

## BIOL 221: Clinical Microbiology

<b>Location:</b>	Evening
<b>Address:</b>	1001 Rogers Street Columbia, MO 65216
<b>Section:</b>	19FALL2/BIOL/221/AEV
<b>Semester Credit Hours:</b>	3
<b>Class Day(s) and Time(s):</b>	Monday, Wednesday 5:30 PM - 7:30 PM from October 21, 2019 to December 14, 2019

### ☰ Syllabus Contents

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### 📘 Course Information

#### Catalog Description

A survey of microorganisms with emphasis on clinically important bacteria, viruses, protozoa, fungi and invertebrates. Emphasis placed on the health care applications of microbiology and transmission of infectious disease agents.

**Prerequisite:** BIOL 110. **Corequisite:** BIOL 221L.

#### Additional Notes

**Attendance Policy:** All students are expected to attend each class period as assigned. When you miss class, you miss important announcements, directions and assignments. If you come in late, the same applies. I will not interrupt class to get you caught up.

**Thanksgiving:** Class will not meet on Wednesday, November 27, the day before Thanksgiving. Class will be rescheduled for Friday, November 22.

### 📖 Textbooks

As part of Truition<sup>SM</sup>, students will receive their course materials automatically as described below.

📖 Marjorie Kelly Cowan. (2018). *Microbiology Fundamentals: A Clinical Approach with access to Connect* (3rd). McGraw-Hill. *eText*

#### Bookstore Information

Visit <https://www.ccis.edu/bookstore.aspx> for details.

### eText Information

If a course uses an eText, (see textbook information above) the book will be available directly in Desire2Learn (D2L) seven days before the session begins, if registered for courses prior to that date. Upon first login to VitalSource, students should use their CougarMail email address; alternate email addresses cannot be used. More information about how to use the VitalSource platform, including offline access to eTexts, can be found in D2L.

### Physical Course Materials Information

Students enrolled in courses that require physical materials will receive these materials automatically at the shipping address on file with Columbia College. Delivery date of physical materials is dependent on registration date and shipping location. Please refer to confirmation emails sent from Columbia College for more details on shipping status.

**Returns:** Students who drop a class are responsible for returning any physical course materials that were shipped. To initiate a return, visit [Ingram Returns](#) to generate a pre-paid return label. Materials from dropped courses must be returned within 30-days of receipt. **Failure to return physical items from a dropped course will result in a charge to the student account for all unreturned items.**

**Note:** Students who opt-out of having their books provided as part of [Tuition<sup>SM</sup>](#) are responsible for purchasing their own course materials.

### Technology Requirements

**THIS IS A TECHNOLOGY-ENRICHED COURSE WHICH COMBINES IN-SEAT INSTRUCTION WITH ONLINE LEARNING.**

Participation in this course will require the basic technology for all classes at Columbia College:

- A computer with reliable internet access
- A web browser
- Acrobat Reader
- Microsoft Office or another word processor such as Open Office

For more information, see [technical requirements](#).

### Course Learning Outcomes

- Describe the basic concepts of bacteriology, virology, mycology and parasitology.
- Differentiate between important groups of pathogenic microorganisms.
- Examine the human bodily interactions with pathogenic and non-pathogenic microorganisms.
- Explain the control and treatment of pathogenic microorganisms.

### Grading

#### Grading Scale

Grade	Points	Percent
A	900 - 1000	90-100%
B	800 - 899	80-89%
C	700 - 799	70-79%
D	600 - 699	60-69%
F	0 - 599	0-59%

#### Grade Weights

Assignment Category	Points	Percent
Online Learning Activity	150	15%
Case Studies	250	25%
Exams	400	40%
Homework	200	20%
<b>Total</b>	<b>1000</b>	<b>100%</b>

 Schedule of Due Dates

Week 1

Assignment	Points	Due
Discussion 1	15	initial post due by 8:00 PM Friday of Week 1, response due by 8:00 PM Sunday of Week 1
Reading Assignments Week 1 Day 1	--	Week 1 Day 1
Reading Assignments Week 1 Day 2	--	Week 1 Day 2
Homework Week 1 Day 2	10	Week 1 Day 2

