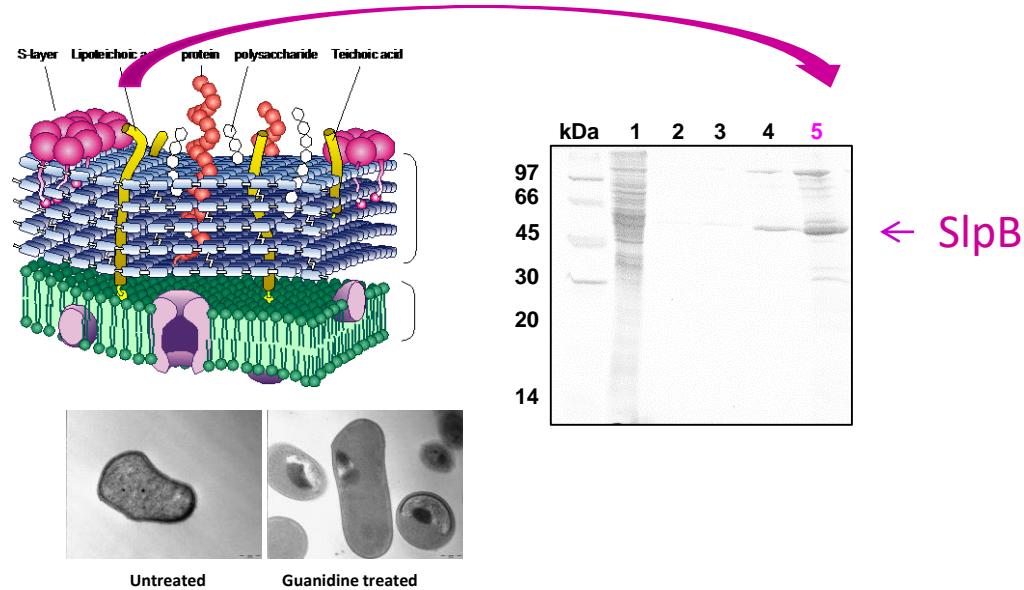
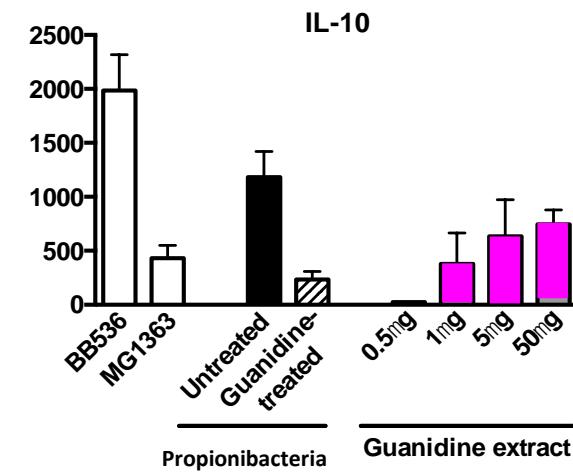
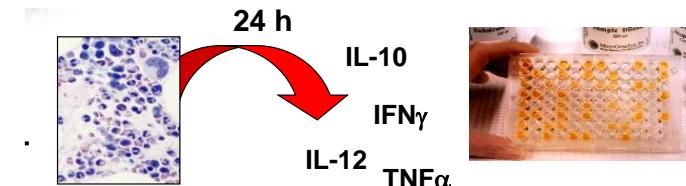


Table 1 – *Propionibacterium freudenreichii* proteins identified by nano-LC-MS/MS after guanidine hydrochloride (shaving column) or in-situ fluorescence labeling* (CyDye column).

