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Interakcje związków endokrynnie czynnych obecnych w żywności z mikrobiotą jelitową człowieka

Interactions of endocrine-disrupting compounds present in food with human gut microbiota

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Abstract

Interactions of endocrine-disrupting compounds present in food with human gut microbiota

Food contamination is the main route of human exposure to endocrine-disrupting compounds (EDCs), including bisphenols (BPs), whose negative impact on the composition and function of gut microbiota (GM) and intestinal homeostasis is becoming an increasingly serious public health issue worldwide. In this dissertation, a comprehensive analysis was conducted on the impact of bisphenol A (BPA) and its analogs – bisphenol S (BPS), bisphenol F (BPF), and tetramethylbisphenol F (TMBPF) – on the taxonomic and functional composition of human GM, as well as an assessment of the GM's ability to eliminate the studied compounds and modify their biological activity in vitro. GM samples were exposed to BPs at a concentration of 1 mM for 48 h under anaerobic conditions. Firstly, the impact of BPA, BPS, BPF, and TMBPF on GM's taxonomic and metabolic profiles was evaluated, particularly emphasizing the production of short-chain fatty acids (SCFAs). In subsequent stages of the study, the ability of GM to remove the studied BPs and its effect on the estrogenic activity of BPs were assessed. Ultimately, the impact of GM metabolites from exposure to BPs on the viability of intestinal epithelial cells (Caco-2) was analyzed. BPA, BPS, and BPF significantly disrupted the taxonomic composition of GM and metabolite production, leading to a significant decrease in SCFA production. TMBPF caused fewer changes than the other BPs, suggesting it may be a safer alternative for producing food contact materials (FCMs). No biotransformation of BPs by GM was observed; however, a process of adsorption was noted, the extent of which increased with the hydrophobicity of the compounds in the order BPS > BPF > BPA > TMBPF. The observed decrease in the estrogenic activity of BPs was mainly due to their adsorption by GM. Exposure of intestinal epithelial cells to supernatants previously treated with BPA, BPF, and TMBPF led to a significant decrease in the viability of Caco-2 cells. These results suggest that exposure of GM to BPs may lead to the formation of harmful metabolites or the reduction of beneficial metabolites produced by GM under the influence of the studied compounds.

Keywords: gut microbiota, bisphenols, endocrine disrupting compounds, food safety

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