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Dental Microbiology
Exam #3
Monday, November 10, 2008
12:30-2:30 p.m.
Lecture Hall B and Room 386, 3rd Floor, Old Dental School Building

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 67 questions on 18 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. The tuberculin skin test measures DTH (delayed type hypersensitivity) to a purified protein derivative (PPD) of tuberculin. 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 can be obtained from an individual who had a primary infection twenty years ago.

2. 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.
   E. The majority of individuals with primary infection rarely succumb to reactivation tuberculosis.

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

3. Regarding *Mycobacterium 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 cell wall once stained *M. tuberculosis* can be readily destained.

4. *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. If someone is exposed to a highly contagious patient with lepromatous leprosy and remains symptom free for several months, there is no chance he/she will ever manifest symptoms of leprosy.
C. A skin test based on DTH (delayed type hypersensitivity) to lepromin is available. Tuberculoid cases have positive skin tests and lepromatous cases have negative 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.

5. Assume that you live in a small town sharing a home with your extended family, including grandparents, and learn that several individuals in your town have recently been diagnosed with active tuberculosis. Choose the correct statement.

→ A. To relax, it would be better for you to go for a hike in the woods rather than to go to the movies to see the latest comedy.
B. Since you feel well, there is no possibility that your have been infected.
C. Your elderly relatives have not left the house for several months, so there is no chance they can get active tuberculosis.
→ D. If one of your family members gets active disease, their treatment would be for ten days with two antibacterials.
E. Your elderly grandfather lived through an epidemic of tuberculosis as a young man, so he is not at risk.

6. All of the following are true for individuals who are immune suppressed, EXCEPT:

A. They are more susceptible to reactivation tuberculosis.
B. Tuberculosis is restricted to pulmonary tissue.
C. Pulmonary tissue destruction by *Mycobacterium tuberculosis* is more rapid.
D. They are at increased risk for disease by *Mycobacterium avium-Mycobacterium intracellulare complex (M. avium)*
E. They always have negative reaction to tuberculin skin test

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

7. The lesion(s) of a disease caused by *Treponema pallidum* subsp. *pallidum* and the stage at which it/they occur is best described by which of the following?

A. a hard chancre and satellite bubos appear during the secondary stage
B. cell-associated hypersensitivity reactions due to cross-reaction between the pathogens and host tissue appear mostly during the latent stage
C. a mucous patch appears orally during the secondary stage as well as a maculopapular, red body rash
D. systemic granulomas causing cardiac and neurologic symptoms appear during the secondary stage
E. gumma which destroy the hard and soft palate plus the tongue generally appear before the tertiary or late stage

8. With reference to syphilis

A. transmission is most likely during the tertiary stage when saliva and other body fluids are likely to contain the most pathogens
B. treatment with benzathine penicillin G will generally cure a patient who will then be immune to subsequent re-infection
→ C. it can occur in a fetus when organisms cross the placenta, possibly resulting in the Hutchinsonian triad of symptoms in the child (congenital syphilis)
D. and other spirochetal diseases, the administration of an appropriate vaccine can prevent appearance of the Jarish-Herxheimer reaction
E. an immunity develops in patients which is antibody-mediated and generally prevents re-infections

9. With reference to spirochetes and/or the diseases they cause:

A. the fluorescent treponemal antibody absorption test (FTA-ABS) is used to determine the presence of specific antibodies in patients with syphilis
→ B. the presence in patients of specific antibodies, called "reagin," is useful in diagnosing syphilis and such tests have a low false-positive incidence
C. leptospirosis (Weil's Disease) can be transmitted to humans by human lice or ticks
D. "relapsing fever" in its endemic form can be transmitted to humans drinking water contaminated with the urine of infected rodents, cattle or dogs
E. bejel, pinta and yaws are chronic diseases, generally seen in larger U.S. cities where unsafe sexual practices are the primary means of transmission

10. Lyme disease

A. is sexually transmitted, resulting in arthritis, neurologic and cardiac symptoms in later stages of the disease
B. if treated early with doxycycline will generally cure patients and prevent subsequent re-infection from tick bites
C. can be serologically diagnosed by the appearance of erythema (chronicum) migrans, generally in the disease's later stages
D. is caused by *Borrelia hermsii* or *B. turicatae* which are often present in wilderness area cabins
E. can be diagnosed by an immunofluorescence assay or by an ELISA or by a Western blot analysis

