

Various Sources of N-3 Polyunsaturated Fatty Acid Supplementation Modulate Mitochondria Membrane Composition and Function

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Abstract : Long term taking high fat diet can lead to over production of energy, result in accumulation of body fat, dyslipidemia and increased lipid metabolism in the body. Over metabolism of lipid results in excessive reactive oxygen species and oxidative stress, may also cause mitochondrial dysfunction and cell death. Krill oil, fish oil and linseed oil are good sources of n-3 polyunsaturated fatty acids (PUFA). The present study investigated the effect of high fat diet and various oil rich of n-3 fatty acids on mitochondrial function and cell membrane composition. Six-weeks old male Sprague-Dawley rats were randomly divided into 8 groups including: control group, high fat diet group, low dosage and high dosage krill oil group, low dosage and high dosage fish oil group, and low dosage and high dosage linseed oil group. After 12 weeks of experimental period, the low dosage krill oil, fish oil group and linseed oil group with different dosage prevented mitochondrial dysfunction caused by high fat diet. The supplementation of different oils increased plasma, erythrocyte and mitochondrial n-3/n-6 ratio and further increased the proportion of PUFA in erythrocyte and mitochondrial membrane. It also decreased serum triglyceride (TG) and low density lipoprotein cholesterol (LDL-C) concentration. However, there was no significant change in serum total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), biomarker of liver function, glucose, insulin, homeostasis model assessment-insulin resistance (HOMA-IR) and plasma malonaldehyde (MDA) concentration when compared with high fat diet group. The supplementation of different sources of n-3 PUFA can maintain mitochondrial function and modulate cell membrane fatty acid composition in high fat diet conditions, and there is a positive relationship between mitochondrial function and mitochondrial membrane composition.

Keywords : fish oil, linseed oil, mitochondria, n-3 PUFA

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