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Effect of Age on Serum Cholesterol and Triglyceride Levels in the Experimental Rats

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ABSTRACT

The feeding of stock diet to different ages, four, eight and twelve months of, rats (Sprague – Dawley) showed that serum cholesterol level of 19 female rats was statistically significant difference at 5 % level among three ages 85.42, 112.11, 122.21 mg/dl in four, eight and twelve months rats respectively. In 14 male rats, the results showed that serum cholesterol level was statistically significant difference between four and eight monthed rats whereas there was no significant difference between eight and twelve monthed rats. The result of serum triglyceride level was fluctuate in both male and female rats among four, eigth, twelve months of age. The results of this study indicated that age of the experimental rats may effect on the serum cholesterol level especially in the female rat.

Key words: cholesterol, triglyceride, serum, age, rats

INTRODUCTION

Edible fats are important food components that enhance palatability by providing texture and enhancing flavour. They also provide essential fatty acids and fat-soluble vitamins. We enjoy eating foods containing fat, but there is a negative side; excessive consumption may not be good for health. The question is what are the right amounts and types of fat we should use and eat ? The average consumer is somewhat aware of the relationship between dietary fat and health. Despite this, there is still a great deal of confusion formulate hypotheses and express themselves in terms of probabilities. Journalists look for news, which is not always balanced. Governments and industry translate complex research findings into information that can be used make policies and to educate the consumer. A balance must be achieved between complicated scientific communication and information that can be more easily communicated and understood by the public.

More than 20 years ago the research groups of Keys and Hegsted in the United States independently published the results of their many experiments on healthy men eating a wide variety of dietary fats. They found that saturated fat raised total blood cholesterol levels compared with a nutritionally equivalent carbohydrate intake. It had been thought since 1956 that polyunsaturated fats (linoleic acid rich) reduced blood cholesterol, whereas monounsaturated fats (oleic acid rich) had no effect. Although techniques to measure the levels of LDL cholesterol and HDL cholesterol were not well developed at that time, it was concluded that these changes in total cholesterol appeared to be the result of changes in LDL cholesterol. These findings formed the basis for

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dietary guidelines and recommendations in the Western industrialised countries in the 1970s and 1980s. (Truswell, 1995).

Dietary principles aimed at reducing the risk of coronary heart disease

- Total fat intake should be equal to or less than 30 % of total energy intake.
- Saturated fat intake should be less than 10 % of total energy intake.
- Polyunsaturated fat should constitute up to10 % of total energy intake (of this, 10 - 20 %, i.e., 1-2 % of total energy, should be n-3 and the rest n-6), and it should contain adequate vitamin E, at least 0.6 mg/g polyunsaturated fat. The balance of dietary fat should be monounsaturated.
- Dietary cholesterol intake should be less than 300 mg/day.
- Dietary fiber (including soluble fiber) intake should be 25-30 g/day.
- Sodium intake should be less than 100 mg (6 g salt) / day.
- Energy intake should be achieve and maintain desirable body weight.
- Eat plenty of fish (including fatty fish), vegetables, fruits and whole-grain cereal.

Plus, exercise regularly and do not smoke

Most dietary fats and oils are triacylglycerols (also called triglycerides), which consist of three fatty acids attached to a glycerol molecule. Their impact on coronary heart disease (CHD) risk depends to a large extent on the types of fatty acids they contain. Fatty acids are differred in their chain length (number of carbon atoms) and degree of saturation (number of double bonds in the carbon chain) and they can effect blood cholesterol levels and, hence, risk for CHD (Kris–Etherton, 1995).

All dietary fats and oils consist of mixtures of three categories of fatty acids:

- saturated – no double bonds.
- monounsaturated – one double bond.
- polyunsaturated – more than one double bond.

The predominant saturated fatty acids in food include lauric acid, myristic acid, palmitic acid, and stearic acid. With the exception of stearic acid, which is believed to have no effect on blood cholesterol levels. These saturated fatty acids raise blood cholesterol and low-density lipoprotein (LDL) cholesterol levels (Grundy and Denke, 1990).

Monounsaturated fat was once believed to have a neutral effect on blood cholesterol levels but recently epidemiologic and clinical intervention studies indicated that prudent diets rich in oleic acid, the predominant monounsaturated fatty acid, lower blood total cholesterol and LDL cholesterol levels when substituted for diets rich in saturated fatty acids (Loscalzo and Stunchi, 1991).

Polyunsaturated fatty acids may be classified by the location of the first double bond from the methyl (CH_3) end. Omega-6 fatty acids include the essential fatty acid linoleic acid; omega-3 fatty acids include the essential fatty acid α - linolenic acid. When substituted for saturated fatty acids in the diet, polyunsaturated fatty acids-especially linoleic acid-actively lower blood total cholesterol and LDL cholesterol levels (Kris-Etherton et al., 1990).

