Sugar kelp consumption inhibits adipose tissue inflammation and fibrosis in diet-induced obesity mice

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In obesity, inflammation and fibrosis in adipose tissue induce systemic inflammation and insulin resistance, triggering the development of obesity-associated diseases. We investigated whether the consumption of U.S.-grown sugar kelp can prevent obesity-associated adipose tissue inflammation and fibrosis using a diet-induced obesity mouse model. Male C57BL/6J mice at 7 weeks' age were divided into three groups: a low-fat (LF) control, a high-fat/high-sucrose/high-cholesterol (HF) control, or HF containing sugar kelp (HF-Kelp, 6.0% dried sugar kelp powder by wt). After 16 weeks on experimental diets, HF-kelp group showed significant decreases in body weight gain, serum triglyceride and total cholesterol, and glucose intolerance compared with the HF group. Mice fed HF-kelp showed less epididymal white adipose tissue (eWAT) weights and total body fat measured by EchoMRI concomitantly with smaller adipocytes compared with HF-fed mice. Also, mRNA levels of inflammatory genes in eWAT were decreased with HF-Kelp consumption compared to HF control, which was further supported by significant decreases in the number of crown-like structures, a hallmark feature of WAT inflammation. Additionally, HF-kelp consumption reduced fibrogenic gene expression and collagen accumulation evidenced by Sirius red-positive area in eWAT. Interestingly, mice fed HF-Kelp showed a significant increase in physical activity measured by an indirect calorimetry. In conclusion, our results demonstrate that sugar kelp consumption inhibits HF-induced body weight gain, likely due to increased physical activity, which further prevent the development of inflammation and fibrosis in WAT.