What is Hormonal Regulation?

Worksheet

Hormonal regulation is the control of body processes by hormones released from endocrine glands into the bloodstream, which bind specific receptors on target cells to trigger a response, mostly through negative feedback loops.

Questions

1. Which gland releases insulin to lower blood glucose?

A) Thyroid gland
B) Pancreas
C) Adrenal gland
D) Pituitary gland

2. What type of feedback shuts down further hormone release once the target level is reached?

A) Positive feedback
B) Neutral feedback
C) Negative feedback
D) Cross feedback

3. Which of these is an example of positive feedback (an exception in hormonal regulation)?

A) Insulin lowering blood sugar
B) Oxytocin intensifying labor contractions
C) Thyroid hormone regulating metabolism
D) Glucagon raising blood sugar

4. What do hormones bind to on target cells?

A) Ribosomes
B) Specific receptors
C) Any protein
D) Random lipid

5. Blood glucose rises to 180 mg/dL after a meal (normal fasting is ~70-100 mg/dL). Trace the feedback response.

6. Blood glucose drops to 60 mg/dL between meals. Trace the feedback response.

7. Blood T4 falls to 3 g/dL (normal is 5-12 g/dL). Trace the thyroid feedback axis.

8. Define: What is a hormone?

9. Define: What is negative feedback?

10. Define: Endocrine vs exocrine gland?

Answer Key

1. B) Pancreas - The pancreas' beta cells release insulin when blood glucose rises.

2. C) Negative feedback - Negative feedback reverses the change, restoring balance and stopping the hormone signal.

3. B) Oxytocin intensifying labor contractions - Oxytocin during childbirth amplifies contractions rather than reversing them - a rare positive feedback loop.

4. B) Specific receptors - Hormones only affect cells that carry matching receptors, which is why they can be selective despite traveling through the whole bloodstream.

5. Beta cells in the pancreas detect glucose at 180 mg/dL (above the ~100 mg/dL set point) Insulin is released into the blood Insulin binds receptors on liver, muscle and fat cells, triggering glucose uptake and glycogen storage Blood glucose falls back toward ~90 mg/dL Insulin secretion decreases (negative feedback complete)

6. Alpha cells in the pancreas detect glucose at 60 mg/dL (below normal range) Glucagon is released into the blood Glucagon triggers the liver to break down glycogen into glucose Blood glucose rises back toward ~90 mg/dL Glucagon secretion decreases (negative feedback complete)

7. The hypothalamus detects low T4 and releases TRH The pituitary responds by increasing TSH secretion (e.g., to 8 mIU/L, normal range 0.4-4.0 mIU/L) High TSH stimulates the thyroid gland to produce more T4 As T4 returns to normal, TRH and TSH secretion decrease via negative feedback

8. A chemical messenger produced by an endocrine gland, released into the blood, that binds specific receptors on target cells to change their activity.

9. A regulatory loop where the response to a hormone reduces the original stimulus, shutting off further hormone release (e.g., insulin lowering blood glucose).

10. Endocrine glands secrete hormones directly into the bloodstream (ductless); exocrine glands secrete products through ducts (e.g., sweat, saliva).