

USMLE-STEP-1^{Q&As}

United States Medical Licensing Step 1

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QUESTION 1

Which of the following antiviral drugs is correctly associated with the appropriate primary toxicity?

- A. amantadine--neutropenia
- B. didanosine--pancreatitis
- C. ribavirin--hepatitis
- D. ritonavir--hemolytic anemia
- E. zidovudine--CNS stimulation, GI complaints

Correct Answer: B

Section: Pharmacology Didanosine causes pancreatitis in a significant number of patients treated for AIDS. Amantadine (choice A) is used in the prevention and treatment of influenza and causes CNS stimulation and light headedness. Ribavirin (choice C) is used for the treatment of respiratory syncytial virus in infants and causes dose-dependent hemolytic anemia in about 10% of patients. Ritonavir (choice D), a protease inhibitor used in AIDS, causes hepatitis. Zidovudine (choice E), another drug used in AIDS, causes neutropenia as its primary doselimiting effect.

QUESTION 2

Several Neisseria species are part of the normal flora (commensals) of the human upper respiratory tract. Which of the following statements accurately describes the significance of these bacteria?

- A. As a part of the normal flora, neisseriae provide a natural immunity in local host defense.
- B. As a part of the respiratory flora, they are the most common cause of acute bronchitis and pneumonia.
- C. Commensal bacteria stimulate a cellmediated immunity (CMI).
- D. Commensal neisseriae in the upper respiratory tract impede phagocytosis by means of lipotechoic acid.

Correct Answer: A

Section: Microbiology/Immunology The term normal or usual microbial flora denotes the microorganisms on the skin and mucus membranes of healthy individuals. This resident flora consists of relatively fixed types of organisms that promptly reestablishes itself if disturbed. If normal flora is altered due to use of broad-spectrum antimicrobials, for instance, transient microorganisms may colonize, proliferate, and cause disease. The resident flora are commensals (symbiotic, not harmful; one may benefit from the other). Normal flora may become opportunistic pathogens if they become established in some other part of the human host. Since normal flora microorganisms are antigenic, it has been proposed that normal flora (like these Neisseriae) help to provide a natural immunity in local host defense (choice A). While there is a normal respiratory flora (choice B), most respiratory diseases (bacterial and/or viral) are usually transmitted from the environment or from other people. Bacteria, in general, affect the humeral (antibody) immunity (choice C). Some noncommensal bacteria may stimulate the CMI (mycobacteria, for example). Neisseria pathogens (gonococci and meningococci) possess capsules and produce mucoid colonies (evidence of capsules), while normal flora colonies are opaque and wrinkled, indicating no capsules (choice D). Techoic acids and lipotechoic acid residues are usually associated with gram- positive bacteria.

QUESTION 3

Which of the following agents is associated with numerous drug-drug interactions because of its inhibition of hepatic cytochrome P450 activity?

- A. atracurium
- B. cromolyn
- C. ketoconazole
- D. Phenobarbital
- E. rifampin

Correct Answer: C

Section: Pharmacology Ketoconazole is a potent inhibitor of cytochrome P450 isozymes; its antifungal action is the result of inhibition of fungal P450. Atracurium (choice A) is used to produce skeletal muscle relaxation during surgery. Atracurium is eliminated by a spontaneous chemical reaction and by plasma cholinesterases, and is not a substrate or inhibitor of cytochrome P450. Cromolyn sodium (choice B) is not a substrate or inhibitor of cytochrome P450. The extremely small amounts of this drug that are absorbed are excreted unchanged in the urine and bile. Phenobarbital (choice D) is eliminated by cytochrome P450 metabolism, and is an inducer of drug metabolism activity. Rifampin (choice E) similarly produces many drug interactions because of its ability to induce (rather than inhibit) cytochrome P450 activity.

QUESTION 4

A 78-year-old woman is found to have a first morning urine specific gravity of 1.010. Assuming that she has not had anything to drink since yesterday evening, this is most indicative of which of the following?

- A. acute pyelonephritis
- B. advanced renal failure
- C. diabetic glomerulosclerosis
- D. hyperlipidemia
- E. normal kidney function

Correct Answer: B

Section: Pathology and Path physiology Urine specific gravity of 1.010 is the same as the specific gravity of glomerular filtrate (i.e., isosthenuric). Thus, this woman was not concentrating her urine overnight (usual SG > 1.020) which is an indication of severe renal damage as seen in advanced renal failure. Patients with acute pyelonephritis (choice A), diabetic glomerulosclerosis (choice C), and hyperlipidemia (choice D) who are not in advanced renal failure would still be expected to show some overnight concentrating ability as, of course, would normal kidney function (choice E).

QUESTION 5

Which of the following agents is most effective as a cardiac stimulant in the treatment of severe beta-blocker overdose?

- A. atrial natriuretic peptide
- B. epinephrine
- C. glucagon
- D. human growth hormone
- E. insulin

Correct Answer: C

Section: Pharmacology The cardiac manifestations of beta-blocker intoxication can be very severe, resulting in bradycardia, AV blockade, and markedly reduced force of contraction and cardiac output. Hypotension is common. However, the heart has glucagon receptors that are linked to stimulation of adenylyl cyclase independent of beta adrenoreceptors, which mediate marked increases in rate and force and substitute for the blocked beta response. (Glucagon also plays a primary role in raising blood glucose levels through activation of glycogenolysis and gluconeogenesis.) Atrial natriuretic peptide (choice A) is released from the cardiac atria and causes vasodilation through activation of membranebound guanylyl cyclase in arteriolar smooth muscle, and sodium excretion in the urine through an increase in glomerular filtration rate and consequent increase in filtration fraction. It is of no value in beta-blocker overdose. If the beta-blocker overdose is sufficient, administration of beta agonists such as epinephrine (choice B) is inadequate to overcome the blockade. Human growth hormone (choice D) is a peptide hormone produced by the anterior pituitary. It stimulates growth at open epiphyses through production of the insulin-like growth factors. It has no direct effect on cardiac function. Insulin (choice E) activates entry of glucose into most tissues and promotes glycogen and triglyceride storage. It has no direct effects on cardiac function.

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