P2. Investigating the effect of different mineral compositions of deep ocean water on the prevention of high fat diet-induced-non-alcoholic fatty liver

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1. Introduction

Non-alcoholic fatty liver disease (NAFLD) has become the most prevalent chronic liver disease in recent years. It is diagnosed when the accumulation of triglycerides within hepatocytes exceeds 5% of liver weight. The accumulated lipid droplets in the liver lead to lipid peroxidation and the inflammatory response. Finally, nonalcoholic fatty liver develops into nonalcoholic steatohepatitis.

Deep ocean water (DOW) contains high levels of minerals such as magnesium (Mg), calcium (Ca), and potassium (K). Previous research indicated that DOW reduced high-fat diet-induced obesity and hepatic lipid accumulation. DOW containing high magnesium and calcium ion reduced serum lipid levels and total cholesterol (TC) levels, and modulated blood pressure.

2. Motivation

DOW has been proven to improve cardiovascular disease and fatty liver. However, various mineral compositions of DOW may have different protective effects against high fat diet-induced in cases of nonalcoholic fatty liver disease. The present study compared the effects of DOW (D), DOW with low potassium (D-Low K), and DOW with low calcium and potassium (D-Low CaK) in order to examine its ability to prevent nonalcoholic fatty liver disease in a mice model fed with high fat diet.

3. Result and discussion

In this study, DOW reduced serum and liver triglyceride (TG) and TC and serum AST and ALT. Furthermore, DOW improved NAFLD by increasing the anti-oxdative enzyme system, superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and glutathione reductase (GRd)), and repressing fatty acid biosynthesis factors (peroxisome proliferator-activated receptor alpha (PPAR-α), fatty acid synthase (FAS) and acetyl-CoA carboxylase (ACC)). However, when the calcium and/or potassium ions were removed from the DOW, the reduction effect on TG level, inhibition of ACC, FAS, and PPAR-α expressions, and activation of SOD, CAT and GRd actvivities expression were weaker.

Therefore, in addition to magnesium ion, both calcium and potassium ions were important ions for the regulation of TG biosynthesis. This study suggested that magnesium, calcium and potassium ions of DOW would have a synergism effect on repressing the fatty acid biosynthesis pathway, increase the antioxidation system, and finally contribute to protection against the development of NAFLD.