Name _____

Dental Microbiology
Exam #3
Wednesday, October 31, 2007
1:30-3:30 p.m.
Lecture Hall B and Room 386, 3rd Floor, Old Dental School Building

Corrected

The Temple University School of Dentistry is guided by an Honor Code. All students are expected to abide by the Honor Code published by the Dental Student Handbook and are expected to maintain a high standard of professionalism and ethics as defined by the Ethical Foundation for Professional Education and Behavior.

There are a total of 54 questions on 13 pages in this exam.

Please use your TUID number on the scan sheet.

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

1. Your 38-year-old female patient manifests an oral condyloma (a mucous-covered eruption) plus a maculopapular rash on her palms. She tells you a similar rash is present elsewhere on her body and is concerned that her pregnancy (now in its sixth month) will be affected by "my allergy." This patient

   A. has a disease which is in its primary stage and her saliva contains highly contagious organisms.
   B. can progress to a secondary disease stage marked by granulomas (gummas), CNS and neurologic abnormalities with oral manifestations.
   C. now has sufficient spirochetes in her blood stream necessary for use in performing specific serologic tests for Reagin antibodies.
   D. is infected with spirochetes which have caused bejel (endemic syphilis); large doses of benzathine penicillin will provide a rapid recovery.
   E. can transmit her disease transplacentally to her fetus which may manifest the Hutchinsonian triad of symptoms after delivery.

2. *Treponema denticola*

   A. is a small spirochete that can invade gingival tissue, aided by its motility
   B. along with *T. vincentii* can inhibit PMN leukocyte function *in vitro*
   C. can be phagocytized by PMN leukocytes but not degraded by them and thus persists in plaque
   D. is non-immunogenic and thus may escape host defenses
   E. All of the above are true for this periodontal pathogen.

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

3. A common tick-born disease in the U.S. can produce erythema chronicum migrans, neurologic abnormalities and a chronic arthritis plus cardiac complications. The etiologic agent is

A. *Borrelia hermsii* and/or *B. turicate*: the disease is called "Relapsing Fever."
B. *Leptospira interrogans*: the disease is variously called "Weil's Disease," spirochetal fever or jaundice.
C. *Borrelia burgdorferi*: the disease is variously called "Lyme Disease" or "Lyme Borreliosis."
D. *Tryponema pallidum* subsp. *pallidum*: the disease is variously called "Yaws" or "Pinta."
E. *Trichomonas tenax*: the disease is called "Vincent's Angina."

4. Necrotizing periodontal disease (NPD)

A. can follow from nutritional deficiency, stress or a Herpes simplex viral infection
B. involves *Prevotella intermedia*, against which IgG levels are present
C. when treated with penicillin was found to show a significant decrease in the numbers of spirochetes present in lesions
D. is associated with *Fusobacterium nucleatum*, which produces adhesins and promotes coaggregation with other plaque bacteria
E. All of the above are correct with reference to acute ulcerative gingivitis (ANUG).

5. Syphilis

A. is the most common sexually transmitted disease in the U.S.
B. is a chronic, systemic granulomatous disease which can result in death
C. is transmitted entirely by contact with contaminated blood
D. can be diagnosed by the fluorescent treponemal antibody absorption test (FTA-ABS) which becomes negative with effective therapy
E. can result in the Jarisch-Herxheimer Reaction which is a manifestation of the primary stage of the disease

6. With reference to the means by which spirochetal diseases are acquired:

A. Leptospirosis is transmitted via rodent and wildlife excretions in food and water.
B. Relapsing Fever is transmitted, in its endemic form, by the bite of mosquitoes.
C. Necrotizing Periodontal Disease (NPD) is primarily transmitted from one adult to another by fomites.
D. Lyme Disease is usually transmitted by the ingestion of contaminated citrus fruits.
E. Syphilis can be transmitted with equal frequency at all stages of the disease.

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

7. Which of the following have a uniquely high lipid content at their cell surface, lack axial fibrils and are thus not motile by means of an endoflagellum?

