Question # 37

A 16-year-old man presents to the emergency room with one day of right lower quadrant pain. He reports fever and one episode of nausea and vomiting. He has been in good health except for self-limited mild-moderate diarrhea 7 to 10 days prior.

He denies any past medical history. He is a high school student and lives in rural Mississippi. He has no history of alcohol or illegal substances. He frequently eats raw oysters and chitterlings (cooked intestines of young pigs). He has a pet turtle.

On examination, he is febrile to 101°F, other vital signs are within normal limits except for a mild tachycardia. He has decreased bowel sounds and right lower quadrant tenderness with mild rebound and guarding. His WBC is 14000.

CT of the abdomen reveals a thickened terminal ileum and enlarged mesenteric lymph nodes.

Which of the following organisms is the most likely cause of this clinical syndrome?

A. Vibrio vulnificus  
B. Salmonella enterica  
C. Yersinia pseudotuberculosis  
D. Campylobacter jejuni  
E. Shigella sonnei

Correct answer: C

Rationale:
Mesenteric adenitis, with or without terminal ileitis can produce a syndrome that is clinically indistinguishable from appendicitis (pseudo-appendicitis). On exploratory laparotomy, the appendix usually looks normal in these patients.

The most common reported bacterial causes of mesenteric adenitis are Yersinia enterocolitica and Yersinia pseudotuberculosis. Yersiniosis is a zoonosis and is associated with exposure to swine, cattle, and rarely with contaminated water. Unpasteurized milk has been the source of several reported cases.

Salmonellosis can be acquired from pet turtles or food sources.

Salmonella, Campylobacter and Shigella do not cause terminal ileitis or mesenteric adenitis.

Vibrio vulnificus can be acquired from oysters but causes sepsis in patients with severe liver disease and not mesenteric adenitis.
Question # 38

A 27-year-old woman is planning to go to sub-Saharan Africa and consults you about taking medicine to prevent malaria. She is five months pregnant. You warn her about the potential severity of malaria during pregnancy and suggest she wait to travel until the baby is born.

She informs you that she must go now to attend the funeral of her father.

Which one of the following should you advise her to take?

A. Mefloquine
B. Chloroquine
C. Atovaquone-proguanil (Malarone)
D. Doxycycline
E. Sulfadoxine-pyrimethamine (Fansidar)

Correct answer: A

Rationale:

Mefloquine appears safe in the second and third trimesters of pregnancy and is active against chloroquine-resistant P. falciparum which is prevalent in sub-Saharan Africa.

Chloroquine is safe in pregnancy but would not be advised because of chloroquine resistance in Africa.

Data on the safety of atovaquone-proguanil in pregnancy are lacking and, although neither drug is teratogenic in animals, this combination is currently not recommended in pregnancy.

Tetracyclines should be avoided in pregnancy.

Sulfadoxine-pyrimethamine is no longer advised for prophylaxis in any group due to severe mucocutaneous reactions that have resulted in death.
Question # 39

A 23-year-old, previously healthy man was seen in an emergency room in Kentucky in August for a severe headache that had been present for one day.

He eats homemade cheese made from raw cow’s milk. Two days before he became ill, he had a Jet Ski accident on a man-made lake and sustained a minor injury to his leg; there was no head trauma. He was awake, alert, and oriented but had a stiff neck. The rest of the examination was unremarkable.

His CSF showed the following:

- WBC: 1740 (82% neutrophils)
- RBC: 30
- Glucose: 18
- Protein: 420
- Gram stain: negative
- Dexamethasone, vancomycin, and ceftriaxone were begun for suspected bacterial meningitis. The following day he was worse with confusion and vomiting.
- Cultures of the blood and CSF had no growth at 72 hours.

Pending further studies which one of the following would be the best course of action to provide coverage for a pathogen not treated by this regimen and suggested by his history?

