

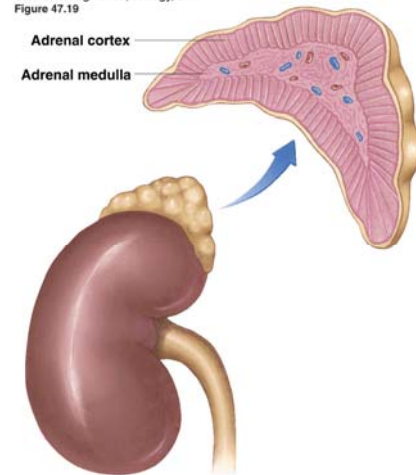


Endocrine Physiology

The Adrenal Gland 2

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Solomon/Berg/Martin, Biology, 6/e
Figure 47.19



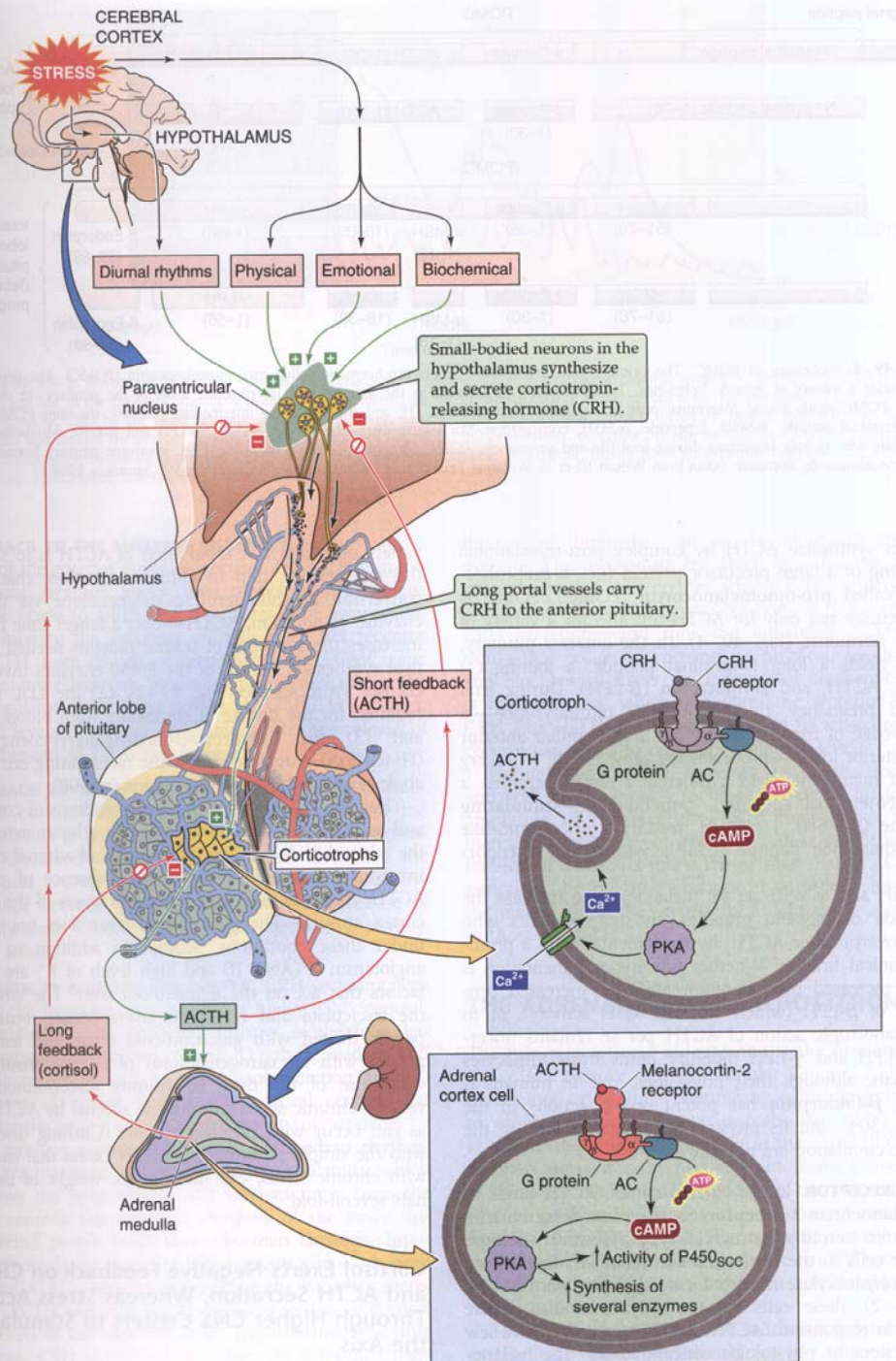
Glucocorticoids

- Produced by the fasciculata and reticularis layers of the adrenal cortex
- Glucocorticoids (cortisol): recognized early to increase plasma glucose levels:
 - Mobilization of amino acids from proteins
 - Enhance liver gluconeogenesis
- Target tissues: most body tissues

