Clinical Case 100

An 18-year old boy fell on his knee while playing basketball. The knee was painful, but the overlying skin was unbroken. The next day, the knee was swollen and remained painful, so the boy was taken to the local emergency room. Clear fluid was aspirated from the knee, and the physician prescribed symptomatic treatment. Two days later, the swelling returned, pain increased, and erythema developed over the knee. Because the patient also felt systemically ill and had an oral temperature of 102°F, he returned to the emergency room. Aspiration of the knee yielded cloudy fluid, and cultures of the fluid and blood were positive with *Staphylococcus aureus*.

1. Name two possible sources of this organism.
2. Staphylococci cause a variety of diseases including scalded skin syndrome, toxic shock syndrome, food poisoning, cutaneous infections, and endocarditis. How do the clinical symptoms of these diseases differ from the infection in this case?
3. What toxins have been implicated in staphylococcal diseases?

Clinical Case 101

An 18-year old boy fell on his knee while playing basketball. The knee was painful, but the overlying skin was unbroken. The next day, the knee was swollen and remained painful, so the boy was taken to the local emergency room. Clear fluid was aspirated from the knee, and the physician prescribed symptomatic treatment. Two days later, the swelling returned, pain increased, and erythema developed over the knee. Because the patient also felt systemically ill and had an oral temperature of 102°F, he returned to the emergency room. Aspiration of the knee yielded cloudy fluid, and cultures of the fluid and blood were positive with *Staphylococcus aureus*.

1. Name two possible sources of this organism.
2. Staphylococci cause a variety of diseases including scalded skin syndrome, toxic shock syndrome, food poisoning, cutaneous infections, and endocarditis. Which of these diseases are intoxications?
3. Which staphylococcal enzymes have been proposed as virulence factors?
4. Which structures in the staphylococcal cell and which toxins protect the bacterium from phagocytosis?
5. What is the role of *S. epidermidis* in infections associated with prosthetic devices? What virulence property helps establish these infections?
Clinical Case 103

A 62-year old man with a history of chronic obstruction pulmonary disease (COPD) entered the emergency room with fever of 102°F, chills, nausea, vomiting, and hypotension. The patient also produced tenacious, yellowish sputum, increasing in productivity over the preceding 3 days. The patient had a respiration rate of 18 per min and blood pressure of 94/52 mm Hg. Chest X-ray examination demonstrated extensive infiltrates in the left lower lung involving both the lower lobe and the lingula. Multiple blood cultures and culture of the sputum yielded Streptococcus pneumoniae. The isolate was susceptible to cefazolin, vancomycin, and erythromycin but resistant to penicillin.

1. What predisposing condition made this patient more susceptible to pneumonia and bacteremia caused by S. pneumoniae? What other populations of patients are susceptible to these infections? What other infections are caused by this organism, and what populations are most susceptible?
2. What is the mechanism most likely responsible for this isolate’s resistance to penicillin?
3. What are the major virulence factors of S. pneumoniae, group A Streptococcus, and group B Streptococcus?

Clinical Case 104

A 62-year old man with a history of chronic obstruction pulmonary disease (COPD) entered the emergency room with fever of 102°F, chills, nausea, vomiting, and hypotension. The patient also produced tenacious, yellowish sputum, increasing in productivity over the preceding 3 days. The patient had a respiration rate of 18 per min and blood pressure of 94/52 mm Hg. Chest X-ray examination demonstrated extensive infiltrates in the left lower lung involving both the lower lobe and the lingula. Multiple blood cultures and culture of the sputum yielded Streptococcus pneumoniae. The isolate was susceptible to cefazolin, vancomycin, and erythromycin but resistant to penicillin.

1. What infections are caused by groups A and B streptococci and in what patient populations do you see them?
2. Group A streptococci can produce streptococcal toxic shock syndrome. Compare the pathogenesis of this disease with that produced by staphylococci.
3. What two nonsuppurative diseases can develop after localized group A streptococcal disease? What is the most likely site of infection for the initial disease?
Clinical Case 105

A family of three ate dinner at a local restaurant. Two hours after eating, all three developed severe abdominal cramps, nausea, and vomiting. They went to a local emergency room where they were found to have normal blood pressure, no temperature elevation, and a normal WBC count and differential. They were treated symptomatically for food poisoning and sent home. Within 24 hours the symptoms subsided for all three.

1. Describe the two forms of *Bacillus* food poisoning.
2. Which form do these patients have?
3. What is the most likely food responsible for this disease?
4. Why was the onset of symptoms so rapid and the duration so short?