A. *Treponema* species
B. *Borrelia* species
C. *Leptospira* species
D. *Fusobacterium* and *Prevotella* species
E. *Borrelia* and *Leptospira* species

8. "Healthy plaque" from disease-free individuals differs from plaque taken from patients with necrotizing periodontal disease (NPD). Which statement best reflects the composition of one or the other?

A. "Healthy plaque" flora are predominantly Gram-negative, enteric rods and motile spirochetes.
B. To a large extent, non-motile, Gram-positive actinomycetes and to a lesser extent streptococci are present in "healthy plaque."
C. "NPD plaque" contains mixed anaerobic flora of which spirochetes are the least numerous, but among these *Treponema denticola* predominates.
D. "Healthy plaque" contains mixed anaerobic flora of which *Prevotella intermedia* and *Fusobacterium nucleatum*, both Gram-negative, predominate.
E. Although both are largely anaerobic, "healthy plaque" flora are mostly spore-forming, Gram-negative bacteria while "NPD plaque" flora are mostly Gram-positive non-spore forming bacteria.

9. With reference to food-borne and infant botulism

A. both cause a flaccid paralysis of voluntary and respiratory muscles that can lead to respiratory arrest
B. they are both caused by a neurotoxin that blocks the release of the neurotransmitter gamma-aminobutryic acid
C. the symptoms are trimus, risus sardonicus and convulsions
D. the toxin responsible is composed of a B and A-chain which respectively bind to and exert toxicity on central nervous system tissue
E. transmission of both forms of disease is due to ingestion of endospores

10. *Clostridium tetani*

A. produces a disease that can be prevented by vaccinating children with several doses of human tetanus immune globulin (TIGH)
B. produces a disease which can be prevented by vaccinating both children and adults: DT_aP (for children) and tetanus toxoid every 10 years (for adults)
C. is a Gram-negative, spore-forming rod whose neurotoxin can produce a spastic-type of paralysis
D. organisms, when ingested, can result in a pseudomembranous colitis due to a necrotizing exotoxin produced in the gut (colon)
E. organisms, when ingested in contaminated meats or poultry can result in an enterointoxication due to a cholera-like toxin

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

11. Which of the organisms below is capable of producing the disease(s) described?

A. *Clostridium difficile*: colonization of the colon (gut) can result in a myonecrosis, cellulitis or fasciitis
B. *Clostridium botulinum*: when used as a bioterrorism weapon, it can produce gas gangrene due to the necrotizing and hemolytic effects of its toxins
C. *Clostridium perfringens*: its alpha and theta toxins act together to produce necrotic, cardiotoxic and hemolytic effects; its enterotoxin causes diarrhea and cramps
D. *Clostridium tetani*: in infants, when its endospores are ingested with honey, it can result in flaccid paralysis/muscle weakness and even respiratory failure
E. All of the above are correct.

12. With reference to species of the aerobic, spore-forming rod *Bacillus*, all of the following are true EXCEPT:

A. "malignant pustule," a form of anthrax contracted by entry of organisms or spores through the skin
B. "woolsorter's disease," a form of anthrax contracted via the inhalation of spores
C. anthrax, a disease caused by a 3 component toxin whose synthesis is under plasmid control
D. a food-borne intoxication which is often associated with ingestion of contaminated boiled rice or meats
E. causing several cases of antibiotic-associated diarrhea seen in a local hospital

13. Candidiasis

A. is a contagious disease generally transmitted from one adult to another
B. is caused by a single species of *Candida*
C. can be diagnosed by the germ tube test
D. begins when mycelial or hyphael filaments first adhere to (oral) host cells by use of adhesins
E. can be treated effectively in its invasive or systemic form with azole antifungal agents alone

14. Infections caused by species of *Epidermophyton, Trichophyton* and/or *Microsporum*

A. are often referred to as Tinea or "ring-worm" infections
B. are facilitated by the organisms' keratinase enzymes
C. can be diagnosed, in part, by culturing skin scrapings on Sabourand's agar
D. can be transmitted person to person or by contact with cats, dogs or horses
E. All of the above are correct.

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

15. The pathogenesis of candidiasis

A. is facilitated by immunologic deficiencies in patients
B. can result in a granulomatous response to the fungi
C. is marked by the penetration of hyphae into infected tissue
D. can be interfered with by host neutrophils and secreted peptides called "defensins"
E. All of the above are correct.

