THE INTEROCEPTIVE CONNECTIONS BETWEEN THE LARGE AND SMALL INTESTINES OF SHEEP

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The problem of changes in the absorptive processes of the intestines during irritation of the interoceptors of the gastro-intestinal tract has not been clarified in the literature. In connection with this, we set up experiments to study the absorptive function of the cecum of sheep during irritation of the receptors of the small intestine.

EXPERIMENTAL METHOD

The experiments were carried out on sheep. An elbow-shaped fistular tube was inserted into the terminal section of the small intestine which had been separated from the cecum and large intestine, and connected by an external anastomosis with the isolated cecum and the initial section of the large intestine. In addition, a fistular tube of the usual shape was inserted in the opposite end of the isolated cecum (see illustration). When the external anastomosis was separated one piece of the cecum was isolated, permitting the quantitative study of the process of absorption in it.

First, the amount of water and of 5% glucose solution absorbed in the cecum, into which 50 ml of fluid were usually introduced, was studied under normal conditions.

The amount of absorption was determined in absolute and relative figures from the difference between the amounts of water or glucose introduced and the amount of water or sugar absorbed from the cecum.

The amount of glucose in the administered solution and in the fluid removed from the intestine was determined by Hagedorn's method and refractometrically.

Then we studied the amount of water and sugar absorbed during irritation of the interoceptors of the isolated portion of the small intestine with a 0.5% solution of hydrochloric acid or a 3% soda solution.

About 70 experiments were carried out on 3 sheep.

EXPERIMENTAL RESULTS

It was established that the sheep Slingshot absorbed 49% of the water, on the average, during 30 minutes. The sheep Whitey, which served as a control, absorbed an average of 46.2% of the water during 30 minutes.

When the mucous membrane of the sheep Slingshot was irrigated with a 0.5% solution of hydrochloric acid, the absorption of water increased here and attained an average of 82.6% (varying from 75 to 91.7%) during 30 minutes.

A contrary effect appeared during irrigation of the mucous membrane of the small intestine with a 3% solution of soda: the absorption of water in the cecum decreased markedly, reaching an average of 26% (varying between 16.6-33%) during 30 minutes.

TABLE 1

Absorption of Water in the Cecal Portion of the Large Intestine of the Sheep Slingshot During 30 Minutes Under the Influence of Irritation of the Chemoreceptors of the Large Intestine

No. of experiment	Amount of water (in ml)		Amount of absorbed water		Chemical irritant introduced into the small intestine
	introduced	removed	in ml	in %	
1	60	40	20	33	No irritant
2	60	30	30	50	» »
3	60	25	35	58,3	» »
4	60	35	25	40,1	» »
5	60	35	25	40,1	» »
6	60	36	24	40	» »
7	60	20	40	66,6	» »
8	60	30	30	50	» »
9	60	25	35	58,3	» »
10	60	30	30	50	» »
Average	. . . . .			48,6	
11	60	5	55	91,7	50 ml of 0.5% HCl solution
12	60	5	55	91,7	The same
13	60	7	53	88,3	» »
14	60	5	55	91,7	» »
15	60	10	40	83,5	» »
16	60	7	53	66,6	» »
17	60	15	45	75	» »
18	60	10	40	83,5	» »
19	60	15	45	75	» »
20	60	15	45	75	» »
Average	. . . . .			82,6	
21	60	50	10	16,6	50 ml og 3% soda solution
22	60	45	15	25	The same
23	60	45	15	25	» »
24	60	41	19	31,7	» »
25	60	40	20	33	» »
26	60	45	15	25	» »
Average	. . . . .			26	

TABLE 2

Absorption of a 5% Solution of Glucose in the Cecal Portion of the Large Intestine of the Sheep Cherry During 30 Minutes Under the Influence of Irritation of the Chemoreceptors of the Small Intestine

