

Defending the barrier

Effects of probiotics on endogenous defence mechanisms
Thesis of Femke Lutgendorff, 2009

Chapter 10. Probiotics modulate mast cell degranulation and reduce stress-induced barrier dysfunction *in vitro*.

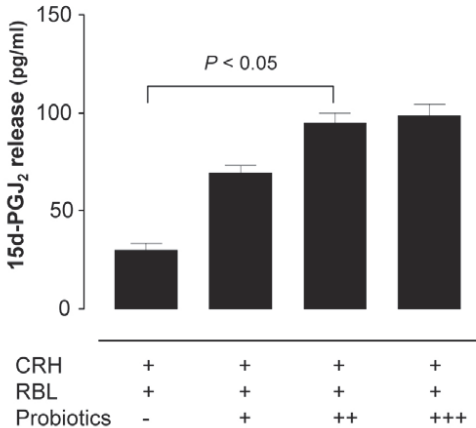
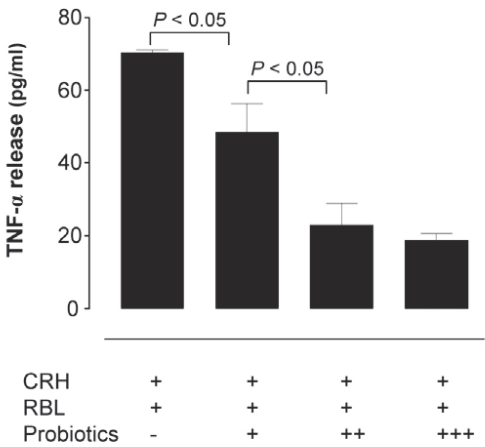
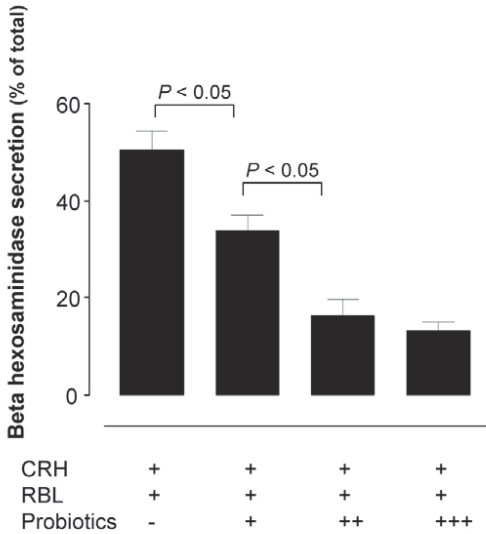
Probiotics change mast cell release

How can the protective effect of Ecologic® 825 pretreatment in stress induced intestinal barrier dysfunction be explained? What is the mechanistic background?

Stress has a negative effect on barrier function of the intestinal mucosa and can contribute to the development of inflammatory bowel diseases¹⁻³. This study focuses on the mechanistic background and the involvement of mast cells. Mast cells play an important role in the onset of barrier dysfunction⁴⁻⁵, but seem to act conversely after treatment with probiotics⁶. How do mast cells contribute to the protective properties of Ecologic® 825 treatment in IBD?

Short summary of study results:

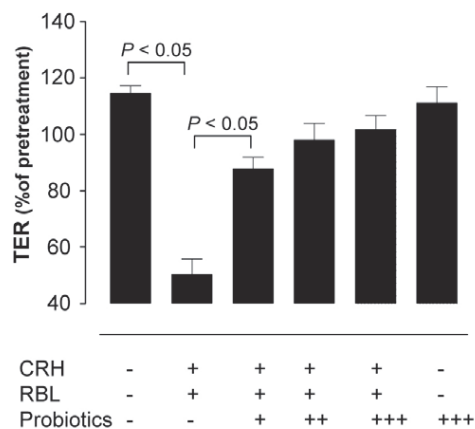
In vitro studies with human colon-derived epithelial cells showed that pretreatment with Ecologic® 825 resulted in decreased production of pro-inflammatory compounds by the mast cells and an upregulation of anti-inflammatory compounds.



The figures show the results of these in vitro experiments. RBL cells (mast cells) were challenged with CRH, which induces stress. After that, proinflammatory compounds Beta hexosaminidase and TNF α were released, and almost no anti-inflammatory 15d-PGJ was formed. Pretreated with Ecologic[®] 825 decreased the levels of pro-inflammatory compounds (as is shown in the top two figures) and increased the release of the anti-inflammatory compound (third figure)

Due to treatment with Ecologic[®] 825, the barrier function of the cells was maintained, even after exposure to stress factors.

This is shown in the figure below:



The barrier function was measured by Trans Epithelial Resistance (TER). The higher the resistance, the better the barrier function. The figure shows that upon treatment with CRH, the TER decreases. But when the cells were pretreated with Ecologic[®] 825, there was less reduction in TER. This effect was dose-dependent.

From this study it can be concluded that Ecologic[®] 825 pretreatment helps to maintain the intestinal barrier function. The study sheds a light on an unexplored working mechanism of pretreatment with probiotics in inflammatory bowel diseases.

References:

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- 2 Soderholm, J. D. *et al.* Augmented increase in tight junction permeability by luminal stimuli in the non-inflamed ileum of Crohn's disease. *Gut* **50**, 307-313 (2002).
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- 4 Santos, J., Yang, P. C., Soderholm, J. D., Benjamin, M. & Perdue, M. H. Role of mast cells in chronic stress induced colonic epithelial barrier dysfunction in the rat. *Gut* **48**, 630-636 (2001).
- 5 Soderholm, J. D. *et al.* Chronic stress induces mast cell-dependent bacterial adherence and initiates mucosal inflammation in rat intestine. *Gastroenterology* **123**, 1099-1108, doi:S0016508502002159 [pii] (2002).
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