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Baker's yeast (1→3)-β-D-glucan Influences Insulin Sensitivity in Mice with Humanized Obese Diabetic Microbiome in High-Fat Diet-Induced Obesity

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Abstract

Introduction: β-glucans are naturally occurring polysaccharides which have isoform specific immunomodulatory and metabolic properties[(1)]. Certain yeast (1→3)-β-D-glucan isoforms improve cholesterol[(2)], glucose[(3)] and lipid homeostasis[(4)]. Feeding (1→3)-β-D-glucan alters the microbiome of high-fat diet (HFD) induced obese (DIO)/type 2 diabetic (T2D) mice[(5)]. Here we investigated the potential impact of baker's yeast (1→3)-β-D-glucan in mice humanized with gut microbiomes from either obese healthy versus obese diabetic subjects on immune-metabolism within the context of high-fat feeding.

Methods: C57Bl/6J male mice received an antibiotic cocktail of Ampicillin, Metronidazole, Vancomycin, Imipenem and Ciprofloxacin HCl in their drinking water for 6 weeks to diminish the endogenous gut microbiota. Mice were inoculated with microbiota samples obtained from obese healthy (OBH) or diabetic (OBD) humans twice daily for 3 days by oral dosing. Mice were fed a low-fat diet (LFD) (10% kcal) for 4 weeks followed by HFD (45% kcal) with/without baker's yeast (1→3)-β-D-glucan (βG), for 9 weeks. Weight, feed intake, glucose tolerance (1.5g/kg), insulin tolerance (0.5U/kg), hepatic and skeletal lipid levels were examined. Tissue specific molecular markers of metabolism and inflammation, and gut microbiome analysis are being determined to compliment the phenotypic data.

Results: OBH mice were more glucose tolerant and insulin sensitive than OBD mice, despite equal weight gain and adipose tissue mass. Fasting HOMA-IR, attributable to higher insulin concentrations, was higher in OBD compared to OBH mice. βG supplementation reduced HOMA-IR in OBD mice ($P < 0.0611$). Hepatic triacylglycerol (TAG) and cholesterol levels were also higher in OBD mice, which were prevented by βG supplementation. Hepatic proteomic, caecal microbiomic and metabolomic analysis is on-going in order to ascertain the impact of the OBD versus OBH dysbosis with/without βG supplementation with specific attention on immune-metabolism.

Conflict of Interest

There is no conflict of interest

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