No. of experiment	Amount of glucose solution introduced		Amount of glucose solution extracted		Amount of glucose absorbed		Chemical irritant introduced into the large intestine
	in ml	in %	in ml	in %	in gr	in %	
2	50	5.11	39	4.98	0.61	24	No irritant
3	50	5.1	46	3.87	0.87	34	The same
4	50	5.2	46	4.3	0.62	23.8	" "
5	50	5.3	40	4.8	0.73	27.5	" "
6	50	5.4	45	4.21	0.81	30.0	" "
7	50	5.4	46	4.4	0.68	25.2	" "
8	50	5.2	43	4.7	0.58	22.3	" "
9	50	5.4	43	4.7	0.68	25.2	" "
10	50	5.4	45	4.2	0.89	30.0	" "
Average						26.9	
11	50	5.1	46	3.87	0.78	30.6	50 ml of 0.5% HCl solution
12	50	5.3	40	4.8	0.73	27.5	The same
13	50	5.6	35	4.2	1.33	47.5	" "
14	50	5.4	46	4.4	0.68	25.2	" "
Average						32.0	

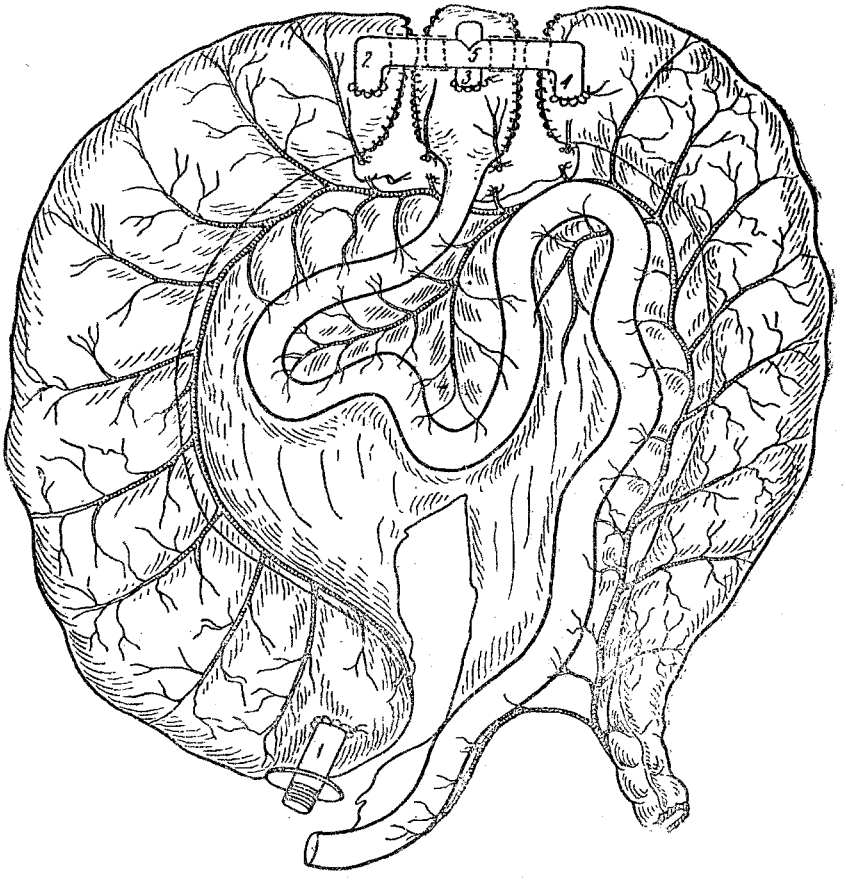

Diagram of the operation "fistula of the cecum with ileo-cecal T-joint".
1) Direct fistula at the cecal end of the intestine; 2), 3), 4) elbow-shaped fistula in the ileo-cecal area; 5) external T-piece.

The corresponding data are presented in Table 1.

The absorption of glucose in the cecum of the sheep Cherry reached an average of 26.9% (varying from 22.3 to 34%) during 30 minutes under normal conditions. During irrigation of the mucous membrane of the small intestine with a 0.5% solution of hydrochloric acid, the absorption of glucose in the cecum increased and reached an average of 32%, with variations between 21.7 and 35.7%, during 30 minutes (Table 2).

The data obtained show clearly that considerable absorption of water, as well as glucose, occurs in the cecum of sheep.

The results of our experiments illustrate the effect of irritating the interoceptors of the small intestine on the absorptive activity of the cecum.