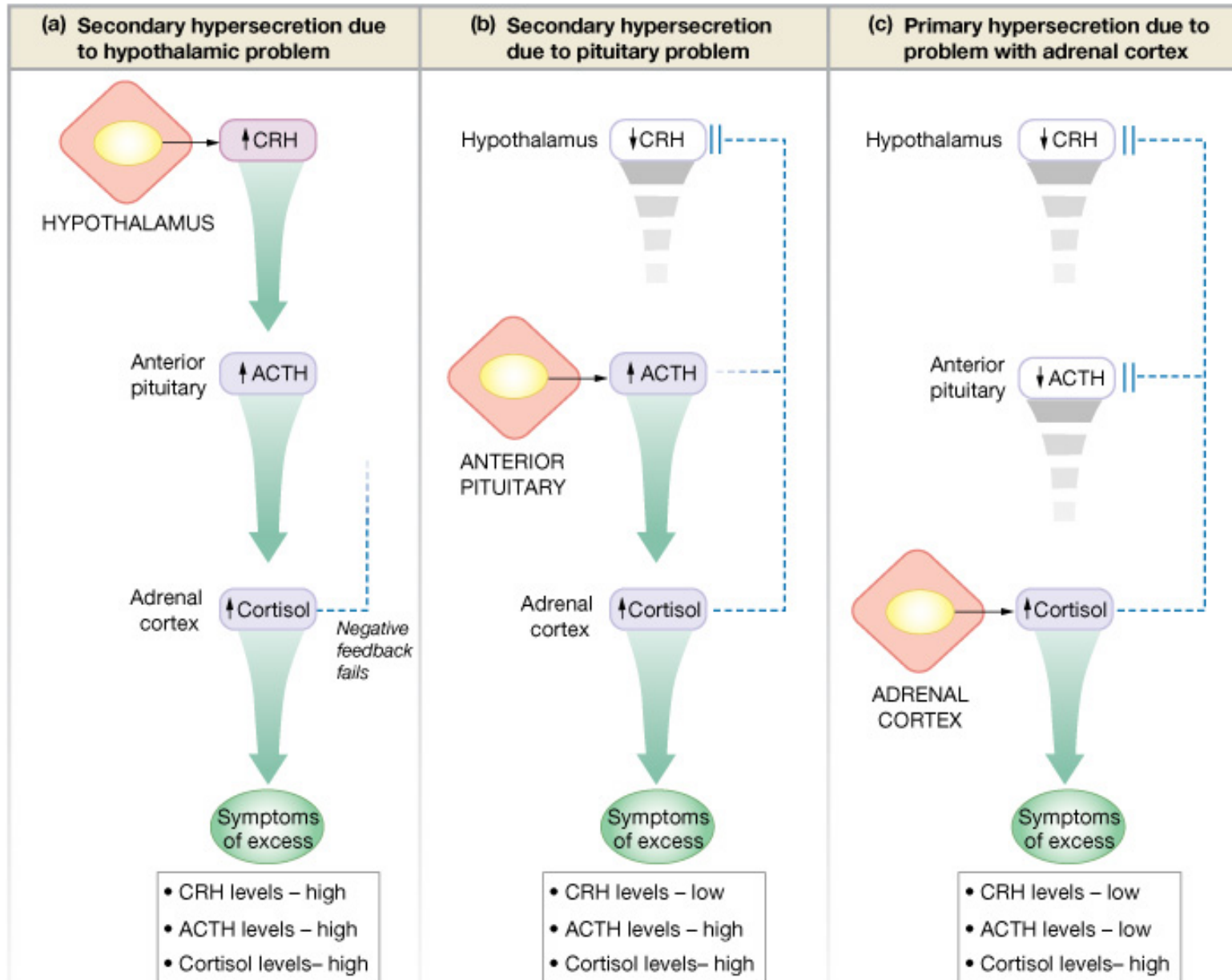
Glucocorticoids (cont.)

