ADRENAL GLUCOCORTICOIDS (Cortisol)

I. Adrenal Gland Secretions
   a. Adrenal Medulla
      i. Secretes Catecholamine’s (Epinephrine)
   b. Adrenal Cortex
      i. Secrets Steroid hormones
         ii. Cortisol is the main glucocorticoid secreted by the adrenal cortex

II. Cortisol Secretion is Controlled by CRH ACTH
   a. Control Pathway of Cortisol secretion is known as Hypothalamic-pituitary-adrenal (HPA) pathway
   b. CRH: Corticotropin-releasing hormone
      i. Secreted into hypothalamic-hypophyseal portal system to be transported into anterior pituitary gland (tropic gland)
   c. ACTH: Adrenocorticotropic Hormone
      i. Activated by CRH presence in anterior pituitary
         ii. ACTH acts on the adrenal cortex to promote synthesis and release of Cortisol
   d. Cortisol
      i. Acts as a Long Loop Negative Feedback signal, inhibiting CRH and ACTH secretions when adequate Cortisol levels are achieved
         ii. Cortisol secretion peaks in the morning and diminishes at night
         iii. Cortisol secretion increases with stress

<table>
<thead>
<tr>
<th>Region of adrenal gland</th>
<th>Secretes</th>
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<tbody>
<tr>
<td>Adrenal medulla</td>
<td>Catecholamines</td>
</tr>
<tr>
<td>Zona reticularis</td>
<td>Sex hormones</td>
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<tr>
<td>Zona fasciculata</td>
<td>Glucocorticoids</td>
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<tr>
<td>Zona glomerulosa</td>
<td>Aldosterone</td>
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</tbody>
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III. Cortisol effect’s on Tissue
   a. Most important metabolic effect of Cortisol is its protective effect against hypoglycemia
      i. In the absence of Cortisol, glucagon (peptide hormone that allows glucose secretion from glycogen) is unable to respond to low levels of glucose
   b. Promotes Gluconeogenesis
      i. Gluconeogenesis of the liver
      ii. Increases systemic blood glucose concentrations by having the liver produce/release excess glucose
   c. Cortisol Causes Breakdown of Skeletal Muscle Proteins
      i. Breaks down skeletal muscle proteins to provide substrates for Gluconeogenesis
   d. Enhances Lipolysis
      i. Enhances adipose breakdown so free fatty acids are available to peripheral tissues for energy use
   e. Suppresses the Immune System
   f. Causes Negative Calcium Balance
      i. Decreases intestinal calcium absorption
      ii. Increases renal calcium excretion
      iii. Causing calcium loss from body
      iv. Catabolic in bone tissue; breaking down the calcified bone matrix
   g. Brain Function
      i. Excess or deficiency causes mood swings or memory/learning alterations

<table>
<thead>
<tr>
<th>Organ/System</th>
<th>Effect</th>
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<tbody>
<tr>
<td>Immune system (including thymus)</td>
<td>Decreases</td>
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<tr>
<td>Plasma Glucose</td>
<td>Promotes/Increases</td>
</tr>
<tr>
<td>Muscle</td>
<td>Catabolism</td>
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<tr>
<td>Adipose</td>
<td>Catabolism</td>
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IV. Exogenous Stimulation of Glucocorticoid Pathway
   a. Exogenous Cortisol
      i. Causes atrophy of
         1. Adrenal Cortex
         2. Anterior Pituitary
            [Hypothalamus probably not effected]
   b. Exogenous ACTH
      i. Causes atrophy of
         1. Anterior Pituitary
            [Adrenal Cortex does not atrophy because it is still being stimulated by
             Cortisol, even though its exogenous; Hypothalamus probably not effected]

V. Hypercortisolism
   Definition: Excess Cortisol in the body
   Symptoms: Excess gluconeogenesis causes hyperglycemia (diabetes like symptoms), tissue wasting, excess
   Cortisol deposits in trunk and face
   Classic Symptoms: Thin arms and legs; obesity in the trunk, and a moon face with plum red cheeks
   Cushing Disease: Hypercortisolism from any cause
   a. Hyperadrenocorticism (Primary Disorder)
      i. Adrenal tumor that autonomously secretes Cortisol
      ii. Not under control of pituitary ACTH
      iii. Primary Hypercortisolism
         1. Causes long negative feedback loop to shut off CRH and ACTH
   b. Cushing Syndrome
      i. Pituitary tumor that autonomously secretes ACTH
      ii. Excess ACTH thus causing over-secretion of Cortisol
      iii. Second Hypercortisolism
   c. Ectopic ACTH Syndrome
      i. Non-pituitary ACTH producing tumor

VI. Hypocortisolism
    Definition: Hyposecretion of Cortisol
    a. Addison’s Disease
       i. Hyposecretion of all adrenal steroid hormones
       ii. Usually induced by autoimmune destruction of adrenal cortex