16. Polyene antifungal agents

A. bind to fungal cytochrome P-450, inhibiting the synthesis of sterols and promoting permeability changes
B. inhibit the synthesis of cholesterol in fungal cell membranes
C. generally cause leakage of the walls of fungi, leading to cell death
D. such as amphotericin B are useful in treating life-threatening, systemic infections
E. All of the above are correct.

17. With reference to fungi and/or the diseases they cause, all of the following are correct EXCEPT:

A. They can cause allergies, promoting IgE synthesis.
B. Some can produce toxins which are dangerous when eaten, such as aflotoxins.
C. The dimorphoric fungi, often called "fungi inperfecti," are most often the cause of systemic/disseminated infections.
D. They can produce diseases that are superficial, cutaneous, subcutaneous and/or systemic.
E. The symptoms produced are generally attributed to their exotoxins and/or LPS endotoxins.

18. *Pneumocystis carinii* and *P. jiroveci*

A. are considered to be protozoans capable of producing satratoxins
B. are the most common opportunistic pathogens in patients with AIDS where pneumonias are produced
C. are responsible for many severe respiratory infections in otherwise healthy humans following droplet inhalation
D. infections are diagnosed, in part, by observing yeast and mold-like structures in infected tissue
E. cause infections often treated effectively with amphotericin-B

19. Opportunistic fungal infections include

A. mucormycosis, which is acute and can manifest at many anatomic sites in debilitated or immunodeficient patients, although generally not orally
B. aspergillosis, which most often results in painful oral lesions, although generally not affecting the lungs
C. oropharyngeal candidiasis (OPC), which in the newborn results from transplacental transmission after the 4th month of pregnancy
D. oropharyngeal candidiasis (OPC), which in patients with AIDS is directly correlated with an elevated CD4 lymphocyte count

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

20. Your 75-year-old (happily married) male patient manifests adherent white, creamy patches throughout his mouth. He has diabetes and his dentures are ill-fitting. He complains of a salty, burning sensation in his mouth although the lesions are not painful. This patient

A. is most likely suffering from necrotizing periodontal disease brought on by anaerobic bacterial overgrowth due to high carbohydrate content of his saliva

B. has a contagious disease; smears of his saliva will (microscopically) show yeast cells and streptococci which will confirm he has contracted acute atrophic candidiasis

C. has acquired a case of neonatal thrush; smears of his lesions will (microscopically) show hyphae, desquamated epithelial cells and streptococci which will confirm this diagnosis

D. should be treated with BACTRIM (sulfamethoxazole/trimethoprim) since he has a fungus infection that is probably refractory to amphotericin B lozenges and azole oral gels

E. most likely has pseudomembranous candidiasis; when scraped off the patches should expose an erythematous base which (microscopically) should reveal hyphal penetration of mucosal tissue

21. Histoplasmosis

A. is a severe respiratory infection seen in most infected patients; it follows inhalation of aerosolized hyphae from dust contaminated with bird feces

B. generally becomes chronic and disseminated, responding well to nystatin therapy after symptoms appear

C. can produce painful, oropharyngeal, indurated ulcers in disseminated cases, with lymph node enlargement

D. is one of many mycotic diseases that show intracellular invasion of the mononuclear phagocytic system (RES) by yeast cells

E. is caused by encapsulated yeast cells, which (when present) show their antiphagocytic capsules when CSF fluid of patients is treated with India ink

22. Cryptococcosis

A. is caused by a dimorphic fungus which forms tuberculate (knobby) macroconidia in the mold stage

B. can be transmitted to humans by inhalation of soil/dust contaminated with pigeon feces

C. generally produces oral lesions but rarely involves the lungs, meninges or the CNS

D. produces symptoms, particularly in patients with AIDS, which resemble the primary stage of syphilis

E. All of the above are correct.

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

23. Subcutaneous mycotic infections

A. include blastomycosis which, in disseminated cases, can produce oral ulcers of the lips, tongue and buccal mucosa
B. are caused by *Malassezia furfur*, where scaly, tan lesions often occur on the chest, back and shoulders
C. include sporotrichosis, caused by *Sporothrix schenckii*, which can result from puncture wounds contaminated with soil
D. are caused by *Coccidioides immitis*, which can be transmitted by spore inhalation or through skin cuts, often causing only mild, cold-like symptoms
E. are caused by dermatophytes, whose cell walls are rich in peptidoglycan and teichoic acids