- CRH from hypothalamus is the major regulator of ACTH secretion
- ADH is also a potent ACTH secretagogue
- ACTH from anterior pituitary stimulates cortisol synthesis and secretion
- CRH (and ACTH) are secreted in pulses
- The greatest ACTH secretory activity occurs in the early morning hours and diminish late in the afternoon.

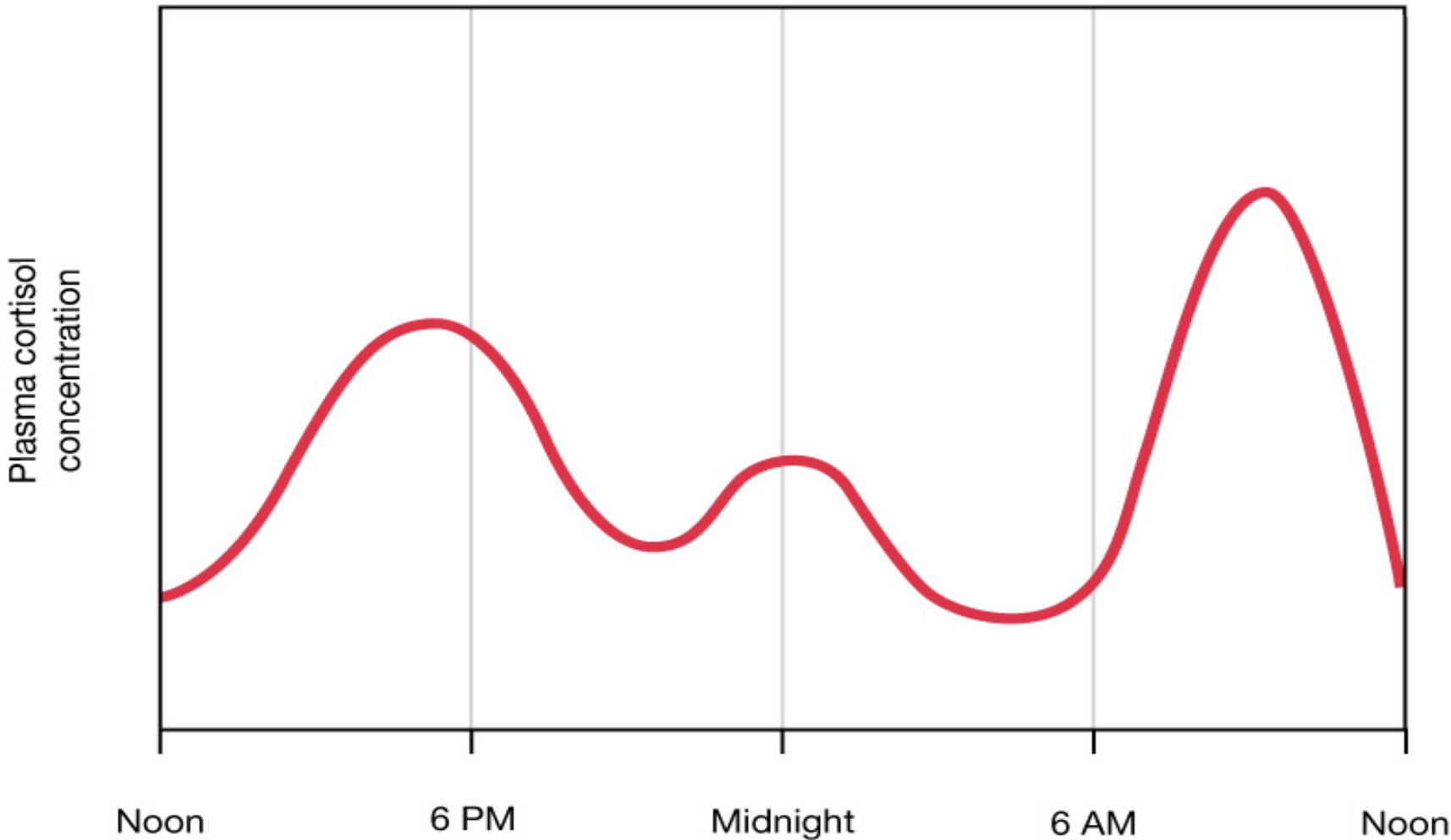
HPA Axis



Primary and secondary hypersecretion of cortisol



Circadian rhythm of cortisol secretion



Actions of Glucocorticoids

- Metabolic response to fasting:
 - Gluconeogenesis from amino acids (increased expression of the enzymes)
 - Mobilization of stored fat (activation of HSL) and its use in β -oxidation and the production of ketone bodies

