

# SYMMETRY OF THE INORGANIC COMPOSITION OF SECRETION FROM TWO SIMULTANEOUSLY FUNCTIONING HOMONYMOUS SALIVARY GLANDS

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The method of emission spectral analysis was used to study the electrolyte composition of the secretions of the right and left submandibular salivary glands of the cat in response to intravenous injection of acetylcholine, pilocarpine, and noradrenalin and to stimulation of the parasympathetic and sympathetic nerves. During excitation of the secretory activity by humoral stimuli both the volume of secretion and the concentrations of sodium, potassium, calcium, and magnesium in it were identical. In response to stimulation of the secretory nerves, although the volume of secretion produced differed from the contralateral and ipsilateral glands, equal volumes of secretion contained equal quantities of electrolytes.

Some investigators have found that the secretions of the right and left homonymous salivary glands are equal [4, 6, 13], whereas others have shown that there is asymmetry in the activity of the glandular apparatus [1-3, 6, 9-12, 14-16], which they have attributed to differences in the level of excitability either of the receptor system [1, 3, 6, 9, 10, 16] or of the brain centers [2]. The compromise view has also been put forward, according to which contralateral glands can function either symmetrically or asymmetrically [7, 8]. The investigators cited above examined mainly the quantitative aspect of secretion. It will naturally be asked how the qualitative composition of the secretion of homonymous salivary glands behaves in response to a simultaneous action of stimuli of equal strength on the two glands.

One of the writers has previously shown [5] that the organic composition of the secretions of the right and left submandibular salivary glands in response to excitation of secretory activity by intravenous injection of humoral stimuli is identical.

The object of the present investigation was to study the inorganic composition of the secretions of the submandibular glands produced in response to intravenous injection of acetylcholine, pilocarpine, and noradrenalin and to stimulation of the secretory nerves.

## EXPERIMENTAL METHOD

Secretion of the salivary glands in response to intravenous injection of acetylcholine, pilocarpine, and noradrenalin and also to stimulation of the parasympathetic and sympathetic nerves was evoked by the method described previously [5].

The content of electrolytes in samples of the secretions of the right and left glands was determined by the emission spectral analysis method on a type ISP-22 spectrograph. Spectrally pure carbon electrodes with external diameter 6 mm, crater diameter 4 mm, and crater depth 6 mm were used. Whole saliva in a volume of 0.1 ml was poured into the crater and the electrode dried in an incubator. The emission spectra

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TABLE 1. Concentration of Electrolytes (in meq/liter) in Secretion of Right and Left Submandibular Salivary Glands of the Cat during Exposure to Different Stimuli ( $M \pm m$ )

	Type of stimulus evoking secretion							
	stimulation of parasympathetic nerve		intravenous injection of acetylcholine		intravenous injection of pilocarpine		stimulation of sympathetic nerve	
	R	L	R	L	R	L	R	L
Volume of secretion (in ml)	0.7±0.06	0.6±0.03	1.1±0.01	1.1±0.03	2.0±0.02	1.9±0.03	0.52±0.04	0.61±0.04
Sodium	97.9±2.73	100.6±4.33	128.8±4.33	122.4±2.66	111.6±1.56	108.9±2.87	132.7±1.77	133.5±2.97
Potassium	17.55±0.31	17.44±0.30	33.55±1.09	32.61±0.76	16.42±0.40	15.93±0.20	31.85±1.30	30.62±1.56
Calcium	22.33±1.29	27.30±0.60	31.10±0.99	30.39±0.92	29.05±0.61	29.67±0.62	30.90±1.03	31.10±0.58
Magnesium	5.91±0.43	6.11±0.66	8.74±0.33	8.61±0.58	8.21±0.33	8.84±0.37	9.99±0.32	10.63±0.43
							0.89±0.03	0.85±0.03
							127.7±2.47	129.5±1.71
							30.24±1.36	30.85±1.18
							31.11±0.60	31.77±1.10
							8.59±0.37	9.03±0.43

Legend: R) right gland; L) left gland.

of the electrolytes were excited by a high-frequency arc with current 0.9 A, voltage 1500 V, and exposure 12 sec. The content of sodium, potassium, calcium, and magnesium was determined from a permanent calibration graph.

## EXPERIMENTAL RESULTS

The results given in Table 1 show that the concentration of electrolytes in the secretions obtained from the right and left glands in response to intravenous injection of cholinergic (acetylcholine and pilocarpine) and adrenergic (noradrenalin) humoral stimuli, as well as the volume of saliva secreted, was the same. In individual experiments differences sometimes occurred between the content of electrolytes in the secretion of the homonymous glands. However, the maximal differences between the sodium concentrations in the secretion of the homonymous glands were 5-6 meq/liter, of potassium and calcium 2-3 meq/liter, and of magnesium 0.2 meq/liter. In the absolute majority of experiments the electrolyte concentration in the secretions of the right and left glands was very similar, so that the differences between the mean values were not statistically significant. It can accordingly be concluded from these results that the electrolyte composition of the secretion of the homonymous salivary glands in response to simultaneous excitation by humoral stimuli is quantitatively and qualitatively identical.

Is the symmetry of the inorganic composition observed only in response to the action of humoral stimuli, or is it also found if secretory activity is evoked by stimulation of the autonomic nerves? To answer this question, the electrolyte composition of secretions obtained from the right and left glands in response to stimulation of the parasympathetic and of the sympathetic nerves was compared (Table 1). Although during stimulation of the nerves the volume of secretion produced by the homonymous glands of the same animal could vary, differences between the concentrations of sodium, potassium, calcium, and magnesium in aliquot volumes of saliva were not statistically significant.

The electrolyte composition of the secretions of contralateral glands is therefore identical whether their secretory activity is evoked by humoral stimuli or by excitation of the secretory nerves.

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