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sciforum-134308: In Vitro Approaches to Assess Xenobiotic/Microbiota Interactions: Insights from Food Additives, Microplastics and Mycotoxins.

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Xenobiotics including food additives, pollutants, and microplastics, are increasingly recognized for their potential to alter the human gut microbiota and its metabolic output. This study employed advanced in vitro gut models to investigate how selected xenobiotic compounds influence microbial ecology and metabolite production in the human colon environment. Two parallel experiments were conducted. In the first, three food texturizers: chitosan, chitosan made by seafood waste and hydroxypropyl methylcellulose (HPMC), were fermented and evaluated via qPCR and GC-MS/SPME to assess microbial composition and volatile metabolites. Results showed that chitosans, particularly with a high degree of deacetylation and solubility, enhanced the growth of beneficial bacteria (e.g., *Bifidobacterium*, *Lactobacillus*) and promoted the production of health-related short-chain fatty acids (SCFAs). In contrast, HPMC favored proteolytic bacteria such as *Clostridiaceae* and led to the accumulation of harmful compounds like p-cresol and skatole, indicating a dysbiotic shift. In the second study, polyethylene (PE) and polystyrene (PS) microplastics were evaluated for their impact on the gut ecosystem. High doses of microplastics reduced SCFA production while promoting the enrichment of opportunistic bacteria (e.g., *E. coli*, *Desulfovibrio*) and the accumulation of toxic aromatic metabolites. These effects are likely driven by bacterial colonization on MP surfaces rather than direct antimicrobial action. A new study is currently in progress focusing on foods, particularly cheeses, contaminated with mycotoxins, to further explore xenobiotic-microbiota interactions in food matrices. Overall, these findings demonstrate the utility of in vitro gut models in evaluating the biological effects of dietary xenobiotics. Both chitosan and microplastics significantly modulated microbial community structure and metabolic function, highlighting potential risks and benefits.



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