Clinical Case 106

A 35-year-old man was hospitalized for headache, fever, and confusion. Seven months previously he had received a transplanted kidney. Physical examination of the patient revealed a temperature of 39°C and obtundation (nonresponsive). Analysis of CSF disclosed a WBC count of 36 cell/mm³ (96% polymorphonuclear leukocytes), glucose concentration of 40 mg/dl, and protein concentration of 172 mg/dl. Gram stain of CSF was negative, but culture of blood and urine revealed gram-positive coccobacilli. (Hint: Facultative intracellular pathogen!)

1. What is the most likely cause of this patient’s meningitis? What is the significance of his immuno-suppression?
2. What are the potential sources of this organism? What other individuals would be at increased risk for infection?
3. Mention a virulence factor used by this pathogen.

Clinical Case 107

A 3-year-old child arrived to the emergency room with an upper respiratory illness and the following symptoms: sore throat, a low-grade fever, and an adherent pseudomembrane covering the tonsils. Specimens from the nasopharynx and throat were inoculated into non-selective and selective media (cysteine-tellurite agar). A gram staining showed small Gram positive bacilli in clumps resembling “Chinese letters”.

1. What is the most likely organism?
2. Describe how transmission took place?
3. Explain why this child was susceptible to this illness?
4. Mention a virulent factor of this pathogen.
Clinical Case 108

A semi-comatose 2-year old was brought into the pediatric ward at Flagstaff Memorial Hospital. The parents described a cold-like syndrome several days prior to hospitalization. A stiff neck and back were evident and a positive Kernig’s sign (a physical sign of meningitis) was elicited. The patient had a temperature of 102°F. No lymph node or skin changes were found. A spinal tap showed increased pressure within the spinal column. The cerebrospinal fluid was cloudy and microscopic examination showed large numbers of polymorphonuclear cells present. The chemistry laboratory reported elevation of the protein level and reduction in the carbohydrate concentration. Gram stain showed Gram positive cocci arranged in pairs or short chains.

1. From the clinical and laboratory observations what is the most probable infecting organism?
2. Why is speed of diagnosis important in meningeal infections?
3. What treatment would you recommend?
4. What is the importance of the finding of large numbers of PMNs?
5. Are the spinal fluid chemistries of any value? If so, what do they indicate?

Clinical Case 109

Following two days of hospitalization, a 60-year old female postoperative patient complained of an extreme soreness in the area of the surgical incision following cholecystectomy. Upon examination by the attending physician, the patient was found to have unusual postoperative distress. Her temperature was 99.5°F. Pulse and respiration rates were within normal limits. Examination of the surgical incision revealed an apparent infection at the site of a drainage tube which had been inserted at the time of surgery. Around the area of the drainage tube there was a blood-tinged exudate. The surrounding skin was erythematous. The patient indicated no previous history or either furunculosis or other skin infections. Gram stain of the specimen showed Gram positive cocci arranged in clusters.

1. What are some of the probable sources of the organisms associated with this patient’s infection?
2. In hospital-acquired infections it is frequently useful to establish the specific identity or “strain” identification of the etiologic agent. For this purpose, name a pathogenic bacterium in which “phage typing” is employed.
3. What characteristics of staphylococci best correlate with their potential pathogenicity?
4. What are some of the complications that may develop in patients with staphylococcal infections of the skin or subcutaneous tissue?
Clinical Case 110

The patient is a 65-year old male who had been hospitalized one week previously with congestive heart failure. While hospitalized, the patient developed a “cold” and two days subsequent, during the night, suddenly developed a severe, shaking chill. At that time, he also complained of headache and generalized aching. By morning, the patient had developed a cough with the production of small quantities of blood-streaked sputum. The patient was slightly cyanotic and showed rapid breathing (40 per minute), elevated pulse and had a temperature of 102°F. Examination of the chest revealed crackles, a pleural friction rub and dullness to percussion over the lower left lobe indicating a pleural effusion. Routine chest x-ray showed infiltrates in the region of the hilum and lower left lobe. The sputum sample was cultured and Gram stain showed Gram positive cocci arranged in pairs or short chains.

1. What are the most common agents associated with pneumonia in elderly adults?
2. In what way might congestive heart failure affect the host-bacterium relationships?
3. If not properly treated, what complications could also develop in this patient?
4. Which Gram negative bacilli may be associated with respiratory infections?

