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United States Medical Licensing Step 1

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**QUESTION 1**

In patients with type 4 renal tubular acidosis (RTA) aldosterone deficiency is often a prominent finding. Distal tubular transport of which of the following ions will be affected in these patients?

- A. hydrogen and potassium in exchange for sodium
- B. hydrogen only
- C. potassium only
- D. sodium and bicarbonate
- E. sodium only

Correct Answer: A

Section: Physiology The RTA refers to related conditions that are disorders of urine acidification even though other renal functions are not impaired. In type 4 RTA, distal nephron dysfunction is due to either inadequate aldosterone production or aldosterone resistance resulting from intrinsic renal disease. Thus, patients develop hyperchloremic acidosis with hyperkalemia, due to impaired distal tubular secretion of both potassium and hydrogen ions. Treatment of patients is directed at controlling serum potassium. Choices B, C, D, and E are inconsistent with the known actions of aldosterone.

QUESTION 2

A 60-year-old male patient is brought to the hospital following sudden onset of weakness and sensory loss in the right face and upper limb. The right lower limb is unaffected. An MRI scan would reveal signs of a stroke in which of the following areas?

- A. in the territory of the left anterior cerebral artery
- B. in the territory of the left middle cerebral artery
- C. in the territory of the left posterior cerebral artery
- D. in the territory of the right middle cerebral artery
- E. in the territory of the right posterior cerebral artery

Correct Answer: B

Section: Anatomy Because the right side of the patient is affected, the stroke is in the territory of the left middle cerebral artery. This artery supplies the lateral aspect of the cerebral hemisphere, including portions of the pre- and postcentral gyri corresponding to the head, upper limb, and trunk on the primary motor (area 4 of Brodmann) and primary sensory (area 3,1,2 of Brodmann) cortical strips. These cortical control areas for the right lower limb are supplied by branches of the left anterior cerebral artery (choice A), which is uninvolved in this case since the lower limb is intact. The left posterior cerebral artery (choice C) supplies the occipital and temporal lobes and is unaffected in this case. Since the right side of the brain controls the left side of the body and the patient is intact on the left side, none of the right side cerebral arteries (choices D and E) are involved.

QUESTION 3



Clinical laboratory results indicate that an AIDS patient in a county hospital in San Antonio is infected with an acid-fast bacillus. Which of the following bacteria is this organism most likely to be?

- A. *M. avium-intracellulare*
- B. *M. fortuitum-chelonae*
- C. *M. marinum*
- D. *M. scrofulaceum*
- E. *M. tuberculosis*

Correct Answer: A

Section: Microbiology/Immunology

M. avium-intracellulare (choice A) is often called the MAC or MAI (*M. avium-intracellulare*) complex. They are ubiquitous in the environment (water, soil, food, animals). MAC organisms seldom cause disease in immunocompetent humans but are efficient opportunists in those immunocompromised, especially in AIDS patients in the United States. In fact, it is one of the most common opportunistic infections of bacterial origin in that situation. Environmental exposure can lead to MAC colonization of either the respiratory or GI tract. A transient bacteremia is usually followed by tissue invasion. Any organ may be affected. A wide variety of clinical presentations may occur, but patients often present with nonspecific symptoms of fever, night sweats, abdominal pain, and diarrhea and weight loss. Diagnosis is made by culturing the organism. Treatment may involve multiple drugs and last from 6 months to 1 year or even for life. *M. fortuitum-chelonae* (choice B) are soil/water saprophytes and may cause superficial or systemic disease only rarely. *M. marinum* (choice C) occurs in water and may cause skin lesions in humans. Infections are relatively rare. *M. scrofulaceum* (choice D) is also found in water and may be a rare saprophyte in adults with chronic lung disease. *M. tuberculosis* (choice E) causes tuberculosis in humans and is a very important human pathogen. Host to host transmission is the usual method observed.

QUESTION 4

A 43-year-old man complains of a 25-lbs weight gain over the past 2 years distributed mostly in the trunk and face. He also states that he has developed abdominal stretch marks and facial acne during the same time period. Physical examination reveals BP 160/100 mm Hg and pulse 90 per minute. Significant laboratory tests were fasting glucose 145 mg/dL and 24-hour urinary free cortisol greatly increased at 390 g/d. The dexamethasone suppression test showed suppression of the urinary free cortisol at high but not low doses. Based upon this information, you would expect to find a hormonally- active tumor in which of the following sites?

- A. adrenal cortex
- B. adrenal medulla
- C. anterior pituitary
- D. posterior pituitary

Correct Answer: C

Section: Pathology and Path physiology This patient has the physical stigmata of excess cortisol or Cushing syndrome which is confirmed by the urinary free cortisol levels. Cortisol also has some mineralocorticoid activity producing sodium and water retention and hypertension. Cortisol promotes gluconeogenesis leading to glucose intolerance, hyperinsulinism and, in some patients, frank diabetes. The fact that urinary cortisol levels were suppressed by high but not low doses of dexamethasone strongly suggests a pituitary-based Cushing syndrome due to excess ACTH



production or Cushing disease. ACTH-producing cells or corticotropes are found in the anterior pituitary. The dexamethasone suppression test rules out the adrenal (choices A and B) as a site for the tumor and posterior pituitary (choice D) is not the location of the ACTH-producing cells.

QUESTION 5

Following an automobile accident a patient suffers a pelvic fracture and significant internal blood loss resulting in hemorrhagic shock. Which of the following organs has the largest specific blood flow (blood flow per gram of tissue) under resting conditions and is especially vulnerable during the shock phase?

- A. brain
- B. heart muscle
- C. kidneys
- D. skeletal muscle
- E. skin

Correct Answer: C

Section: Physiology During resting conditions, approximately 15% of the cardiac output goes to the brain, 15% to the muscles, 30% to the GI tract, and 20% to the kidneys. However, when normalized by organ weight, the kidneys receive the largest specific blood flow (400 mL/100 g) at rest and are particularly vulnerable during hemorrhagic shock. The brain (choice A) also receives relatively high specific blood flow (50 mL/100 g). Heart muscle (choice B), not surprisingly, also has a relatively high resting specific blood flow (60 mL/100 g), which may increase fivefold during exercise. Skeletal muscles (choice D) have low specific blood flow (23 mL/100 g) at rest, which may increase up to 20-fold during strenuous exercise. Blood flow through the skin (choice E) varies between 1 and 100 mL/100 g and serves temperature regulation.

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