

## Effects of exercise and dietary polyunsaturated fatty acid intervention in alleviating the detrimental effects of streptozotocin-induced diabetes in rats

### ABSTRACT

Diabetes mellitus is now becoming a major health problem with an increasing prevalence rate. The risk of diabetes mellitus results from lifestyle changes which is related to diet and physical activities. Diabetic patients would have the clinical characteristics of diabetes mellitus such as hyperglycaemia and lipid abnormalities which significantly contribute to produce complications of diabetes mellitus. Attention to diet and weight management, combine with exercise may help to improve the glycaemic control and lipid profiles. A prompt and adequate treatment to prevent or delay the complications of diabetes mellitus by alleviating these deleterious characteristics of diabetes mellitus is needed. Thus, the present study was undertaken to assess the potential of exercise and dietary polyunsaturated fatty acid (PUFA) intervention in alleviating detrimental effects of diabetes mellitus, particularly on the blood glucose level and blood lipid profiles. The efficacy of exercise and dietary PUFA intervention in streptozotocin (STZ)-induced diabetic rats was investigated on the basis of body weight, blood glucose levels and blood lipid profiles. A total of 32 Sprague-Dawley male rats weighing between 250-300 grams were divided equally into eight groups. Diabetes mellitus was induced by giving a single intraperitoneal injection of STZ at the dosage of 40 mg/kg. Four groups were exercised daily by swimming for 8 weeks while the other four groups were not subjected to any exercise. Menhaden oil, soybean oil and butter were incorporated into the treatment diets for both exercise and non-exercise groups. The treatment diets were defined as follows: rat chow diet only (Control diet), rat chow added with 6.66% (w/w) menhaden oil and 3.34% (w/w) menhaden oil and 6.66% (w/w) soybean oil (Diet 2) and rat chow containing 10% (w/w) butter (Diet 3). Experiment I was conducted to determine the body weight and blood glucose levels of rats at week 0, 2, 4, 6 and 8. In Experiment II, blood was collected at the end of 8 weeks for the determination of blood lipid profiles that encompassed: Triglycerides, Total cholesterol, High-density lipoprotein (HDL)-cholesterol and Low-density lipoprotein (LDL)-cholesterol. The results obtained from this study showed that exercise and dietary PUFA intervention can be considered as the integral components of treatment and prevention strategy in diabetes mellitus by improving the body weight control and blood glucose levels. The exercise and dietary PUFA intervention groups (2 groups, Diet 1 and 2) significantly reduced the body weight gain and blood glucose level compared to the non-exercise groups (2 groups) (average from 2 groups; body weight gain: 237 vs 289; blood glucose level: 8.99 vs 16.43 mmol/L) over a period of eight weeks in STZ-induced diabetic rats. This study also has documented a significance of exercise and dietary PUFA intervention to improve the lipid profiles by lowering the triglycerides, total cholesterol and LDL- cholesterol levels as compared to the non-exercise group (average from 2 groups; 0.43 vs 1.34, 1.04 vs 1.39 and 0.38 vs 0.47 mmol/L, respectively). Thus, results obtained in the present study suggested that exercise and dietary PUFA intervention may have an impact on alleviating the detrimental effects of diabetes mellitus by improving the body weight gain, blood glucose levels, and blood lipid profiles.