**Modern stressors of gut microbes**

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1. **Introduction:**

Our intestine is inhabited by a large and diverse community of microbes, collectively referred to as the gut microbiota, composed of a thousand of distinct species. We (the host) and our microbiota coexist for better or worse. On one hand, the maintenance of a healthy relationship confers mutual benefices: the microbiota is our partner to fight against pathogens and helps our body to digest food. On the other hand, this friend can also turn to be our best enemy since it may become harmful leading to serious conditions, uncontrolled intestinal inflammation and associated diseases, such as Inflammatory Bowel Diseases (IBD), colon cancer, and metabolic abnormalities. How such an ally can become our enemy? In other words, why and how the intestinal microbiota become deleterious? Our research seeks to address these fundamental questions, and we now have some clues on how this relationship can turn sour.

1. **Impact of dietary component on our gut microbiota:**

Among the various factors that can influence our microbiota, diet is now recognized to play a crucial role, either beneficially or detrimentally. In our laboratory, we previously reported that dietary emulsifiers, which are detergent-like molecules incorporated into most processed foods to improve texture and extend shelf life, induced deleterious modifications of the microbiota population that were associated with a development of intestinal inflammation (Chassaing et al., 2015). In this previous study, we fed mice with two extensively used dietary emulsifiers, polysorbate 80 and carboxymethylcellulose, at doses modeling the broad consumption of combinations of several of them, as commonly incorporated into processed foods. When mice consumed these emulsifiers, we observed drastic changes in the bacterial species that composes mice gut microbiota. These alterations of the composition occurred in a manner that made the microbiota more harmful for the host (more pro-inflammatory). Also, the mucus layer, which lines the intestine wall and is normally devoid of any bacteria, was infiltrated by some bacteria, suggesting that these ones became more invasive when mice consumed emulsifiers (Chassaing et al., 2015). A follow up mechanistic study demonstrated that dietary emulsifiers are directly targeting and modifying the microbiota in a detrimental way (Chassaing et al., 2017).

More recently, we demonstrated that emulsifier consumption also favored cancer development by altering the intestinal bacteria (Viennois et al., 2017). When using a mouse model of colorectal cancer, we observed that dietary emulsifier consumption was sufficient to make the mice more susceptible to develop colonic tumors. Our results also indicated that this enhanced tumor development was linked with the detrimentally altered intestinal microbiota (Viennois et al., 2017). We determined that dietary emulsifier-induced alterations in the microbiota were necessary and sufficient to impair the operation of our intestinal epithelial cells (line of cells delimitating our intestine), a characteristic that is known to govern tumor development. When mice were devoid of any bacteria (germ-free mice), the effects of consuming emulsifiers were eliminated. The transplantation of microbiota from emulsifier-treated mice to non-treated germ-free mice transferred alterations in intestinal epithelial cells to the recipient mice, suggesting that the microbiota plays a central role in favoring tumor development (Viennois et al., 2017).

1. **Conclusion:**

These findings support the concept that disturbing the normally healthy host-microbiota relationship can promote chronic diseases, such as IBD and colon carcinogenesis. While our studies focused on the deleterious effects of dietary emulsifiers, this concept may apply to others modern stressor of the gut microbiota, such as artificial sweeteners (Rodriguez-Palacios et al., 2018; Suez et al., 2014), dietary polysaccharide (Nickerson and McDonald, 2012) and thickening agents (Tobacman, 2001). On a more optimistic note, some other dietary components, such as soluble fibers, may beneficially affect our microbiota, and our ongoing work seeks to identify means to maintain a friendly relationship between the host and the microbiota.

1. **References:**

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