A. Add ampicillin  
B. Add tetracycline  
C. Change ceftriaxone to imipenem  
D. Add amphotericin  
E. Add antituberculous therapy

Correct answer: D

Rationale:

This patient has a clinical picture most consistent with the diagnosis of primary amebic meningoencephalitis. This rare, almost always fatal infection is due to Naegleria fowleri, a thermophilic freshwater ameba. Infection occurs when water enters the nose; amebae migrate along the olfactory nerves into the brain.

Most cases occur in Southern states during July through September. Symptom onset is typically 1 to 14 days after water exposure; disease progresses rapidly. The CSF findings mimic those of bacterial meningitis.

Diagnosis is made by seeing actively moving trophozoites in a fresh wet-mount of centrifuged CSF. Trophozoites may be seen on Giemsa or Wright stain of CSF but are not seen with Gram stain. Although survival from Naegleria meningoencephalitis is unusual, intrathecal and intravenous
amphotericin B has often been a part of a successful multidrug regimen and is recommended for treatment.

Listeria is a possible diagnosis, but would be unusual in a young, previously healthy male. Eating cheese made from unpasteurized milk is a risk factor for listeriosis. In this case, the cultures are negative at 3 days (at least 70% of cases have positive CSF) and, while not approved, meropenem is probably active as therapy (ampicillin or trimethoprim-sulfa are preferred). Don't get confused by the name "Listeria monocytogenes" - while mononuclear cells may be predominant in CSF prior to therapy, 100% neutrophils also can be seen. Negative blood and CSF cultures make this diagnosis unlikely.

Tetracycline would be good for a rickettsial infection that can present a clinical picture of meningitis, but the profound hypoglycorrhachia and high WBC are against that diagnosis. The negative CSF culture essentially rules out untreated bacterial meningitis, and there would be no reason to change to imipenem.

Tuberculosis would not progress this rapidly, and by the time it was to cause a sugar of 18 and a protein of 420 there should be a predominance of lymphocytes.
A 25-year-old graduate student is seen for penile ulcers. The ulcers have been present for two weeks and are painful. He says the ulcers began as “red bumps” that developed into “pimples” and then eroded into ulcers. Over the past 2-3 days he noted a tender lump in his groin.

The problem began during a trip to Africa from which he returned just three days ago. While in Africa he had vaginal intercourse with several commercial sex workers and did not always use a condom.

On exam he is afebrile and findings are confined to his genital area. There are two 1cm adjacent “kissing” ulcers in the coronal sulcus. They are tender and filled with a yellow purulent exudate. There is a tender, large lymph node in the left groin.

Which one of the following is the most likely cause of his problem?

A. Treponema pallidum  
B. Herpes simplex  
C. Chlamydia trachomatis  
D. Haemophilus ducreyi  
E. Klebsiella (Calymmatobacterium) granulomatis

Correct answer: D

Rationale:

The classic presentation of chancroid due to Haemophilus ducreyi is a deep painful ulcer with purulent exudate; painful inguinal lymphadenitis is common. The infection is rare in the United States but is a major cause of genital ulcers in sub-Saharan Africa.

Primary syphilis due to Treponema pallidum produces a painless ulcer (chancre).

Herpes simplex produces a cluster of painful vesicles, typically on the penile shaft, which quickly ulcerate.

Lymphogranuloma venereum due to Chlamydia trachomatis presents as inguinal adenopathy. An initial genital ulcer may be noted but typically heals within a few days followed by adenopathy which is usually unilateral.

Granuloma inguinale or donovanosis due to Klebsiella granulomatis presents as a painless ulcer without regional adenopathy.
Question # 41

An 18-year-old woman presents to her primary care physician's office complaining of lower abdominal pain with low-grade fevers and chills. She denies any other symptoms. Her last menstrual period was two weeks earlier, and it was normal. She is in a monogamous relationship with a male partner.

On examination, her temperature was 38.3°C, and she has mild abdominal tenderness on deep palpation, and cervical motion tenderness on bimanual examination.

Her urine pregnancy test was negative, and a wet mount of vaginal secretions was unremarkable.

In addition to doxycycline, which of the following antibiotics is most appropriate to treat her infection?

