

Energy metabolism in albino rat when fed dietary formulations of n-3 polyunsaturated fatty acids (PUFA)

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(Accepted : September, 2008)

Consumption of fish especially that of marine, which is a rich source of n-3 polyunsaturated fatty acids (PUFA) prevent the occurrence of coronary heart diseases. Besides, n-3 PUFA are essential in growth and development of humans. Levels of ATP and ADP were more with higher significance ($P < 0.001$) when compared to AMP in both liver and muscle of male and female albino rats fed dietary formulations of high n-3 PUFA (Control < Low n-3 PUFA diet < Medium n-3 PUFA diet < High n-3 PUFA diet). Energy charge (EC) represents the levels of ATP and ADP in both sexes of rats fed dietary formulations of n-3 PUFA, whereas the levels of AMP were more in rats fed low n-3 PUFA diet (Control > Low n-3 PUFA diet > Medium n-3 PUFA diet > High n-3 PUFA diet) and low energy charge is a reflection of higher level of AMP.

Key words : n-3 PUFA, Energy charge, ATP, Metabolism, Albino rat.

INTRODUCTION

The metabolism of individual polyunsaturated fatty acids (PUFA) may be influenced differently by nutritional status and nutritional intake (Nilsson *et al.*, 1996). The energy liberated by catabolism is not used directly by cells but is applied instead to the formation of certain high-energy compounds, which serve as carriers of energy. Structurally these compounds are anhydride, amidine or thioester derivatives of a phosphoric acid or a carboxylic acid (Ramesh Chand, 1994). Adenosine triphosphate (ATP), Adenosine diphosphate (ADP) and Adenosine monophosphate (AMP) are the most important adenylate nucleotides in the animal body. Knowledge on fish oils especially PUFA is limited and so in the role of PUFAs in human nutrition and health, hence this also substantially contributes knowledge on fish physiology, biochemistry and aquaculture and its applied studies and ultimately to the field of medicine and health education. Besides, marine fish *Rastrelliger kanagurta* which showed higher levels of PUFA in the muscle and liver, the freshwater fishes also have PUFA in the form of alphalinolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) can also be recommended as sources of PUFA and we can include these for nutritional requirements (Nagabhushan Reddy and Basha Mohideen, 2005).

Most of the vital activities of the animal cell such as secretion or contraction, rely on the conversion of ATP-ADP phosphate transfer system and for some biosynthetic processes, the energy is derived from the hydrolysis of ADP to AMP (Hoar, 1976). As a primary energy source,

these adenylate compounds serve as allosteric modulators in many important metabolic reactions. Therefore, an attempt was made in this study to estimate the energy metabolism in albino rat when fed dietary formulations of n-3 PUFA.

MATERIALS AND METHODS

The more commonly used rats and mice; they have blood lipid profiles and responses to dietary fatty acids that resemble those of humans (Fernandez, 2001). Thus, the albino rat, *Rattus norvegicus albinus* of Wistar strain was selected for the experiment.

Experimental design:

The animals were divided in to 4 groups of 12 rats each (6 males and 6 females). Males weighing 180 ± 10 g (aged about 120 days) and females weighing 160 ± 10 g (aged about 110 days) were bred in central animal house. All the rats were housed in plastic cages under controlled conditions of 12h light and 12h dark cycle, 50% humidity and at $30 \pm 2^\circ\text{C}$ and were maintained in accordance with the guidelines of National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India.

These experimental rats of both the sexes were fed different formulations of dietary n-3 PUFA (300-400g) (prepared by mixing different amount of muscle of a marine fish mackerel, *Rastrelliger kanagurta* which is a rich source of n-3 PUFA with the standard pellet diet) at regular intervals of 5-6h and water was given *ad libitum* for a period of 6 weeks.

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