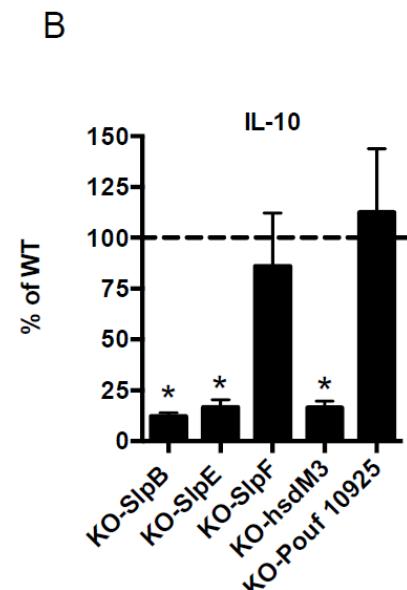
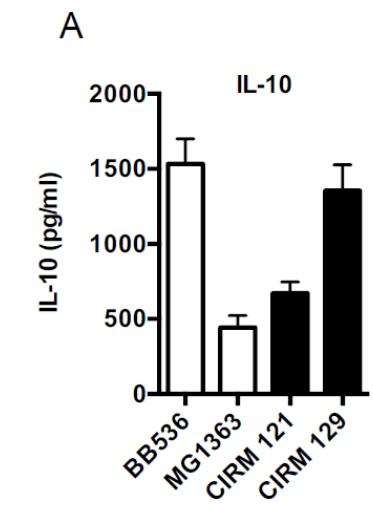
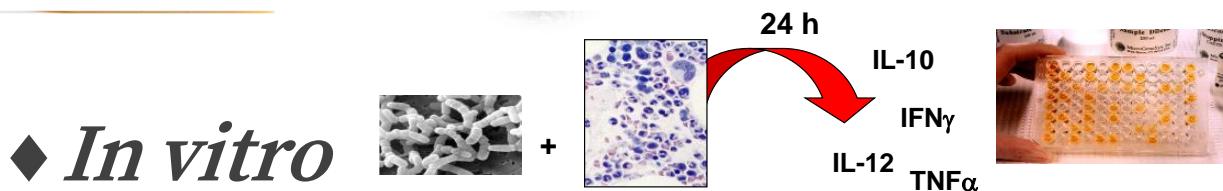
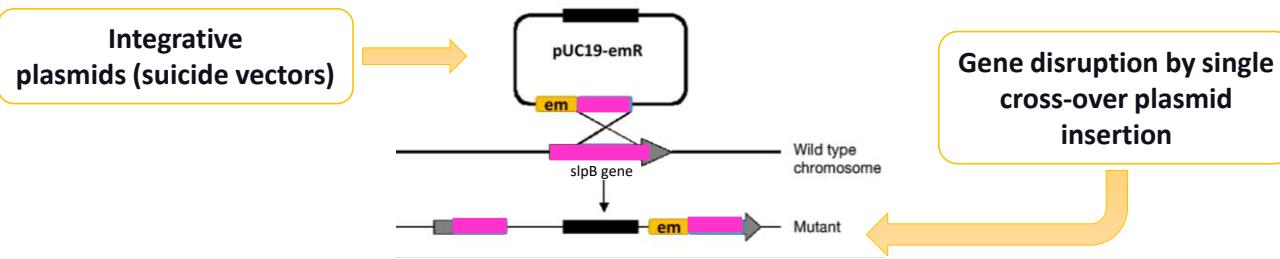
Locus Tag	Description	Gene	Function
PFCIRM129_12235	Internalin A	inlA	Miscellaneous
PFCIRM129_05460	Surface protein with SLH domain	slpE	Cell wall
FCIRM129_09350	Surface layer protein A	slpA	Cell wall
PFCIRM129_00700	Surface layer protein B	slpB	Cell wall
PFCIRM129_11445	Large surface protein A	lspA	Cell wall



