

1. Your patient is a 75-year-old man with an indwelling urinary catheter following prostatectomy for prostate cancer. He now has the sudden onset of fever to 40°C, blood pressure of 70/40 mm Hg, and a pulse of 140 bpm. You draw several blood cultures, and the laboratory reports that all are positive for a gram-negative rod that forms red pigmented colonies. Which one of the following bacteria is the most likely cause of this infection?

- (A) *Escherichia coli*
- (B) *Klebsiella pneumoniae*
- (C) *Proteus mirabilis*
- (D) *Pseudomonas aeruginosa*

(E) *Serratia marcescens*

2. You're a public health epidemiologist who is called to investigate an outbreak of bloody diarrhea in 16 people. You find that it is associated with eating rare hamburgers in a particular fast-food restaurant. A culture of the remaining uncooked hamburger grows a gram-negative rod that produces a dark purple colony on EMB agar, which is evidence that it ferments lactose. Which one of the following bacteria is the most likely cause of this outbreak?

(A) *Escherichia coli*

- (B) *Salmonella enterica*
- (C) *Salmonella typhi*
- (D) *Shigella dysenteriae*
- (E) *Vibrio cholerae*

3. Your patient has third-degree burns over most of his body. He was doing well until 2 days ago, when he spiked a fever, and his dressings revealed pus that had a blue-green color. Gram stain of the pus revealed a gram-negative rod that formed colorless colonies on EMB agar. Which one of the following bacteria is the most likely cause of this infection?

- (A) *Campylobacter jejuni*
- (B) *Escherichia coli*
- (C) *Haemophilus influenzae*

(D) *Pseudomonas aeruginosa*

(E) *Salmonella enterica*

4. Regarding the patient in Question 3, which one of the following is the best combination of antibiotics to treat the infection?

- (A) Azithromycin plus gentamicin
- (B) Doxycycline plus gentamicin
- (C) Metronidazole plus gentamicin
- (D) Piperacillin/tazobactam plus gentamicin
- (E) Vancomycin plus gentamicin

5. Regarding the members of the family Enterobacteriaceae, which

one of the following statements is the most accurate?

(A) All members of the family are anaerobic, which means they must be cultured in the absence of oxygen.

(B) All members of the family ferment lactose, which is an important diagnostic criterion in the clinical laboratory.

(C) All members of the family have endotoxin, an important pathogenetic factor.

(D) All members of the family produce an enterotoxin, which ADP-ribosylates a G protein in human enterocytes.

6. You're on a summer program working in a clinic in a small village in Ecuador. There is an outbreak of cholera, and your patient has massive diarrhea and a blood pressure of 70/40 mm Hg. Which one of the following would be the most appropriate action to take?

(A) Administer antimotility drugs to diminish the diarrhea.

(B) Administer intravenous saline to replenish volume.

(C) Administer tetracycline to kill the organism.

(D) Perform stool cultures and fecal leukocyte tests to make an accurate diagnosis.

7. Your patient is a 20-year-old woman with diarrhea. She has just returned to the United States from a 3-week trip to Peru, where she ate some raw shellfish at the farewell party. She now has severe watery diarrhea, perhaps 20 bowel movements a day, and is feeling quite weak and dizzy. Her stool is guaiac-negative, a test that determines whether there is blood in the stool. A Gram stain of the stool reveals curved gram-negative rods. Culture of the stool on MacConkey's agar shows colorless colonies. Which one of the following bacteria is the most likely cause of this infection?

(A) *Escherichia coli*

(B) *Helicobacter pylori*

(C) *Proteus mirabilis*

(D) *Pseudomonas aeruginosa*

(E) *Vibrio cholerae*

8. Your patient is a 6-year-old boy with bloody diarrhea for the past 2 days accompanied by fever to 40°C and vomiting. He has a pet corn snake. Blood culture and stool culture from the boy and stool culture from the snake (taken very carefully!) revealed the same organism. The cultures grew a gram-negative rod that formed colorless colonies on EMB agar. Which one of the following bacteria is the most likely cause of this infection?

(A) *Helicobacter pylori*

(B) *Proteus mirabilis*

(C) *Salmonella enterica*

(D) *Shigella dysenteriae*

(E) *Vibrio cholerae*

9. Your patient is a 25-year-old woman with pain on urination and cloudy urine but no fever or flank pain. She has not been hospitalized. You think she probably has cystitis, an infection of the urinary bladder. A Gram stain of the urine reveals gram-negative rods. Culture of the urine on EMB agar shows colorless colonies, and a urease test was positive. Swarming motility was noted on the blood agar plate. Which one of the following bacteria is the most likely cause of this infection?