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

11. With reference to spirochetes, all of the following are true EXCEPT:

A. In the primary and secondary stage lesions of syphilis they can be observed by darkfield microscopy.
B. They have endoflagella and divide by transverse fission.
C. Their outer membranes are a bilayer of phospholipids which may stimulate cross-reacting antibody synthesis.
D. They are Gram-positive organisms with definite nuclei and polarity
E. *Borrelia burgdorferi* is transmitted to humans, generally by bites of the *Ixodes* tick and mostly during spring and summer.

12. In necrotizing periodontal disease (NPD)

A. spirochetes account for about 30% of plaque flora with *Treponema denticola* likely involved in the pathogenesis
B. *Prevotella intermedia* is present, producing collagenase, a proteolytic enzyme
C. *Fusobacterium nucleatum* is present, producing adhesins and promoting coaggregation with other anaerobes
D. patients show elevated levels of immunoglobulins against *P. intermedia* and spirochetes
E. All of the above are correct.

13. Vincent's Angina

A. is a fusospirochetal disease involving *Fusobacterium necrophorum* and can occur in debilitated patients
B. is a chronic, polymicrobic infection involving *Entamoeba gingivalis* and *Trichomonas tenax*
C. is an infectious disease, generally transmitted by adults to adults and where both exotoxins and endotoxins play a significant role
D. like Vincent's Stomatitis/ulcerative gingivostomatis, it results in massive, oral tissue destruction, as well as necrosis at various body sites
E. All of the above are correct.

14. With reference to oral spirochetes

A. they increase in numbers once teeth erupt
B. they show a predilection for subgingival plaque
C. their numbers increase drastically in aggressive periodontitis ("early onset periodontitis") as well as in chronic periodontitis ("adult periodontitis")
D. those associated with various forms of periodontal disease can invade tissues although not necessarily individual cells
E. All of the above are correct.

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

15. A 28 year old jockey experienced a deep puncture wound of the foot while dismounting his horse in the stable.

A. He is likely to develop botulism and should be given a mixture of antitoxins (A, B and E).
B. He is in danger of developing either gas gangrene or tetanus or both.
C. He is not in danger of developing a clostridial myonecrosis because he was previously vaccinated with DTP_a
D. He should be given human tetanus immune globulin (TIGH) to convey an "artificial active" type of immunity.
E. He should be given tetanus toxoid to provide an "artificial passive" type of immunity.

16. With reference to infections caused by anaerobic bacteria, all of the following are true EXCEPT:

A. They are promoted by poor circulation, ischemia and are of special concern in diabetic patients whose tissues are richer in carbohydrates.
B. They are able to begin in tissues where the E_h (oxidation-reduction potential) rises to +150 mV.
C. Surgical debridement, amputation, penicillin and hyperbaric oxygen are all possible treatments for the myonecrosis caused by *Clostridium perfringens*.
D. Infant botulism generally results from spores which, after ingestion, germinate in the intestine, producing vegetative cells which produce an extracellular neurotoxin.
E. The neurotoxin of *Clostridium botulinum* is synthesized as a result of the presence of a temperate bacteriophage ("lysogenic conversion") or a plasmid or a chromosomal gene.

17. Clostridial diseases are mediated by which of the following?

A. the alpha and theta toxins of *C. perfringens* which together act to produce hemolytic and cardiotoxic effects
B. tetanospasmin, a neurotoxin blocking release of acetyl choline at peripheral cholinergic synapses
C. botulinum toxin, acting on CNS tissue to block release of gamma-aminobutyric acid (GABA)
D. the exotoxins of *Clostridium difficile* which are produced in the colon (gut), causing hemolytic anemia, toxemia and kidney failure
E. the enterotoxin of *Clostridium perfringens* which has ADP-ribosylating activity responsible for risus sardonicus and trismus

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

18. With reference to Gram-positive, aerobic spore-forming bacteria and/or the diseases they can cause, all of the following are true EXCEPT:

A. Anthrax can be acquired by inoculation of spores through exposed skin or by inhalation.
B. The anthrax toxin is composed of 3 proteins, e.g., an edema toxin (composed of protective antigen + edema factor) and the lethal factor.
C. The food-borne intoxication caused by *Bacillus cereus* is often associated with ingestion of contaminated cooked rice, meat, pudding or cream.
D. An endotoxin elaborated by *Bacillus anthracis* stimulates adenyl cyclase production and fluid excretion resulting in symptoms lasting up to 24 hours
E. "Malignant pustule" and "Woolsorter's Disease" are both manifestations of symptoms which can be prevented by an available vaccine.

