

# ON RESIDUAL (LATENT) EXCITATION

I. A. Lapina

From the I. P. Pavlov Department of Physiology (Head-Prof. P. S. Kupalov) of the Institute of Experimental Medicine (Director-Corresponding Member of the Academy of Medical Sciences of the USSR, Prof. D. A. Biryukov) of the Academy of Medical Sciences of the USSR, Leningrad

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A conditioned salivary reflex which is completely limited to the salivary gland on either side (unilateral reflex) can be developed in dogs whose tongues have been made to extend by K. S. Abuladze's method.

In experiments with unilateral reflexes, the following rule has been observed consistently. If two conditioned reflexes are developed in the animals separately, for example, one for reinforcement with acid of the left section of the tongue (left-sided reflex), and another for the smearing of the right section of the tongue with the same acid (right-sided reflex), then in the stereotype, when there is a change from the stimuli of one side, the first application of stimuli to the other side causes a positive effect not on the same side, but on the side of the previous unconditioned stimulation.

Below in Tables 1-3 the worksheets of experiments on three dogs are shown. A solution of .3N hydrochloric acid was used as the unconditioned stimulus in all the experiments. In all the experiments the interval between stimuli was 5 minutes; the duration of the isolated action of the stimulus was 20 seconds.

TABLE 1

Change in the Reflexes of the Dog Palma in an Experiment in Which a Whistle was Reinforced by Smearing Acid on the Left Section of the Tongue, Noise on the Right Side

Conditioned stimulus	Stimulation number	Left Parotid Gland Reflex		Right Parotid Gland Reflex	
		conditioned	unconditioned	conditioned	unconditioned
Whistle	253	15	435	0	70
"	254	20	440	0	50
"	255	35	435	0	15
Noise	152	0	250	0	270
"	153	0	105	25	410
"	154	0	60	20	450

As is evident from the data presented, each time there was a change from the conditioned stimulus which produced a reaction by one salivary gland in the stereotype, to the stimulus which produced a reaction on the other side (in two experiments to noise and in one to gurgling), the isolated action of the stimulus either caused secretion of saliva from the gland with which the given conditioned stimulus had never been connected or brought about a total absence of salivation (dog Palma). The conditioned reflex effect was observed more often on the opposite side.

TABLE 2

Change in the Reflexes of the Dog Pirate in an Experiment in Which a Whistle was Reinforced by Smearing Acid on the Right Section of the Tongue, Noise on the Left Side

Conditioned stimulus	Stimulation number	Left Parotid Gland Reflex		Right Parotid Gland Reflex	
		conditioned	unconditioned	conditioned	unconditioned
Whistle	105	0	100	25	510
"	106	0	95	55	500
"	107	0	20	45	500
Noise	67	0	380	10	220
"	68	35	545	0	150
"	69	55	505	0	100

TABLE 3

Change in the Reflexes of the Dog Silva in an Experiment in Which a Whistle was Reinforced by Smearing Acid on the Right Section of the Tongue, Gurgling on the Left Section

Conditioned stimulus	Stimulation number	Left Parotid Gland Reflex		Right Parotid Gland Reflex	
		conditioned	unconditioned	conditioned	unconditioned
Whistle	66	0	10	25	220
"	67	0	6	45	235
"	68	0	3	40	245
Gurgling	18	0	245	12	75
"	19	50	295	0	15
"	20	60	315	0	20

The above phenomenon was repeated in spite of the fact that the stimuli which were applied in the second half of the experiment (noise, gurgling) were combined 800-1000 times and the conditioned reflexes for them were firmly established.

It is sufficient to change the stereotype and to place the conditioned reflexes first in the experiment for the conditioned reflex to appear on the same side when the conditioned stimulus is applied.

The data of the control experiments are presented in Tables 4 and 5.

TABLE 4

Change in the Reflexes of the Dog Palma in Control Experiments, Noise Reinforced by Smearing the Right Section of the Tongue with Acid

Conditioned stimulus	Stimulation number	Left Parotid Gland Reflex		Right Parotid Reflex	
		conditioned	unconditioned	conditioned	unconditioned
Noise	453	0	24	22	326
"	454	0	15	34	415
"	455	0	8	39	436

TABLE 5

Change in the Reflexes of the Dog Silva in Control Experiments  
Gurgling Reinforced by Smearing the Left Section of the Tongue With Acid

Conditioned stimulus	Stimulation number	Left Parotid Gland Reflex		Right Parotid Reflex	
		conditioned	unconditioned	conditioned	unconditioned
Gurgling	68	44	393	0	37
"	69	57	415	0	19
"	70	69	442	0	6

What do the results obtained signify ?

When the unconditioned acid stimulus was applied to a section of the tongue which had been made to extend, salivation occurred from the parotid gland on the same side. At a certain strength of this unconditioned stimulus and by combining it with the conditioned stimulus, a unilateral conditioned reflex was developed.

The state of increased excitability which was achieved by the action of the unilateral conditioned and unconditioned stimuli, did not disappear immediately but was preserved latently for a long time, not being manifested unless stimulation was applied.

The appearance of a positive reaction in the gland with which the given conditioned reaction was not connected indicated that latent excitation remained in the salivation center of the gland which worked previously. According to our experiments, this latent excitation was preserved for 7-8 hours and more. At the same time a reaction of the gland on the same side as the stimulated section of the tongue was absent, which may be explained by the development of an inhibitory state by induction from the salivation center of the opposite side.

Taking into account the data of K. S. Abuladze [1], A. A. Travina [3] and A. P. Kuznetsov [2] regarding the fact that stable areas of excitation are kept for a long time in one cerebral hemisphere, it can be assumed that residual (latent) excitation is preserved for a long time unilaterally in the cortical area of the chemical (stomatic) analyzer.

#### SUMMARY

An interesting regularity can be observed in experiments on dogs with an isolated part of the tongue (K. S. Abuladze's method). If conditioned reflexes are established in the animals with an isolated part of the tongue any irritation of the symmetrically situated part of the tongue causes at first a positive effect on the side of previously unconditioned stimulation.

The positive reaction of the gland which has no connection to the given conditioned or unconditioned reaction indicates that a latent excitation persists on the salivary center of the previously active gland. The author's experiments showed that a latent excitation remained in the cortical portion of the mouth chemical analyzer for 7-8 hours.

#### LITERATURE CITED

[1] K. S. Abuladze in the book: Works of the 15th Conference on Problems of Higher Nervous Activity, dedicated to the 50th anniversary of the teaching of I. P. Pavlov,\* Moscow-Leningrad, 1952, pp. 130-134.

[2] A. P. Kuznetsov in the book: Abstracts of reports of the Third Conference of Young Scientists of the Institute of Experimental Medicine,\* 1954, pp. 31-32.

[3] A. A. Travina, in the book: Abstracts and reports of papers presented at the Sixteenth Conference on Problems of Higher Nervous Activity,\* Moscow-Leningrad, 1953, pp. 213-215.

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\* In Russian.