

# SECRETION FROM THE PAROTID SALIVARY GLANDS AFTER THE EXTIRPATION OF THE SUPERIOR CERVICAL SYMPATHETIC GANGLION

## COMMUNICATION II. THE CONDITIONED-REFLEX SECRETION FROM THE PAROTID SALIVARY GLANDS AFTER THE REMOVAL OF THE SUPERIOR CERVICAL SYMPATHETIC GANGLION

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In our first communication [2] findings are presented which show the changes which take place in unconditioned and natural conditioned reflexes after a one-sided extirpation of the upper cervical sympathetic ganglion. In the present communication findings are shown on the conditioned reflex secretion of the parotid salivary glands after an identical operation. The experiment was done on three dogs: Jack, Nalet and Piratka, in which food conditioned reflexes were developed to the metronome sound.

### EXPERIMENTAL METHODS AND RESULTS

Jack. The reflex to the metronome with a rhythm of 60 beats per minute (M60) developed rapidly, simultaneously on the left and right sides. The size of the reflex was the same on both sides and the latent period on the left and right was 6 seconds. In the process of the development of differentiation to a metronome with a rhythm of 120 beats per minute (M120) and the alteration in the significance of the stimuli, the mean size of the conditioned reflex increased; the reflex on the left became greater and its latent period shorter than on the right (see Table).

The analysis of the production of differentiation and later of the change of the qualitative meaning of the positive and inhibiting signals, has shown that Jack's basic nervous processes are well marked, but that stimulation is stronger than inhibition.

After extirpating the upper cervical sympathetic ganglion from the right side, the reflex remained only on the side operated; on the opposite side it appeared after two days. The asymmetry became reversed; the latent period on the right became shorter than on the left.

The differentiation remained disturbed for 12 days; the size of the reflex reaction to the inhibition signal was the same on the right and on the left, but on the right, on the operated side, the reflex appeared in a greater number of combinations than on the left.

In the same dog a new conditioned reflex was developed for a bell. The conditioned reflex appeared much sooner on the sympathectomized side; it was more strongly expressed and its latent period was shorter than on the intact side (see Table).

Piratka. The reflex to M60 was developed rapidly, simultaneously on the left and on the right. An absolute differentiation had already developed after the 9th use of the unsupported signal. The change in the significance of the conditioned signals took place rapidly on the right and left simultaneously, and the reflex was the same on both sides (see Table).

In Piratka the left upper cervical sympathetic ganglion was removed. On the day following the operation the conditioned reflex was restored only on the operated side; it appeared only on the 7th day on the opposite side. The size of the conditioned reaction became greater in the sympathectomized gland, and became less than before on the intact side. The latent period of the reflex on the operated side became shorter than on the opposite side (see Table)

The Conditioned Reflex in Dogs Before and After Extirpation of the Upper Cervical Sympathetic Ganglion

Dogs	Conditioned stimulus	Artificial conditioned reflex (in drops)				Latent period (in seconds)			
		before operation		after operation		before operation		after operation	
		on left	on right	on left	on right	on left	on right	on left	on right
Jack	Metronome	2.4	1.8	Operation on right		8	11	Operation on right	
	Bell	—	—	1.6	2.5	—	—	11	8
Piratka	Metronome	1.7	1.7	Operation on left		12	12	Operation on left	
				2.4	1.3			6	11
Nalet	Metronome	—	—	Operation on left		—	—	Operation on left	
				6.3	2.6			3	5

After the reestablishment of the conditioned reflexes a 2 1/2 month break was made in the work. After the break the positive conditioned reflexes disappeared and the unfortified reflexes had passed off. The normal relations were reestablished only after 9 months, after the application of bromide preparations — earlier on the operated than on the intact side.

Nalet. In this dog the conditioned reflexes to M60 were produced 2 1/2 months after the removal of the left upper sympathetic cervical ganglion. On the operated side the reflex first appeared after the 5th combination, and on the right after the 13th combination. Similar to the case of the other dogs, the average size of the conditioned reflex on the sympathectomized side was much greater than on the intact, the latent period being shorter (see Table).

## DISCUSSION OF RESULTS

The study of the conditioned reflex secretion simultaneously from both sides permits a partial evaluation of the action of the symmetric parts of the central nervous system, through which the reflex reaction takes place. In the normal, the appearance of the conditioned reflex, its reestablishment after an interval in the experiment and its differentiation and alteration, took place simultaneously on the left and on the right. Therefore in the corresponding symmetrical sections of the cerebral cortex the conditioned connections and conditioned (internal) inhibitions are developed simultaneously.

The size of the conditioned reflex and also the duration of its latent period on the right may be equal to the size of the reflex on the left, with an identical latent period (Piratka), but it can also differ (in Jack during the differentiation and alteration). Therefore the degree of the conditioned reflex stimulation of the corresponding symmetrical areas of the cerebral cortex may differ. The appearance of the asymmetry of the artificial conditioned reflexes does not depend on the correlation of the unconditioned reflexes. Thus there was no asymmetry of the unconditioned reflex in Jack under normal conditions, whereas in Piratka the unconditioned reflex was normally greater on the right than on the left [2].

After the removal of one of the upper cervical sympathetic ganglia, the formation of a new conditioned reflex, the reestablishment of the old reflexes, the differentiation and alteration (following a break in the work or after operation) took place more rapidly on the operated side than on the intact. In the given case we have come upon the following findings: in the symmetrical areas of the brain temporary connections are not developed and reestablished simultaneously; in all cases an asymmetrical secretion was observed, which, compared with the normal, increased on the operated side and decreased on the opposite.

The mentioned changes in the conditioned reflex secretion after the removal of one of the upper cervical sympathetic ganglia, are probably determined by various reasons. The fact is, that the extirpation of the upper cervical sympathetic ganglion undoubtedly affects not only the efferent influences, but also disturbs the afferent signalization of the gland into the corresponding cortical representation, and consequently, the excitability of the latter changes. Apparently, by virtue of the induction relations, the excitability of the symmetrical areas of the cortex of the second hemisphere is changed in the opposite direction, which has been shown by the corresponding changes in the rate of the development of the conditioned reflexes and their size.

Besides, it is possible that in the phenomenon observed by us, a definite part was played by the disturbance in the self-regulation of the functional qualities of the nervous system, carried out by the cortex through the sympathetic nervous system, as is considered by E. A. Asratyan [1], B. D. Stefanzov [3] and others.

#### LITERATURE CITED

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\*T. p. = C. B. Translation pagination.