

EFFECT OF THYROCALCITONIN ON PERIODIC MOTOR ACTIVITY OF THE GASTRO-INTESTINAL TRACT

N. N. Lebedev and A. I. Briskin

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Experiments on dogs with fistulas of the stomach and various parts of the small intestine, in which periodic motor activity was recorded, showed that intravenous injection of highly purified bovine thyrocalcitonin (TCT) in doses of 2-10 units/kg (much higher than the doses used clinically for the treatment of patients with bone pathology), does not cause changes in the indices of periodic motor activity of the stomach or the various parts of the small intestine despite a definite decrease (by 10-20%) in the serum calcium level.

KEY WORDS: thyrocalcitonin; motor activity of the gastro-intestinal tract.

Dependence of the motor and secretory activity of the digestive tract on the functional state of the thyroid [7, 8, 13] and parathyroid [6, 8, 12] glands is well known.

It was therefore decided to study the effect of thyrocalcitonin (TCT), produced by the parafollicular cells of the thyroid gland [9], on periodic motor activity of the gastro-intestinal tract.

TABLE 1. Indices of Periodic Motor Activity of Dog Stomach before and after Injection of TCT

Animal No.	Series	Duration of periods of contraction (min)	Number of contractions per period	Duration of cycles of periodic activity (min)
1	Control	21,2±0,8 (32)	13,3±0,8 (24)	94,2±2,5 (19)
	TCT	15,3±0,3*	9,5±1,8 (4)	107,0±9,1 (2)
	3-5 units/kg	22,1±2,5 (6)	12,3±1,2 (6)	77,0±6,7 † (6)
	10 units/kg	21,7±1,2 (39)	12,1±0,6 (38)	74,4±3,7 (28)
2	Control	20,8±1,8 (8)	11,8±0,6 (8)	81,8±1,4 (8)
	TCT	23,0±1,9 (21)	14,5±1,5 (21)	88,3±4,3 (14)
3	Control	27,0±1,9 (8)	16,8±1,3 (8)	84,4±2,7 (7)
	TCT	25,5±1,5 (2)	12,2±2,0 (2)	75,0±7,9 (3)
	3-5 units/kg			
	10 units/kg			

*p < 0.01.

†p < 0.1.

Legend. Number of observations in parentheses.

Laboratory of Pathophysiology of Digestion, Institute of General Pathology and Pathophysiology, Academy of Medical Sciences of the USSR. Laboratory of Toxicology and Biocontrol, All-Union Research Institute of Technology of Blood Substitutes and Hormonal Preparations, Moscow. (Presented by Academician of the Academy of Medical Sciences of the USSR A. M. Chernukh.) Translated from Byulleten' Eksperimental'noi Biologii i Meditsiny, Vol. 80, No. 9, pp. 10-12, September, 1975. Original article submitted October 14, 1974.

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EXPERIMENTAL METHOD

Experiments were carried out on three mongrel dogs weighing 15-18 kg with fistulas of the stomach, duodenum, and various parts of the jejunum. Each dog had at least two intestinal fistulas. Motor activity of the stomach and intestine was recorded during physiological hunger of the animals by a balloon-kymograph method. The duration and frequency of the periods of contraction and rest were investigated. Highly purified TCT, obtained from freshly frozen bovine thyroid glands [1], was injected intravenously into the animals in doses of between 2 and 10 units/kg in 5 ml physiological saline. Control animals received the same volume of the solvent. Before the injection of TCT and for 180 min thereafter the blood calcium concentration was determined at intervals of 15-30 min by a complexometric method [3].

EXPERIMENTAL RESULTS

In the control series the duration of the periods of gastric contractions was between 21.2 ± 0.8 and 23.0 ± 1.87 min, the number of contractions per period was between 12.1 ± 0.3 and 14.5 ± 1.5 , and the duration of the cycles of periodic gastric activity between 74.4 ± 3.73 and 94.2 ± 2.46 min. No statistically significant changes were found in the serum calcium level to correspond to the phases of the cycles of periodic gastric activity. During the resting period the calcium concentration was 9.55-9.61 mg/100 ml serum, falling during the period of contractions to 8.93-10.31 mg/100 ml.

After intravenous injection of TCT into the dogs in both minimal (2 units/kg) and maximal (10 units/kg) doses the serum calcium level fell within 45-75 min by 10-20%, returning after 2-3 h to, or sometimes above, its initial value. The indices of motor activity of the stomach and intestine in the overwhelming majority of experiments were not significantly altered (Table 1). Only in one dog was the duration of the periods of contractions reduced, in the absence of changes in the other indices, in three experiments 60 min after injection of TCT in doses of 3-5 units/kg. After injection of TCT in a dose of 8 units/kg into the same dog the duration of the periods of gastric contractions was indistinguishable from that in the control, but some decrease in the duration of the cycles of periodic activity was observed. The rhythm of periodic activity of the parts of the intestine investigated, the graphic characteristics of the periods of contraction, and the ratio between rhythmic and tonic components in each period likewise remained unchanged. Agreement between the periodic motor activity of the intestine and that of the stomach and also between the various parts of the intestine likewise was unchanged after TCT administration.

These results agree with those of experiments on rats in which no significant changes were found in the rate of movement of a marker in the alimentary tract after intravenous injection of porcine TCT [5], despite a decrease of 10-20% in the serum calcium level [11]. The doses of TCT used in the present experiments were similar to those usually given to produce a detectable inhibitory action of TCT on bone resorption in animals [4, 10] and they were 10-30 times greater than doses given to patients to stimulate delayed reparative osteogenesis [2]. The clinical use of TCT ought not, therefore, to be accompanied by any undesirable changes in motor activity of the gastro-intestinal tract.

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