# Chapter 5 Central Role of the Brain in Stress and Adaptation

# Allostasis, Biological Embedding, and Cumulative Change

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# Abstract

The brain is the central organ of stress and adaptation because it perceives what is threatening and determines behavioral and physiological responses. Brain circuits are remodeled by stress–which changes the ability to self-regulate anxiety and mood–to perform working and episodic memory, as well as executive function and decision making. The brain regulates the body via the neuroendocrine, autonomic, immune, and metabolic systems, and the mediators of these systems and those within the brain and other organs activate epigenetic programs that alter expression of genetic information so as to alter cellular and organ function. While the initial active response to stressors promotes adaptation (“allostasis”), there can be cumulative change (e.g., body fat, hypertension) from chronic stress and resulting unhealthy behaviors (“allostatic load”) that can lead to disease, e.g., diabetes, cardiovascular disease (“allostatic overload”). Besides the embedding of early life experiences, the most potent of stressors are those arising from the social and physical environment that affects both brain and body. Gradients of socioeconomic status reflect the cumulative burden of coping with limited resources, toxic environments, and negative life events, as well as health-damaging behaviors that result in chronic activation of physiological systems that lead to allostatic load and overload. Can we intervene to change this progression? After describing the new view of epigenetics that negates the old notion that “biology is destiny,” this chapter summarizes some of the underlying cellular, molecular, and neuroendocrine mechanisms of stress effects upon brain and body. It then discusses integrative or “top down” approaches involving behavioral interventions that take advantage of the increasing ability to reactivate plasticity in the brain. At the societal level, policies of government and the private sector affect health directly or indirectly and must be redirected, to allow people to make choices that improve their chances for a healthy life.