STIMULATION OF DOPAMINE RECEPTORS IN THE PARAVENTRICULAR NUCLEUS OF THE HYPOTHALAMUS OF MALE RATS INDUCES PENILE ERECTION AND INCREASES EXTRA-CELLULAR DOPAMINE IN THE NUCLEUS ACCUMBENS: INVOLVEMENT OF CENTRAL OXYTOCIN

Succu Salvatora, Sanna Fabrizio, Melis Tiziana, Argiolas Antonio, Melis Maria Rosaria

Bernard B. Brodie Department of Neuroscience, University of Cagliari, Italy

The paraventricular nucleus of the hypothalamus (PVN) is an important integration centre between the central and the peripheral nervous system. The PVN contains the cell bodies of a group of oxytocinergic neurons which project to several brain areas and to the spinal cord. These oxytocinergic neurons play an important role in the control of erectile function and copulatory behaviour. Dopamine in the PVN activates oxytocinergic neurons and facilitate penile erection and sexual activity by acting on dopamine receptors of the D2 and D4 subtype. Microdialysis studies have also shown an increase in paraventricular dopaminergic activity not only during the consummatory but also the anticipatory phase of sexual behaviour and dopamine has also been found to increase during sexual behaviour in the dialysate of the nucleus accumbens shell (NAs), a brain area involved in the anticipatory aspects (motivation and rewarding) of sexual behaviour.
Then we wanted to study if dopamine in the PVN mediates the anticipatory phase of sexual behavior by increasing dopaminergic activity in the NAs. In order to test this hypothesis, we studied the effect of a pro-erectile dose of apomorphine (0.1 μg), a classic mixed dopamine receptor agonist, and of PD 168077 (0.1 μg), a selective D4 receptor agonist, on the release of dopamine and DOPAC in the dialysate of the NAs, by intracerebral microdialysis.
As expected, apomorphine and PD 168077 induced penile erection episodes, and this increase occurred concomitantly to an increase in extracellular dopamine and DOPAC concentration in the dilaysate from NAs. When induced by apomorphine, these effects were reduced by 80% by raclopride, a selective D2/D3 receptor antagonist (1 μg) and only by 40-45% by L-745,870 (1 μg), a selective dopamine D4 receptor antagonist. When induced by PD 168077, these effects were reduced by more than 80% by L-745,870 (1 μg), but only by 35-40% by raclopride (1 μg). Irrespective of the dopamine agonist used to induce penile erection, the pro-erectile effect and the concomitant increase in dopamine and DOPAC concentration in the NAs dialysate were almost completely abolished by d$(CH_2)_5$Tyr(Me)-Orn^8-vasotocin(1 μg), a potent oxytocin receptor antagonist, given into the lateral ventricles. The present results show for the first time that the stimulation of dopamine receptors (mainly of the D2-D4 subtype) in the PVN releases oxytocin in brain areas that influence the activity of mesolimbic dopaminergic neurons mediating the pleasurable and reinforcing effects of sexual activity.