24. Which of the following are targets for the activity of many antifungal agents?

A. the ability of fungi to form various types of micro- and macroconidia, i.e., spores
B. the ability of yeast cells to transform into hyphae and vice versa, depending on temperature
C. the presence of sugars and their derivatives such as mannans, glucans and chitin in fungal cell walls
D. the synthesis and/or presence of ergosterol in fungal cell membranes
E. the presence of true nuclei in septate or non-septate fungal cells

25. Enterobacteria

A. constitute greater than 95% of the normal fecal flora
B. such as the coliforms can be differentiated from *Salmonella* and *Shigella* by the lactose fermentation test
C. such as *Salmonella* lack the O, H, and K surface antigens but are able to ferment lactose
D. are the leading cause of all gastrointestinal illnesses in the U.S.
E. unlike staphylococci and streptococci found in undisturbed dental unit water supplies, are NOT a potential cause of oral-facial infections

26. The pathogenesis of *Vibrio cholerae* does NOT involve

A. adherence to and multiplication in gut tissue, mediated by toxin-coregulated pili
B. sloughing off of intestinal epithelial cells producing "rice water stools"
C. massive diarrhea, dehydration, acidosis, shock and possible death
D. an A-B type toxin, with one component attaching to host cell gangliosides and the other having ADP-ribosylating activity
E. All of the above are involved.

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

27. With reference to the transmission of diarrheal diseases, all of the following are true EXCEPT

A. Shigellosis is highly communicable and can be transmitted from person to person by food, feces and flies

B. Cholera can be transmitted by contaminated seafood, flies, and water (commonly)

C. *Campylobacter* pathogens can be transmitted by ingestion of contaminated food and drink, and especially from contact with chickens or their products

D. *Helicobacter pylori* pathogens can be transmitted by ingestion of contaminated poultry, meat, eggs and dairy products (commonly) but also from fruits and vegetables

E. Enterocolitis can be caused by *Salmonella enterica* serovar *Typhimurium*; it is (commonly) transmitted by ingested domestic fowl and powdered eggs contaminated with chicken feces as well as by meats, fruits and vegetables

28. Enterobacterial infections can be mediated by one or more mechanisms. With reference to these infections, all of the following are correct EXCEPT:

A. exotoxins, which are polypeptides often composed of 2 subunits, usually having enterotoxin activity

B. endotoxins, which often act on gut cells by inducing increased levels of cyclic AMP, resulting in electrolytic imbalance and fluid loss

C. mucosal cell invasion of the large intestine, producing local inflammation and dysentery

D. penetration of the mucosal barrier of the small intestine which can result in systemic disease

E. an exotoxin and an endotoxin can both play a role in the pathogenesis of shigellosis

29 Within 4 days after a July 4th picnic at which warm hamburgers and cool soft drinks were served, several children and adults experienced abdominal cramps, nausea, vomiting and profuse, bloody diarrhea. Two older adults and one of the children required hospitalization. The child (4 years old) suffered kidney failure, neurologic symptoms and later died. These patients

A. clearly experienced "traveler's diarrhea," caused by enterotoxigenic *Escherichia coli* (ETEC), whose exotoxin acts similarly to choleragen

B. probably suffered from a bacteriuria, caused by *E. coli* since *E. coli* is most often responsible for urogenital tract infections including cystitis and pyelonephritis

C. likely were attacked by enterohemorrhagic *E. coli*, serotype 0157:H7 (EHEC), whose exotoxin acts similarly to Shiga toxin

D. clearly suffered a *Shigella dysenteriae* infection where the pathogen invaded the intestinal tract, causing topical ulcers, bleeding and mucopurulent diarrhea

E. likely were attacked by *Pseudomonas aeruginosa* which can cause a variety of illnesses and whose toxin A binds to elongation factor 2 (EF-2) and has ADP-ribosylating activity

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

30. *Salmonella* bacteria

A. can cause typhoid, which is a zoonosis
B. can cause systemic infections, such as a gastroenteritis
C. can cause food poisoning, which is the least common of all salmonella infections
D. can transfer plasmids responsible for antibiotic resistance
E. All of the above are correct.

