BLOOD LIPID CONCENTRATION IN ANIMALS OF DIFFERENT SEXES

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Experiments on rabbits and dogs showed that the blood cholesterol level is the same in males and females, but the lecithin level is higher in females, so that the cholesterol/lecithin ratio is lower in females.

The cholesterol concentration in female animals has been shown to be higher than in males. Similar results have been obtained in birds [11, 13], rats [6, 7, 8], rabbits [1, 2, 12], and monkeys [4]. The β-lipoprotein level in females is also higher than in males [1, 3]. Meanwhile, other investigations [9] have demonstrated a much higher incidence of spontaneous atherosclerosis of the aorta in males (rabbits) than in females. The same pattern applies also to animals kept on an atherogenic diet [1, 5, 10].

It is possible that phospholipids and their ratio to cholesterol play an important role in the resistance of females to atherosclerosis. However, experimental studies do not provide any clear guidance on this problem.

The object of the present investigation was to study indices of lipid metabolism in animals of different sexes in order to shed light on factors predisposing to the development of atherosclerosis.

EXPERIMENTAL METHOD

Experiments were carried out on normal rabbits and dogs of both sexes. Cholesterol was determined by two methods: in whole blood by the method of Éngel'gardt and Smirnova and in blood serum by the method of Burstein and Samai, and the total serum lipid phosphorus by the method of Fiske and Subbarow. To determine the lecithin concentration, the value found for the phosphorus was multiplied by 25. In all animals the determinations were repeated from 3 to 5 times and the mean value for that animal was calculated, after which the results as a whole were subjected to statistical analysis.

EXPERIMENTAL RESULTS

The results are given in Table 1.

Comparison of the results shows that the level of individual lipids is higher in rabbits than in dogs. No other species-specific differences were found.

No differences in the cholesterol concentration were found in males and females by the use of both methods of determination. Although a higher cholesterol level was found in the females, the difference was not statistically significant.

The β-lipoprotein level was higher in the females than males. This difference was significant in rabbits, but not significant in dogs, although the absolute concentration of β-lipoproteins was also higher in the females than in the males.

The concentrations of total lipid phosphorus and of lecithin were higher in female rabbits and dogs than in males.

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TABLE 1. Indices of Lipid Metabolism in Animals of Different Sexes

Index	Rabbits					Dogs				
	males		females		P	males		females		P
	n	M±m	n	M±m		n	M±m	n	M±m	
Cholesterol (in mg%, method of Engel'gardt and Smirnova)	70	35,3±1,3	81	40,9±1,5	>0,05	21	77,1±5,2	21	79,4±6,9	>0,05
Cholesterol (in mg%, method of Lieberman and Burchhardt)	50	54,5±3,3	45	60,3±4,5	>0,05	11	134,2±17,7	10	149,1±16,3	>0,05
β-lipoproteins (in mg%)	59	113,19±5,43	59	147,87±7,03	<0,001	13	237,90±36,50	14	278,93±48,50	<0,05
Phosphorus (in mg%)	48	3,54±0,26	46	5,53±0,36	<0,001	11	8,80±0,73	10	11,43±0,88	<0,05
Lecithin (in mg%)	48	88,54±6,61	46	138,90±8,9	<0,001	11	219,70±19,40	10	285,70±20,40	<0,05
Cholesterol/lecithin ratio	42	0,69±0,06	37	0,52±0,05	<0,05	11	0,62±0,06	10	0,58±0,09	>0,05

The absence of differences in the cholesterol concentrations, in conjunction with the higher lecithin levels, led to a decrease in the cholesterol/lecithin ratio in the females compared with the males. This difference in rabbits was statistically significant.

These experiments thus demonstrate sex differences in the indices of lipid metabolism, and specifically a higher lecithin concentration and a lower cholesterol/lecithin ratio in females than in males.

The most important factor predisposing to the development of atherosclerosis is not an absolute increase in the cholesterol level, but a relative preponderance of cholesterol over phospholipids. It is this state which more accurately reflects the "readiness" of cholesterol to infiltrate the arterial wall. The results of the present investigation are interesting from this point of view. If, other conditions being equal, the cholesterol/lecithin ratio is higher in males, this suggests that under unfavorable circumstances males will be more vulnerable. Increased resistance to atherosclerosis is found in females [1, 5, 10].

The differences in the lipid concentrations discovered in animals of different sexes naturally do not completely explain the well-known differences between the incidence of cardiovascular disorders in males and females. Other factors probably concerned are differences in the character of hematopoiesis, coagulation of the blood, and the anatomical structure of the heart and blood vessels. However, the physicochemical properties of the blood and, in particular, the forms in which cholesterol is bound and its ratio to the phospholipids may also have an important role.

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