

## **Effects of nutritional supplements on the porcine intestinal innate immune response to intestinal pathogens - infection models**

Since the European ban on the use of antibiotics for prevention of infections by bacterial pathogens in animal production, there has been great interest in finding alternatives to antibiotics to support animal health and food safety. Probiotic bacteria as well as nutritional supplements are among possible alternatives being investigated worldwide. Probiotics are defined as living micro-organisms which can confer health benefits to humans and animals. Probiotics, as well as other nutritional supplements, have been found to reduce the rates of infection and recovery periods from diarrhea caused by pathogens in animal herds, as well as providing a number of other reported health benefits to both animals and humans. However, the mechanisms behind these reported beneficial effects remain largely unknown. Our group has been part of a large, multidisciplinary research group investigating the effects and mechanisms of probiotics and other nutritional supplements on animal health, with a particular focus on intestinal innate immune responses. In cooperation with our partners within the SFB852, we have been examining the intestinal responses of piglets in feeding trials with probiotic bacteria such as *Enterococcus faecium* NCIMB 10415 and *Bacillus cereus* var. Toyoi as well as zinc. Furthermore, we have established *in vitro* porcine intestinal epithelial and macrophage cell culture systems for screening of probiotic bacteria and/or factors on innate immune responses of these cell types which play a role in modulating host defense responses against gastrointestinal pathogens such as *Salmonella*.

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### **Funding/Grant Support:**

Collaborative Research Group (SFB) 852 "Nutrition and intestinal microbiota - host interactions in the pig (2010 - 2013)

### **Collaborations:**

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### **Selected Publications:**

Siepert, B., N. Reinhardt, S. Kreuzer, A. Bondzio, S. Twardziok, G. Brockmann, K. Nöckler, I. Szabó, P. Janczyk, R. Pieper and K. Tedin (2013) *Enterococcus faecium* NCIMB 10415 supplementation affects intestinal immune-associated gene expression in post-weaning piglets. *Vet. Immunol. Immunopathol.* (in press).

Scharek-Tedin, L., R. Pieper, W. Vahjen, K. Tedin, K. Neumann and J. Zentek (2013) *Bacillus cereus* var. Toyoi modulates the immune reaction and reduces the occurrence of diarrhoea in piglets challenged with *Salmonella* Typhimurium DT104. *J. Anim. Sci.* (in press).

Bednorz, C., S. Günther, K. Oelgeschläger, B. Kinnemann, R. Pieper, S. Hartmann, K. Tedin, T. Semmler, K. Neumann, P. Schierack, A. Bethe and L. Wieler (2013) Feeding the probiotic *Enterococcus faecium* strain NCIMB 10415 specifically reduces *Escherichia coli* pathotypes adherent to the gut mucosa of piglets. *Appl. Environ. Microbiol.* (in press).

Bednorz, C., K. Oelgeschläger, B. Kinnemann, K. Neumann, R. Pieper, A. Bethe, T. Semmler, K. Tedin, P. Schierack, L.H. Wieler and S. Günther (2013) The broader context of antibiotic resistance: zinc feed supplementation of piglets increases the proportion of multi-resistant *Escherichia coli* *in vivo*. *Int. J. Med. Microbiol.* 303:396-403.

Mafamane, H., I. Szabó, M.F. Schmidt, M. Filter, N. Walk, K. Tedin and L. Scharek-Tedin (2011) Studies on the effect of an *Enterococcus faecium* probiotic on T cell populations in peripheral blood and intestinal epithelium and on the susceptibility to *Salmonella* during a challenge infection with *Salmonella* Typhimurium in piglets. *Arch. Anim. Nutr.* 65:415-430.

Schierack, P., S. Kleta, K. Tedin, J.T. Babila, S. Oswald, T.A. Oelschläger, R. Hiemann, S. Pätzold and L.H. Wieler (2011) *E. coli* Nissle 1917 affects *Salmonella* adhesion to porcine intestinal epithelial cells. *PLoS One* 6:e14712.

Szabó, I., L.H. Wieler, K. Tedin, L. Scharek-Tedin, D. Taras, A. Hensel, B. Appel and K. Nöckler (2009) Influence of a probiotic strain of *Enterococcus faecium* on *Salmonella enterica* serovar Typhimurium DT104 infection in a porcine animal infection model. *Appl. Environ. Microbiol.* 75:2621-2628.