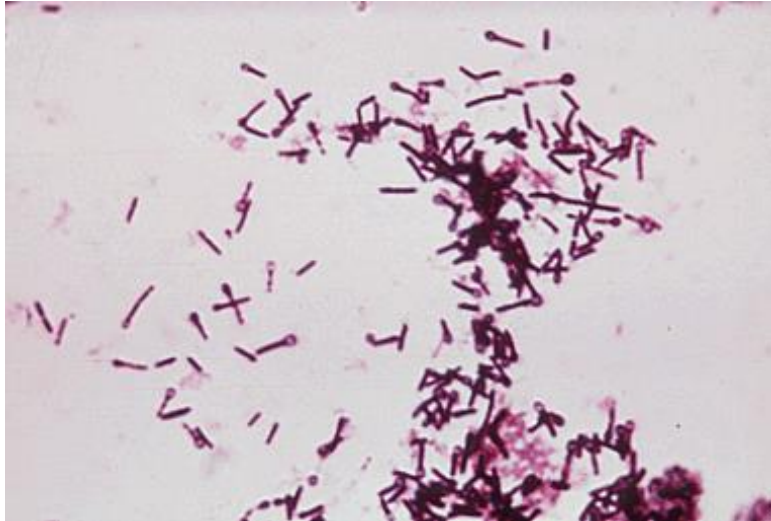


**Microbiology Case Studies
Dr. Gary Mumaugh**



Case Study Problems

This is the protocol that must be used for the cases:

- 1) Open the case history from the class website, read it and study it.
- 2) Type your answers directly after the case questions.
- 3) When your answers are completed, cut and paste the answers into an email to drmuma@gmail.com
- 4) The answers should reflect scientific and medical accuracy. Answers should be thoughtful and reflect comprehension of the type of bacterial infection.
- 5) Names of bacteria should be correctly written. Example – in italics with Genus capitalized and species in lower case
Staphylococcus aureus or *Staphylococcus aureus*
- 6) Grades will be based upon the criteria stated. It is possible to get more points for the case for thoroughness.
- 7) In the subject line of the email, put "Micro Case", so Dr. M will know what it is and will open and grade immediately.
- 8) DO NOT PRINT AND HAND IN. Hard copies will NOT be accepted.

**This hard copy of the case histories is provided for study purposes only.
Digital copies are available on the class website for grading purposes.**

Microbiology Case #1

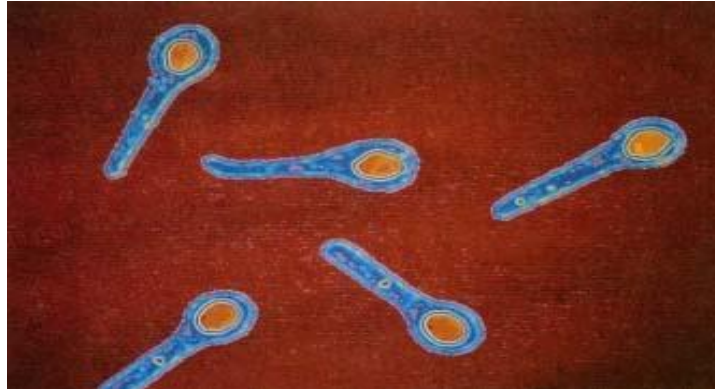


Mrs. Allen, a high school teacher, noticed that one of the girls in the front row of her first period Biology class seemed to have red and teary eyes. Initially when she approached the student, Jennie, she believed her to be crying and upset. When she questioned Jennie, she found that her eyes were red and appeared to be very irritated. She referred her to the nurse. Upon closer examination, the nurse found the student's right eye to be blood shot. The lower lid was swollen and bright red. A thick discharge was found in the corner of the eye. Jennie complained that her eye throbbed. The school nurse told Jennie not to touch her eye. She called the parents and suggested that Jennie see a physician immediately for the correct diagnosis and treatment. Jennie remained in the nurse's office until her parents came to take her to the doctor.

Case #1 Questions

1. What is the most likely diagnosis for this condition?
2. What is the etiology of this infection?
3. What sign(s) lead one to suspect that the infection is bacterial in origin?
4. What is the treatment for this condition. (List specific antibiotics)
5. Is the condition communicable? Please explain?
6. What are some natural defenses of the eyes that assist in the prevention of infections?