Clinical Case 111

A six-year old boy was presented at the Emergency Room of Flagstaff Memorial Hospital. The child has become acutely ill and was reported to have fever, nausea, headache, and difficulty in swallowing. Examination of the patient’s oropharynx showed edema of the uvula and soft palate, swollen tonsillar tissues and a glistening, swollen oropharynx covered with a thick mucous. The tongue was bright red and partially coated. The patient’s face was flushed and his temperature was 104°F. A slight, erythematous and punctate rash was observed to be present on the upper chest and back. Cervical lymph nodes were enlarged and tender. The throat culture was ordered and Gram stain showed Gram positive cocci arranged in short chains.

1. What infectious agents must be considered in making a differential diagnosis on this patient?
2. For any patient, why is an accurate diagnosis of streptococcal pharyngitis important?
3. What is the treatment of choice for this patient?
4. What are possible complications for this patient if not properly treated?
Clinical Case 112

A 22-year old female school teacher entered the emergency room with a 2-day history of headache and fever. On the day of admission the woman failed to come to school. When the woman’s mother went to her apartment she found her daughter in bed, confused, and highly agitated. When the patient arrived in the emergency room, she was comatose. Purpuric skin lesions were present on her trunk and arms. Analysis of her spinal fluid demonstrated 380 cells/mm³ (93% of polymorphonuclear leukocytes), protein concentration of 220 mg/dl, and glucose concentration of 32 mg/dl. Gram stain of CSF showed many gram-negative diplococci, and the same organisms was isolated from blood and CSF. Despite prompt initiation of therapy with penicillin, the patient expired.

1. What is the most likely organism responsible for this fulminant disease? What virulence factors could be responsible for this disease?
2. What is the most likely source of this organism? What should be done for the students in contact with this teacher?
3. What other diseases are caused by this organism?
4. What virulence factors have been associated with Neisseria gonorrhoeae?
5. What measures should be used to control infections with Neisseria gonorrhoeae?

Clinical Case 113

A 25-year-old, previously healthy woman entered the emergency room for evaluation of bloody diarrhea, and diffuse abdominal pain of 24 hours’ duration. She complained of nausea and had vomited twice. She denied a history of inflammatory bowel disease, previous diarrhea, or contact with other individuals with diarrhea. Onset of symptoms began 24 hours after eating an undercooked hamburger at a local fast food restaurant. Rectal examination revealed watery stool with gross blood present. Sigmoidoscopy showed diffuse mucosal erythema and petechia with modest exudation but no ulceration or pseudomembranes. Cultures for Salmonella, Shigella, Yersinia, and Campylobacter were negative as was the examination for enteric parasites.

1. What is the most likely organism responsible for episodes of hemorrhagic colitis? Which other Enterobacteriaceae can present as colitis?
2. What are the five groups of Escherichia associated with gastroenteritis? What is the disease associated with these organisms?
3. What are the four forms of Salmonella infection?
4. Describe the epidemiology of Yersinia pestis infections.
Clinical Case 114

A 57-year-old man was hospitalized in New York City with a 2-day history of severe, watery diarrhea. The illness began 1 day after returning from Ecuador. The patient was dehydrated with electrolyte replacement to compensate for the watery diarrhea, the patient made an uneventful recovery. Stool cultures were positive for *Vibrio cholerae*.

1. What clinical signs are characteristic of cholera?
2. What virulence factors mediate this disease?
3. How did this patient acquire this infection?
4. How does this differ from infections caused by *Vibrio parahaemolyticus*?
5. How can cholera be controlled in areas where infection is endemic?

Clinical Case 115

A mother and her 4-year-old son came to the local emergency room with a 1-day history of diarrhea and abdominal cramping. Both patients had low-grade fevers, and the child had gross blood in the stool specimen. The onset of symptoms developed 18 hours after a dinner of mixed green salad, chicken, corn, bread, and apple pie. Culture of blood samples were negative, but *Campylobacter jejuni* was isolated from stool specimens of both the mother and child.

1. What is the most likely food responsible for these infections? What measures should be used to prevent these infections?
2. What campylobacters are commonly found in blood specimens? What disease is caused by this organism and in what patient populations?
3. What diseases have been associated with *Helicobacter pylori*? What virulence factors does this organism possess, and what are their biological effects?
Clinical Case 116

A 63-year old man had been hospitalized for the previous 21 days for management of newly diagnosed leukemia. During the period of hospitalization the patient had developed a urinary tract infection with *E. coli* and was treated for 14 days with broad spectrum antibiotics. On hospital day 21 the patient developed fever and shaking chills. Within 24 hours the patient became hypotensive, and ecchymic skin lesions appeared. Despite aggressive therapy with antibiotics, the patient expired. Multiple blood cultures were positive for *Pseudomonas aeruginosa*.