31. Small, coccobacillary Gram-negative bacterial rods can cause a variety of diseases which often do not produce gastrointestinal symptoms. With reference to these diseases, all of the following are correct EXCEPT:

A. pneumonic and sylvatic plaques, caused by *Yersinia pestis*; the former is transmitted between humans by droplets
B. tularemia, caused by *Francisella tularensis*; it is transmitted to humans by handling, eating or drinking contaminated water or by insect bites
C. brucellosis, caused by species of *Brucella*; it is transmitted to humans by contact with contaminated animal products
D. "undulant fever," "bubonic plague" and "rabbit/deer fly fever" are examples of such diseases.
E. urogenital tract infections, caused by species of *Pseudomonas, Enterobacter, Proteus* and *Acinetobacter*

32. In the past, several maladies had no known or clear causes. We now know that some are strongly associated with and/or are caused by infectious agents. Among these are

A. cystic fibrosis, which is actually caused by the exopolysaccharide of *Pseudomonas* species adhering to intestinal mucosa
B. viral influenza, which is caused by *Klebsiella pneumoniae*, especially in debilitated patients
C. gastritis and duodenal ulcers, which can result from chronic infections with *Campylobacter jejuni*
D. Gastric adenocarcinoma (stomach cancer); the risk of developing this is strongly associated with *Helicobacter pylori* in the stomach, where urease production and inflammation are important contributors.
E. Giullian-Barré Syndrome, an acute neurologic and paralytic disease which is a serious sequela of *Pneumocystis carinii* lung infections in patients with AIDS

33. Many anaerobic infections

A. are caused by bacteria that contain superoxide dismutase and which can decompose hydrogen peroxide
B. are mixed (polymicrobic) infections where synergy between the bacteria promotes the disease
C. are able to begin in tissues where the E_h (oxidation/reduction potential) is above +200 mV, as is the case in dental plaque
D. can begin in the colon where the ratio of anaerobic to aerobic bacteria is 1:1, similar to gingival crevice debris
E. can be diagnosed by identifying potential pathogens found in feces, throat and vaginal swabs as well as voided urine

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

34. *Bacteroides fragilis* group members

A. are the most frequently isolated anaerobes from all human clinical specimens
B. are the most antibiotic resistant anaerobes isolated from all human clinical specimens
C. have a polysaccharide capsule which inhibits phagocytosis and facilitates adherence to tissues and abscess formation
D. are generally associated with infections found below the diaphragm, being normal flora of the colon
E. All of the above are correct.

35. With reference to anaerobic infections and/or the organisms that cause them, all of the following are correct EXCEPT:

A. *Porphyromonas gingivalis* has a capsule and fimbriae; it is frequently found in subgingival plaque and is a risk factor for cardiovascular disease, stroke and diabetes.
B. *Fusobacterium nucleatum* is involved in adult periodontitis where it coaggregates with streptococci, spirochetes and *P. gingivalis*, forming "corn-cob" structures and aiding in biofilm development on enamel surfaces.
C. Of all the anaerobes usually encountered in the oropharynx, female genital tract, skin and colon, the predominant types form endospores and are Gram-positive rods.
D. Clinical clues that aid in the diagnosis of anaerobic infections include a fetid odor, tissue necrosis, crepitant tissues and the presence of thrombophlebitis.
E. Treatment for many anaerobic infections often requires drainage and the administration of antibiotics such as metronidazole where *Bacteroides fragilis* is present.