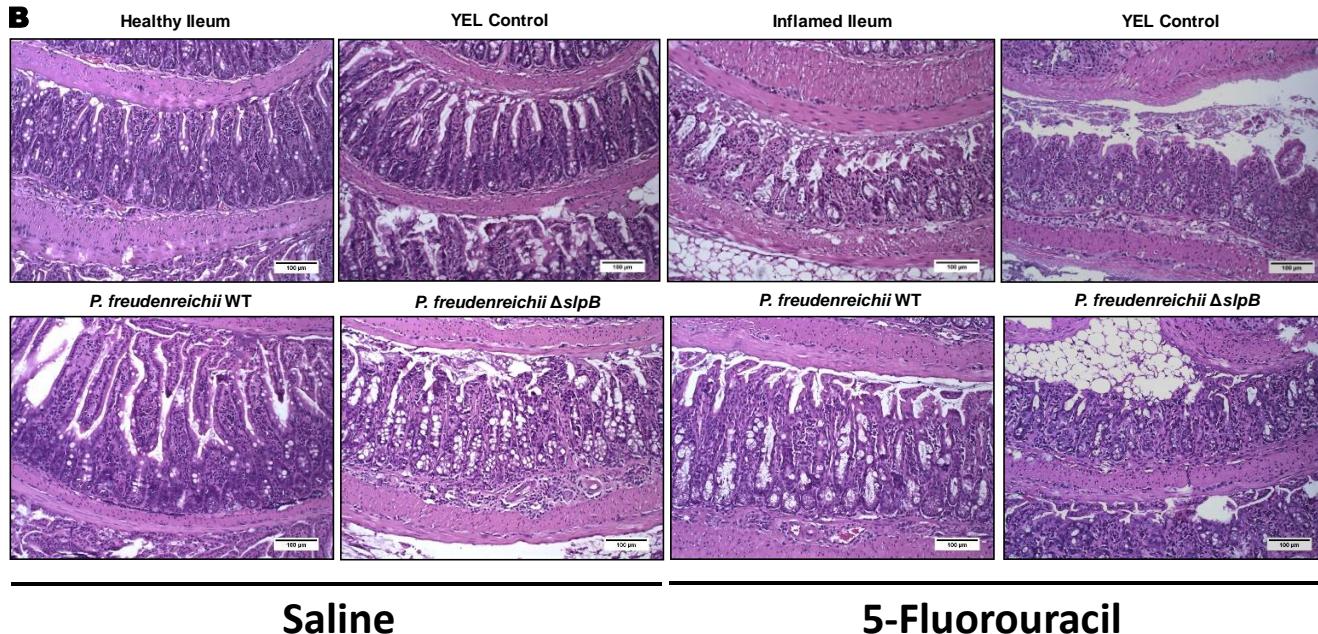
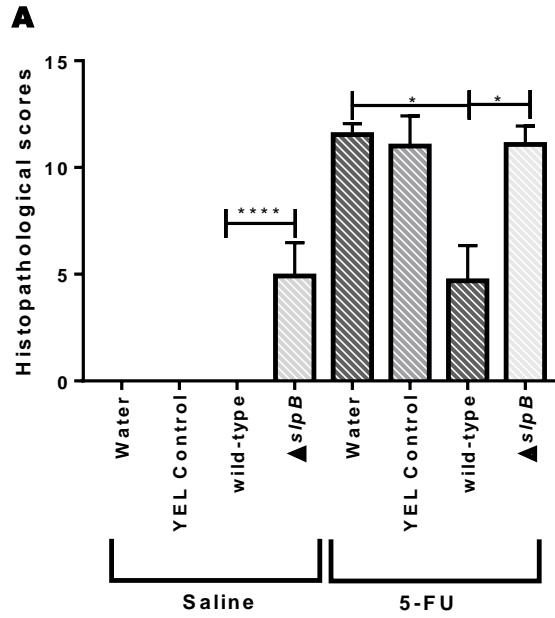
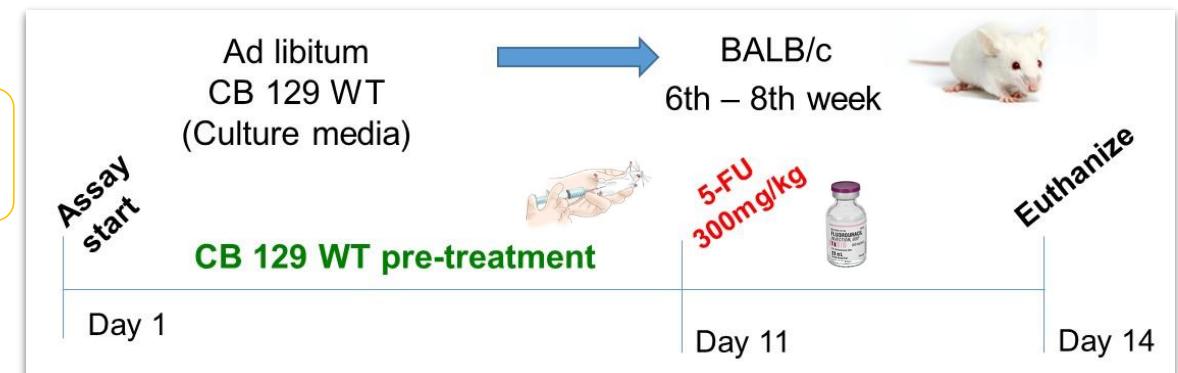
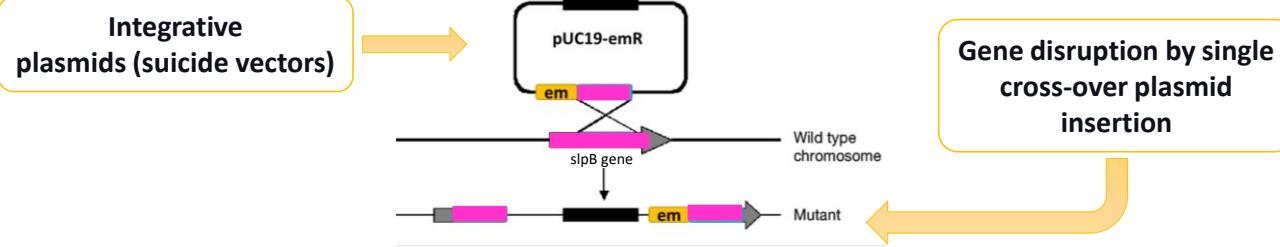
Stripped propionibacteria lose immunomodulatory properties

