GROWTH AND HOMEOSTASIS

Rates of hormone synthesis and release are regulated by the hypothalamus. Neuronal-level control governs secretion of releasing factors that travel from the hypothalamus to the anterior lobe of the pituitary gland, causing release of hormones that stimulate specific endocrine glands that, in turn, secrete hormones for stimulation of target tissue responses as illustrated for the stress response in Figure 10.1. Through its hormones, the hypothalamus plays a major role in the control of metabolic activity throughout the body, including basic functions such as hunger, thirst, body heat and sleep.

Growth hormone releasing hormone (GHRH), also known as somatocrinin, is carried by the hypothalamo-hypophysial portal circulation to the anterior lobe of the pituitary gland, where it stimulates secretion of growth hormone (GH), also known as somatotropin. GHRH and GH are both released in pulses. GH promotes growth of the body via protein synthesis and fat breakdown. GH stimulates the production of insulin-like growth factor-I (IGF-I), also known as somatomedin C, which is produced primarily by the liver as an endocrine hormone.

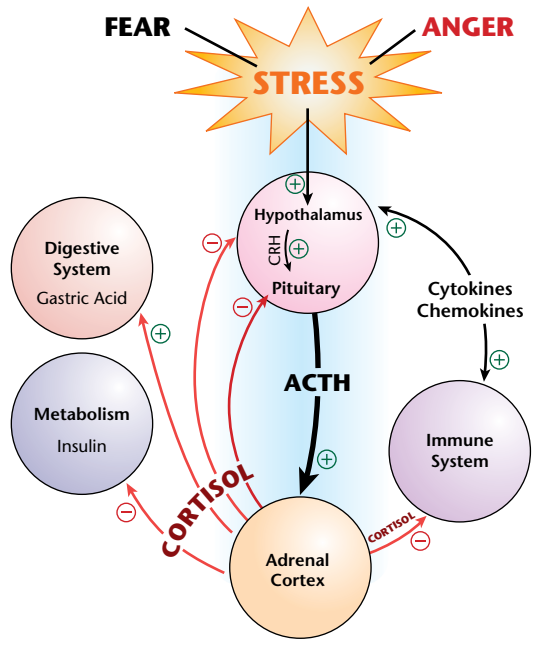

FIGURE 10.1 — **Metabolic and System Responses to Stress**

The hypothalamic, pituitary and adrenal glands respond in tandem to elicit multiple tissue responses when stress signals are received. When the brain perceives the removal of the threat, then the initiating neuronal signals subside and the system returns to basal levels of activity.

GROWTH HORMONE (GH) AND INSULIN-LIKE GROWTH FACTOR-I (IGF-I)

GH: Single-polypeptide chain of 191 amino acids
IGF-I: Single polypeptide chain of 70 amino acids

Effects on Target Tissue Cells	Laboratory Evaluations
Incorporation of amino acids into protein	Insulin resistance
Releasing FFA from adipocytes	Elevation of serum phosphate
Elevated basal and random GH level	Hypercalciuria
Inhibiting glucose uptake by tissues	Hyperprolactinemia
	Glucose-suppressed GH concentration
	GH response to insulin-induced hypoglycemia
	GH response to arginine infusion
	GH response to GHRH or somatomedin-C infusion

Functions: The principal effect of GH is to stimulate the liver and other tissues to synthesize IGF-I.[10] Thus, IGF-I mediates the action of growth hormone. The levels of IGF-I, unlike growth hormone, are relatively constant during the day, making its measurement more reliable. The greater stability of serum IGF-I is due in part to the buffering action of IGF-binding protein that is also present in serum. The presence of a binding protein raises the question of whether bound, free or total forms should be measured. Salivary IGF-I levels measure the active, free form and reflect the GH status of the patient.[11] The concentrations of serum IGF-I are low at birth (< 100 ng/mL) and rise steeply during childhood and puberty, reaching values as high as

Notes: