Endocrine mid (Guyton review)

Q1. Which of the following is inconsistent with the diagnosis of Graves' disease?

A) Increased heart rate

B) Exophthalmos

C) Increased plasma levels of triiodothyronine (T3)

D) Increased plasma levels of thyroxine (T4)

E) Increased plasma levels of thyroid-stimulating hormone

Answer: *E) In Graves' disease, thyroid-stimulating immunoglobulins bind to cell membrane receptors, causing the thyroid to produce excessive amounts of thyroid hormones (T3 and T4). As a result of negative feedback, increased plasma levels of T3 and T4 suppress the secretion of thyroid-stimulating hormone. In addition, increased plasma levels of immunoglobulins often cause exophthalmos, and an increased heart rate is a common response to high circulating levels of thyroid hormones.*

Q2. Which of the following statements about antidiuretic hormone is true?

A) It is synthesized in the posterior pituitary gland

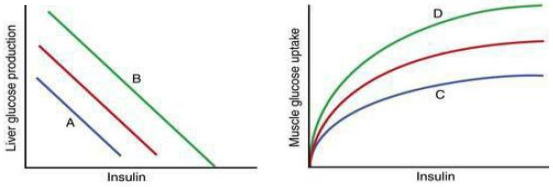
B) It increases salt and water reabsorption in the collecting tubules and ducts

C) It stimulates thirst

D) It has opposite effects on urine and plasma osmolality

Answer: *D) Antidiuretic hormone (ADH) increases the permeability of the collecting tubules and ducts to water, but not to sodium, which in turn increases water reabsorption and decreases water excretion. As a result, urine concentration increases, and the retained water dilutes the plasma. ADH is synthesized in the supraoptic and paraventricular nuclei of the hypothalamus and has no direct effect on the thirst center.*

Q3. In the figure, which lines most likely illustrate these relationships in a patient with acromegaly?



A) A and C
B) A and D
C) B and C
D) B and D

Answer: *C) In acromegaly, high plasma levels of growth hormone cause insulin resistance. Consequently, there is increased glucose production by the liver and impaired glucose uptake by peripheral tissues.*

Q4. In the figure, line D most likely illustrates the influence of which of the following?

A) Exercise
B) Obesity
C) Growth hormone
D) Cortisol
E) Glucagon

Answer: *A) During exercise, glucose utilization by muscle is increased, which is largely independent of insulin.*

Q5. Some cells secrete chemicals into the extracellular fluid that act on cells in the same tissue. Which of the following refers to this type of regulation?

A) Neural
B) Endocrine
C) Neuroendocrine
D) Paracrine
E) Autocrine

Answer: *D) Paracrine communication refers to cell secretions that diffuse into the extracellular fluid to affect neighboring cells.*

Q6. Which of the following pairs is an example of the type of regulation referred to in question 5?

A) Somatostatin—growth hormone secretion
B) Somatostatin—insulin secretion
C) Dopamine—prolactin secretion
D) Norepinephrine—corticotropin-releasing hormone secretion
E) Corticotropin-releasing hormone—adrenocorticotropic hormone secretion

Answer: *B) The delta cells of the pancreas secrete somatostatin, which inhibits the secretion of insulin and glucagon from the pancreatic beta and alpha cells, respectively. Choice D is an example of neural communication, and the remaining choices are examples of neuroendocrine communication.*

Q7. A patient has an elevated plasma thyroxine (T4) concentration, a low plasma thyroid-stimulating hormone (TSH) concentration, and a thyroid gland that is smaller than normal. Which of the following is the most likely explanation for these findings?

A) Patient has a lesion in the anterior pituitary that prevents TSH secretion
B) Patient is taking propylthiouracil
C) Patient is taking thyroid extract
D) Patient is consuming large amounts of iodine
E) Patient has Graves' disease

Answer: *C) If a subject were taking sufficient amounts of exogenous thyroid extract to increase plasma levels of T4 above normal, feedback would cause TSH secretion to decrease. Low plasma levels of TSH would result in atrophy of the thyroid gland. In Graves' disease, the same changes in plasma levels of T4 and TSH would be present, but the thyroid gland would not be atrophied. In fact, goiter is often present in patients with Graves' disease. A lesion in the anterior pituitary that prevents TSH secretion or the taking of propylthiouracil or large amounts of iodine would be associated with low plasma levels of T4.*

Q8. Which of the following anterior pituitary hormones plays a major role in the regulation of a nonendocrine target gland?

A) Adrenocorticotropic hormone
B) Thyroid-stimulating hormone
C) Prolactin
D) Follicle-stimulating hormone
E) Luteinizing hormone

Answer: *C) The major target tissue for prolactin is the breast, where it stimulates the secretion of milk. The other anterior pituitary hormones (adrenocorticotropic hormone, thyroid-stimulating hormone, folliclestimulating hormone, and luteinizing hormone) stimulate hormones from endocrine glands.*

Q9. A patient has a goiter associated with high plasma levels of both thyrotropin-releasing hormone (TRH) and thyroid-stimulating hormone (TSH). Her heart rate is elevated. This patient most likely has which of the following?

A) Endemic goiter
B) Hypothalamic tumor secreting large amounts of TRH
C) Pituitary tumor secreting large amounts of TSH
D) Graves' disease

Answer: *B) A hypothalamic tumor secreting large amounts of TRH would stimulate the pituitary gland to secrete increased amounts of TSH. As a result, the secretion of thyroid hormones would increase, and this would result in an elevated heart rate. In comparison, a patient with either a pituitary tumor secreting large amounts of TSH or Graves' disease would have low plasma levels of TRH because of feedback. Both TRH and TSH levels would be elevated in endemic goiter, but the heart rate would be depressed because of the low rate of T4 secretion.*

Q10. A 46-year-old man has "puffy" skin and is lethargic. His plasma thyroid-stimulating hormone concentration is low and increases markedly when he is given thyrotropin-releasing hormone. Which of the following is the most likely diagnosis?

A) Hyperthyroidism due to a thyroid tumor
B) Hyperthyroidism due to an abnormality in the hypothalamus
C) Hypothyroidism due to an abnormality in the thyroid
D) Hypothyroidism due to an abnormality in the hypothalamus
E) Hypothyroidism due to an abnormality in the pituitary

Answer: *D) Lethargy and myxedema are signs of hypothyroidism. Low plasma levels of thyroid-stimulating hormone indicate that the abnormality is in either the hypothalamus or the pituitary gland. Because the pituitary was responsive to the administration of thyrotropin-releasing hormone (TRH), this suggests that pituitary function is normal and that the hypothalamus is producing insufficient amounts of TRH.*

Q11. Which of the following hormones is both synthesized and stored in the pituitary gland?

A) Growth hormone (GH)
B) GH releasing hormone (GHRH)
C) ADH
D) Somatostatin
E) Somatomedin

Answer: *A) GH and ADH are stored in the anterior and posterior lobes of the pituitary gland, respectively. However, although GH is also synthesized in the (anterior) pituitary gland, this is not the case for ADH. ADH and the hypothalamic releasing (GHRH) and hypothalamic inhibitory hormones (somatostatin) are synthesized in the hypothalamus. Somatomedins are growth factors (small proteins) that stimulate growth in bone and peripheral tissues. One of the most important somatomedins is somatomedin C, which is produced by the liver in response to GH. Somatomedin C stimulates all aspects of bone growth.*

Q12. Which of the following hormones is largely unbound to plasma proteins?

A) Cortisol
B) Thyroxine (T4)
C) Antidiuretic hormone
D) Estradiol
E) Progesterone

Answer: *C) In general, peptide hormones are water soluble and are not highly bound by plasma proteins. Antidiuretic hormone, a neurohypophysial peptide hormone, is virtually unbound by plasma proteins. In contrast, steroid and thyroid hormones are highly bound to plasma proteins.*

Q13. Why is milk produced only after delivery, not before?

A) Levels of luteinizing hormone and follicle-stimulating hormone are too low during pregnancy to support milk production.
B) High levels of progesterone and estrogen during pregnancy suppress milk production
C) The alveolar cells of the breast do not reach maturity until after delivery.
D) High levels of oxytocin are required for milk production to begin, and oxytocin is not secreted until the baby stimulates the nipple.

Answer: *B) Although estrogen and progesterone are essential for the physical development of the breast during pregnancy, a specific effect of both these hormones is to inhibit the actual secretion of milk. Even though prolactin levels are increased 10- to 20-fold at the end of pregnancy, the suppressive effects of estrogen and progesterone prevent milk production until after the baby is born. Immediately after birth, the sudden loss of both estrogen and progesterone secretion from the placenta allows the lactogenic effect of prolactin to promote milk production.*

Q14. In an experiment, patients in group 1 are given compound X, and patients in group 2 are given compound Y. After 1 week, group 1 patients have a lower metabolic rate and a larger thyroid gland than group 2 patients do. Identify compounds X and Y. (T4, thyroxine; TRH, thyrotropin-releasing hormone; TSH, thyroid-stimulating hormone)

	Compound X	Compound Y
A)	TSH	Placebo
B)	T_4	Placebo
C)	Placebo	TSH
D)	Placebo	T_4
E)	Placebo	TRH

Answer: *D) Administration of T4 in amounts that increase plasma levels of the hormone above normal would be expected to increase the metabolic rate and decrease TSH secretion. Decreased plasma levels of TSH lead to atrophy of the thyroid gland. Thus, patients in group 1 would have a lower metabolic rate and a larger thyroid than patients in group 2, who were administered T4.*

Q15. A patient has hyperthyroidism due to a pituitary tumor. Which of the following sets of physiological changes would be expected?

	Thyroglobulin synthesis	Heart rate	Exopthalomos
A)	↑	↑	+
B)	↑	↑	–
C)	↑	↓	+
D)	↓	↓	+
E)	↓	↓	–
F)	↓	↑	–

Answer: *B) A pituitary tumor secreting increased amounts of TSH would be expected to stimulate the thyroid gland to secrete increased amounts of thyroid hormones. TSH stimulates several steps in the synthesis of thyroid hormones, including the synthesis of thyroglobulin. Increased heart rate is among the many physiological responses to high plasma levels of thyroid hormones. However, high plasma levels of thyroid hormones do not cause exophthalmos. Immunoglobulins cause exophthalmos in Graves' disease, the most common form of hyperthyroidism.*

Q16. A 25-year-old man is severely injured when hit by a speeding vehicle and loses 20% of his blood volume. Which of the following sets of physiological changes would be expected to occur in response to the hemorrhage? (ADH, antidiuretic hormone)

	Atrial stretch receptor activity	Arterial baroreceptor activity	ADH secretion
A)	↓	↓	↑
B)	↓	↓	↓
C)	↔	↑	↑
D)	↑	↑	↑
E)	↑	↑	↓

Answer: *A) Hemorrhage decreases the activation of stretch receptors in the atria and arterial baroreceptors. Decreased activation of these receptors increases ADH secretion.*

Q17. A patient with normal thyroid function has been given the wrong medication. Which of the following sets of changes would most likely be reported if this patient took propylthiouracil for several weeks? (T4, thyroxine; TSH, thyroid-stimulating hormone)

	Thyroid size	Plasma T_4 concentration	Plasma TSH concentration
A)	↓	↓	↓
B)	↓	↓	↑
C)	↑	↓	↓
D)	↑	↓	↑
E)	↑	↑	↑

Answer: *D) Propylthiouracil blocks several of the early steps in the synthesis of thyroid hormones but does not prevent the formation of thyroglobulin in follicular cells. Therefore, if propylthiouracil were administered to a normal patient, plasma levels of T4 would fall, and decreased feedback inhibition would lead to an increase in TSH secretion. High plasma levels of TSH would cause hypertrophy of the thyroid gland, even though the production of thyroid hormones is depressed.*

Q18. A 30-year-old woman is breast-feeding her infant. During suckling, which of the following hormonal responses is expected?

A) Increased secretion of antidiuretic hormone (ADH) from the supraoptic nuclei
B) Increased secretion of ADH from the paraventricular nuclei
C) Increased secretion of oxytocin from the paraventricular nuclei
D) Decreased secretion of neurophysin
E) Increased plasma levels of both oxytocin and ADH

Answer: *C) During suckling, stimulation of receptors on the nipples increases neural input to both the supraoptic and paraventricular nuclei. Activation of these nuclei leads to the release of oxytocin and neurophysin from secretion granules in the posterior pituitary gland. Suckling does not stimulate the secretion of appreciable amounts of ADH.*

Q19. Which of the following hormones activate enzyme-linked receptors?

A) ADH
B) Insulin
C) ACTH
D) PTH
E) Aldosterone

Answer: C) Follicle-stimulating hormone stimulates the granulosa cells of the follicle to secrete estrogen.

Q20. Which of the following findings is most likely in a patient who has myxedema?

A) Somnolence
B) Palpitations
C) Increased respiratory rate
D) Increased cardiac output
E) Weight loss

Answer: *A) Somnolence is a common feature of hypothyroidism. Palpitations, increased respiratory rate, increased cardiac output, and weight loss are all associated with hyperthyroidism.*

Q21. If a woman hears her baby cry, she may experience milk ejection from the nipples even before the baby is placed to the breast. What is the explanation for this?

A) The sound of the hungry baby's cry elicits secretion of oxytocin from the posterior pituitary, which reaches the breast and causes contraction of the myoepithelial cells.
B) The sound of the hungry baby's cry causes a reflex relaxation of the myoepithelial cells, allowing the milk to flow.
C) The sound of the hungry baby's cry elicits a surge of prolactin from the anterior pituitary, which promptly stimulates milk production from the breast.
D) The sound of the hungry baby's cry elicits sympathetic nervous system discharge that causes contraction of the myoepithelial cells.

Answer: *A) Neural projections from higher centers of the brain to the hypothalamus can elicit the secretion of oxytocin into the blood from the posterior pituitary gland. Upon reaching the breast, oxytocin stimulates contraction of the myoepithelial cells, forcing milk from the alveoli and ducts to the nipple.*

Q22. Which of the following hormones is not stored in its endocrine-producing gland?

A) T4
B) PTH
C) Aldosterone
D) ACTH
E) Insulin

Answer: *C) Steroid hormones are not stored to any appreciable extent in their endocrine producing glands. This is true for aldosterone, which is produced in the adrenal cortex. In contrast, there are appreciable stores of thyroid hormones and peptide hormones in their endocrine-producing glands.*

Q23. Which of the following findings would likely be reported in a patient with a deficiency in iodine intake?

A) Weight loss
B) Nervousness
C) Increased sweating
D) Increased synthesis of thyroglobulin
E) Tachycardia

Answer: *D) Because iodine is needed to synthesize thyroid hormones, the production of thyroid hormones is impaired if iodine is deficient. As a result of feedback, plasma levels of thyroid-stimulating hormone increase and stimulate the follicular cells to increase the synthesis of thyroglobulin. This results in a goiter. Increased metabolic rate, sweating, nervousness, and tachycardia are all common features of hyperthyroidism, not hypothyroidism due to iodine deficiency.*

Q24. Which of the following sets of physiological changes would be most likely to occur in a patient with acromegaly?

	Pituitary mass	Kidney mass	Femur length
A)	↓	↓	↑
B)	↓	↑	↑
C)	↑	↔	↔
D)	↑	↑	↔
E)	↑	↑	↑

Answer: *D) A pituitary tumor secreting growth hormone is likely to present as an increase in pituitary gland size. The anabolic effects of excess growth hormone secretion lead to enlargement of the internal organs, including the kidneys. Because acromegaly is the state of excess growth hormone secretion after epiphyseal closure, increased femur length does not occur.*

Q25. Which of the following would least likely be associated with thyrotoxicosis?

A) Tachycardia
B) Increased appetite
C) Somnolence
D) Increased sweating
E) Muscle tremor

Answer: *C) Thyrotoxicosis indicates the effects of thyroid hormone excess. Thyroid hormone excites synapses. In contrast, somnolence is characteristic of hypothyroidism. Tachycardia, increased appetite, increased sweating, and muscle tremor are all signs of hyperthyroidism.*

Q26. Growth hormone secretion would most likely be suppressed under which of the following conditions?

