P3.19.

Vasopressin administration into the paraventricular nucleus normalizes plasma oxytocin and corticosterone levels in Brattleboro rats

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Adult male rats of the Brattleboro strain were used to investigate the impact of the congenital absence of vasopressin (AVP) on plasma oxytocin (OXT), adrenocorticotropin (ACTH), corticosterone (CORT) levels and OXT release within the hypothalamic paraventricular nucleus (PVN) in response to a 10-min forced swimming. Plasma ACTH samples revealed virtually identical stress responses for AVP-deficient Brattleboro (KO) and control animals. In contrast, plasma CORT and OXT levels were significantly elevated 105 min after onset of the stressor in KO animals only. Microdialysis samples collected from the PVN showed significantly higher levels of OXT both under basal conditions and in response to stressor exposure in KO vs. control animals accompanied by elevated OXT mRNA levels in the PVN of KO rats. These findings suggest that the increased OXT levels in the PVN caused by the congenital absence of AVP may contribute to normal ACTH stress responses in KO animals. However, whereas the stressor-induced elevation of plasma OXT in KO rats may be responsible for their maintained CORT levels, OXT seems unable to fully compensate for the lack of AVP. Retrodialyzing synthetic AVP into the PVN in KO animals revealed that this treatment normalized plasma OXT and CORT levels 105 min after forced swimming. Thus, endogenous AVP released within the PVN is likely to act as a paracrine signal to facilitate the return of plasma OXT and CORT to basal levels after acute stressor exposure.