ROLE OF DIFFERENT PARTS OF THE SMALL INTESTINE IN CHOLESTEROL EXCRETION

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The cholesterol concentration in a segment from the upper part of the small intestine is 37-70 mg%, and in a segment from the lower part 56-95 mg%. After resection of 50% of the proximal part of the small intestine, an increase in the cholesterol concentration is found in a segment removed from the upper part.

The gastro-intestinal tract can no longer be regarded as a system with purely digestive functions. The work of Razenkov [4], Zamychkina [2], and Shlygina [5] has shown that the gastro-intestinal tract participates in the intermediate metabolism of proteins, phosphorus, and lipotropic substances.

Martsevich [3] has shown that large quantities of cholesterol are excreted into the lumen of the digestive canal, and that the quantity of cholesterol excreted into the intestine is correlated with the blood cholesterol concentration, especially if lipid metabolism is disturbed. The ability of the small intestine to excrete cholesterol was investigated by Gavrilov [1], Sperry [10], and others. The role of different parts of the small intestine varies: absorption and synthesis of cholesterol take place at different intensities at different levels of the intestine [6, 7, 9]. Very little information is available concerning the excretion of cholesterol. According to Sperry and Angewine [11], about 20% of the lipids in the feces was excreted by the large intestine, and the rest by the wall of the small intestine. Recent work of Byers et al. [8] is in agreement with these observations.

The object of the present investigation was to study the role of different parts of the small intestine in the excretion of cholesterol under normal conditions and after reaction of the proximal part of the intestine.

EXPERIMENTAL METHOD

Experiments were carried out on dogs with isolated loops of the upper and lower parts of the small intestine formed by Thiry's method 20-25 cm distally to the duodenum and 20-25 cm proximally to the ileocolic valve, while in two dogs a segment was isolated from the upper part of the intestine only.

Juice was collected during periodic secretion 18-20 h after feeding for a period of 4 h, and the weight of the solid and liquid parts was determined. The cholesterol concentration in the blood and intestinal juice was determined by the method of Engel'gardt and Smirnova as modified by Zamychkina and Kryukova, in 0.5 ml of homogenate of intestinal juice and in 0.1 ml of blood plasma. The principle of determination was the same for the juice and the blood. Cholesterol was extracted with an alcohol-ether mixture (3:1) and estimated colorimetrically on the basis of its color reaction with acetic acid and acetic anhydride.

EXPERIMENTAL RESULTS

The results showed that large quantities of cholesterol are excreted with the intestinal juice into the lumen of the digestive tract. In the experimental dogs the mean cholesterol concentration in a homogenate of the intestinal juice from the proximal portion was 56±3 mg%, and from the distal portion 77±4 mg%.

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TABLE 1. Concentration of Cholesterol in Intestinal Juice of Isolated Segments of Intestine (in mg%)

Dog	Upper part		Lower part	
	normal	after resection	normal	after resection
Zhuk	70±8	92±8	75±11	112±12
Groznyi	37±3	41±5	56±9	50±5
Trus	47±5	57±6		
Charli	57±8	40±5		

A higher cholesterol concentration in the lower part of the intestine was found in all five investigated dogs.

The proximal portion of the small intestine was resected in four dogs, 50% of the total length of the small intestine being removed. All the dogs survived the operation and quickly regained their weight.

Variations in the blood cholesterol concentration after the operation did not exceed the mean normal limits, but the direction of the changes varied from one dog to another: in the dog Trus the blood cholesterol concentration rose slightly (120-210 mg%, normal 80-120 mg%), while in the dog Charli a tendency was observed for the blood cholesterol concentration to fall (80-100 mg%, normal 100-200 mg%).

After resection of the proximal portion of the intestine, the cholesterol concentration in juice from the upper loop was increased in 3 of the 4 dogs, and in the juice of the lower loop it was increased in one of two dogs (Table 1). The tendency toward a higher cholesterol concentration in the intestinal juice of the isolated segment from the lower part of the intestine than in the upper part persisted also after resection of the proximal part.

It can be concluded from these results that the distal part plays a more important role in the excretion of cholesterol than the proximal part.

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