19. Anaerobic bacteria can be defined in several ways as follows:

A. They are Gram-negative, spore-forming rods.
B. They can use the cytochrome chain for oxidative phosphorylation reactions.
C. Most lack coagulase but can detoxify the superoxide anion.
D. They are unable to grow in the presence of 10% oxygen.
E. All of the above are correct.

20. *Bacteroides fragilis* group members

A. are generally found in gingival crevice debris where facultative bacteria outnumber anaerobic bacteria by about 10:1
B. are often involved in intra-abdominal abscesses (along with *Fusobacterium* and *Peptostreptococcus* species) and for which penicillins have been found useful
C. possess a potent lipopolysaccharide capsule which is responsible for causing endotoxic shock
D. can transfer genes (via plasmids and transposons) which often convey resistance to metronidizole when used for therapy
E. can cause polymicrobic infections at a variety of sites where both a humoral and cellular-type of immunity can play a role in the host's response

21. Which of the following is/are a strongly tissue destructive periodontal pathogen, seen mostly in adult forms of chronic and aggressive periodontitis, in root canals, and is also associated with coronary artery disease?

A. *Tannerella forsythia*
B. *Porphyromonas endodontalis*
C. *Prevotella intermedia*
D. *Porphyromonas gingivalis*
E. *Capnocytophaga* species as well as *Eikenella corrodens*

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

22. All of the anaerobic and/or facultative bacteria below can be found in the oral cavity. Their association with diseases and/or virulence factors involved are indicated. All of the following combinations are correct EXCEPT:

A. *Actinobacillus actinomycetemcomitans* : found in localized juvenile/aggressive periodontitis, it forms capsules and pili (fimbriae) which aid in adherence to surfaces and colonization

B. *Porphyromonas gingivalis* : invades epithelial and endothelial cells where it replicates and induces inflammation and platelet clumping leading to thrombi formation

C. *Treponema denticola* : its virulence factors include motility, LPS/endotoxin, collagenase, and hyaluronidase, leading to cytotoxicity and connective tissue breakdown

D. *Porphyromonas endodontalis* : associated with pain in root canal infections and acute suppurative infections of the root apex, it produces dark pigmented colonies on agar

E. *Fusobacterium nucleatum* : a periodontal pathogen which produces 2 unique invasive factors, e.g., a leukotoxin and an immunosuppressive factor which respectively kill monocytes-macrophages and inhibit lymphoid responsiveness to antigens or mitogens

23. With reference to the classification and morphology of fungi:

A. They lack cell walls, although their cytoplasmic membranes contain sugar derivatives (mannans and glucans), proteins and chitin.

B. They lack true nuclei (that are surrounded by a membrane) as well as a nucleolus.

C. Their cell/cytoplasmic membranes contain ergosterol while their cell walls generally lack peptidoglycans and teichoic acids.

D. Many of the disease-producing organisms are called "fungi imperfecti" because their sexual phase is the invasive form.

E. They can occur either as yeasts (single cells) or as hyphae (molds) but none can occur as both forms.

24. Oropharyngeal candidiasis

A. is caused only by a single species of *Candida, C. albicans*
B. is marked by a penetration of host tissues by yeast cells
C. can be prevented by use of broad spectrum antibacterial antibiotics
D. is a risk factor in immunosuppressed patients with an elevated $CD4^+$ T lymphocyte count
E. can be effectively treated with amphotericin B lozenges and an oral miconazole gel

25. *Malessezia furfur*

A. infections affect the most superficial/outer layers of skin and hair, growing only on the surface
B. produces scaly eruptions often on the chest, back and shoulders
C. is a fungus found normally on the skin near sebaceous glands since it is lipophilic
D. produces macular skin lesions that are often tan in color and fluoresce by Wood's (U.V.) light
E. All of the above are correct.