But extracted proteins induce IL-10

► If we mutate Surface Layer Protein genes: PBMC assay

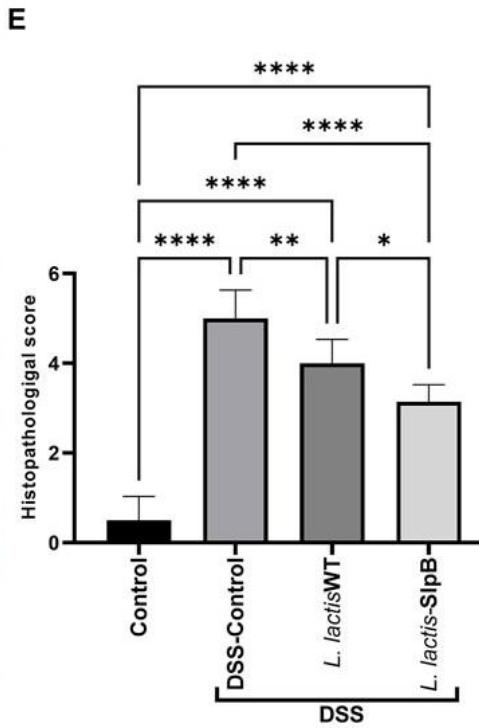
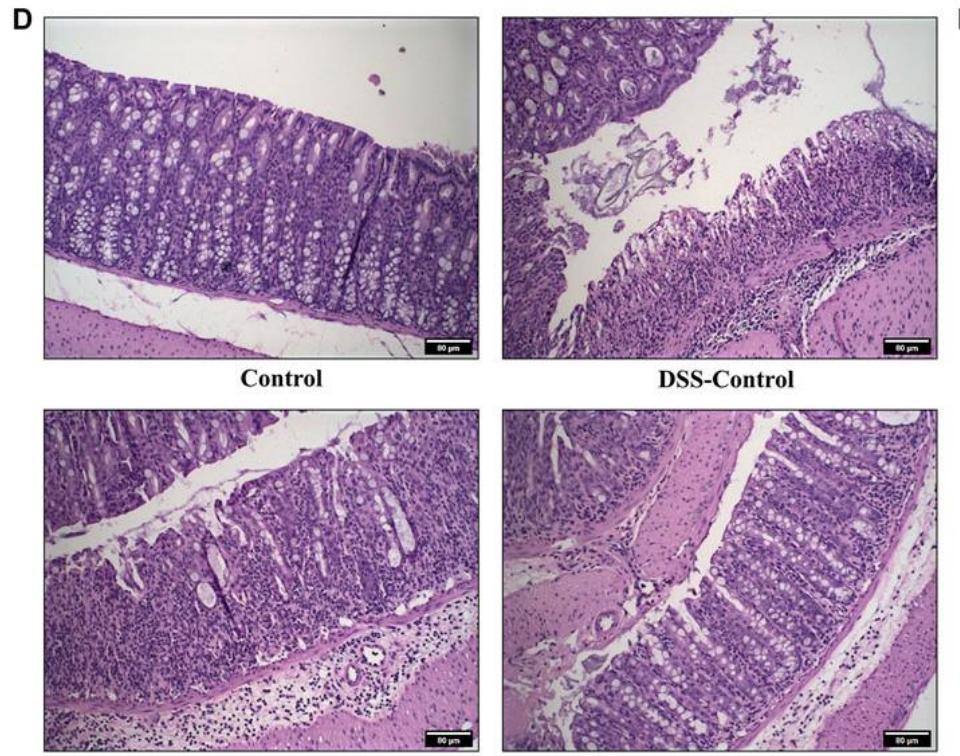
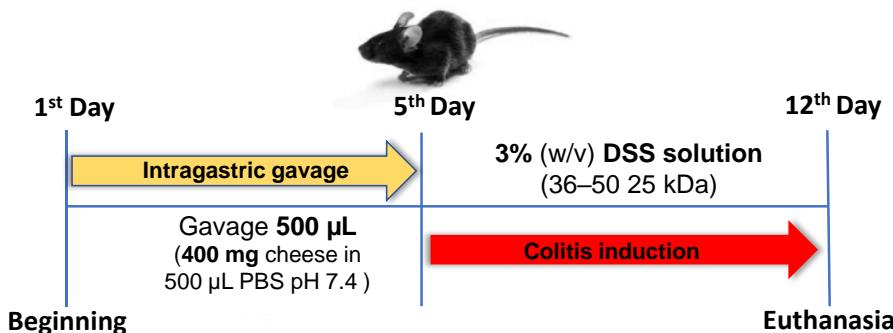