1. What factors made this man at increased risk for infection with *P. aeruginosa*? What are the epidemiological characteristics of this organism?
2. What virulence factors possessed by the organism make it particularly serious pathogen?
3. What measures could be used to manage this infection in this patient? What control measures should be used to prevent additional infections in other patients in the hospital unit?
4. What antibiotics can be used to treat *P. aeruginosa* infections?

Clinical Case 117

A previously healthy 18-month-old boy woke from his sleep with a severe headache and stiff neck. Because the child had a fever of 39.4°C and appeared quite ill, the mother took him to a local emergency room. At the time cerebrospinal fluid was collected, it appeared cloudy with 400 WBCs/mm³ (95% polymorphonuclear neutrophils) present, protein of 75 mg/dl, and glucose of 20 mg/dl. Small gram-negative bacilli were observed on Gram stain of the CSF, and culture of CSF and blood was positive for *Haemophilus influenzae*.

1. Discuss the epidemiology of *Haemophilus influenzae* meningitis, and compare this with meningitis caused by *Neisseria meningitidis*.
2. Why is it now unusual to find *H. influenzae* infections in young children? What other diseases are caused by this organism?
3. Why is chocolate agar needed for this isolation of *Haemophilus*? What other techniques can be used to isolate this organism in culture?
Clinical Case 118

A 5-year-old girl entered the local public health clinic with a severe, intractable cough. During the previous 10 days the child had a persistent cold that grew progressively worse. The cough had developed the previous day and was so severe that it was frequently followed by vomiting. The child appeared exhausted from the coughing episodes. A blood cell count showed a marked leukocytosis with a predominance of lymphocytes. The examining physician suspects the child has pertussis.

1. What laboratory tests can be performed to confirm the physician’s clinical diagnosis? What specimens should be collected, and how should they be submitted to the laboratory?
2. What virulence factors are produced by *Bordetella pertussis*?
3. What is the natural progression and prognosis of this disease? How can it be prevented?

Clinical Case 119

A 73-year-old man was admitted to the hospital with dyspnea, chest pain, chills, and fever of several days duration. He had been well until 1 week before admission when he noted the onset on a persistent headache and a productive cough. The patient had smoked 2 packs of cigarettes a day for more than 50 years, drank a six pack of beer daily, and had a history of bronchitis. Physical examination revealed an elderly man in severe respiratory distress with a temperature of 39.0°C, pulse, 120, respiratory rate, 36, and blood pressure, 145/95 mm Hg. Chest examination revealed an infiltrate in the middle and lower lobes of the right lung. The white blood cell count was 14,000 cell/mm³ (80%PMNs). Gram stain of the sputum showed neutrophils but no bacteria, and routine bacterial cultures of sputum and blood were negative.

1. Infection with *Legionella pneumophila* is suspected. What laboratory tests can be used to confirm this?
2. How is the *Legionella* able to survive phagocytosis by the alveolar macrophages?
3. What environmental factors are implicated in spreading infections with *Legionella*? How can this risk be eliminated or minimized?
Clinical Case 120

A 31-year-old woman with left-sided face pain visited the emergency department of a local hospital. She was unable to open her mouth because of facial muscle spasms and had been unable to eat for 4 days because of severe pain in her jaw. Her attending physician noted trismus and risus sardonicus. She reported 1 week previously she had incurred a puncture wound to her toe while walking in the garden. The wound was cleaned and small pieces of wood removed, but she did not seek medical attention. Although she had received tetanus immunizations as a child, she had not received a booster vaccination since age 15.

The presumptive diagnosis of tetanus was made.

1. How should this diagnosis be confirmed?
2. What is the recommended procedure for treating this patient? Should management wait until the laboratory results are available? What is the long-term prognosis for this patient?
3. Compare the mode of action of the toxins produced by Clostridium tetani and C. botulinum.
4. What virulence factors are produced by C. perfringens? What diseases are caused by this organism?