A. Ertapenem
B. Procaine penicillin
C. Azithromycin PO
D. Levofloxacin PO
E. Ceftriaxone IM

Correct answer: E

Rationale:

The patient has pelvic inflammatory disease based on the presence of cervical motion tenderness on examination. A single physical finding (cervical motion tenderness, uterine tenderness, or adnexal tenderness) is sufficient to make a clinical diagnosis of PID. The presence of fever (a minor criterion) does increase the specificity of the diagnosis, but it decreases the overall sensitivity of the diagnosis (that's why minor criteria are no longer part of the clinical diagnostic criteria).

The patient has mild to moderate infection, is not pregnant, is not vomiting, and there is nothing to suggest that she will not be able to follow-up within 72 hours. As such, outpatient management is appropriate.

She needs to be covered for both gonorrhea and chlamydia +/- anaerobic coverage.

Doxycycline appropriately covers chlamydia.

250mg of intramuscular ceftriaxone with 14 days of oral doxycycline is a recommended regimen.

Cefotetan and ampicillin/sulbactam are both appropriate to use but they are intravenous. There is no reason to use an intravenous regimen in this patient. There is also no reason to use a broad spectrum drug such as ertapenem.

Azithromycin plus doxycycline is not a first-line recommended regimen due to the limited efficacy data and the gastrointestinal side effects of azithromycin when used to treat gonococcal infections.

Given the increasing resistance of gonorrhea to fluoroquinolones, the regimen of Levofloxacin PO is no longer recommended for the treatment of PID.
Question # 42

A 47-year-old male presents with confusion and fever for 2 days. The patient’s family tells you he was bitten by a dog on his left thumb 3 days prior to developing symptoms. He has a history of splenectomy as an adolescent after blunt abdominal trauma.

On physical exam, the temperature is 102.4°F and blood pressure 90/60 with norepinephrine vasopressor support. The patient is intubated and mechanically ventilated due to altered mental status.

His skin is notable for palpable, non-blanching, purplish lesions over the arms and legs.

There is a laceration in the left thumb with mild surrounding erythema and no purulence.

His WBC count is 16500, platelets are 19000, he has acute renal failure, and he has a laboratory picture of disseminated intravascular coagulation.

- A. Pasteurella multocida
- B. Streptococcus mitis
- C. Capnocytophaga canimorsus
- D. Fusobacterium spp.
- E. Pasteurella canis

Correct answer: C

Rationale:

Capnocytophaga canimorsus is a fastidious Gram negative rod that is part of the normal oral flora of dogs and cats. It is a cause of fulminant sepsis in those with history of splenectomy, chronic alcohol abuse, or immunosuppression. The associated mortality can be as high as 35%. This organism may take several days to grow in cultures. Peripheral blood smear may show fusiform rods. Combinations of β-lactam/β-lactamase inhibitor agents is the treatment of choice, other alternatives are ceftriaxone, carbapenems, or clindamycin. The microbiology of infected dog bites is complex, mixed aerobic and anaerobic bacteria are present in the majority of infections if appropriate culture techniques are utilized.

- Pasteurella spp. is the most common isolated pathogen isolated from both dog and cat bites.
- Pasteurella canis is the most common isolate of dog bites.
- Pasteurella multocida subspecies multocida is the most common isolates of cat bites.
- The next more frequently encountered aerobic organisms are streptococci and staphylococci.
- The most common anaerobic organisms isolated are Fusobacterium spp., Bacteroides spp. (in particular B. tectum), Porphyromonas spp., Prevotella spp., Propionibacterium acnes, and Peptostreptococcus spp.

The clinical picture seen with the listed Pasturella species and Fusobacterium infections is less severe and there is no increased risk of severe disease in those with a history of splenectomy.
Question # 43

Bacteria most often become resistant to imipenem by which of the following mechanisms?

A. Acetylation of antibiotic  
B. Active efflux of antibiotic out of the cell  
C. Modification of pentapeptide side chain in cell wall peptidoglycan  
D. Modification of ribosomal binding site  
E. Production of metallo beta-lactamase

Correct answer: E

Rationale:

Carbapenem antibiotics (e.g., imipenem, meropenem, ertapenem) are potent antibiotics active against virtually all groups of organisms, with only a few exceptions (e.g., resistance has been reported for all oxacillin-resistant staphylococci, selected Enterobacteriaceae and Pseudomonas, and some other gram-negative rods).

