Oxytocin injected into the ventral tegmental area induces penile erection and increases extracellular dopamine in the nucleus accumbens and paraventricular nucleus of the hypothalamus of male rats.

The neuropeptide oxytocin (20-100 ng), induces penile erection when injected unilaterally into the caudal but not rostral mesencephalic ventral tegmental area (VTA) of male Sprague-Dawley rats. Such pro-erectile effect started 30 min after treatment and was abolished by the prior injection of d(CH2)5Tyr(Me)2-Orn8-vasotocin (1 µg), an oxytocin receptor antagonist injected into the same caudal ventral tegmental area or of haloperidol (1 µg), a dopamine receptor antagonist, injected either into the nucleus accumbens shell (NAs) or into the paraventricular nucleus of the hypothalamus (PVN) ipsilateral to the injected ventral tegmental area. Penile erection was seen 15 min after the occurrence of, or concomitantly to, an increase in extracellular dopamine and its metabolite 3,4-dihydroxyphenylacetic acid (DOPAC) in the dialysate obtained from the nucleus accumbens or the paraventricular nucleus, which was also abolished by d(CH2)5Tyr(Me)2-Orn8-vasotocin (1 µg), injected into the ventral tegmental area before oxytocin. In the caudal ventral tegmental area oxytocin-containing axons/fibres (originating from the paraventricular nucleus) appeared to closely contact cell bodies of mesolimbic dopaminergic neurons retrogradely labelled with Fluorogold injected into the nucleus accumbens shell, suggesting that oxytocin effects are mediated by the activation of mesolimbic dopaminergic neurons, followed in turn by that of incerto-hypothalamic dopaminergic neurons impinging on oxytocinergic neurons mediating penile erection. As the stimulation of paraventricular dopamine receptors not only induces penile erection, but also increases mesolimbic dopamine neurotransmission by activating oxytocinergic neurons, these results provide further support for the existence of a neural circuit in which dopamine and oxytocin influence both the consummatory and motivational/rewarding aspects of sexual behaviour.

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