36. Many Gram-negative and a few Gram-positive bacteria are associated with and/or participate in oral diseases. With reference to these organisms, all of the following are correct EXCEPT:

A. *Porphyromonas gingivalis* is a "recognized periodontal pathogen" although *Tannerella forsythia, Prevotella intermedia* and *Treponema denticola* also are present in chronic periodontitis.
B. Species of *Capnocytophaga* and *Eikenella corrodens* are unique periodontal pathogens since they produce a leukotoxin and an immunosuppressive factor, invasive factors that respectively kill WBCs and inhibit lymphoid responsiveness to bacterial antigens.
C. *Porphyromonas endodontalis* is a Gram-negative anaerobe which produces a dark pigment on agar; it is associated with suppurative and often painful infections of the root apex where spirochetes and *Actinomyces* species may also be present.
D. *Actinobacillus actinomycetemcomitans, Porphyromonas gingivalis* and *Prevotella intermedia* are together strongly associated with both chronic and adult forms of periodontitis.
E. *Actinobacillus actinomycetemcomitans* is a "recognized periodontal pathogen" involved in (localized) aggressive periodontitis (LAP); it produces collagenase and is often associated with the localized disease in juveniles.

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

37. The tuberculin skin test measures DTH (delayed type hypersensitivity) to a purified protein derivative (PPD) of tuberculin *Microbacterium (M) tuberculosis*. With reference to this test:

A. A positive PPD indicates that the individual has active tuberculosis.
B. A positive PPD cannot be obtained from an individual who had a primary infection twenty years ago.
C. A positive PPD can be obtained within 24 hours after an individual is infected with *M. tuberculosis*.
D. A negative PPD test in an individual with AIDS shows that the patient is not infected with *M. tuberculosis*.
E. A negative PPD test may be obtained from an individual who had a primary infection twenty years ago.

38 Primary infection by *M. tuberculosis* is usually handled well by the host. All the following are true about reactivation tuberculosis, EXCEPT:

A. Tubercle bacilli can remain viable for long periods of time in well-oxygenated tissues, and be a causal agent of reactivation.
B. Is associated with immunosuppression due to malnutrition, alcoholism, diabetes, old age, and in some instances even the stress of puberty or pregnancy.
C. The primary infection cannot merge into the reactivation type of tuberculosis.
D. The chronic fever and weight loss may be mediated by macrophage-derived tumor necrosis factor (TNF).
E. The majority of individuals with primary infection rarely succumb to reactivation tuberculosis.

39. Choose which statement is true about *M. tuberculosis* and tuberculosis:

A. Humans have low innate immunity to *M. tuberculosis*.
B. Less than 10 bacilli can initiate a pulmonary infection in susceptible individuals.
C. An animal variant (*M. bovis*), found in cows, cannot cause tuberculosis in humans.
D. Spread of *M. tuberculosis* outside the lung has no serious clinical manifestations.
E. Because of high lipid content of the cell wall, once stained, *M. tuberculosis* can be readily destained.

40. *Mycobacterium leprae* is the causal agent for leprosy. The following facts about the organism and the disease are all true EXCEPT:

A. Two disease forms of leprosy are recognized, tuberculoid and lepromatous.
B. The incubation period for leprosy can exceed 3 years.
C. A skin test based on DTH (delayed type hypersensitivity) to lepromin is available. Tuberculoid cases have negative skin tests and lepromatous cases have positive skin tests.
D. In lepromatous leprosy CMI (cell mediated immunity) is deficient.
E. There are an estimated 10 million people infected with *M. leprae* in Asia, Africa and Latin American.

DIRECTIONS: For the following questions, select the **ONE BEST** answer in each case.

41. All of the following statements are true regarding the disease diphtheria or its causative organism, EXCEPT:

A. Cultures of a patient's blood are negative, indicating a non-invasive bacterial disease.

B. The disease is caused by a protein exotoxin which is encoded on a lysogenic bacteriophage carried by toxin-producing strains of the organism. The toxin enters the systemic circulation and inhibits protein synthesis in a variety of tissues, particularly heart.

C. Treatment for the acute disease primarily consists of giving diphtheria toxoid to boost immunity, as well as antibiotic therapy to kill the organism at the localized site of infection.

D. The causative toxin-producing organism found in the pseudomembrane of a diseased patient is susceptible to many common antibiotics, including erythromycin and penicillin.

