Oxytocin: Beyond the Uterus
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**Objectives:** Upon completion of this presentation, participants will be able to understand the involvement of oxytocin in the regulation of brain functions, such as complex social behavior and cognition and its emerging role in pain inhibition.

**Summary:** Oxytocin is well known to the obstetric anesthesiologist as a neuropeptide produced in the hypothalamus that is released into the circulation where it acts as a hormone to promote uterine contractility during labor and delivery as well as milk production during breast feeding. The reproductive actions of oxytocin have been described for over a century and the peripheral release of oxytocin during parturition, lactation and sexual function have been documented as early as in the 1950s. However, oxytocin is also released directly into the brain where it functions as a neurotransmitter, and its effects on the central nervous system are currently eliciting much interest. The extent of oxytocin’s involvement in behavior was only identified in the 1970s when central infusion of oxytocin in virgin female rats was shown to stimulate maternal behavior who would otherwise ignore or attack pups.

Based on these early animal experiments, recent work has shown that oxytocin plays an important role in human social and non-social behaviors. Oxytocin is believed to play a key role in maternal-infant bonding, attachment and nurturing. Due to a great diversity and the complexity of social attachments in humans, oxytocin is also involved in pair bonding and has recently been called the ‘love hormone’. Studies have identified a key role of oxytocin in memory, face recognition, identification of emotions, trust (including behavior during neuro-economic games, i.e. gambling), decision-making, learning, stress, depression, fear reduction and even feeding behaviors. Several studies have also explored the role of disrupted or pathological oxytocin signaling in psychiatric disorders including autism and schizophrenia.

Closer to the interest and practice of anesthesiologists and pain providers, a role for oxytocin in pain inhibition is emerging. Animal studies have shown that oxytocin mediates antinociception and analgesia via descending fibers of the para-ventricular hypothalamic nucleus (PVN). Activation of a sub-population of neurons (in lamina II) by oxytocin has recently shown to amplify local GABAergic inhibition. The translation of these animal studies demonstrating oxytocin-induced antinociception through oxytocin that is secreted in the spinal cord dorsal horn by descending axons of the PVN still needs to be examined in human studies. Evidence that this phenomenon is also present in humans is currently examined by several groups, as this could result in a novel target for the management of chronic pain and in particular that of neuropathic pain.

Finally, in a clinical study examining the role of ethnicity on pain perception, African-American women were found to exhibit lower plasma levels of oxytocin that were associated with lower pain tolerance in response to different painful modalities, as compared to Whites.

**Key Points**
1. Central oxytocin mediates numerous social and non-social behaviors
2. Central oxytocin has recently been identified as a key mediator on pain inhibition at the level of the spinal cord
3. Studies on a potential role for central oxytocin to manage human chronic pain may be providing exciting perspectives

**Key References**