Microbiology Case #2



A 62 year old botanist and horticulturist was admiring her garden of lilies when she spotted a weed in the midst of her flowers. She had left her gloves in the house. Unfortunately when she went to remove the offensive weed, the tiny thorny base gashed her hand. She immediately went into the house and washed the wound and added some topical antibiotic just in case. However, within a day she noticed a puffy red swelling around the gash. By the second day she became concerned when she awoke to find that when she tried to get up out of bed she found walking difficult. She immediately called her son who came to take her to the ER of the local hospital immediately. By the time she reached the hospital she began to experience difficulty with speech and muscle spasms. The doctor inspected the wound site and noted the now severe swelling. He was more concerned by his patient's growing respiratory distress and acute muscle spasms.

The physician contacted the woman's primary care giver. He found that she had not received a Tetanus booster in more than ten years. Troubled by this information, he immediately intubated his patient and administered counter measures.

Case Study #2 Questions

1. What is the immunization the patient should have received?
2. What is the recommended period for booster shots.
3. The causative agent for this disease is _____.
4. What are the identifying characteristics of this organism?
5. How did the organisms enter the hand of the gardener?
6. What causes the paralysis?
7. What other organisms belong to this Genus that are medically significant?

Microbiology Case #3



The patient is a 29-year-old surgical nurse seen in the clinic for evaluation of a needle puncture wound in her left hand. Earlier in the day, when assisting in the ER, in an attempt to revive a cardiac arrest, she sustained a deep puncture wound in her left palm from a needle that had accidentally dropped onto the gurney. The needle was visibly contaminated with blood. She immediately washed her hand thoroughly with soap, water and Betadine and then applied a topical antiseptic, and dressed the puncture site with a loose dressing.

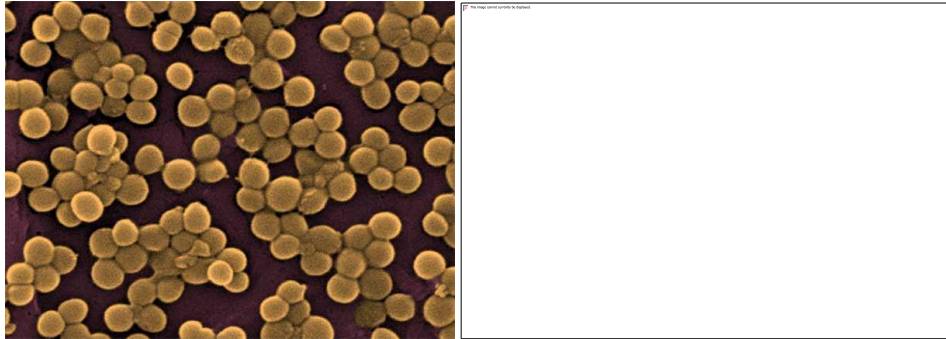
She is married with a three-year-old child. She has no history of blood transfusions or drug abuse. She donated blood at a hospital blood drive four weeks earlier. Her tetanus shots are up to date, but she has not been immunized for Hepatitis B.

Two days after her visit to the office, tests of the cardiac patient's blood revealed that he had a chronic viral infection.

Case Study #3 Questions

1. What are the main diagnostic considerations?
2. What risk of infection did the patient face?
3. What measures could be taken to reduce the risk?
4. How much time could expire before preventative measures are ineffective?
5. What is this nurse's prognosis?

Microbiology Case #4



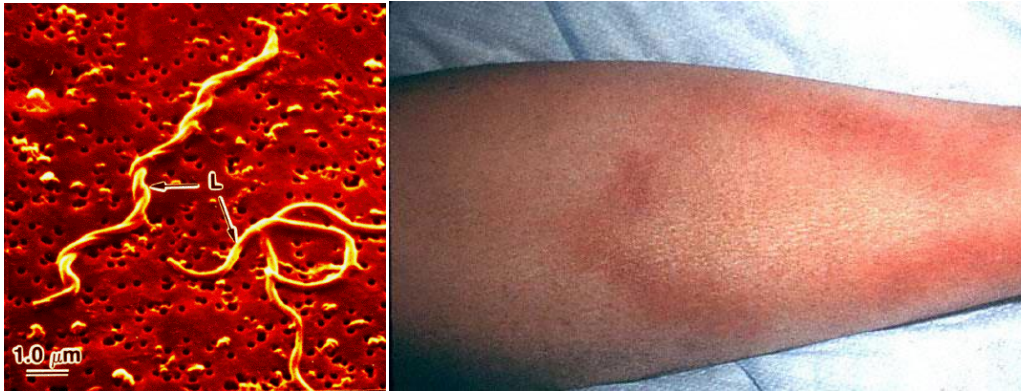
An eighteen year old student in an automotive technology class at the local high school complained of a pain in his hand. His mother was concerned because he was feverish and lethargic. He wanted to stay home from school. The young man reluctantly admitted to his mother that he had cut his hand during his automotive class while working on a car engine. He had washed his hand with soap and water immediately at the faucet in the classroom. He had also covered the gash with a band aid. Although his teacher had given him a pass to the school nurse to a follow up, the student conveniently forgot when the bell rang and he had to get to his next class on time.

