DISTURBANCES IN WATER BALANCE CONTROLS FOLLOWING LESIONS TO THE
AREA POSTREMA AND ADJACENT SOLITARY NUCLEUS

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THE AP/cmNTS LESION AND SYNDROME

Lesions which remove the area postrema (AP) and the subjacent portions of the nucleus of the solitary tract (cmNTS) which lie in the caudal brainstem close to the dorsal spinomedullary junction cause dramatic and apparently permanent alterations in energy and fluid balance\(^1\),\(^2\). There is a well characterized syndrome of transient hypophagia and accompanying weight loss. Two to three weeks into this syndrome normophagia resumes with eventual stabilization of body weight but at a lower level. In addition there is a mild hyperdipsia. See figure 1.

The lesion removes the area postrema which is a circumventricular organ (CVO) of the brain and as such lacks a blood brain barrier. For this reason many investigators have suggested that CVOs are sites for putative central receptors. We suspect that they must subserve visceral function providing the brain with information on the status of the internal milieu derived from parameters circulating in the blood. In addition the neighboring portions of the nucleus of the solitary tract are involved in the lesion. More specifically, this includes portions of the commissural and medial subnuclei of the NTS which are relay nuclei for peripheral sensory afferents from the viscera.

NEURAL CONNECTIVITY OF THE AP/cmNTS

When one considers the neural connections of this area of the brain, it is immediately apparent that the lesion has much wider ranging effects than initially indicated by the very small size of

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Fig. 1. Left side. The AP/cmNTS lesion. (A) Photomicrograph of the normal dorsal medulla of the rat. (B) Labelled schematic drawing of the same area. (C) Photomicrograph of the dorsal medulla of a lesioned rat. The shaded area in (B) indicates the missing tissue.

Abbreviations: AP = area postrema, TS = tractus solitarius, DMNX = dorsal motor nucleus of the vagus, XII = Hypoglossal nucleus, mmNTS = medial subnucleus of the nucleus of the solitary tract, ncom = commissural subnucleus of NTS, dInTS = dorsal lateral subnucleus of NTS, vln = ventral lateral subnucleus of NTS, ni = subnucleus intersitialis of NTS, and sc = spinal canal.

Right side. Alterations in body weight control and ingestive behavior as a result of the AP/cmNTS lesion in male rats. (A) Body weight. (B) Food intake. (C) Water intake. (D) Water/food ratios.

the damaged area. First, we know from tracing studies in which the entire subdiaphragmatic vagus nerve is dipped into free horseradish peroxidase (HRP) that this portion of the NTS recives a heavy input from abdominal, visceral, sensory fibers. A small portion of these fibers terminate within the area postrema as well. The terminal fields are especially heavy in the commissural subnucleus underlying the area postrema and in the subnucleus gelatinosus which is just anterior and slightly lateral to the area postrema.