

ABSTRACT:

There is a crucial need to identify and test sustainable alternatives to fish oil as a means to supplement dietary omega (n-3) fatty acids to impact the global health problem of metabolic syndrome and its associated diseases. Accordingly, *Echium* oil has a high content of the n-3 fatty acid stearidonic acid (SDA), a precursor to the bioactive lipids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) found in fatty cold-water fish, and known to improve metabolism and may help delay the onset of or prevent diabetes. To characterize the effects of dietary Echium oil (EO) vs. fish oil (FO), the oils were formulated into either a low-fat (10% kcal; LF) or high-fat (60% kcal; HF) diabetogenic diet, compared to a low-fat and high-fat control (no n-3 supplementation; CON) diet, and fed to male C57BL/6Tac mice for 12 weeks. EO and FO diets had no effect on blood glucose concentrations or plasma insulin levels throughout the study. The EO-enriched HF diet improved glucose tolerance by week 12 compared to the CON ($p<0.05$) and FO ($p<0.1$) groups. EO supplementation reduced visceral fat weight without affecting body mass, promoted a metabolically favorable high polyunsaturated fatty acid (PUFA) to low saturated fatty acid (SFA) ratio in adipose and muscle tissues compared to the CON and FO diet groups, and led to higher tissue EPA and DHA concentrations compared to CON ($p<0.1$). Tissue EPA and DHA in EO were not as high as the concentrations found in mice fed the FO diets. In conclusion, EO-supplemented diets in mice appear to have similar, but distinct effects from FO diets that may be exploited in future strategies to curtail metabolic disorders.