

# EFFECT OF STIMULATION OF ILEOCECAL INTEROCEPTORS ON MOVEMENTS OF LARGE INTESTINE

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Stimulation of mechanoreceptors and chemoreceptors in the ileocecal region in a resting state stimulates motor activity of the large intestine, but in a state of activity it depresses intestinal movements.

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The ileocecal region has for many years attracted the attention of physiologists. K. M. Bykov and G. M. Davydev [2] and A. V. Rikkl' and co-workers [3-6, 8] established close functional connections between the ileocecal region and other parts of the gastro-intestinal tract, namely with the stomach, pancreas, and liver. P. G. Bogach [1] demonstrated the existence of interoceptive influences from the ileocecal region on movements of the small intestine. According to several authors the ileocecal region is an important nodal point with well marked activity [2].

Bearing in mind the close anatomical connections between the ileum and the large intestine and the high sensitivity of the terminal part of the ileum, especially the area next to the ileocecal sphincter, we decided to study the role of ileocecal receptors in the regulation of movements of the large intestine.

## EXPERIMENTAL METHOD

Chronic experiments were carried out on 5 dogs with lateral fistulas of the ileum and proximal part of the transverse colon. Mechanoreceptors of the ileocecal region were stimulated by inflating a thin-walled rubber balloon inserted into the ileum through the intestinal fistula tube. A pressure of between 20 and 80 mm Hg was created inside the balloon. The chemoreceptors of the ileum were stimulated by the following adequate chemical stimuli: 10-20% peptone solution containing traces of amino acids, 2% soap solution (sodium salt of fatty acids from sunflower oil), 5% sucrose solution.

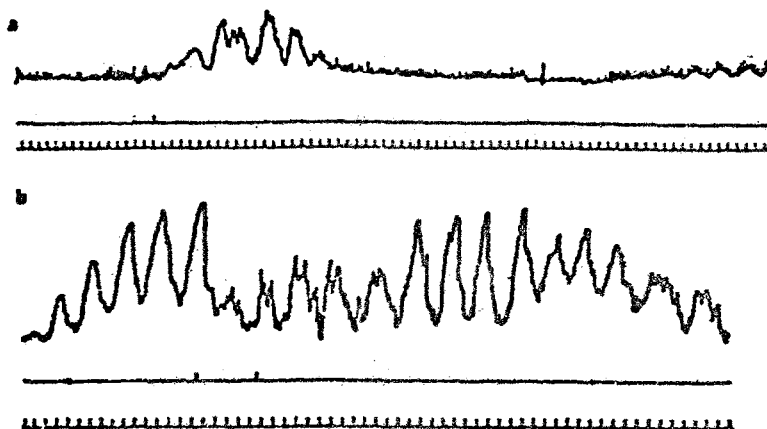
Movements of the large intestine were recorded graphically by means of a balloon and Marey's capsule with hydro-pneumatic transmission systems. The experiments were performed on fasting animals (18-20 h after the last meal).

## EXPERIMENTAL RESULTS

Brief (1-2 min) stimulation of the mechanoreceptors of the ileum near the ileocecal sphincter (pressure in balloon not exceeding 20-25 mm Hg) against a background of a resting state or weak motor activity of the large intestine had no effect on movements of the large intestine. In most cases, when the pressure in the balloon was increased to 40 mm Hg, an increase in the intestinal tone and stimulation of contractions of the large intestine were observed. This excitation persisted for several minutes after stimulation of the mechanoreceptors of the ileum had stopped.

Brief stimulation of the mechanoreceptors of the terminal ileum (pressure inside balloon 60-80 mm Hg) always evoked a definite motor response of the large intestine. After a short latent period of 30-120 sec, depending on the strength of stimulation of the mechanoreceptors, the tone of the large intestine rose sharply, and against the background of this increased tone intestinal contractions of types I and II (using the classification of Templeton and Lawson) developed (Fig. 1, a). The latent period and amplitude of the reflex response of the large intestine to stimulation of mechanoreceptors of the terminal ileum depended on the strength of stimulation applied to mechanoreceptors of the ileum. The clearest and most prolonged excitation of

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**Fig. 1.** Effect of stimulation of ileocecal mechanoreceptors (pressure inside balloon 40 mm Hg) on movements of large intestine. **a)** large intestine in resting state; **b)** against background of strong contractions. Curves from top to bottom: contractions of large intestine, marker of beginning and end of stimulation, time marker 15 sec.



**Fig. 2.** Effect of 10% peptone solution on movements of large intestine when acting on mucous membrane of ileum. Significance of curves as in Fig. 1.

motor activity of the proximal portion of the transverse colon was observed when the pressure in the ileum was 60 mm Hg. After stimulation of the ileocecal mechanoreceptors had stopped, the movements of the large intestine weakened, and after a short time a resting state developed.

If the ileocecal mechanoreceptors were stimulated during a period of strong motor activity of the large intestine a decrease in tone and inhibition of contractions of the large intestine were observed (Fig. 1, b).

Since the intestinal contents can act on the ileocecal receptors chemically as well as mechanically, it was important to study responses of the large intestine to stimulation of the ileocecal chemoreceptors by adequate chemical stimuli.

The study of the effect of various stimuli from the terminal ileum on motor activity of the large intestine showed that stimulation of the ileocecal chemoreceptors by introduction of 10% peptone solution with traces of amino acids into its lumen at a time when the large intestine was in a state of rest or of weak motor activity initiated or intensified existing movements of the large intestine (Fig. 2). The latent period of this response was 20-100 sec. Reflex motor responses of the large intestine to stimulation consisted of peristaltic and tonic waves, contractions of Teniplet and Lawson's types II and III [9]. After injection of peptone solution into the ileum at a time of powerful contractions of the large intestine, these were inhibited (tone was lowered and the amplitude of the contractions reduced).

Similar motor responses of the large intestine were observed after introduction of 20% peptone solution into the ileum. When 50 ml of 20% peptone solution was injected into the ileum the motor response of the large intestine was stronger and more prolonged than after introduction of 20 ml of this solution.

Irrigation of the ileocecal mucous membrane with 2% soap solution or 5% sucrose solution while the large intestine was in a resting state likewise initiated its motor activity. Weak contractions of the large intestine were intensified after injection of 2% soap solution or 5% sucrose solution into the ileum, while strong contractions of the large intestine were inhibited.

Adequate chemical substances introduced into the ileum thus cause reflex initiation or stimulation of movements of the large intestine or modify the character of its contractions if these were strong at the time of injection of the solution. This shows that the ileocecal chemoreceptors, which are excited by adequate chemical substances (hydrolysis products of food substances), are important in regulating motor activity of the large intestine. The results of these experiments demonstrate that adequate stimulation of ileocecal mechanoreceptors also excites movements of the large intestine. The stronger the stimulation of the ileocecal mechanoreceptors, the greater the strength and duration of this excitation. Our experiments show that the ileum is highly susceptible to stimulation by chemical substances. This fact can be explained in the light of B. I. Lavrent'ev's morphological observations [7], indicating the presence of numerous nerve elements in the walls of the ileocecal region. The high sensitivity of the terminal ileum to chemical and mechanical stimuli suggests that the ileocecal region plays an important role in regulation of the caudal movement of the intestinal contents.

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