► If we mutate Surface Layer Protein SlpB gene: mucositis challenge



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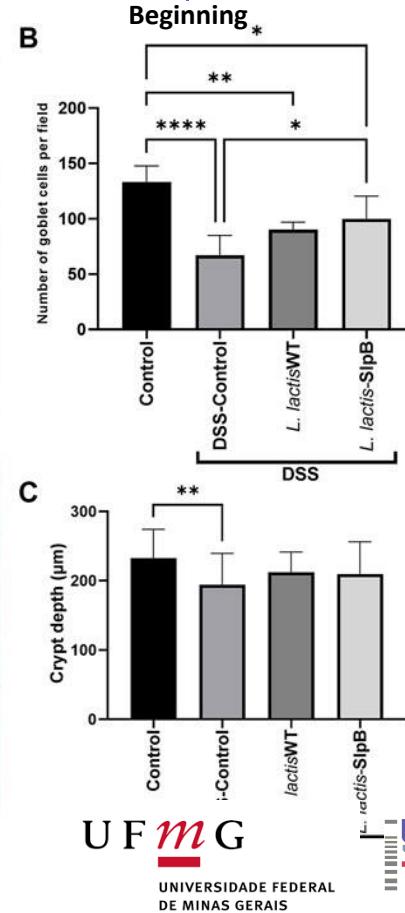
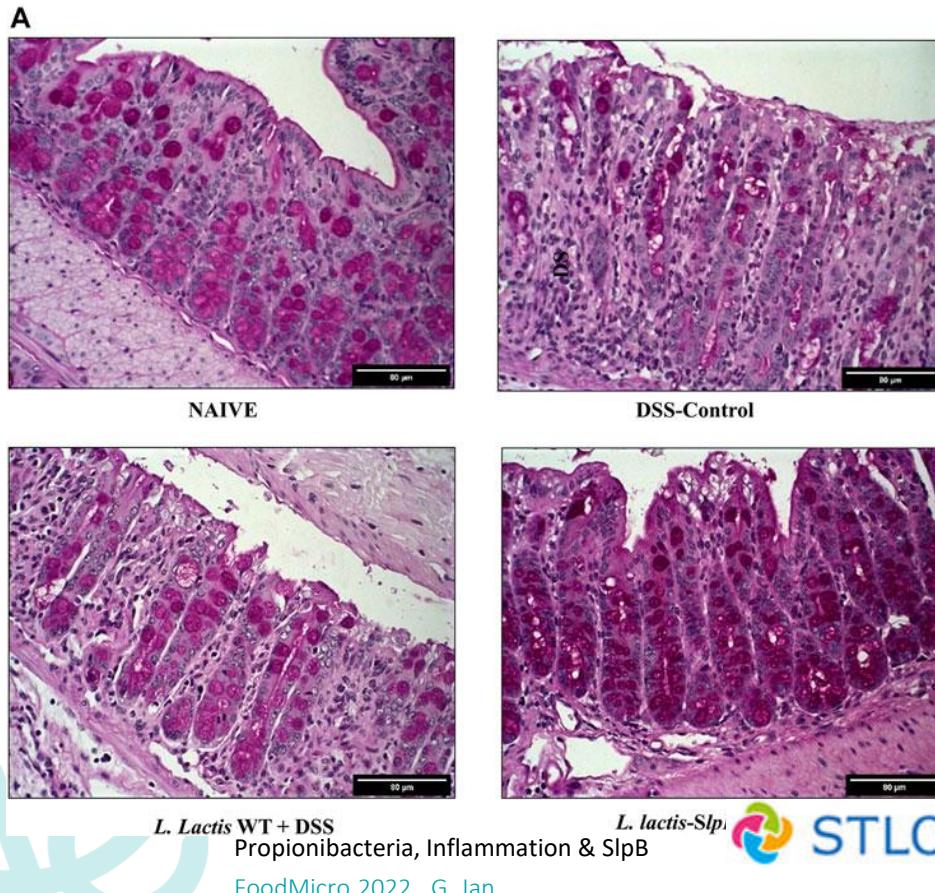
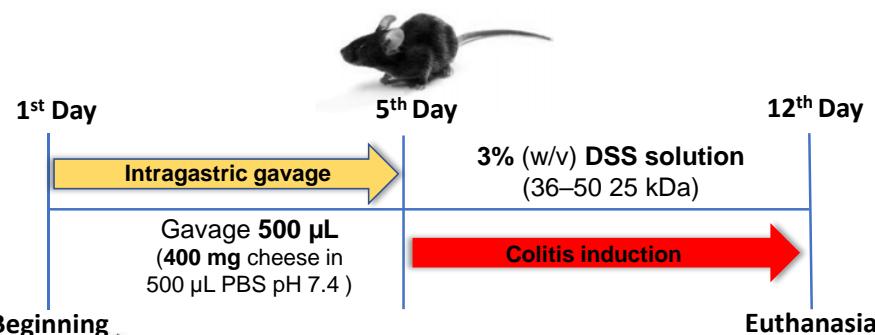
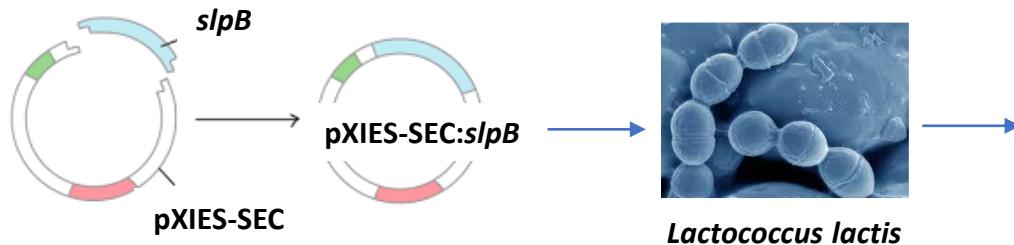
► If we express SlpB in *Lactococcus lactis*: colitis challenge



► **SlpB expression provides *L. lactis* with enhanced anti-inflammatory properties**



> If we express SlpB in *Lactococcus lactis*: colitis



> SlpB expression protects from mucus and goblet cells depletion

Do Carmo et.al., 2021, *Front. Pharmacol.* SlpB Protein Enhances the Probiotic Potential of *L. lactis* NCDO 2118 in Colitis Mice Model



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> Take-home messages



- Propionibacteria: strain-dependent immunomodulatory properties
- Anti-inflammatory effect of propionibacteria-containing cheese in different models of inflammatory diseases
- Surface layer protein SlpB plays a key role in this interaction
- This can be transferred to another bacterium via heterologous expression

INRAe

I ❤ Emmental



I ❤ Γραβιέρα Κρήτης



➤ Thank you for your attention

