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Effect of prior stress on interleukin-1β and HPA axis responses to acute stress

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Abstract:
Interleukin-1β (IL-1β) level is modulated during multiple stress reactions both in brain structures involved in hypothalamic-pituitary-adrenal (HPA) axis regulation and peripheral systems. Multiple distinct stressors induce different IL-1β and HPA axis responses. The purpose of the present study was to determine if the effect of prior repeated restraint stress on IL-1β levels in prefrontal cortex, hippocampus, hypothalamus and plasma may have an impact on alterations induced in HPA axis responses. Experiments were performed on male Wistar rats which were exposed to 10 min restraint stress twice a day for 3 days. Twenty four hours after the last stress period rats were restrained for 10 min and decapitated at 0, 1, 2 or 3 h after cessation of stress. Control rats were injected *ip* with saline and some of experimental groups with IL-1β receptor antagonist (IL-1ra). After rapid decapitation, trunk blood was collected and prefrontal cortex, hippocampus and hypothalamus were excised and frozen. Interleukin-1β, adrenocorticotropic hormone (ACTH) and corticosterone (CORT) levels were determined in plasma using commercially available kits and IL-1β levels in brain structures samples were analyzed by western blot procedure. Repeated restraint for 3 days alone did not alter resting plasma levels of IL-1β, and moderately augmented plasma ACTH and CORT levels and IL-1β content in brain structures 24 h after the last restraint. IL-1β antagonist abolished the increase in plasma levels of IL-1β, ACTH and CORT as well as IL-1β in brain structures in response to repeated stress and also reduced these changes induced by 10 min stress. This suggests the selectivity of IL-1β receptors in central and peripheral mechanisms modulating the stress-induced HPA axis responses. These results indicate that repeated stress markedly increases IL-1β production in brain structures involved in HPA axis regulation. The present results support the role of brain and peripheral IL-1β in adaptation of HPA response during prolonged stress.

Key words:
Interleukin-1β, limbic-hypothalamic-adrenal axis, IL-1β in stress responses, immuno-endocrine responses, ACTH, corticosterone