A) Acromegaly
B) Gigantism
C) Deep Sleep
D) Exercise
E) Acute hyperglycemia

Answer: *E) Under acute conditions, an increase in blood glucose concentration will decrease growth hormone secretion. Growth hormone secretion is characteristically elevated in the chronic pathophysiological states of Acromegaly and Gigantism. Deep sleep and exercise are stimuli that increase growth hormone secretion.*

Q27. A 30-year-old woman reports to the clinic for a routine physical examination. The examination reveals that she is pregnant. Plasma levels of TSH are high but total T4 concentration (protein bound and free) is normal. Which of the following best reflects this patient's clinical state?

A) Graves' disease
B) Hashimoto's disease
C) Pituitary tumor secreting TSH
D) Hypothalamic tumor secreting TRH
E) Patient is taking thyroid extract

Answer: *B) Circulating levels of free T4 exert biological effects and are regulated by feedback inhibition of TSH secretion from the anterior pituitary gland. Protein bound T4 is biologically inactive. Circulating T4 is highly bound to plasma proteins, especially to thyroid-binding globulin (TBG), which increases during pregnancy. An increase in TBG tends to decrease free T4, which then leads to an increase in TSH secretion, causing the thyroid to increase thyroid hormone secretion. Increased secretion of thyroid hormones persists until free T4 returns to normal levels, at which time there is no longer a stimulus for increased TSH secretion. Therefore, in a chronic steady-state condition associated with elevated TBG, high plasma total T4 (bound and free) and normal plasma TSH levels would be expected. In this pregnant patient, the normal levels of total T4 along with high plasma levels of TSH would indicate an inappropriately low plasma level of free T4. Deficient thyroid hormone secretion in this patient would be consistent with Hashimoto's disease, the most common form of hypothyroidism.*

Q28. Which of the following metabolic substrates is preferentially metabolized by growth hormone?

A) Fats
B) Proteins
C) Glycogen
D) Glucose

Answer: *A) Fats are readily oxidized by growth hormone. In contrast, growth hormone decreases carbohydrate utilization and promotes the incorporation of amino acids into proteins.*

Q29. Which of the following physiological responses is greater for triiodothyronine (T3) than for thyroxine (T4)?

A) Secretion rate from the thyroid
B) Plasma concentration
C) Plasma half-life
D) Affinity for nuclear receptors in target tissues
E) Latent period for onset of action in target tissues

Answer: *D) In target tissues, nuclear receptors for thyroid hormones have a greater affinity for T3 than for T4. The secretion rate, plasma concentration, half-life, and onset of action are all greater for T4 than for T3.*

Q30. In order for milk to flow from the nipple of the mother into the mouth of the nursing infant, which of the following must occur?

A) Myoepithelial cells must relax
B) Prolactin levels must fall
C) Oxytocin secretion from the posterior pituitary must take place
D) The baby's mouth must develop a strong negative pressure over the nipple
E) All of the above

Answer: *C) Oxytocin is secreted from the posterior pituitary gland and carried in the blood to the breast, where it causes the cells that surround the outer walls of the alveoli and ductile system to contract. Contraction of these cells raises the hydrostatic pressure of the milk in the ducts to 10 to 20 mm Hg. Consequently, milk flows from the nipple into the baby's mouth.*

Q31. Which of the following is an inappropriate hypophysial hormone response to the hypothalamic hormone listed?

(ACTH, adrenocorticotropic hormone; CRH, corticotropin-releasing hormone; GH, growth hormone; GnRH, gonadotropin-releasing hormone; LH, luteinizing hormone; TRH, thyrotropinreleasing hormone; TSH, thyroid-stimulating hormone)

	Hypothalamic hormone secretion	Hypophysial hormone
A)	Somatostatin	↓ GH
B)	Dopamine	↑ Prolactin
C)	GnRH	↑ LH
D)	TRH	↑ TSH
E)	CRH	↑ ACTH

Answer: *B) Prolactin secretion is inhibited, not stimulated, by the hypothalamic release of dopamine into the median eminence. Growth hormone is inhibited by the hypothalamic inhibiting hormone somatostatin. The secretion of luteinizing hormone, thyroid-stimulating hormone, and adrenocorticotropic hormone are all under the control of the releasing hormones indicated.*

Q32. A patient is administered sufficient thyroxine (T4) to increase plasma levels of the hormone several-fold. Which of the following sets of changes is most likely in this patient after several weeks of T4 administration?