Resistance to this class of antibiotics is most commonly due to production of metallo beta-lactamases (also called carbapenemases).

The carbapenemase produced by Klebsiella pneumoniae is referred to as a KPC beta-lactamase. This carbapenemase can be carried by other enteric organisms.

The NDM-1 (New Delhi Metallo-carbapenemase-1) Enterobacteriaceae carry a different plasmid from the KPC organisms but also are resistant to all the penicillins, carbapenems, cephalosporins, quinolones and aminoglycosides.

The isolates can be suspected by their resistance pattern and confirmed by PCR or the Hodge test.
**Question # 44**

A 56-year-old alcoholic woman with adult onset diabetes mellitus and depression fractured her right hip falling down the stairs.

She had an open reduction and internal fixation repair one week ago, but developed redness and drainage of the wound secondary to a vancomycin resistant E. faecium (VRE) infection of the operative site. She was started on linezolid and you are called to see her on day 8 of hospitalization (day 2 of linezolid) because of anxiety, tremulousness, fever to 39.6°C, agitation and confusion.

The patient takes metformin (Glucophage) and glipizide for her diabetes mellitus and citalopram (Celexa) for her depression.

The most likely explanation if this is a drug related phenomenon is:

A. Delirium tremors  
B. IgE mediated allergic reaction  
C. IgG mediated allergic reaction  
D. Hyper-serotonin syndrome  
E. Malignant hyperthermia

**Correct answer: D**

**Rationale:**

*This patient most likely has a serotonin release syndrome due to linezolid interaction with an SSRI.*

Linezolid is a weak monoamine oxidase inhibitor (MAOI) and can rarely interact with selective serotonin reuptake inhibitors (SSRI’s) such as citalopram causing a hyper-serotonin syndrome. You should be aware of this interaction since intervention can be life saving, and since this is easy to test on the board examination.

This is too late to be delirium tremens assuming that she has not been drinking in the hospital: delerium tremens occurs within 2-4 days of alcohol cessation and while it may last for 5-7 days, it would not start on the eight day of hospitalization.

Malignant hyperthermia is usually related to inhalational anesthetics (halothane) or succinycholine and occurs in the operating room or recovery room in most instances.

*This could be neuroleptic malignant syndrome that would be related to a neuroleptic (citalopram) but which would have nothing to do with linezolid. This was not offered as a choice.*
Question # 45

A 31-year-old woman is brought to the emergency room department by her husband for fever and neurological symptoms.

She was completely well until 3 days earlier, when she felt nauseated and vomited twice. That evening she felt like she had a fever. During the next two days fever continued, she felt “achy,” developed a headache, and continued to have nausea and vomiting. Upon awakening this morning she complained of double vision, and her husband noted her eyes “weren’t looking in the same place.”

In the emergency room she was found to have a temperature of 102.4°F. There was no rash. She had mild nuchal rigidity, right 6th cranial nerve palsy, and a sensory deficit over most of the left side of her body. Her gait was very unsteady. The rest of the exam was unremarkable. An MRI of the head demonstrated inflammation of the pons and medulla.

Which one of the following organisms is the most likely cause of her illness?

A. Streptococcus pneumoniae  
B. Nocardia asteroides  
C. Mycobacterium tuberculosis  
D. Listeria monocytogenes  
E. Cryptococcus neoformans

Correct answer: D

Rationale:

This patient has inflammation of the brainstem (rhombencephalitis).

Listeria monocytogenes can involve the meninges and/or the brain parenchyma, including the brainstem, producing meningitis, abscess or encephalitis.

Listerial rhombencephalitis is a well-described syndrome that typically occurs in healthy adults (unlike other forms of listeriosis). The classic syndrome is a biphasic illness characterized by a prodrome of fever, headache, nausea, and vomiting lasting about 3-4 days, followed by the sudden onset of progressive, asymmetrical cranial nerve deficits, cerebellar signs, and hemiparesis or hemisensory deficits, with or without meningeal signs.