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

26. *Coccidioides immitis*

A. infections are rarely seen in the U.S.
B. infections affect Caucasians and dark-skinned patients with equal severity
C. generally produces fungus balls in the lungs, called "aspergillomas"; it is an ascomycete
D. generally produces a mild, self-limiting upper respiratory infection ("cold"-like) following inhalation of spores
E. causes disease when its arthroconidia are ingested with contaminated grains

27. Antifungal agents include

A. imidazoles (or "azoles") which bind to fungal cytochrome P-450, inhibiting cholesterol synthesis
B. polyenes which form a complex with sterols in cell walls, producing pores and ion leakage
C. griseofulvin which is administered I.V. and is useful against systemic infections
D. nystatin and amphotericin B which are polyenes that produce cytoplasmic membrane barrier defects but have systemic toxicity
E. All of the above are correct.

28. A 76 year old male patient is experiencing symptoms suggestive of a chronic meningitis. A spinal tap (fluid specimen) shows encapsulated yeast cells that are dividing and/or budding when "stained" with India ink. With reference to the patient:

A. he probably has a candidiasis infection and should be treated with amphotericin B
B. the capsule is probably an antiphagocytic polysaccharide and he may have cryptococcosis
C. when cultured on Sabourand-dextrose agar the yeast cells should form hyphae, since his disease is probably caused by a dimorphic fungus
D. the pathogen is likely a dermatophyte belonging to the genera *Epidermophyton, Trichophyton* or *Microsporum*
E. he should be treated with a keratinolytic agent to insure minimal toxicity based on his age

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

A. fungi grow slowly in host tissues
B. they can produce granulomatous lesions resembling neoplasms
C. disease lesions can resemble those of TB or syphilis
D. fungal spores (conidia) are as resistant as bacterial endospores
E. fungi are a common cause of allergy due to IgE presence

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

30. With reference to immunity against *Candida* infections, all of the following are correct EXCEPT:

A. Antifungal peptides ("defensins 1 and 2") confer a degree of innate immunity when secreted by mucosal epithelial cells.
B. Neutrophiles can phagocytize and kill yeast cells when opsonized by antibody and complement.
C. Since many individuals normally harbor these fungi, there is no immunity against such infections.
D. Both humoral and cell mediated immunity play a defensive role.
E. Lymphocytes and macrophages play a role in combating the oropharyngeal disease.

31. A 31 year old female patient with an HIV infection shows advancing pseudomembranous plaque lesions which appear as white patches at several oral sites. She complains of an unpleasant salty taste and the sensation of oral "blisters." With reference to this patient:

A. A germ tube test, using serum and any yeast cells in her lesions (or grown from them) should be positive in a few hours.
B. Her risk of contracting candidiasis was decreased by the broad spectrum antibacterial antibiotics she was given to combat her HIV infection.
C. She probably contracted her disease ("neonatal thrush") as an infant following passage through the birth canal.
D. Transmission of her disease is largely due to person-to-person contact, as is true for most fungal diseases.
E. Microscopically, the patches are composed largely of chlamydospores and blastospores, since their ability to adhere to host tissue is necessary for a *Candida* infection.

32. Many fungal diseases are transmitted via inhalation or entrance of spores through skin abrasions. Which of the following are LEAST likely to be transmitted in these ways?

A. Aspergillosis and Sporotrichosis
B. Mucormycosis (Zygomycosis) and Blastomycosis
C. Liver cirrhosis and carcinoma due to aflatoxins
D. Pneumonia caused by *Pneumocystis jiroveci.*
E. Tinea capitis and Tinea pedis

33. Which of the following fungi is dimorphic, is spread by inhalation of dust/soil contaminated with bird feces, generally produces mild respiratory tract infections or no symptoms at all but can invade the reticuloendothelial system, i.e., is an intracellular pathogen?

