

# Hormones and the stressed brain



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Hormones and the Stressed Brain The brain and body's response to the environment depends on the stress system in the body. Cortisol found in humans or corticosterones in rodents are the important regulators of the stress system in the body. The individual differences in coping with the environment and others depend on them. These in turn are affected by genetic factors and individual experience. A number of actions are performed by important action performed by corticosterone and Cortisol, namely, molecular aggregations, membrane processes, and gene transcription.

In regard to gene transcription or writing, corticosteroid operates in 2 ways. One, the mineralocorticoid receptors ( MR's) that control the genes for stabilization of neural activity produced in response to the stress due to the release of corticotrophin-releasing hormone (CRH)-1 receptor. The glucocorticoid receptors (GRs) which unlike the MRs have low affinity induce agitation in the genes in response to the stress level produced by cortisol. GRs along with CRH-2 receptors, and parasympathetic system of behavioral alteration, aid in storing energy and information for any future occasions. Coordination and balance between the two is important for mental and physical health. Imbalance may occur due to genetic defect, individual experience etc altering the neural signal route controlling memory, emotion etc. Understanding the mechanism of corticosteroid help to find causes behind various stress related ailment like depression.

The individuals response to his/her environment is determined by the stress mediators or management hormones like corticosteroids mostly concentrated in the brain. In a healthy human being with perfectly balanced stress system the response operates is synonymous to the switch on and off

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responses of an electric fan. Sometimes these mediators may not operate in a balanced and coordinated way as in normal healthy humans. At times the mediators may respond slowly to actual dangers or adverse conditions, in the environment. Sometimes the stress mediators may continue to send stress signals long after the danger situation has been removed. In individuals who have a proclivity to a disease like depression malfunctioning stress mediators further increase this tendency. Short term changes in the way the stress genes respond can sometimes lead to long term changes in the genes. As a result of this maladaptive and abnormal physiological and behavioral changes occur.

Corticosteroid hormones function along with catecholamines and various other transmitters. When the corticosteroid control is inadequate, stress responses are very strong. When an individual is not able to adapt to stress corticosteroid levels remain high and keep on circulating for a long duration. Both these conditions are detrimental to an individual's mental and physical health and can even lead to damage to the major body functioning.

Depression patients have high cortisol levels especially during periods when sympathetic activity is high.

Studies have found out that depressed patients respond positively to antigluocorticoid therapy. Mice exposed to continuous stress and high corticosterone concentrations showed decline in spatial learning. Whereas continuous GR blockade from the brain resulted in increased cognitive performance. Thus the balance of the stress systems is paramount for health as well as homeostasis. There are differences in the way an individual responds to stress.

Studies have shown that a male rat's response may vary from active

fight/fight to passive/conservation withdrawal response to various psychological challenges. Passive animals are found to adopt better to various environmental changes where there is dominance of parasympathetic activity and a high circulation of cortisol right after the stress full condition.

Female social interaction patterns have not been studied and female (regulated by oxytocin) responses to stress may be different to males (regulated by aggressive vasopressin) due to genetic differences.

Thus the stress system depending on the way they function can be either beneficial or harmful. Studying the various receptors, hormones and their mechanism can help to understand the role of stress system in the various stress related disorder and device new drugs to help the afflicted individuals.