SERUM AND LIVER CHOLESTEROL LEVELS IN EXPERIMENTAL FEVER

T. D. Lukina

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A single intravenous injection of pyrogenal (10 μg/kg) or a culture of Bacillus mesentericus ($3 \cdot 10^9$ bacterial cells/ml/kg body weight) lowered the total blood serum cholesterol concentration on account of its ester-bound fraction and increased both the ester-bound and the free cholesterol concentrations in the liver after 3 h. After 24 h, when the normal temperature was restored, the concentrations of cholesterol and its fractions in both the serum and liver were higher than initially.

KEY WORDS: fever; cholesterol metabolism.

Most investigators have found an increase in the blood serum cholesterol concentration in various types of experimental fever both in the initial period and also after 24 h, when the normal temperature is restored [5-10]. However, reports have been published of an initial decrease before the eventual increase in the serum cholesterol concentration during fever [4]. The tissue cholesterol level in experimental fever still remains incompletely studied.

The object of the present investigation was to study the effect of pyrogenal and a culture of Bacillus mesentericus on the liver and blood levels of cholesterol and its fractions.

EXPERIMENTAL METHOD

Rabbits weighing 2.5-3.5 kg were used. Fever was induced by a single intravenous injection of pyrogenal (10 μg/kg) or of a culture of B. mesentericus ($3 \cdot 10^9$ bacterial cells/ml/kg body weight). Investigations were carried out 3 and 24 h after injection of the pyrogens. Cholesterol was determined in the blood serum [1] and in the liver [3].

EXPERIMENTAL RESULTS

The body temperature of the animals rose by 2.2°C 3 h after injection of pyrogenal and by 1.8°C after injection of B. mesentericus. In both cases the body temperature was back to normal after 24 h. The total serum cholesterol concentration was reduced by 22.9% ($P < 0.001$) 3 h after injection of pyrogenal and by 29.1% ($P < 0.001$) after injection of B. mesentericus; after 24 h the levels were increased by 26.5% ($P < 0.05$) and 31.03% ($P < 0.05$) respectively compared with the initial value (58.84 ± 0.92 mg %). The concentration of ester-bound cholesterol in the blood serum underwent similar changes. It was reduced by 43.7% ($P < 0.001$) and 43.5% ($P < 0.001$) 3 h after the injection of pyrogenal or B. mesentericus, and increased by 33.02% ($P < 0.001$) and 26.7% ($P < 0.001$) respectively compared with the initial value (37.25 ± 0.67 mg %) 24 h after the injection. The free cholesterol concentration in the serum 3 h after injection of pyrogenal and B. mesentericus was unchanged. Later pyrogenal still had no effect on the free cholestrol concentration, whereas 24 h after injection of B. mesentericus its concentration was 38.49% higher ($P < 0.001$) than the control (21.59 ± 1.36 mg %).

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Injection of the pyrogens was followed by changes in the cholesterol level in the liver tissue also. For instance, 3 h after injection of pyrogenal the total liver cholesterol concentration was increased by 47.1% ($P < 0.001$) and after injection of B. mesentericus by 66.0% ($P < 0.001$). During the period of normalization of the body temperature the total cholesterol concentration in the liver still remained significantly raised – by 34.4% and 77.6% respectively compared with the initial level of 363.8 ± 15.7 mg/100 g body weight. The content of ester-bound cholesterol in the liver 3 h after injection of pyrogenal was increased by 25.4% ($P = 0.001$) and by 38.6% ($P < 0.001$) after injection of B. mesentericus. The concentration of cholesterol esters in the liver after 24 h remained higher (by 33.3 and 97.5%, respectively) than initially (119.5 ± 6.9 mg/100 g).

The free cholesterol concentration in the liver 3 h after injection of pyrogenal was 57.8% higher ($P < 0.001$) than initially (244.3 ± 12.7 mg/100 g) and 79.5% higher ($P < 0.001$) after injection of B. mesentericus. The free cholesterol concentration in the liver still remained significantly increased after 24 h – by 34.9% after injection of pyrogenal and by 67.9% after injection of B. mesentericus.

At the height of development of fever all the animals thus exhibited hypocholesteremia due to a decrease in the level of ester-bound cholesterol. When the normal temperature was restored the cholesterol concentration increased and hypercholesteremia developed as the result of an increase in the concentration of cholesterol esters. According to Veselkin [2] metabolic changes at the beginning of fever are associated with predominance of excitation of the sympathetic nervous system and those at the end of fever with predominance of the parasympathetic excitation.

The fall in the serum cholesterol concentration 3 h after injection of the pyrogens could be due either to retention of cholesterol in the liver or an increase in its breakdown. The increase in the cholesterol level in the liver was greater than its decrease in the blood. Presumably, therefore, cholesterol synthesis in the body is increased during fever, more especially because later (after 24 h) the cholesterol concentration was increased both in the serum and the liver.

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