A. *Histoplasma capsulatum*
B. *Coccidioides immitis*
C. *Aspergillus fumigatus*
D. *Pneumocystis jiroveci*
E. *Amanita phalloides*

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

34. The activation of adenyl cyclase by the ribosylation of ADP can lead to the presence of cyclic AMP. Which of the following organisms does NOT utilize such a system in its pathogenesis?

A. *Vibrio cholerae*
B. *Clostridium perfringens* type A
C. *Bacteroides fragilis*
D. *Bacillus cereus*
E. *Campylobacter jejuni*

35. *Shigella dysenteriae*

A. is often transmitted to humans via contaminated beef and poultry
B. exotoxin inactivates 60S ribosomes cleaving 28S RNA and affecting protein synthesis
C. elaborates Shiga toxin which causes a mucopurulent diarrhea by elaborating cyclic AMP
D. is a coliform enteric pathogen whose endotoxin is composed of a heat-labile protein
E. All of the above are correct.

36. The pathogenesis of enterobacterial infections can be mediated by which of the following mechanisms?

A. endotoxin
B. exotoxin
C. mucosal cell invasion of either the small or large intestine
D. penetration of the small intestine's mucosal barrier
E. All of the above are correct.

37. *Escherichia coli*

A. is able to ferment lactose (LAC) while *Salmonella* and *Shigella* species are LAC negative
B. is rarely involved in urogenital tract infections while staphylococci and enterococci are most often responsible
C. serotype 0157:H7 (enterohemorrhagic) is primarily transmitted from one human being to another by droplet inhalation
D. can cause "traveler's diarrhea" (enterotoxigenic) by a mechanism similar to that of the Shiga toxin
E. All of the above are correct.

38. *Helicobacter pylori*

A. is THE leading cause of diarrheas in the U.S., more than *Salmonella* and *Shigella* species combined
B. produces serious complications such as the Guillain-Barré syndrome following ingestion of contaminated chickens, a major means of transmission
C. is responsible for burn wound sepsis, blue-green pus and eyeball infections
D. toxin A binds to elongation factor 2, inhibiting peptide movement to ribosomes and thus protein synthesis
E. is found in dental plaque, causes gastritis and is strongly associated with peptic ulcers and stomach carcinoma

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

39. Typhoid is

A. a zoonosis which can affect various body organs
B. caused by *Salmonella Cholerasius*, manifesting as a systemic infection with septicemia, following ingestion of contaminated food or water
C. transmitted via contaminated feces of chickens, cows, diary products, eggs, meats and even vegetables
D. caused by a LAC negative enteric rod whose O, H and K(V_i) antigens aid in its epidemiologic identification
E. a mild gastroenteritis for which even fluid replacement therapy is rarely needed except for children and the elderly

40. *Brucella, Francisella* and *Yersinia* species are

A. Gram-positive bacilli which produce diseases of high mortality when ingested with contaminated food
B. spore-forming bacilli responsible for Black Death, pneumonic plague and tularemia respectively
C. small, Gram-negative rods which cause undulant fever, tularemia and bubonic plague respectively
D. generally responsible for gastroenteritis-type diseases, being spread by human to human transmission
E. transmitted largely via the fecal-oral route, causing nosocomial/hospital acquired infections in debilitated patients

41. Which of the following is LEAST likely to be a secondary invader and/or responsible for a nosocomial infection?

A. *Klebsiella pneumoniae*
B. *Enterobacter aerogenes*
C. *Salmonella Typhi*
D. *Serratia marcescens*
E. *Acinetobacter species*

42. Actinomycetes

A. such as *Actinomyces israelii* is responsible for a granulomatous disease which can cause swellings of the face, neck and jaw
B. such as *Actinomyces viscosus* and *A. naeslundii*, along with streptococci, are associated with root surface caries
C. are Gram-positive, branching filamentous bacteria that morphologically resemble fungal hyphae
D. can colonize the tooth surface, comprising a sizable percentage of the cultivable (healthy) plaque flora
E. All of the above are correct.

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

43. As intracellular, opportunistic, Gram-positive pathogens, species of *Nocardia* can be responsible for

A. mycetomas/"Madura Foot", often acquired via soil contamination of an injured foot
B. systemic disease initiated by inhalation of the organisms
C. a granulomatous disease resembling TB in immunosuppressed patients
D. diseases in which small, colored granules are found in discharged pus
E. All of the above are correct.

