

WATER INTAKE OF PARTIALLY AGEUSIC RATS¹

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Stimulation of the tongue by water has an excitatory effect on the gustatory afferents in some mammals (1), while in man and the white rat a decrease in the resting level of neural activity is observed in response to water stimulation (2). This resting discharge is presumably due to the stimulation of taste receptors by salivary constituents which are reduced in concentration by application of water to the tongue. The resting level of gustatory activity may be presumed to be a function of the concentration of some as yet unidentified salivary constituents, and recent observations on the water intake of desalivate rats suggest that such alterations in concentration may play a role in water intake regulation. Water intake measured during food deprivation is severely depressed in desalivate rats (3,4), and the effect is dependent on the particular salivary secretions which are blocked, there being little effect if the parotid ducts are ligated, while ligation of the major sublingual and submaxillary ducts results in a sizeable reduction in water intake (4). These observations suggest the possibility that changes in the concentration of some salivary constituent or constituents normally accompany dehydration and in turn produce an alteration in the resting or adaptation level of stimulation to gustatory afferents which in turn serves as a stimulus for drinking.

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In the present experiment, the function of gustatory afferents in water intake regulation was assessed by observing the water intake of rats with varying degrees of ageusia produced by peripheral nerve section.

Sixteen male albino rats of the Sprague-Dawley strain, approximately 90 days of age, served as subjects. Four groups of four animals each were prepared as follows: a control group of normals, and groups with bilateral divisions of the chorda tympani, glossopharyngeal, and pharyngeal branch of the vagus (CT, IX, X), chorda tympani and glossopharyngeal only (CT, IX), and pharyngeal branch of the vagus only (X). All operations were performed under nembutol anesthesia (50 MG/KG) in one stage with the exception of the second group. One stage operations dividing the glossopharyngeal and vagus nerves were found to invariably result in death from respiratory difficulty and/or difficulties in swallowing. Performing the divisions on right and left sides separated by a week to ten days time greatly improved recovery rate. In all cases the nerves were readily identified with the aid of a dissecting microscope.

The animals were housed in individual wire-mesh cages, and water-intake measured with 100 ml graduated cylinders, fitted with rubber stoppers and curved, glass drinking spouts. The cylinders were mounted on the fronts of the cages with the drinking spouts projecting inside about two inches. Fluid intake measurements were begun three weeks following the last operation.

Preliminary to the water intake measures, a preference test for sucrose was run to evaluate the degree of ageusia. The animals were tested on sucrose concentrations of 1.0, 5.0, 10.0, 20.0, and 25.0 grams %, (grams per 100 ml of solution). Each animal was given the choice between tap water and each sucrose solution for a 48 hour period, the positions of the water and sucrose solutions being switched at 24 hours to correct for position preference. Sucrose solutions were presented in order of increasing concentration.

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