Hormones: basic concepts

1. How do peptide hormones differ from steroid hormones?

Hormones acting on cell-surface receptors: peptide hormones

1. What are the basic types of peptide hormone?
2. Where do they act on a cell?
3. How do G protein-coupled receptors activate cells?
4. What is phospholipase C?
5. What is the function of the Gα protein?
6. How does a tyrosine kinase receptor activate cells?

Hormones acting on receptors located in the cell nucleus

1. Can a steroid or thyroid hormone enter a cell’s nucleus?
2. Where are receptors for steroid and thyroid hormones located and what happens after formation of the hormone-receptor complex?

Feedback control of hormone secretion

1. What is negative feedback?

Hypothalamo-hypophyseal (pituitary) axis

1. What is the difference between the adenohypophysis and the neurohypophysis?
2. Which hormones are secreted by the adenohypophysis and the neurohypophysis?
3. Outline the path of the hypothalamo-hypophyseal portal system and explain why it is an important conduit between the hypothalamus and adenohypophysis.

Growth hormone

1. What are the main effects of growth hormone?
2. What is the role of insulin-like growth factors?
3. How is growth hormone secretion controlled?

Prolactin

1. What is the main action of prolactin?

Thyroid function

1. How do the thyroid follicular cells use dietary iodine to form thyroid hormones?
2. How is thyroid hormone activated or inactivated inside target cells?
3. What is the most important factor affecting TRH secretion?
4. What is goiter and why does it occur in animals that are iodine deficient or fed plants containing goitrogens?
5. What are the clinical symptoms expected in a hyperthyroid cat and what are the cause of the symptoms?
6. What are the clinical symptoms expected in a hypothyroid dog?

Parathyroid gland, thyroid C-cells, and calcium homeostasis

1. What are the main actions of parathyroid hormone and how this helps to increase blood calcium concentration?
2. How is vitamin D metabolized and what is the role of parathyroid hormone?

Thyroid calcitonin

1. How does calcitonin decrease blood calcium concentration?
Pituitary–adrenal axis

1. What are the three zones of the adrenal cortex and which hormones do they produce?
2. Aldosterone production is stimulated by changes in blood pressure and perfusion of the kidney. Describe how this is mediated.
3. What are the actions of aldosterone that cause sodium to be reabsorbed from renal tubular fluid?
4. Describe how stress causes cortisol to be secreted.
5. How does the hypothalamus control cortisol secretion?
6. Where are the receptors for the adrenal corticosteroids located? Do mineralocorticoids only act on mineralocorticoid receptors and do glucocorticoids only act on glucocorticoid receptors?
7. What are the major actions of cortisol on tissues, including the immune system?
8. Androgens are also made in the adrenal cortex. Where and what function could they serve in females?
9. Describe the symptoms expected in an animal with Addison’s disease and explain why they occur.
10. Describe the symptoms expected in an animal with Cushing’s syndrome and explain why they occur.

Adenohypophysis gonadotropin–sex steroid axis

1. How is production of GnRH controlled?
2. FSH stimulates granulosa cells of the ovary to produce which hormones?
3. Which hormone do luteinized granulosa cells produce?

Function of the pars intermedia of the adenohypophysis

1. How does melanocyte-stimulating hormone allow a fish to alter its coloration?

Adrenal medulla

1. What role do the adrenal medullary cells play in the sympathetic nervous system?
2. What are the effects of epinephrine on blood flow and tissue metabolism to prepare the animal for fight or flight?

Neurohypophysis or posterior pituitary

1. Describe the path of axons from the paraventricular nucleus and supraoptic nucleus of the hypothalamus to the neurohypophysis.
2. What are the main effects of oxytocin and what controls its secretion?
3. Describe the main effects of antidiuretic hormone and how its secretion is controlled.

Insulin

1. How is insulin secretion controlled?
2. What is GLUT-4 and what role does insulin have in controlling GLUT-4 expression in adipose and muscle cells?
3. Does glucagon affect GLUT-4 expression?
4. Do brain, mammary gland, and intestinal epithelium require insulin in order to take glucose from the blood?
5. What are the effects of insulin on liver, muscle, and adipose tissue?
6. Describe the symptoms expected in an animal with diabetes.

Glucagon

1. How is glucagon secretion controlled? How would insulin deficiency affect this?
2. What are the effects of glucagon on liver, muscle, and adipose tissue?

The Pineal Gland and Melatonin

1. How does exposure to sunlight affect melatonin secretion and how might this determine when a female of a species that is a seasonal breeder may begin to cycle sexually?