44. Which of the following is found in dental plaque, has a "whip handle" morphology and forms "corncob" structures with streptococci (similar to those formed by *Fusobacterium nucleatum*) but is probably not a cause of a dental disease?

A. *Rothia dentocariosa*
B. *Arachnia propionica*
C. *Bifidobacterium* species
D. *Corynebacterium (Bacterionema) matruchotii*
E. *Actinomyces radicidentis*

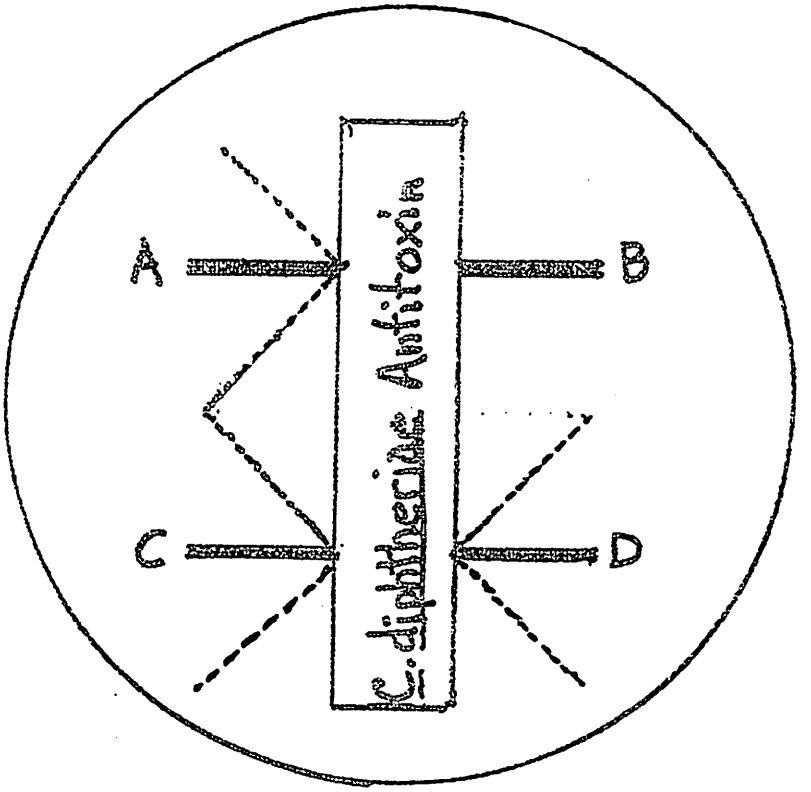
45. With respect to *Bordetella pertussis*:

A. Adults rarely, if ever, become infected with this organism due to effective long-lasting childhood immunization.
B. Chocolate agar is used for culturing in the presence of 10% CO_2.
C. Identification is based upon an array of biochemical tests including sugar fermentation tests.
D. It is more readily isolated from cases of whooping cough during the "whooping" (paroxysmal) stage of the disease rather than during the early catarrhal or "cold" stage of the disease.
E. It produces an A-B toxin which ADP ribosylates a regulatory protein for adenyl cyclase.

46. With respect to *Neisseria gonorrhoeae*:

A. A vaccine, primarily used in the military, consists of pili and a lipopolysaccharide. Effectiveness in civilians has yet to be determined.
B. Both males and females with symptoms of disease caused by this organism are initially treated based upon Gram stain of exudate showing Gram-negative diplococci.
C. Penicillin in high doses is still the treatment of choice and the most economical.
D. Persons infected with this organism may have a negative genital culture but still be asymptomatic carriers, with positive cultures at other sites, e.g., oral and anal.
E. Recurrent infections due to this organism are primarily due to treatment failure.

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



47. With regard to the above diagram showing the results of a gel-diffusion test with three strains of *Corynebacterium diphtheriae* organisms from patients (A, B, and C) growing on a suitably enriched agar plate (Elek plate) overlaid with a filter paper strip containing *C. diphtheriae* antitoxin, which of the following statements is correct? Organism D is a *C. diphtheriae* toxigenic control.