E. Cutaneous forms of this disease have been seen with development of small pustular (boil-like) lesions.

42. A 25-year-old homosexual male has a repeat occurrence of a "pus-like" discharge from his penis following initial therapy. A Gram stain in the emergency room shows intracellular Gram-negative diplococci. The diagnosis is obvious. The following are probably true about this case EXCEPT:

A. His sexual partners should be treated even in the absence of any symptoms.

B. The organism can be invasive and cause bacteremia, if left untreated.

C. The disease could have been prevented if he were immunized with a vaccine containing pili and outer membrane proteins from the organism.

D. Antigenic variation of pili due to genetic rearrangements perhaps afford escape mechanisms from the immune system.

E. Reinfection rather than treatment failure is probably the cause of this repeat infection.

DIRECTIONS: Select the **ONE** lettered word or phrase that best matches the numbered word or phrase. Letters may be used once, more than once, or not at all.

A. *Neisseria gonorrhoeae*
B. *Corynebacterium diphtheriae*
C. *Haemophilus influenzae*
D. *Brucella abortus*
E. *Bordetella pertussis*
F. *Neisseria meningitidis*
G. *Streptococcus pneumoniae*
H. *Haemophilus ducreyi*
I. *Enterococcus faecalis*

For each patient select the microorganism most likely to have caused the illness described.

43. C A 4-year-old child with signs and symptoms of meningitis was seen in the emergency room. Gram stain of the spinal fluid showed pleomorphic coccobacillary Gram-negative rods which required both X and V factors on initial isolation on chocolate agar.

44. A A 17-year-old bisexual male develops profuse urethral exudate which shows Gram-negative intracellular diplococci upon staining. Initial treatment is successful, but he was subsequently suspected of being an infective contact for another male patient. Rectal culture follow-up revealed a carrier state for the organism.

45. B A 2-year-old boy with a sore throat, fever and exudative lesions on the tonsils developed a thick, tough, grayish pseudomembrane after 3 days of penicillin treatment which semioccluded the posterior pharynx. Culture on a special isolation medium grew colonies of short Gram-positive pleomorphic club-shaped bacilli.

46. E A 4-year-old child develops a slowly evolving upper respiratory tract infection and after about 2 weeks experiences coughing and sneezing with production of large numbers of infectious agents in aerosol form followed by explosive paroxysmal coughing. Culture of the tonsilar area during the early catarrhal stage of the disease reveals slowly growing Gram-negative rods isolated on enriched media.

47. F A 6-year-old boy had a low-grade fever for a few days and suddenly developed a seizure with a fever of 103°F. He had an elevated white blood cell count and cerebrospinal fluid contained many polymorphonuclear leukocytes and Gram-negative diplococci. Blood culture also grew the same organism and a hemorrhagic rash developed on his arms.

48. H A 20-year-old military recruit reports to the clinic with painful ulcers on his external genitalia. The organism causing this sexually transmitted disease was found to be a small Gram-negative rod when skin scrapings were grown following prolonged incubation on an enriched medium containing X factor (hemin).

For each statement below, select the microorganism to which it most appropriately applies.

49. I A The pathogenicity of this Gram-negative diplococcus is due to its ability to attach to mucosal epithelial cells as well as to the endotoxic effect of the cell envelope lipooligopolysaccharide (LOS) and the production of IgA protease.

50. C The pathogenesis of disease caused by this pleomorphic Gram-negative organism resides primarily in the antiphagocytic polyriboseribitol phosphate (PRP) capsule of which type b is most commonly associated with infection.

51. D In humans, undulant fever is the hallmark of disease and the intracellular obligate parasitism of this causative Gram-negative coccobacillary rod is commonly associated with long-term chronic disease.

52. B Long-lasting immunity to infection (about 10 years) is conferred by immunization with a toxoid vaccine from this Gram-positive organism.

53. F Bivalent (group A and C) and quadrivalent (group A, C, Y and W135) capsular polysaccharide antigens are available for use as vaccines in exposed and high-risk populations for this Gram-negative infection.

54. E Multivalent vaccines are available containing 3-5 acellular antigenic "toxins" from this Gram-negative organism which should be administered to all infants on a multi-dose schedule.