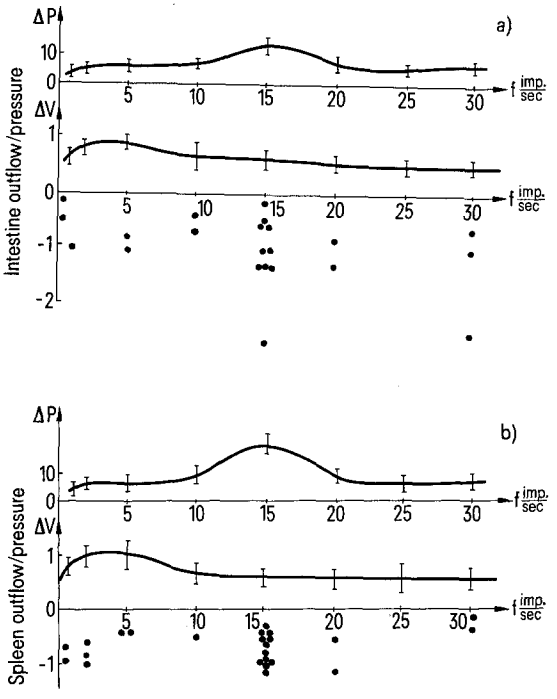

Fig. 2. The character and the magnitude of the resistance and capacitance vessel responses in a) the spleen and b) intestine under electrical stimulation of the sympathetic fibres. Abszissa, * the stimulation frequency; ordinate, * perfusion pressure changes (Δ P) and outflow changes (Δ V). The dilatatory responses of the capacitance vessels are shown as separate points.

maximal diameter of arteriovenous anasthomoses decreased under electrical stimulation of sympathetic fibres from 52 $\pm$ 4.5 μm to 34.3 $\pm$ 2.5 μm in the spleen and from 45.6 $\pm$ 1.3 μm to 32 μm in the small intestine. The microsphera shunting coefficient[9] also decreased (from 0.60 $\pm$ 0.04 to 0.50 $\pm$ 0.09 in the spleen and from 0.50 $\pm$ 0.05 to 0.20 $\pm$ 0.05 in the small intestine). These data did not allow us to explain the non-uniformity of capacitance vessel responses observed in our experiments during electrical stimulation of the sympathetic fibres, by changes in arteriovenous anasthomosis flow.

Conclusions. 1. Both constrictory and dilatory response of the spleen and intestine capacitance vessels could be observed under electrical stimulation of the vasomotor fibres, resistance vessel response being always constrictory. 2. The uniformity of the capacitance vessel responses was not due to the resistance vessel responses, capillary filtration and changes in arteriovenous anastomosis flow.

ВЫВОДЫ. При электрической стимуляции симпатических нервов на фоне констрикции резистивных сосудов тонкого кишечника и селезёнки могут проявляться как констрикторные, так и дилататорные реакций емкостных сосудов. Характер реакций емкостных сосудов тонкого кишечника и селезёнки в этом случае не зависит от величин реакций резистивных сосудов, фильтрации жидкости и пропускной способности артерио-венозных анастомозов.

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Is There a Special Pacemaker for Stepping?

Recently 'locomotor discharges' were obtained in the anterior ventral roots of motionless decorticated animals. On the basis of this fact, a hypothesis of a special supraspinal 'locomotor pacemaker' was formulated[1]. In fact, as shown in our present paper, there is no special pacemaker for stepping. The rhythmical discharges which are registered in the spinal ventral roots of motionless animals are provoked by the respiratory centre.

Methods. Experiments were performed on 5 adult cats decorticated under ether anaesthesia. These cats had been used in our previous experiments devoted to investigation of the mechanisms of locomotion[2–4]. The dorsal and ventral roots (S_1–L_6) and the phrenic nerve were intersected. The electrical activity was recorded simultaneously in the central part of the phrenic nerve and in the filaments of the ventral root. Complete motor paralysis was produced by i.v. injection of Flaxedil (4–5 mg/kg). Artificial respiration was performed through a tracheofissura. The volume of the respiratory pump was 25–30 ml, the frequency 30 per min. Asphyxia was evoked by an arrest of artificial respiration for 2–3 min, hyperventilation by increasing the volume of the respiratory pump up to 50–60 ml.

Results and discussion. In the records A, B and C (Figure) the electrical activity from the filament of the spinal ventral root (S_1) and the phrenic nerve were recorded during complete motor paralysis produced by i.v. injection of Flaxedil.

Records A were obtained during normal artificial ventilation. The discharges in the filament of the ventral spinal root (A_1) are in accordance with the discharges of the phrenic nerve (A_2). The discharges of the ventral root filaments appear in the interval between the inspiratory discharges of the phrenic nerve. In other experiments, the discharges in the ventral roots may appear simultaneously, before or after the inspiratory discharges of the phrenic nerve. This probably depends on the following: to produce stepping, the discharges of different ventral roots which innervate distinct muscles must appear in strict succession. Therefore the interval between the discharges of the phrenic nerve and the ventral root filaments may differ. But the correlation between them is a rule constant.

