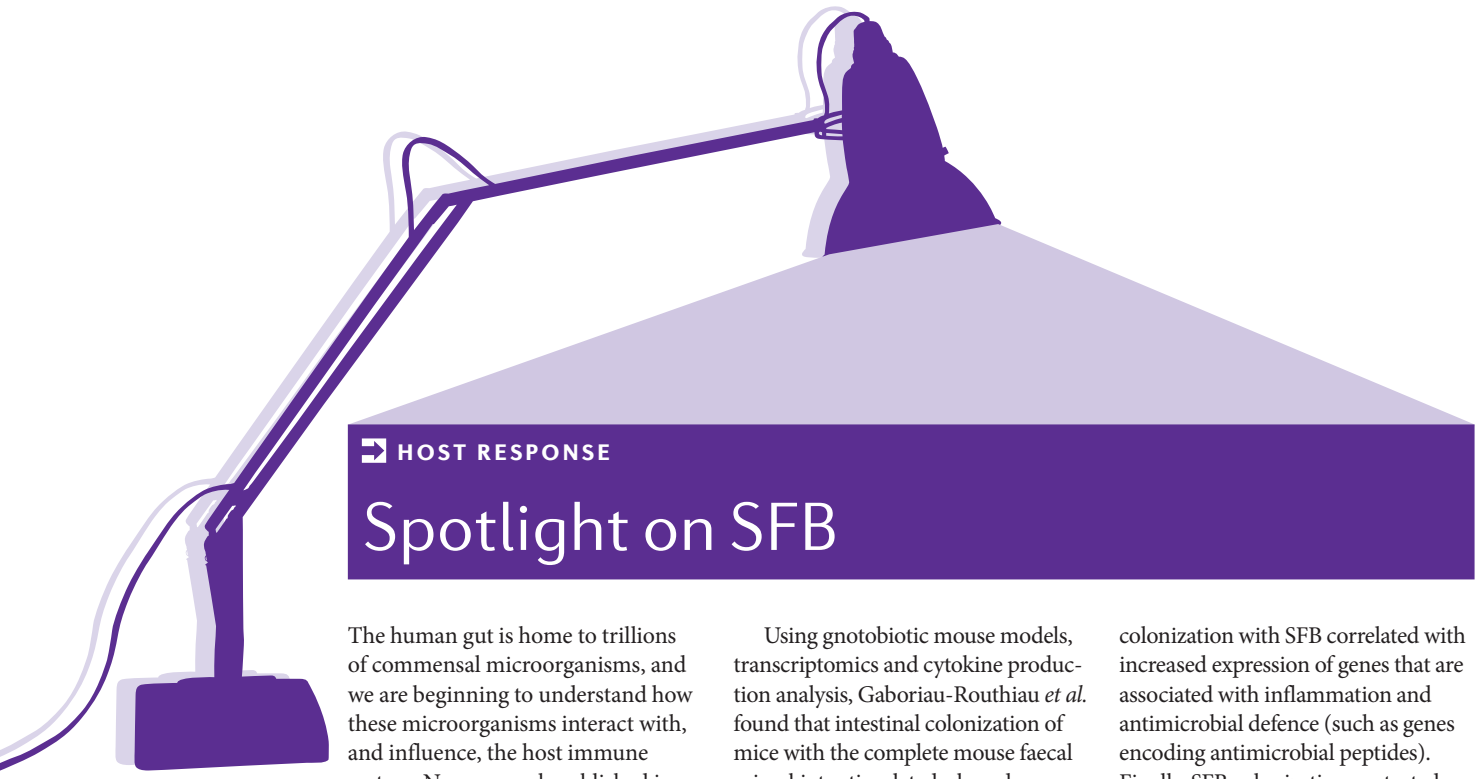

HOST RESPONSE

Spotlight on SFB

The human gut is home to trillions of commensal microorganisms, and we are beginning to understand how these microorganisms interact with, and influence, the host immune system. New research published in *Immunity* and *Cell* now reveals that a specific commensal species, segmented filamentous bacterium (SFB), has a crucial role in the maturation of the adaptive T cell response in the gut.

The commensal microbiota are known to have a key role in immune system maturation and T cell homeostasis in the gut, but a role for a specific member of the microbiota had not been identified. Previous studies have shown that SFB, a species of non-culturable, Gram-positive, anaerobic, spore-forming bacteria that is closely related to *Clostridium*, stimulates the production of secretory immunoglobulin A and the recruitment of intra-epithelial lymphocytes to the gut. The effects of SFB colonization on the immune response in the mouse gut were studied by both Gaboriau-Routhiau *et al.* and Ivanov *et al.*

Using gnotobiotic mouse models, transcriptomics and cytokine production analysis, Gaboriau-Routhiau *et al.* found that intestinal colonization of mice with the complete mouse faecal microbiota stimulated a broad range of pro-inflammatory and regulatory T cell responses. Analysis of gnotobiotic mouse faecal samples by fluorescent *in situ* hybridization revealed that a restricted number of microbial species induced these adaptive T cell responses and that SFB was one such species. Finally, the authors showed that SFB adheres to the luminal surface of Peyer's patches and stimulates the Peyer's patch T cell response, which reinforces previous work showing that adaptive T cell responses to gut microorganisms are initiated in Peyer's patches.

In contrast to this broad effect, the results of the microarray analysis carried out by Ivanov *et al.* showed that SFB specifically induces the accumulation of T helper 17 (T_H17) cells in the small intestine. Colonization of germ-free mice with SFB induced T_H17 cell differentiation, which involved the induction of the acute-phase protein serum amyloid A. Furthermore, colonization with SFB correlated with increased expression of genes that are associated with inflammation and antimicrobial defence (such as genes encoding antimicrobial peptides). Finally, SFB colonization protected the host from the intestinal pathogen *Citrobacter rodentium*.

Although these results differ, both studies identify SFB as a commensal species with a key role in the maturation of the adaptive mucosal immune response in the gut. Further work is needed to establish the exact mechanisms involved. Interestingly, a third recent paper suggests that enteric α-defensins are important for the growth of SFB in the gut and for regulating intestinal microbial ecology.

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ORIGINAL RESEARCH PAPERS Gaboriau-Routhiau, V. *et al.* The key role of segmented filamentous bacteria in the coordinated maturation of gut helper T cell responses. *Immunity* **31**, 677–689 (2009) | Ivanov, I. I. *et al.* Induction of intestinal Th17 cells by segmented filamentous bacteria. *Cell* **139**, 485–498 (2009) | Salzman, N. H. *et al.* Enteric defensins are essential regulators of intestinal microbial ecology. *Nature Immunol.* 22 Oct 2009 (doi:10.1038/ni.1825)