Anti-inflammatory Effects of GC

- Glucocorticoids are used to alleviate inflammation
 - Inhibit production of prostaglandins and leukotrienes (mediate inflammation)
 - This occurs via stimulation of an inhibitor of phospholipase A₂, which is needed for PG synthesis
 - Decrease the inflammation reaction by decreasing permeability of capillary membranes, reducing swelling
 - They also reduce effects of histamine

Suppression of Immune System

- When administered in high doses, GC can:
 - Suppress antibody formation
 - Kill immature T and B lymphocytes

Glucocorticoids and Stress:

- Without GCs, the body cannot cope with even mild stressors
- Fat & glucose metabolism
- Maintenance of the vascular response to norepinephrine
- Effects on CNS

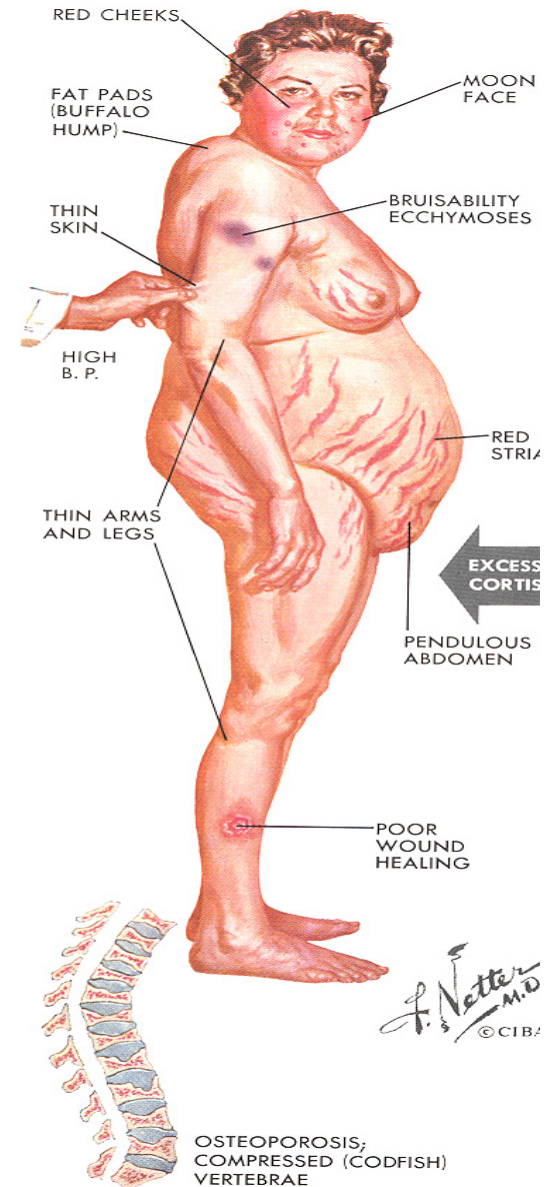
Cushing's Syndrome

- Cushing's syndrome results from continued high glucocorticoid levels
- 3rd - 6th decade, 4 to 1 females
- Causes:
 - pharmacologic
 - pituitary adenoma 75-90%
 - adrenal adenoma, carcinoma
 - ectopic ACTH

Cushing's Syndrome

Signs:

- Fat is deposited in the body trunk (central obesity)
- Buffalo hump
- Moon facies (subcutaneous fat in cheeks and submandibular)
- Purple striae
- Blood-glucose levels rises chronically, causing adrenal diabetes
- May cause beta cells to die