Clinical Case 121

A 35-year-old man with a history of intravenous drug use entered the local health clinic with complaints of a dry persistent cough, fever, malaise, and anorexia. Over the preceding 4 weeks the patient had lost 15 pounds and had experienced chills and sweats. The chest radiograph revealed patchy infiltrates throughout the lung fields. Because the patient had a nonproductive cough, sputum was induced and submitted for bacterial, fungal, and mycobacterial cultures, as well as examination for Pneumocystis. Blood cultures were performed, as well as serologic tests for HIV infection. The patient was HIV positive. Pneumocystis testing was negative, as were all cultures after 2 days of incubation; however, cultures were positive for M. tuberculosis after an additional 1 week of incubation.

1. How does the presentation of M. tuberculosis and M. avium-intracellulare infections differ in HIV-infected patients?
2. Why is M. tuberculosis more virulent in HIV-infected patients compared with non-HIV-infected patients?
3. How does the composition of the mycobacterial cell wall affect the staining properties of this group of organisms?
4. What is the definition of a positive skin test (PPD) for M. tuberculosis?
5. Why do mycobacterial infections have to be treated for 6 months or more?
Clinical Case 122

A 18-year-old woman spoke of knee pain that developed 2 weeks previously. Three months earlier, soon after vacationing in Connecticut, she noticed a circular area of redness, approximately 10 cm in diameter, on her lower leg. Over the next 2 weeks the area enlarged and the border became more clearly demarcated. However, the rash gradually disappeared. A few days later she experienced the onset of headaches, an inability to concentrate, and nausea. The symptoms also gradually decreased in intensity. Approximately 1 month later the pain in her knee developed for she sought medical treatment. Upon examination of the knee, mild tenderness and pain was noted. A small amount of serious fluid was aspirated 45.0 X 10^7/ml. Antibodies to *Borrelia burgdorferi* were present in the patient’s serum: titer of 1:32 and 1:1024 for IgM and IgG, respectively.

1. What are the initial and late manifestations of Lyme disease?
2. What are the limitations of the following diagnostic tests for Lyme disease: microscopy, culture, serology?
3. What are the reservoir and vectors for syphilis, epidemic and endemic relapsing fever, Lyme disease, and leptospirosis?

Clinical Case 123

A 21-year-old student developed increasing lethargy, headache, cough, a low-grade fever, and chills and sweats at night. When she was seen at the student health center, she had a nonproductive cough and experienced dyspnea on exertion. Her pulse rate was 95 per minute, and respiratory rate was 28 per minute. Her pharynx was erythematous; scattered rhonchi and rales but no consolidation were noted by auscultation. A chest radiograph revealed patchy infiltrates. Gram stain of sputum revealed many WBCs but no organisms. *Mycoplasma* complement fixation titer upon admission was 8 and increased to 32 a week later. She was treated with erythromycin and responded slowly over the next 2 weeks.

1. Should cultures of induced sputum have been performed to confirm the serologic diagnosis? Why?
2. How does *Mycoplasma* differ from other bacteria?
3. Describe the epidemiology of *M. pneumoniae* infections. What is characteristic about this patient?
4. What other mycoplasmas cause human disease?
Clinical Case 124

A 22-year-old man had a history of urethral pain and purulent discharge. This had developed after sexual contact with a prostitute. Gram stain of the discharge revealed abundant gram-negative diplococci resembling *Neisseria*. The patient was treated with penicillin and sent home. Two days later the patient returned to the emergency room with a complaint of persistent watery urethral discharge. Abundant WBCs were observed on Gram stain but no organisms. Culture of the discharge was negative for *Neisseria gonorrhoeae* but positive for *Chlamydia trachomatis*.

1. Why was penicillin ineffective against *Chlamydia*? What antibiotic can be used to treat chlamydial infections in this patient?
2. Describe the growth cycle of chlamydia?
3. Describe the differences among the three chlamydial species that cause human disease.
4. Describe the pathogenesis of trachoma? How does this differ from conjunctivitis seen in newborns and in adults?
5. Compare the epidemiology of psittacosis with respiratory infections caused by the other chlamydial species.

Clinical Case 125 (Trypanosomes)

The patient was a 44-year-old female heart transplant patient, approximately 1 year after transplant. The patient complains to her primary physician about headache, nausea, and vomiting. She has no skin lesions. A head CT scan demonstrates ring-enhancing lesions. A biopsy of the lesions is performed. All cultures (bacterial, fungal, viral) are negative. Special strains of the tissue revealed multiple cystlike structures of varying size.

1. What is the differential diagnosis of infectious agents in this patient? What is the most likely etiological agent?
2. What other tests would you do to confirm the diagnosis?
3. What aspects of the medical history might suggest a risk for the infection with this agent?
4. What are the therapeutic options and the likelihood of successful therapy?