Public health recommendations for the treatment of high blood cholesterol levels include decreasing the consumption of saturated fatty acids total fat. Reducing total fat and/or emphasizing fats that are rich sources of monounsaturated and polyunsaturated fatty acids facilitates decreasing the amount of saturated fat in the diet. Americans consume on average 12-14 % of calories from saturated fatty acids and 34-36 % of calories from total fat (Wright et al., 1991; Tippett and Goldman, 1994; Daily dietary fat and total food-energy intakes-third National Health and Nutrition Examination Survey, 1994). Dietary recommendations advise that no more than 30 % of calories come from all fats and that less than 10 % of calories come from saturated fatty acids.

From reviewing literature, the research

papers about effect of age on blood lipid levels is very rare, so in this paper we have tried to present information about effect of age on serum lipid levels in the experimental rats.

MATERIALS AND METHODS

Animals : Nineteen female and fourteen male Sprague – Dawley rats of the following ages were used : four, eight and twelve months, the corresponding mean weights of the females in these age groups were 265, 307 and 332 g ; and 409, 485 and 510 g, respectively for the males. The animals had free access to water and experimental diet having the following composition and chemical analysis of experimental diet according to the deliver shown in Table 1 and Table 2.

The studies were carried out in the mornings. The animals were anesthetized with ether and blood was collected by heart puncture. Serum was removed after centrifuging with 2500 rpm and was analysed for cholesterol and triglyceride levels.

Statistical analysis

Datas were statistically analysed using Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test. A value of $p < 0.05$ was considered significant.

RESULTS AND DISCUSSION

Table 3 showed that the level of cholesterol in serum was statistical significantly increased from four to eight and from eight to twelve months in female rats. The result in Table 4 showed that serum cholesterol levels significantly changed from four to eight months and remained unchanged from eight to twelve months. In both of female and male young rats (four months) the cholesterol level was thus below 100 mg/dl where as serum cholesterol level of the older rats (eight and twelve months) were higher than 100 mg/dl.

The level of serum triglyceride both in female and male rats were fluctuate among four, eight, twelve months of age.

The serum triglycerides showed a different course with age. They increased slightly from four to eight months and strikingly from a value of 113.86 mg/dl on the eight months to 88.43 mg/dl at the age of twelve months in male rat. In female rats, serum triglycerides levels showed significantly increased from four months to eight months and significantly decreased at the age of twelve months.

In agreement with the previous findings by Carlson et al (1968), the level of cholesterol in plasma remained essentially unchanged from 1 to 4 months in order to increase significantly from 4 to 9 and from 9 to 18 months. In young rats (1 and 4 months) the cholesterol level was there around 100 my/dl which a level of around 300 was reached in the oldest (18 months).

Table 1 Composition of experimental diet.

Composition	g/100 g
Corn meal	24
Fish meal	20
Soybean extract	12
Wheat bran	15
Rice flour	20
Mineral mixture	3
Vitamin mixture	2
Sugar	2
Vegetable oil	2

Table 2 Chemical analysis of experimental diet.

Composition	g/100 g	mg/g
Protein	22.86	
Fat	12.95	
Moisture	12.33	
Ash	9.07	
Dietary fiber	15.45	
Cholesterol		0.96

Table 3 Means of serum cholesterol, triglyceride levels and body weight in nineteen female rats of the following ages : four, eight and twelve months.

Age (month)	Cholesterol (mg/dl)	Triglyceride (mg/dl)	Body weight (g)
4	85.42[a]	88.58[a]	264.79
8	112.11[b]	127.89[c]	307.00
12	122.21[c]	106.74[b]	332.53

Values in a column with different superscripts are significant different, $P < 0.05$.

Table 4 Means of serum cholesterol, triglyceride levels and body weight in fourteen male rats of the following ages : four, eight and twelve months.

Age (month)	Cholesterol (mg/dl)	Triglyceride (mg/dl)	Body weight (g)
4	79.79[a]	108.29[a]	408.64
8	156.43[b]	113.86[b]	485.14
12	157.71[b]	88.43[a]	510.07

Values in a column with different superscripts are significant different, $p < 0.05$.

The plasma triglycerides showed a different course with age. They increased slightly from 1 to 4 months and strikingly from a level of 0.8 m mole/l on the fourth month to 2.5 m mole/l at the age of 9 months and then they remained constant.

In conclusion this study showed that the level of cholesterol in serum was significantly increased from four to eight and from eight to twelve months in female rats. In male rats, serum cholesterol levels significantly changed from four to eight and remained unchanged from eight to twelve months. The results of this experiment indicate that age of experimental rats may effect on the serum cholesterol level especially in the female rat.

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