There is a long list of organisms (eg HSV, TB, Crypto) and non infectious causes (paraneoplastic, multiple sclerosis, autoimmune) that are less common. Think of Listeria first!

Streptococcus pneumoniae causes meningeal infection and almost never produces parenchymal brain disease.
**Nocardia** infection of the CNS presents more indolently and involves the cortex, typically with abscess formation.

Parenchymal brain infection can occur with tuberculosis, but usually has a slower progression and involves formation of tuberculomas in the cortex. Progression is too rapid for cryptococcosis.
**Question # 46**

A previously healthy 21-year-old male is admitted with the onset earlier that day of severe headache, followed by vomiting and lethargy.

In the emergency room he was found to be poorly responsive to verbal stimuli, had nuchal rigidity, normal optic fundi and an otherwise normal neurologic examination.

Blood cultures, WBC and differential were obtained and emergency CT requested prior to planned lumbar puncture.

The decision to start antibiotics immediately was made.

- A. Vancomycin and ceftriaxone
- B. Vancomycin, ceftriaxone and dexamethasone
- C. Vancomycin, ampicillin and ceftriaxone
- D. Vancomycin, ampicillin, ceftriaxone and dexamethasone
- E. Ceftriaxone alone

**Correct answer: B**

**Rationale:**

The presence of pneumococci with reduced resistance to penicillin has made use of vancomycin plus ceftriaxone routine as a part of the initial, empirical regimen.

Addition of ampicillin to treat possible listeriosis is advisable for elderly and immunosuppressed adults but not healthy young patients as this one.

Addition of high-dose corticosteroid has remained controversial but one study has convinced many of the experts that 4 days of dexamethasone 10 mg IV q6h, begun before or simultaneous with the administration of antibiotics, decreases mortality in patients with purulent meningitis.

If the lumbar puncture indicates that purulent meningitis is not present, the dexamethasone can be stopped and the diagnosis and therapy can be reassessed.
Question # 47

A college student with a severe cough is hospitalized for what was thought to be a “community-acquired pneumonia.” You are asked to see her on the third hospital day, and you suspect, and then confirm, a diagnosis of pertussis.

She has been treated with ceftriaxone and azithromycin since admission.

What type of isolation would you recommend for this patient?

A. Contact isolation  
B. Airborne isolation  
C. Droplet isolation  
D. No isolation

Correct answer: C

Rationale:

The 2007 CDC guidelines recommend droplet precautions for hospitalized patients with pertussis at least until they have had effective therapy for five days.

Remember, classically airborne precautions (N95 masks) are only indicated for TB, varicella, and measles.
Question #48

An outbreak of nosocomial pneumonia occurs in 3 patients over one month at a large hospital. The patients were hospitalized on different wards but had in common being seen 10 to 14 days prior to onset in a clinic that has a decorative waterfall and fountain.

What is the most likely pathogen?

A. Acinetobacter baumannii  
B. Pseudomonas aeruginosa  
C. Legionella pneumophila  
D. Aeromonas hydrophila  
E. Stenotrophomonas maltophilia

Correct answer: C

Rationale:

Legionella pneumophila and other legionella species can cause nosocomial pneumonia outbreaks in hospitals and nursing facilities from exposure of patients to the water aerosols in the hospital. Specific procedures are used by hospitals to treat the water supply to prevent this type of pneumonia.

Pseudomonas aeruginosa, Aeromonas, and Stenotrophomonas may be associated with nosocomial pneumonia occasionally from humidifiers used with respiratory equipment. Acinetobacter baumannii has caused nosocomial pneumonia in patients on ventilators but not from aerosols. Legionella has caused nosocomial pneumonia from aerosols generated by air conditioners or other ways, such as by this decorative waterfall and fountain. Eradication of Legionella from hospital water systems is possible but expensive and difficult. Unnecessary exposure to water aerosols, as from this waterfall, is easier to correct.