Records B were obtained during the arrest of the artificial ventilation. In accordance with the hypercapniae evoked by asphyxia inspiratory, discharges of the phrenic

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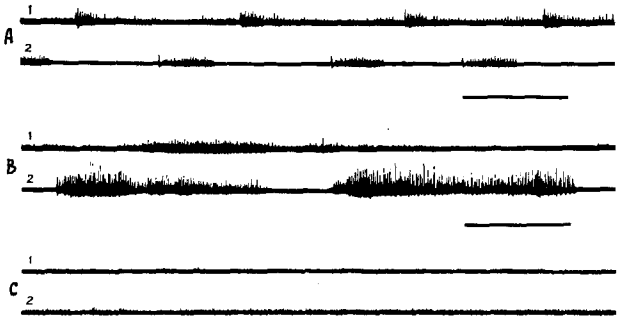
nerve (B_2) become more powerful and longer. In the same manner, discharges of the spinal ventral roots (B_1) also become more powerful and longer.

Records C were obtained during hyperventilation. In accordance with apnea evoked by hyperventilation, the inspiratory discharges of the phrenic nerve disappear (C_2). In the same manner the discharges of the spinal ventral root also disappear (C_1).



Electrical activity from a filament of the ventral root S_1 (1) and from the phrenic nerve (2). A, during normocapnia; B, during asphyxia; C, during hypocapnia.

Thus the 'locomotor discharges' of the ventral roots are always in accordance with the discharges of the respiratory centre. They become more powerful when the inspiratory discharges of the respiratory centre become more powerful and disappear when the discharges of the respiratory centre disappear. Consequently the locomotor discharges which are recorded in the ventral roots of the motionless animals are probably the result of irradiation of excitation from the respiratory centre to the spinal mechanism generating stepping movements. There is no basis for the hypothesis of a special pacemaker for stepping.

БЫВОДЫ. «Локомоторные разряды», регистрирующиеся в передних корешках спинного мозга обездвиженного флаксседилом животного, являются результатом иррадиации возбужденияа из дыхательного центра. Они не могут служить доказательством наличия спинального пейсмейкера шагания.

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An Experimental Investigation into the Traversing of Ventricle by Gut in the Unionid Bivalve, *Lamellidens corrianus*

Disposition of heart in relation to alimentary canal varies in molluscs. The heart is either dorsal or ventral to the gut, or, as in the majority of lamellibranchs and rhaphidoglossans, it is penetrated to varying degrees by the hinder portion of intestine.

In the fresh-water mussel, *Lamellidens corrianus*, the ventricle of the heart is traversed all along its length by the hind-gut. An attempt has been made here to seek some physiological explanation for this structural arrangement in the mussel, by means of experiments designed as shown in the Figure.

The first type of experiments were planned with a view to establish whether bathing of gut by blood helps in the nutritional physiology of the animal by permitting a direct absorption of digested nutrient material from the gut into the blood contained within the ventricle. The gut was ligatured about $^1/_2$ cm prior to its entry into the pericardium, and 2 sets of experiments were then performed.

In the first set, glucose solution (20 mg/ml) was injected into the gut in the portion just anterior to the ligature; and glucose-content was estimated in samples of blood tapped from the ventricle till 30 min after glucose injection (A in the Figure). Since the ligature did not allow entry of injected glucose into the portion of gut traversing the heart, any possibility of its direct absorption from hind-gut into ventricular blood was eliminated. Any rise in blood sugar level within the ventricle would, therefore, be due to entry of glucose into ventricular blood through the usual absorption channels of the body.

In the second set, glucose was injected into the portion of gut just posterior to the ligature, and blood samples were collected and analyzed for sugar as in the first set (B in the Figure). In this case, since the injected glucose was not permitted by the ligature to enter any portion of the digestive tract except the one lodged within the heart, any glucose coming into the ventricular blood would have come not via the usual routes but by direct absorption from the hind-gut.

On comparing the 2 sets of results, it is noticed that while uptake of glucose by blood through the usual absorption channels is appreciably high, the blood sugar level rising 3–4-fold within 15 min, there is no direct absorption of nutrient from gut into blood within the ventricle, the blood sugar level remaining almost unchanged. Thus, there is no evidence that nutrition in *L. corrianus* is enhanced by any direct absorption of nutrients from the alimentary canal into the ventricular blood. Functional importance of the piercing of ventricle by gut, therefore, does not appear to lie in these quarters.

Keeping this in view, another type of experiments was planned in order to find out if lodging of alimentary tract within the ventricle permits excretion of undesirable matter directly from ventricular blood to rectal lumen. Experiments were set up as in the aforesaid cases; and saline solution was slowly pushed into the lumen of gut just posterior to the ligature till it completely replaced the rectal contents. Thereafter, about 0.05 ml of the solution filling the rectal lumen was tapped, and was found to give negative results when tested by potassium ferricyanide for ferrous ions. Two sets of experiments were then conducted.

In the first set, ferrous sulphate solution (5 mg/ml) was injected into the ventricle, and contents of rectum were frequently tapped and chemically tested for the presence of ferrous ions (C in the Figure). A significant amount of ferrous ions could be detected in the gut-content samples after a couple of min of introducing them into the ventricle. This shows that ferrous ions are transported from ventricular blood to rectal lumen.