(A) *Escherichia coli*

(B) *Helicobacter pylori*

(C) *Proteus mirabilis*

(D) *Pseudomonas aeruginosa*

(E) *Serratia marcescens*

10. Your patient has abdominal pain, and a mass is discovered in the left lower quadrant. Upon laparotomy (surgical opening of the abdomen), an abscess is found. Culture of the pus reveals *Bacteroides fragilis*. Regarding this organism, which one of the following is the most accurate?

(A) A stage in the life cycle of *Bacteroides fragilis* involves forming spores in the soil.

(B) *Bacteroides fragilis* is an anaerobic gram-negative rod whose natural habitat is the human colon.

(C) *Bacteroides fragilis* produces black colonies when grown on blood agar.

(D) Pathogenesis by *Bacteroides fragilis* involves an exotoxin that increases cyclic AMP by ADP-ribosylation of a G protein.

(E) The toxoid vaccine should be administered to prevent disease caused by *Bacteroides fragilis*.

11. Regarding the patient in Question 10, which one of the following is the best antibiotic to treat the infection?

(A) Doxycycline

(B) Gentamicin

(C) Metronidazole

(D) Penicillin G

(E) Rifampin

12. Your patient in the gastrointestinal clinic is a 50-year-old insurance salesman with what he describes as a "sour stomach" for several months. Antacids relieve the symptoms. After taking a complete history and doing a physical examination, you discuss the case with your resident, who suggests doing a urea breath test, which tests for the presence of urease. Which one of the following bacteria does the resident think is the most likely cause of the patient's disease?

(A) *Helicobacter pylori*

(B) *Proteus mirabilis*

(C) *Salmonella enterica*

(D) *Serratia marcescens*

(E) *Shigella dysenteriae*

13. Your patient is a 35-year-old woman with epilepsy who had a grand-mal seizure about 2 months ago. She comes to see you now because she has been coughing up foul-smelling sputum for the past week. Chest X-ray reveals a cavity with an air-fluid level. Gram stain of the sputum reveals gram-negative rods, and culture reveals black colonies that grow on blood agar only in the absence of air. Which one of the following bacteria is the most likely cause of this infection?

(A) *Bacteroides fragilis*

(B) *Campylobacter jejuni*

(C) *Klebsiella pneumoniae*

(D) *Prevotella melaninogenica*

(E) *Proteus mirabilis*

ANSWERS (1) (E) (2) (A) (3) (D) (4) (D) (5) (C) (6) (B) (7) (E) (8) (C) (9) (C) (10) (B) (11) (C) (12) (A) (13) (D)

1. Regarding poliovirus and the disease poliomyelitis, which one of the following is most accurate?

(A) Poliovirus is transmitted primarily by the fecal–oral route.

(B) New antigenic variants arise by coinfection with animal strains of poliovirus.

(C) Paralytic poliomyelitis is the most common manifestation of poliovirus infection.

(D) Poliovirus has single-stranded RNA as its genome and a polymerase in the virion that synthesizes its mRNA.

(E) The current vaccine recommendation is to give the live, attenuated vaccine for the first three immunizations to prevent the child from acting as a reservoir, followed by boosters using the killed vaccine.

2. A 70-year-old retired carpenter has signed up with a volunteer organization to build houses in a developing country where polio is still endemic. He plans to be there about 9 months. He thinks he has never been immunized against polio. Which one of the following is the most appropriate thing to do?

(A) Give immune serum globulins (ISG).

(B) Give the killed vaccine containing only type 3.

(C) Give the killed vaccine containing types 1, 2, and 3.

- (D) Give the live vaccine containing only type 3.
- (E) Give the live vaccine containing types 1, 2, and 3.
3. Regarding norovirus, which one of the following is most accurate?
- (A) The diarrhea is caused by an exotoxin that increases cyclic adenosine monophosphate (cAMP).
- (B) There are no neutrophils or red cells in the stool.**
- (C) Ritonavir, a protease inhibitor, is the drug of choice for chronic diarrhea caused by norovirus.
- (D) Ingestion of undercooked hamburger is a common mode of acquisition of norovirus as cattle are a major reservoir of the virus.
- (E) The diagnosis of norovirus-induced diarrhea is typically made by the detection of a fourfold or greater rise in antibody titer to the virus.
4. Regarding rotavirus, which one of the following is most accurate?
- (A) Rotavirus is a major cause of nosocomial diarrhea in intensive care units.
- (B) The vaccine against rotavirus contains live, attenuated virus as the immunogen.**
- (C) Rotavirus has a nonsegmented, single-stranded RNA genome, and there is no polymerase in the virion.
- (D) The diagnosis of rotavirus diarrhea is typically made by the detection of a fourfold or greater rise in antibody titer to the virus.
- (E) Diarrhea caused by rotavirus is due to a viral protein that increases the release of IgA from many submucosal B lymphocytes.

