Response to “Oxytocin Influence on the Nucleus of the Solitary Tract: Beyond Homeostatic Regulation.”

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We are very pleased with the interest in our recent work reviewed in the Journal Club. The discussion provided was interesting and nicely incorporated our very technical and highly focused work into a larger systems framework. We would like to take this opportunity to note a couple of points we find important.

Functional role of oxytocin: Which neurons respond? The Journal Club article highlights the multiple integrative roles associated with oxytocin and interconnections to anxiety, behavior and the multiple pathways engaged. As noted by the Journal Club, our report found that half of second-order NTS neurons were oxytocin-sensitive. To more fully understand the functional impact of oxytocin in processing visceral information, we need to know several additional things. NTS receives afferent information from most visceral organs (e.g. heart, lungs, gastrointestinal tract, and liver) which convey multiple aspects of local visceral conditions (modalities, e.g. mechanical and chemical). We do not know whether oxytocin is associated with particular organs for example. A second key aspect of function is the phenotype of the NTS neuron and the destination of its axon. Clearly, oxytocin controlling the activity of a GABAergic NTS interneuron (Bailey et al., 2008) might be quite different than a catecholaminergic neuron projecting to PVN. Our article highlighted one specific group of NTS neurons that received information from cardiopulmonary receptors that were associated with oxytocin. We might add bidirectional arrows to the Journal Club pathway diagram to emphasize the predominant pattern of connections between NTS and forebrain structures(Loewy, 1990). The paraventricular nucleus of the hypothalamus (PVN) is particularly interesting in this
regard since PVN is thought to be the source of oxytocin within NTS and other studies (Bailey et al., 2006a; Bailey et al., 2007) from our lab found that PVN-projecting NTS neurons are generally not 2\textsuperscript{nd} order neurons. Clearly, additional studies will be required to determine which populations of NTS neurons are sensitive to oxytocin.

**Oxytocin vs. vasopressin.** In addition to oxytocin, projections from the PVN to the NTS release the structurally similar peptide vasopressin. In contrast to oxytocin, vasopressin inhibits approximately one third of ST-NTS synapses (Bailey et al., 2006b). This scenario seems to provide the PVN with a peptide-specific reciprocal control of the flow of afferent information through the NTS. However, while oxytocin is relatively selective for the oxytocin receptor, vasopressin has equal affinity for both the vasopressin and oxytocin receptors (Barberis and Tribollet, 1996). Across our studies, however, the pharmacological profiles suggest that oxytocin and vasopressin receptors populate different afferent populations on different sets of NTS neurons and it is not clear whether a promiscuity of vasopressin might have functional consequences. Clearly, the oxytocin findings reinforce the fundamental importance of receptor distribution.
Reference List


