Adrenal Gland = Stress Gland

1. How is the adrenal cortex stimulated?
2. How is the adrenal medulla stimulated?
3. What does the adrenal medulla release during fight or flight?
4. Name the 3 hormones that the adrenal cortex releases.
5. What building block is required for steroid hormone production?
6. What is the target of:
    - aldosterone
    - cortisol
    - testosterone
7. What are the functions of:
    - aldosterone
    - cortisol
    - testosterone
8. What are the symptoms of Cushing's Disease?
9. For each symptom, describe why it would occur during Adrenal Overactivity:
    - High Blood Sugar
    - Acne and facial hair
    - Redistribution of body fat: skinny legs, large belly, fat bump on back of neck
    - High BP, accompanied by edema and "moon-shaped" face
    - Frequent illness, Poor Healing and/or increased risk of cancer
10. When a person is under a lot of stress, they may have high blood sugar, high blood pressure, and frequent illness. Based on what you know about the hypothalamic/pituitary gland connection and its control of the adrenal gland hormones, why is this occurring?
11. When a female is under a great deal of stress chronically, she stops ovulating. Based on what you know about the hypothalamic/pituitary gland connection and its control of the adrenal gland and the ovaries, speculate on why this may occur.

Answers:

Adrenal Gland = Stress Gland

1. How is the adrenal cortex stimulated?
   The pituitary gland gland releases ACTH to stimulate the adrenal gland.
2. How is the adrenal medulla stimulated?
   sympathetic motor neurons from the spinal cord
3. What does the adrenal medulla release during fight or flight?
   The adrenal medulla releases epinephrine and norepinephrine into the bloodstream.
4. Name the 3 hormones that the adrenal cortex releases.
   aldosterone; testosterone; cortisol
5. What lipid molecule is required for steroid hormone production?
   Cholesterol
6. What is the target of:
   - Aldosterone:
     DCT (distal convoluted tubule) of kidney tubules
   - Cortisol:
     cortisol: most cells (and specifically liver and adipose)
   - Testosterone:
     most cells
7. Functions of
   - aldosterone:
     - **increase salt and water reabsorption in kidneys (raises blood pressure)**
   - cortisol:
     - **increase blood glucose (stimulate liver to break down glycogen and make more sugar);**
     - **increase blood fatty acids (stimulate adipose to break down fat and move it to the belly and back of neck);**
     - **anti-inflammatory**
   - testosterone:
     - **facial hair (skin may become more prone to acne);**
     - **increase muscle mass;**
     - **increase bone density;**
     - **increase competition/aggression**
8. What are the symptoms of Cushing's Disease?
   thin limbs, large belly, mood face/edema; high blood sugar; high blood pressure
9. For each symptom, describe why it would occur during Adrenal Overactivity:
   - **high blood sugar: cortisol stimulates the liver to break down glycogen and add sugar to blood**
   - **acne/facial hair: testosterone**
   - **redistribution of body fat: cortisol stimulate lipolysis in the legs and then the fats settle back down, but in the highly cortisol-sensitive greater omentum**
   - **high BP, edema, moon shaped face: aldosterone causes salt, water reabsorption and consequent high BP**
   - **frequent illness, poor healing: cortisol depresses immune activity**
10. When a person is under a lot of stress, they may have high blood sugar, high blood pressure, and frequent illness. Based on what you know about the hypothalamic/pituitary gland connection and its control of the adrenal gland hormones, why is this occurring?
    The limbic system stimulates the hypothalamus when we are under emotional stress. The hypothalamus then overstimulates the pituitary gland to release ACTH, which causes overstimulation of the adrenal cortex.
11. When a female is under a great deal of stress chronically, she may stop ovulating. Based on what you know about the hypothalamic/pituitary gland connection and its control of the adrenal gland and the ovaries, speculate on why this may occur.
    Possibly increased testosterone is suppressing reproductive activities in the ovaries; also stress in the hypothalamus would affect the release of FSH and LH from the pituitary gland, both of which need to be carefully timed throughout the month to support a healthy reproductive cycle.