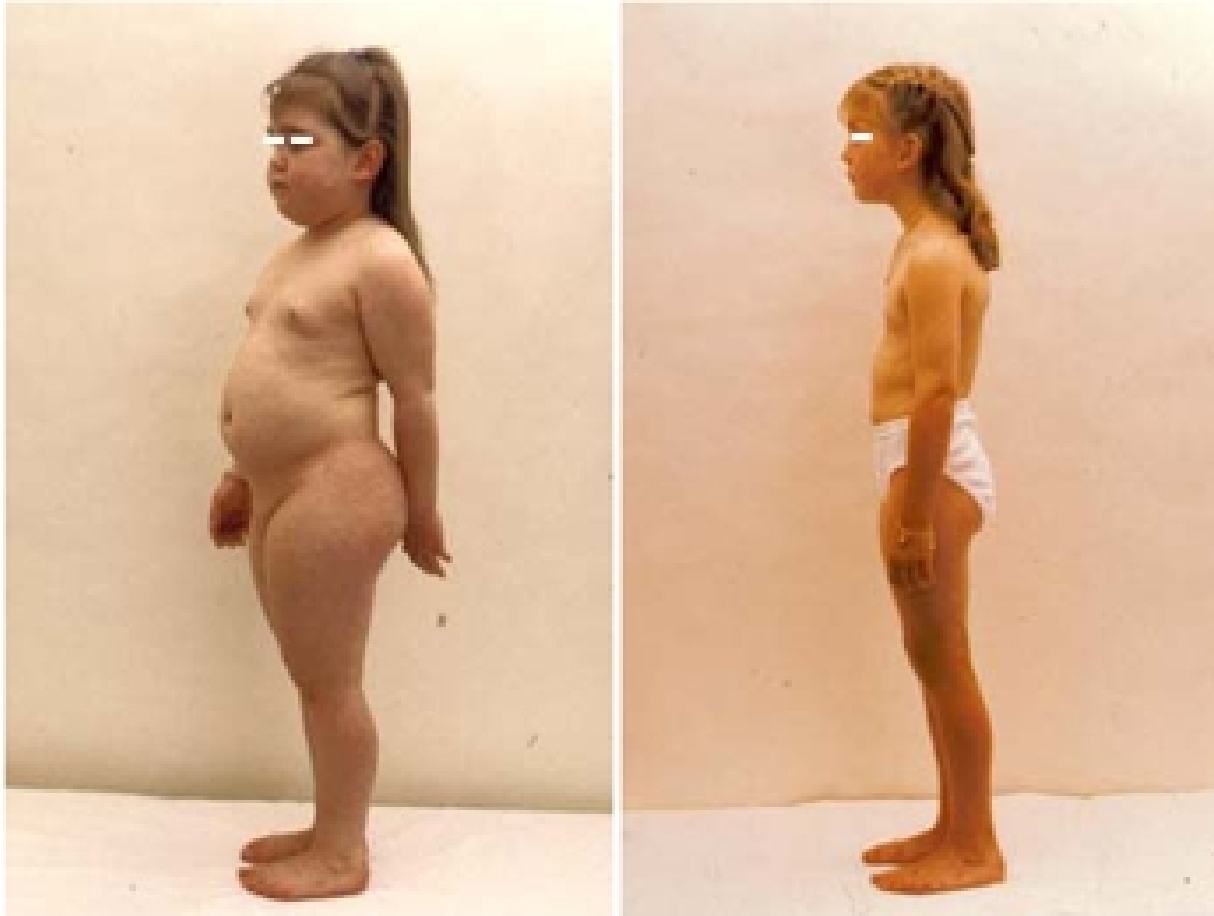
Cushing's Syndrome

- Purple striae



Cushing's Syndrome

- treatment based on cause



Adrenocortical insufficiency

- primary causes, ie. **Addison's disease**
 - autoimmune disease, tumors, infection, hemorrhage, metabolic failure, ketoconazole
- secondary causes
 - hypopituitarism, suppression by exogenous steroids

Adrenocortical insufficiency

- symptoms, signs
 - fatigability, weakness, anorexia, nausea, weight loss, hyperpigmentation, hypotension, women loss of axillary and pubic hair
 - can lead to severe volume depletion and shock
 - Reduced cortisol results in poor blood glucose regulation
 - Patient cannot cope with stress
 - Adrenal crisis: asthenia, severe pains in the abdomen, vascular collapse....

Adrenocortical insufficiency

- treatment
 - glucocorticoid replacement, mineralocorticoid replacement

Gonadocorticoids (Sex Hormones)

- Produced by the fasciculata and reticularis layers of the adrenal cortex
- Most gonadocorticoids secreted are androgens mainly dehydroepiandrosterone (DHEA)
- Androgens contribute to:
 - The onset of puberty
 - The appearance of secondary sex characteristics
 - Sex drive in females