ANSWERS (1) (A) (2) (C) (3) (B) (4) (B)

SELF-ASSESSMENT QUESTIONS

1. An outbreak of jaundice occurs in several young children who attend the same day care center. If the outbreak was caused by a virus, which one of the following is the most likely cause?
- (A) Hepatitis A virus**
- (B) Hepatitis B virus
- (C) Hepatitis C virus
- (D) Hepatitis D virus
2. Regarding hepatitis A virus (HAV), which one of the following statements is most accurate?
- (A) The HAV vaccine contains live, attenuated virus as the immunogen.
- (B) The screening of blood for transfusion has greatly reduced the

spread of this virus.

(C) The diagnosis is typically made by serologic tests rather than by culturing the virus.

(D) Multiple episodes of hepatitis A are common because it has three serotypes.

(E) It has a segmented, negative-polarity, single-stranded RNA genome and an RNA polymerase in the virion.

3. A woman who is hepatitis B surface antigen (HBsAg) positive and hepatitis B surface antibody (HBsAb) negative has just given birth. Which one of the following is the most appropriate thing to do for the newborn?

(A) Nothing. The child is protected against hepatitis B.

(B) Immunize with the vaccine containing HBsAg (HBV vaccine).

(C) Give hepatitis B hyperimmune globulin (HBIG).

(D) Give both the HBV vaccine and HBIG.

4. Regarding hepatitis B virus (HBV) and the disease hepatitis B, which one of the following is most accurate?

(A) The most reliable indicator that a person can transmit HBV is the presence of HBsAg in the blood.

(B) HBV has a circular, partially double-stranded DNA as its genome and has a DNA polymerase in the virion.

(C) Healthcare personnel who sustain a needle-stick injury while taking blood from a person with hepatitis B should receive acyclovir.

(D) HBV infection induces antibody to HBcAg (core antigen), which protects the person from a second attack by the same strain of HBV.

(E) A person in the "window period" can be diagnosed as having been infected by HBV if antibody to the surface antigen (HBsAg) is present.

5. Regarding hepatitis C virus (HCV), which one of the following is most accurate?

(A) Chronic infection with HCV predisposes to hepatocellular carcinoma.

(B) HCV is a defective virus that requires concurrent hepatitis B virus (HBV) infection in order to replicate.

(C) Chronic infection with HCV occurs less frequently than chronic infection with HBV.

(D) The killed vaccine against HCV is poorly immunogenic, so booster doses must be given at least every 5 years.

(E) Proper sewage disposal has significantly decreased the incidence of hepatitis C.

6. Regarding hepatitis D virus (HDV), which one of the following is most accurate?

(A) Alpha interferon can eradicate the latent state established by HDV.

(B) Immunization against hepatitis B virus (HBV) will reduce the incidence of hepatitis caused by HDV.

(C) HDV has DNA as its genome and an RNA-dependent DNA polymerase in the virion.

(D) The laboratory diagnosis of HDV infection is made by growing HDV in cells coinfecting with HBV.

(E) Many HDV infections occur in young children in the diaper stage in day care centers because the virus is transmitted primarily by the fecal-oral route.

7. Your patient is a 35-year-old man who complains that the whites of his eyes have turned yellow. After taking a history and doing a physical, you order serologic tests to determine whether he has viral hepatitis. On the basis of the results, you tell him that he has a mild form of hepatitis that does not cause long-term damage to the liver. Your conclusion is based on a positive result on which one of the following tests?

(A) Antibody to hepatitis C virus

(B) Hepatitis B surface antigen

(C) Hepatitis delta antigen

(D) IgM antibody to hepatitis A virus

8. Your patient is a 20-year-old woman with chronic hepatitis B that was diagnosed by detecting hepatitis B antigen in her blood more than 6 months after her acute infection. Which one of the following is the best choice of drug to treat her chronic hepatitis B?

(A) Acyclovir

(B) Foscarnet

(C) Entecavir

(D) Ritonavir

(E) Zidovudine

9. Your patient is a 27-year-old man with a history of intravenous drug use who now is diagnosed with chronic hepatitis C. He is HIV antibody negative. Which one of the following is the best choice of drugs to treat his chronic hepatitis C?

(A) Acyclovir and foscarnet

(B) Ganciclovir and enfuvirtide

(C) Sofosbuvir and velpatasvir

(D) Zidovudine and lamivudine

(E) Tenofovir and simiprevir

ANSWERS (1) (A) (2) (C) (3) (D) (4) (B) (5) (A) (6) (B) (7) (D) (8) (C) (9) (C)