	Respiratory rate	Heart rate	Plasma cholesterol concentration
A)	↑	↑	↑
B)	↑	↑	↓
C)	↑	↓	↑
D)	↓	↓	↑
E)	↓	↑	↓

Answer: *B) Increased heart rate, increased respiratory rate, and decreased cholesterol concentration are all responses to excess thyroid hormone.*

Q33. Release of which of the following hormones is an example of neuroendocrine secretion?

A) Growth hormone
B) Cortisol
C) Oxytocin
D) Prolactin
E) Adrenocorticotropic hormone

Answer: *C) The secretion of chemical messengers (neurohormones) from neurons into the blood is referred to as neuroendocrine secretion. Thus, in contrast to the local actions of neurotransmitters at nerve endings, neurohormones circulate in the blood before producing biological effects at target tissues. Oxytocin is synthesized from magnocellular neurons whose cell bodies are located in the paraventricular and supraoptic nuclei and whose nerve terminals terminate in the posterior pituitary gland. Target tissues for circulating oxytocin are the breast and uterus, where the hormone plays a role in lactation and parturition, respectively.*

Q34. Inhibition of the iodide pump would be expected to cause which of the following changes?

A) Increased synthesis of thyroxine (T4)
B) Increased synthesis of thyroglobulin
C) Increased metabolic rate
D) Decreased thyroid-stimulating hormone secretion
E) Extreme nervousness

Answer: *B) Inhibition of the iodide pump decreases the synthesis of thyroid hormones but does not impair the production of thyroglobulin by follicular cells. Decreased plasma levels of thyroid hormones result in a low metabolic rate and lead to an increase in thyroid-stimulating hormone (TSH) secretion. Increased plasma levels of TSH stimulate the follicular cells to synthesize more thyroglobulin. Nervousness is a symptom of hyperthyroidism and is not caused by thyroid hormone deficiency.*

Q35. Which of the following pituitary hormones has a chemical structure most similar to that of antidiuretic hormone?

A) Oxytocin
B) Adrenocorticotropic hormone
C) Thyroid-stimulating hormone
D) Follicle-stimulating hormone
E) Prolactin

Answer: *A) Both antidiuretic hormone and oxytocin are peptides containing nine amino acids. Their chemical structures differ in only two amino acids.*

Q36. A patient has hypothyroidism due to a primary abnormality in the thyroid gland. Increased plasma levels of which of the following would most likely be reported?

A) Cholesterol
B) Thyroxine-binding globulin
C) Reverse triiodothyronine (RT3)
D) Diiodotyrosine
E) Iodide

Answer: *A) Increased plasma cholesterol concentration is commonly observed in hypothyroidism.*

An experiment was conducted in which rats were injected with one of two hormones or saline (control) for 2 weeks. Autopsies were then performed, and organ weights were measured (in milligrams)

	Control	Hormone 1	Hormone 2
Pituitary	12.9	8.0	14.5
Thyroid	250	500	245
Adrenal glands	40	37	85
Body weight	300	152	175

Q37. Hormone 1 is which of the following?

A) Thyroid-releasing hormone
B) Thyroid-stimulating hormone (TSH)
C) Thyroxine (T4)
D) Adrenocorticotropic hormone (ACTH)
E) Cortisol

Answer: *B) In this experiment, the size of the thyroid gland increased because thyroid-stimulating hormone (TSH) causes hypertrophy and hyperplasia of its target gland and increased secretion of thyroid hormones. Increased plasma levels of thyroid hormones inhibit the secretion of thyrotropin-releasing hormone, which decreases stimulation of the pituitary thyrotropes, resulting in a decrease in the size of the pituitary gland. Higher plasma levels of thyroid hormones also increase metabolic rate and decrease body weight*

Q38. Hormone 2 is which of the following?

A) TSH
B) T4
C) Corticotropin-releasing hormone
D) ACTH
E) Cortisol

Answer: *C) In this experiment, the size of the pituitary and adrenal glands increased because corticotropinreleasing hormone stimulates the pituitary corticotropes to secrete adrenocorticotropic hormone, which in turn stimulates the adrenals to secrete corticosterone and cortisol. Higher plasma levels of cortisol increase protein degradation and lipolysis and, therefore, decrease body weight.*

Wish you best luck!

Done by: Monerah Alsalouli