

Effect of chain length and saturation of the fatty acids in dietary triglycerides on lipid metabolism in Wistar rats

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Abstract

We investigated the effect of the chain length and the degree of saturation of fatty acids in dietary triglycerides on serum lipid profiles and hepatic lipid metabolism in Wistar rats. Fat component of the basal diet (soybean oil) was replaced with fats with fatty acids of different chain lengths and saturation and the serum lipids were monitored for 150 days. Principal component (PC) analysis of serum lipid components was related to chain length and saturation. The combined effect of chain length and saturation on PC 1 scores was evaluated by multiple regression analysis. The results indicated that average chain length of the fatty acids of triglycerides has a higher influence on the quality of serum lipid parameters than the average degree of saturation. Expression of selected genes responsible for lipid metabolism showed similar trends in medium chain saturated and long chain polyunsaturated diet groups.

Practical applications

Dietary lipids contain a wide range of saturated and unsaturated fatty acids with different chain lengths. Overall contribution of these different fatty acids decides the health effects of the lipids in the diet. Present study shows that the fats with medium chains and higher degree of saturation and fats with long chains and higher degree of unsaturation (lower degree of saturation) affect serum lipid parameters and expression of hepatic genes involved in the lipid metabolism in a similar manner. Such information is important for physicians to plan dietary schemes to improve the nutritional health and manage the noncommunicable diseases.

KEYWORDS

antioxidant activity, dietary fatty acids, fatty acid chain length, gene expression, lipid profiles, saturated fat

1 | INTRODUCTION

Fatty acid composition is the main decisive factor of health effects of fats. Many studies have categorized fatty acids based on saturation or unsaturation in the evaluation of health effects (Okere et al., 2006). Saturated fatty acids are considered to confer negative health effects such as elevated serum cholesterol levels and

increased risk of coronary heart disease (CHD) (Liu et al., 2017). Monounsaturated fatty acids have beneficial effects on lipid profiles (Wharburg, 2004). Epidemiological studies and clinical trials indicate that n-3-polyunsaturated fatty acids (n-3-PUFA) are known to cause beneficial effects on cardiovascular disease, though there are different opinions (Ander et al., 2003). Clinical trials with healthy young adults have indicated that the diets rich in the long chain saturated