When questioned by his mother, the young man admitted to having diarrhea and vomiting the previous day. His mother immediately made an appointment with the doctor. The doctor noticed that the boy's arm was sensitive to touch. Upon further examination, the boy had an open sore with pus. The area around the injury was edematous. The physician immediately noticed that he also had purplish, red streaks running up his arm from the site of the injury. The doctor confirmed his suspicions when he also observed enlarged lymph nodes under the arm with the open wound. The skin on the arm felt very warm and dry.

Case Study #4 Questions

1. What type of infection do you believe he has on his hand?
2. From the patient's complaints and physical examination, which symptoms lead you to your choice of the etiological agent?
3. From the history, which of the information confirmed your choice?
4. What is likely to follow if this infection were not treated?
5. What errors in the initial treatment of the student's injury occurred?
6. What would you do to avoid this type of infection? How could it be avoided?
7. What treatment should begin immediately?
8. What tests should be done in the clinical laboratory at the hospital to determine the antibiotic to be used?

Microbiology Case #5



A young under graduate student at UM - Duluth majoring in Forestry, checked in at the university medical care center, reporting a wide spectrum of health concerns. She had recently completed a deer population study as a part of a research project in the North Shore area. A week after her field work was completed, the student began to feel fatigued and listless. She experienced an inability to concentrate and a general feeling of malaise. She reported aches in her legs which she attributed to walking miles through the forests. The physician noted a circular "rash" about 5 inches in diameter, with a bright red edge and a dim red center with the appearance of a "bull's eye". On physical exam, the patient had a fever of 38.5 °C and an irregular heartbeat. Her white blood count reflected an elevation of white blood cells, greater than 15,000 cells/cm³. The physician ordered a test for Lyme's Disease to confirm his suspicions.

Case #5 Questions

1. What is your best diagnosis of this case?
2. What features are critical to your diagnosis?
3. What is the environmental pathway for this vector borne infection?
4. How did the student come into contact with this vector?
5. What is another name for the "bull's eye rash" and when does it occur?
6. What is the incubation period?
7. What precautions should the student have used to avoid this disease?
8. The symptoms suggest what type of antibiotic therapy?
9. How should the treatment be followed to eliminate the possibility of serious and continuing health problems?

Microbiology Case #6



At the Mount Union hospital, a 5-year old white male child in good general health and physical condition was presented at the Saturday walk-in clinic by his mother. He was brought in because he had a fever, was cranky and had complained of a sore throat for about 24 hours. On physical examination by the attending resident, the patient had a fever of 39.3C, and he had considerable swelling and drainage of the pharynx and in the conjunctivae. His tonsils were enlarged and coated with a white patchy exudate. He had a red throat and swollen anterior cervical lymph nodes. His ears were clear. His chest sounded clear and he had no additional remarkable findings on routine examination.

1. What would be your presumptive diagnosis for this child?
2. What are the classical signs and symptoms of this infection?
3. What diagnostic testing would be indicated to follow this exam?
4. What is the most likely treatment for this illness?
5. Why is the treatment important?
6. What factors of this case allowed you to make a presumptive diagnosis?

Microbiology Case #7

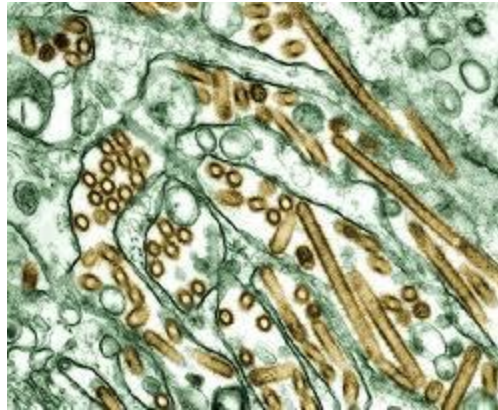


A lethargic 22-month old child was presented by her mother to the emergency room at 2:15am on a Sunday. The child had a history of a runny nose, hoarse cough and low-grade fever (~99F) for the past 48 hours. The mother was concerned about the forced and noisy breathing of the child. The pediatrician examined the child and found cloudy eyes and mild inflammation of the ears, but no overt signs of bacterial infection (no significant changes in the eardrums). The throat of the child was red and coated with mucus. The larynx was swollen and raw.