A. Both A and B are toxigenic.
B. Life-long immunity probably would be produced in a patient who recovered from clinical infection due to organism A or organism C.
C. Organism A is non-toxigenic.
D. Organism B gives a positive Schick Test.
E. Organism B is toxigenic.

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

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

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

D. 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.

E. 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.

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

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

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

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

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

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

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

50. F A one-year-old child was admitted to a hospital in Alaska following a seizure and is limp and unresponsive. Her mother tells the physicians that the child had a "runny nose" earlier in the day and had been suffering from a "cold" for several days since beginning her enrollment at a daycare center. Overnight her neck becomes stiff and blood and cerebrospinal fluid (CSF) cultures are positive for gram-negative pleomorphic coccobacilli. The bacteria were cultured on chocolate agar (containing X & V factors).

51. G A 15-year-old boy presents at the emergency room with a 24-hour history of painful urination. He has discharge in his underwear and on the tip of his penis. Urine appears clear, although many white blood cells are present. The young man gives a history of heterosexual activity with 5 partners over the past 6 months. All his partners were "clean" he said. Gram stain of the discharge reveals intracellular gram-negative diplococci. Urine culture on blood agar was negative for bacteria.

52. C An 18-month-old child has been suffering from "cold" symptoms for the past 10 days. He was seen by a physician and found to have a fever, an exudate on his pharynx, and enlarged cervical lymph nodes. His chest was clear. A throat culture was taken and the child given a course of ampicillin. The child's condition worsened. He became increasingly lethargic, developed respiratory distress, and was admitted to a hospital. On examination, the child was found to have an exudate in the posterior pharynx consisting of a gray-white, thick membrane. A club-shaped gram-positive rod, which displayed a palisades arrangement, was cultured from it. Methylene-blue stain showed metachromatic granules.

53. A 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.

54. H An 18-year-old college student came home to visit her family for the weekend and was healthy until the first evening, when she went to bed with a headache and fever. The next morning her mother found her drowsy and lethargic. On presentation to the emergency room she was found to have an elevated temperature, increased heart rate, a purple hemorrhagic rash on her trunk, legs, and wrists and nuchal rigidity (stiff neck). Gram staining of skin lesions revealed gram-negative diplococci. Cerebrospinal fluid contained many polymorphonuclear leukocytes and gram-negative diplococci.

55. E 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 on culture following prolonged incubation on an enriched medium containing X factor (hemin).

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.

(choices repeated from previous page)

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

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

56. G 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.

57. F 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.

58. B 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.

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

60. A 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 organism infection.

61. A 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.

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. 75% aqueous solution of isopropanol (isopropyl alcohol)
B. an iodophore (povidone-iodine) compound such as Betadine®
C. Benzalkonium chloride (Zephiran®)
D. chlorhexidine compounds (e.g., Hibiclens®, Hibitane®)
E. hexachlorophene (e.g., Phisohex®)
F. hydrogen peroxide 3% aqueous solution
G. moist heat autoclaving at 15 lbs./sq.in. and at 121 °C (250 °F) for 30 min
H. pasteurization at 63 °C for 30 min
I. sodium hypochlorite solution (e.g., household bleach or Clorox®) in 5-10% concentration

62. D — a phenolic type bactericidal disinfectant with low toxicity used as an antiseptic agent for skin disinfection, active against both Gram-positive and Gram-negative organisms

63. I — a disinfectant used to decontaminate inanimate surfaces or glassware which are contaminated with blood or body fluids containing pathogenic bacteria, spores, and viruses such as polio, hepatitis, and HIV

64. G — the best and quickest method or compound for ensuring sterilization of surgical instruments (kills both vegetative bacterial cells and spores, as well as fungi and viruses)

65. B — a skin disinfectant (antiseptic) compound which has rapid and effective residual microbicidal activity best for use prior to venipuncture

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

66. Which one of the following organisms or class of organisms is not destroyed or killed by Pasteurization?

A. Bacterial endospores
B. HIV
C. Influenza virus
D. Mycobacteria
E. Vegetative bacteria

67. What specific chemical or procedure is used to sterilize disposable surgical supplies such as gloves or plastic syringes?

A. Alcohol
B. Anionic surfactants
C. Hexachlorophene
D. Hydrogen peroxide
E. Ionizing radiation