Hormonal Cycles

To complete this worksheet, select:

Module: Regulation
Activity: Animations
Title: Hormonal Cycles

1. Briefly describe each component of an endocrine feedback loop:
   
   **Stimulus**
   
   **Production Cell**
   
   **Hormone**
   
   **Target Cell**
   
   **Target Cell Action**
   
   **Response**

   **Responding to Blood Glucose Changes**

2. Describe how increased blood glucose levels respond to increased insulin levels.

   
   
   

3. Describe how insulin affects each of the following:

   a. liver cells

   
   
   

   b. adipose cells
4. What is the overall affect of insulin on blood glucose levels? 

5. Again, select “blood glucose level” for your controlled condition, but this time, select “decrease” for your stimulus. Glucagon will be your hormonal choice. Exercise, or not eating recently, will cause blood glucose levels to fall. Glucagon is stimulated from the pancreatic islets. Describe its affect; its role in re-establishing homeostasis.

6. Now, investigate the effect of GHRH/hGH on decreasing blood glucose levels. How do these hormones affect the liver in response to declining blood glucose levels?

7. Continue your investigation of hGH. How does hGH affect adipose tissue? How does this contribute to homeostatic balance?

8. Again, select “Blood glucose level” from the Controlled Condition list and “Decrease” from the stimuli list. This time, investigate ACTH-Cortisol.
   a. Declining blood glucose levels stimulates ACTH secretion from the anterior pituitary. What affect does ACTH have on the target cells within the adrenal cortex?
b. Explain cortisol's role in glycogenolysis and gluconeogenesis. How do these contribute to homeostasis?

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c. Describe cortisol's affect on muscle cells. How does this contribute to homeostasis?

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d. Continue your exploration of cortisol. Describe its affect on adipose tissue and how this affects homeostasis.

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e. Summarize the total response of cortisol induced changes.

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Responding to Blood Calcium Changes

9. Select "Blood Calcium Level" for your controlled condition. Start this investigation with its "increase" as the stimulus. This time, calcitonin, secreted by the thyroid gland, is the hormone at play. How does calcitonin contribute to homeostatic balance?

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10. Continue your investigation of "Blood Calcium Levels." This time, however, adjust the stimulus to a “decrease” in level. Parathyroid Hormone (PTH) will now be investigated.
   a. Explain the affect of parathyroid hormone on bone. How does this activity contribute to homeostasis?

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   b. If blood calcium levels drop, the parathyroid glands are stimulated to secrete Parathyroid Hormone. How does PTH affect target cells in the kidney? What is the affect of calcitriol in the body?

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   c. Summarize how PTH affects blood calcium levels. ________________________________________________________________

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Responding to Blood Pressure Changes

11. Select "Blood pressure level" from the controlled condition list. Investigate "increase" as the stimulus. Your only hormone choice is Atrial Natriuretic Peptide (ANP).
   a. How does ANP affect blood vessels in response to stress situations? How does this contribute to homeostasis?

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   b. How does ANP affect kidney nephrons? How does this contribute to homeostasis?

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12. Select, again, "Blood pressure level" from the controlled condition list. This time, however, investigate “decrease” as the stimulus. You'll investigate the affects of three hormones. Start with the first one, Antidiuretic Hormone (ADH).
   a. What affect does ADH have on the smooth muscle in blood vessel walls?

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b. How does ADH affect the principal cells of the kidney? 

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c. How does ADH affect the sweat glands? How does this contribute to homeostasis? 

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d. What is the total result of actions caused by ADH? 

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13. Once again, select "Blood pressure level" from the Controlled Condition list and "Decreased" from the Stimulus list. This time, select Renin/Angiotensin II from the Hormone list.

a. What does renin do? 

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b. Describe the affect of angiotensin II on the adrenal cortex. 

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c. Describe the affect of aldosterone on the nephrons of the kidney. 

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d. Describe the affect of angiotensin II on the proximal convoluted tubule of the kidney. 

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e. What is the total result of renin/angiotensin II? 

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14. Set the Controlled Condition to "Blood Pressure" and the stimulus to "Decreased." Select Aldosterone from the Hormone list. Describe aldosterone affects on the body.

Responding to Metabolic Changes

15. Set the Controlled Condition to "Metabolism". The only stimulus choice you have is "decreased", so select it, too. First, investigate the effect of TRH, TSH, and Thyroid Hormone.
   a. What secretes TRH, what is its target, and what is its affect?

   b. What is the target and affect of TSH?

   c. How do thyroid hormones, T3 and T4, affect cell metabolism?

   d. How do thyroid hormones affect blood vessels and the heart?

   e. How do thyroid hormones affect skeletal, muscular, and nervous system cells during growth and development?
16. Continue your exploration of metabolism homeostasis by selecting “Metabolism” from the Controlled Condition list and “Decreased” from the Stimulus list. Select “GHRH and hGH” from the Hormone list.
   a. What is the source and function of GHRH?

   b. What is the source and affects of hGH?

Responding to Stress

17. Select “Stress” from the Controlled Condition list. “Increased” is your only stimulus alternative. Select epinephrine/NE from the Hormone alternatives.
   a. What affect does epinephrine and norepinephrine (NE) have on the heart? How does this contribute to homeostasis?

   b. Describe the affect of epinephrine and norepinephrine on blood vessel smooth muscle. How do these effects contribute to homeostasis?

   c. How does epinephrine and norepinephrine affect liver cells? How does this contribute to homeostasis?

   d. How does epinephrine and norepinephrine affect bronchiole smooth muscle? How does this contribute to homeostasis?
e. In summary, how does epinephrine and norepinephrine contribute to homeostasis?


18. Continue your exploration of how the Controlled Condition of "Stress", when "Increased", can be hormonally regulated. This time, select "Cortisol" from the Hormone list.

a. What affect does cortisol have on muscle and liver cells?


b. What affect does cortisol have on blood vessels? How does this contribute to homeostasis?


c. What affect does cortisol have on macrophages?


d. What affect does cortisol have on lymphocytes?


e. In summary, what general role does cortisol have in maintaining homeostasis?


19. Again, continue your investigation of regulating "Stress" as a Controlled Condition. Your only choice of stimulus is "Increased." This time, select GHRH-hGH from the hormone list. You've already seen how these hormones regulate blood glucose.

a. How does this increase in blood glucose contribute to homeostasis?
20. Select “Stress”, once again, as your Controlled Condition. “Increased” is, again, your only choice of Stimulus. Select Thyroid Hormones from the Hormone list. You have already studied how Thyroid Hormones affect metabolism. How do these hormones contribute to homeostasis during a stress reaction?

21. And finally, finish your investigation of “Stress” as a Controlled Condition when the Stimulus is “Increased.” This time, investigate the Hormone aldosterone. You have already studied how aldosterone contributes to blood volume homeostasis. How does this also contribute to homeostasis during a stress reaction?

Return to the Lesson 1 webpage to continue your work through the Endocrine System.