The physician performed a rapid Strep test and found it was negative. Throat swabs were taken for culture. The physician placed the child in a room with a warm vaporizer for about 30 minutes. This dramatically improved the breathing of the child.

1. What is the presumptive diagnosis for this case?
2. Will the throat cultures likely show evidence of *Streptococcus pyogenes*?
How about *Staphylococcus aureus*?
3. Do you believe that this is a bacterial or viral disease?
4. Why do you believe this?
5. What further treatment is indicated for this case?

Microbiology Case #8



A 22-year old male college student was presented at the university health clinic. He looked tired and pale. He presented because of high fever and chest pain. He was afraid he was having a heart attack (bad week of exams). He was examined immediately by the PA and an EKG strip was run. He had no evidence of acute heart problems. The attending physician visited the patient. He obtained the following history from the past 36 hours. The patient had a tight cough. He had significant muscle aches and pains. He had a bad headache and had had fevers of 101-103F.

The physician ordered a chest x-ray. It did not show any significant consolidated inflammation suggestive of pneumonia. The patient showed significant nasal drainage and a moderately tight, but productive cough on physical exam. He had a fever of 101F and generally inflamed mucous membranes. A rapid Strep test showed no evidence of Streptococcal infection and his tonsils and adenoids had been removed.

1. What is the most likely diagnosis for this patient?
2. On what do you base this diagnosis?
3. What secondary infection problems should be monitored?
4. What is the preferred treatment for this disease?

Microbiology Case #9



A 68-year old patient with Alzheimer disease was brought to the emergency room by the staff of a local nursing home. He presented as lethargic with a sallow complexion. He had an admission temperature of 102.4F and a respiratory rate of 33/minute. During respiration, the right side of his chest moved better than the left. He showed dense consolidation of the lower lobe of the left lung on physical exam. A sputum sample revealed blood and a greenish color.

A chest x-ray showed tight consolidation of the left lung with evidence of formation of cavities in the lung tissue from cytotoxic damage. The patient complained of chills in the exam room, combined with his fever. A smear of his sputum demonstrated no acid-fast bacteria.

1. What is your presumptive diagnosis for this case?
2. What evidence could the sputum give for this case?
3. Is the reduced respiration rate and unequal chest movement indicative of the pathology?
4. Is this a bacterial or viral disease?
5. How should this patient be treated?

Microbiology Case #10



A 35-year old accountant presented to his physician with a steady burning pain just right of the mid-line of the of the abdominal region in an area from 1 to 4 inches above the "belly button." The pain usually followed meals by about 1-3 hours. He had several episodes of vomiting, which included frank blood.

On physical examination, the patient had no fever. He appeared generally well. He had no evidence of weight loss. He showed slight rebound tenderness in the upper abdomen. An occult blood test revealed the presence of blood.

1. What would your diagnosis in this case be?
2. What organism is most likely to be responsible for these symptoms and findings?
3. What further testing or things should you look for?
4. What is the treatment for this infection?
5. Is there any prevention for this infection?

Microbiology Case #11



A 26-year old white female presents in her physician's office with genital itching and sharp, severe pain on the labia. She complains of three previous episodes of pain over the past 6 months, each of which were followed by the appearance of red sores which crusted and healed without a scar.

On examination the physician observes a cluster of small red blisters localized in the area of the worst pain. No significant discharge was observed from the vagina. The patient's urine was clear and yellow. Urinalysis revealed normal specific gravity, no sugar, no protein, no white blood cells or red blood cells and no bacteria. The patient's temperature was 36.5C.

The patient history reveals that she is unmarried. She is moderately sexually active and currently using an oral contraceptive which she has been taking for about 4 years. The woman stated that she has had 5 sexual partners over the past year. She reported that her episodes have become progressively more severe.

1. What is the cause of this woman's complaint?
2. What is the incidence of this diagnosis in the USA?
3. As her physician, would you recommend that this woman modify her sexual activity?
4. Is there an effective treatment for this condition?
5. What serious long-term risk does this woman have?

Microbiology Case #12

A 24-year old, female graduate student in biology presented with exhaustion, weakness and a low grade fever. She was pale and showed poor ability to concentrate.

Her history revealed that she had gradually become increasingly tired and weakened over the past two months. She had experienced low-grade fevers over the past month and felt she would need to drop out of her graduate program if she did not get this under control. She had had a severe strep throat about a year earlier and showed some signs of rheumatic fever at the time. She had had minor dental surgery about two months earlier.

On examination, she had a temperature of 100F. She had slightly enlarged cervical lymph nodes. She had a heart murmur, with abnormal valve sounds. Her ears, eyes and throat were clear. She had clear lungs and there were no significant findings in other systems.

