COMMENTARY ON: **ACUTE MYOCARDIAL INFARCTION ACTIVATES MAGNOCELLULAR VASOPRESSIN AND OXYTOCIN NEURONES. ROY RK, AUGUSTINE RA, BROWN CH, SCHWENKE DO. *J Neuroendocrinol*. 2019 Dec; DOI: 10.1111/jne.12808.**

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Myocardial infarction (MI) is the leading cause of mortality and disability worldwide (1). In the years following MI, incidences of congestive heart failure (CHF) increase dramatically. Specifically, structural remodeling of the left ventricle results in ventricular abnormalities which contribute to CHF following MI (2).

It is well-established that the renin-angiotensin-aldosterone-system (RAAS) contributes to the detrimental remodelling of the left ventricle following MI (3). In addition to the RAAS, the antidiuretic hormone, vasopressin, is a potent regulator of fluid homeostasis. Vasopressin is secreted into circulation at the posterior pituitary by magnocellular neurosecretory neurons in the supraoptic (SON) and paraventricular (PVN) nuclei of the hypothalamus. Among other functions, vasopressin acts on receptors in the kidney to increase water retention, resulting in an overall increase in plasma volume. MI is associated with elevated secretion of vasopressin to promote fluid retention and preserve cardiac output in the weeks and months following MI. However, increased plasma volume is detrimental, contributing to the overstretching of the myocardium, resulting in remodelling of the left ventricle and subsequent CHF (4). Previous studies have established that magnocellular neurons in the SON and PVN are activated as early as 2 weeks following MI (5). Further, inhibition of vasopressin receptors V_{1a} and V_2 reduce MI-associated fluid retention and attenuate ventricular remodelling in animal models (4). These studies underline the importance of the vasopressin system in regulating fluid balance after MI. Yet, the mechanisms mediating increased vasopressin secretion following MI remain not well understood.

In the December 2019 issue of *The Journal of Neuroendocrinology*, Roy *et al*. demonstrate that magnocellular neurosecretory neurons in the SON and PVN exhibit increased activity within 90 minutes following MI in rodent models (6). While previous literature has shown increased activity of these neurons as early as 2 weeks following MI, this study brings light to the rapid and robust changes in neuronal activation nearly immediately after MI. The authors demonstrate this by showing an increased number of immunolabelled c-Fos-positive neurons in the SON, PVN, as well as nucleus tractus solitaries (NTS) and rostral ventrolateral medulla (rVLM) (6). They further demonstrate that there are greater proportions of both c-Fos-positive vasopressin and oxytocin magnocellular neurons in the SON and PVN (6). While oxytocin is most often associated with uterine contraction and lactation, it can also activate vasopressin receptor 2 (7), producing anti-diuretic effects and thus might also contribute to post-MI anti-diuresis.

The results of this study demonstrate that both vasopressin and oxytocin magnocellular neurons have increased activity shortly after MI in rodents (6). Increased c-Fos expression in these neuronal populations insinuate increased vasopressin and oxytocin hormonal release, which is responsible, at least partially, for the prolonged anti-diuresis following MI. Although the exact mechanism mediating the activation of magnocellular neurosecretory neurons following MI remains elusive, the authors speculate that it involves a modulation of peripheral baroreceptors.

Acute MI induces a transient decrease in cardiac output and blood pressure (8), leading to the activation of low pressure baroreceptors, which project to, and increase the activity of a subpopulation of NTS and rVLM neurons to facilitate sympathetic nerve activity (6). In support of this idea, the authors demonstrate that MI causes an acute increase in the expression of c-Fos in Tyrosine Hydroxylase-positive cells in these nuclei, which they attribute to the activation of noradrenergic neurons (6). Furthermore, the authors propose that stimulation of adrenergic projections to the PVN and SON (9, 10) can increase the magnocellular neurons activity (6).

These novel findings increase our understanding of the temporal profile of magnocellular neuron activity after MI. These data suggest that vasopressin and oxytocin secretion is evoked to induce immediate anti-diuresis following MI in animal models. The results of this study emphasize the importance of rapid intervention for both future basic and clinical studies of MI. While long-term changes in neuronal activity following MI are well established, here, the authors demonstrate the promptness in which these changes occur. Future studies focusing on the regulation of magnocellular neurosecretory cells by NTS and rVLM neurons activated in MI will improve our understanding of the events occurring immediately after MI and their contribution to CHF.

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