1. What would be your primary diagnosis of this patient?
 - a. autoimmune heart failure due to rheumatic fever
 - b. subacute bacterial endocarditis
 - c. acute bacterial endocarditis
 - d. generalized viral infection
2. What agent do you think is causing this problem?
 - a. *Streptococcus pyogenes* caused the problem
 - b. *Staphylococcus epidermidis*
 - c. *Streptococcus pneumoniae*
 - d. *Herpes simplex*
3. How would you make a definite diagnosis?
 - a. I would look for rheumatoid factor in the serum.
 - b. I would get a blood culture and culture for *Staphylococcus epidermidis* or viridans Strep.
 - c. I would do a blood culture and look for beta hemolytic colonies.
 - d. I would do a chest x-ray and look for the inflammatory signature of the protozoa.
4. Which of the following is a common outcome when this disease is untreated?
 - a. The patient may have a stroke.
 - b. The patient may develop an aneurysm.
 - c. The patient may develop glomerulonephritis.
 - d. Any of the above could occur.
 - e. None of the above could occur.
5. Why would this diagnosis be clinically significant to a dental hygienist?

Microbiology Case #13

A white male, 17 years of age presented at the emergency room with a severe headache, vomiting, and a stiff neck with pain running up his back. On admission, his temperature was 101F. The young man appeared to have trouble hearing during the nurse's interview and also seemed to have trouble concentrating.

The history revealed that the young man is a wrestler for the local high school team. He had felt as though he were getting a cold the past few days, since his last meet in Hicksville. He did not smoke or drink, but he had attended a party two days earlier thrown by his girlfriend and the other cheerleaders to celebrate his victory in the sectionals. He had been holding his weight at 162 for the season, so he ate little and did not drink on the day of meets (today is a day of the meet).

On physical exam, the physician noticed several areas of small purplish spots on the skin of the back, thigh and arm. The boy thought those were from wrestling.

1. Which of the following is the most likely diagnosis?
 - a. *Neisseria gonorrhoeae* induced meningitis
 - b. *E. coli* induced meningitis
 - c. *Neisseria meningitis* induced meningitis
 - d. *Streptococcus pneumoniae* induced meningitis
2. Which of the following was a critical factor in your choice of diagnosis?
 - a. The fact the he is a wrestler and he does not eat or drink much.
 - b. The headache, vomiting, stiff neck, fever and purplish spots.
 - c. The party he went to with the cheerleaders.
 - d. His trouble hearing.
3. Which of the following will likely happen if he is not treated?
 - a. He will continue to have a fever and stiff neck for a few days and recover.
 - b. His symptoms will progressively worsen until he develops shock and dies.
 - c. He may get better in a few days, but will likely have permanent hearing loss.
 - d. It is impossible to tell, because not enough data is available for an assessment of his condition.
4. (3 point essay) Meningitis has a bacterial form and a viral form. What are similarities and differences of these two forms?

Microbiology Case #14

A missionary couple, living in West Africa, bring their 4-year old son to the office of their physician on the second day of a visit home to Minnesota. The boy had a mild episode of diarrhea about seven days earlier and would not eat. He seemed to recover, but the mother noticed that the boy was having trouble walking the previous night and had seemed to have trouble dressing himself and walking that day.

On examination, the patient had no significant fever (98.9) and normal bowel sounds. His chest, ears and eyes were clear. He had no rebound tenderness in the abdomen. The physician noted that the child had poor muscular reflexes in his arms and legs. The child also was a bit lethargic and seemed confused.

The family lives in an isolated village in Africa. The mother opposes vaccinations on personal grounds, so the child has only had the initial series of DPT shots and no other typical vaccines. The village where they live has many problems with parasites and insect borne fevers (including Dengue).

Urine, stool and blood samples were collected for analysis.

1. This disease is most likely:
 - a. an intestinal infection or parasite.
 - b. a respiratory infection or parasite.
 - c. a neurological infection or parasite.
 - d. Not enough information is given to determine this.
2. My best guess at a diagnosis is:
 - a. Hib meningitis
 - b. sleeping sickness
 - c. polio
 - d. a parasitic worm
 - e. malaria
3. Which of the following samples could easily provide confirmation of your diagnosis?
 - a. The stool would show the presence of the worms.
 - b. The serum would have antibody against polio.
 - c. The urine would contain *H. influenzae* organisms.
 - d. The blood would contain red blood cells with malarial parasites.
 - e. Only CSF will show the answer.
4. Would receiving the childhood vaccine series have prevented this problem?
 - a. yes, without doubt
 - b. yes, most likely
 - c. possibly, but living in Africa the pathogen load might be too high
 - d. no, no vaccine is normally given