Week 2

Assignment	Points	Due
Discussion 2	20	initial post due by 8:00 PM Friday of Week 2, response due by 8:00 PM Sunday of Week 2
Homework Week 2 day 1	10	Week 2 day 1
Homework Week 2 Day 2	10	Week 2 Day 2
Exam 1 Week 2 Day 2	100	Week 2 Day 2

Week 3

Assignment	Points	Due
Discussion 3	20	initial post due by 8:00 PM Friday of Week 3 response due by 8:00 PM Sunday of Week 3
Case Study 1 Week 3 Day 1	125	Week 4 Day 1
Homework Week 3 Day 2	20	Week 3 Day 2

Week 4

Assignment	Points	Due
Discussion 4	15	initial post due by 8:00 PM Friday of Week 4 response due by 8:00 PM Sunday of Week 4
Homework Week 4 Day 1	10	Week 4 Day 1
Homework Week 4 Day 2	20	Week 4 Day 2
Exam 2 Week 4 Day 2	100	Week 4 Day 2

Week 5

Assignment	Points	Due
Discussion 5	20	initial post due by 8:00 PM Friday of Week 5 response due by 8:00 PM Sunday of Week 5
Homework Week 5 Day 2	20	Week 5 Day 2
Case Study 2	125	Week 6 Day 2

Week 6

Assignment	Points	Due
Discussion 6	20	initial post due by 8:00 PM Friday of Week 6 response due by 8:00 PM Sunday of Week 6
Homework Week 6 Day 1	20	Week 6 Day 1
Homework Week 6 Day 2	10	week 6 Day 2
Exam 3 Week 6 Day 1	100	Week 6 Day 1

Week 7

Assignment	Points	Due
Discussion 7	20	initial post due by 8:00 PM Friday of Week 7 response due by 8:00 PM Sunday of Week 7
Homework Week 7 Day 1	20	Week 7 Day 1
Homework Week 7 Day 2	20	Week 7 Day 2
<b>Week 8</b>		
Assignment	Points	Due
Discussion 8	20	initial post due by 8:00 PM Friday of Week 8 response due by 8:00 PM SATURDAY of Week 8
Homework Week 8 Day 1	20	Week 8 Day 1
Homework Week 8 Day 2	10	Week 8 Day 2
Exam 4	100	Week 8 Day 2
<b>Total Points: 1000</b>		

## Assignment Overview

Online Component Summary and Expectations

### Discussions

In this course, there will be eight (8) discussions that must be completed. You must complete one (1) initial post and one (1) response post by the due date assigned by your instructor. You must post your initial post first before you will be able to see your classmates' posts. Response posts must be meaningful and contribute to the overall discussion. Posts such as "I agree." or "Good Point." will not receive credit.

You must provide full APA formatted citations when appropriate.

#### Assignments

You will be assigned homework questions for each chapter.

#### Examinations

You will 4 exams each worth 100 points.

## Course Outline

Click on each week to view details about the activities scheduled for that week.

### Week 1: Introduction to Microbes and Their Building Blocks and Tools of the Laboratory

#### Discussion 1

## Discussion 1: Achievements in Public Health 1900-1999

Locate this *MMWR* article through an online search engine: *CDC. Achievements in public health, 1900—1999: Control of infectious disease. MMWR 1999;48(29):621—629.* Read the article thoroughly, and then answer the questions below.

- What three endeavors in the 20th century led to drastic reductions in the mortality from infectious disease in the United States?
- In 1900, what were the top three causes of death? In 1997, what were the top three causes of death?

- What major setbacks occurred in the 20th century, indicating the unpredictability of infectious disease and the need for continued surveillance and control measures?
- What are some advantages to the technology related to infectious disease that was developed in the 20th century?
- What changes in the 20th century actually lead to greater issues in disease transmission?

## Explanation:

Question 1: The improvement in disease control during the 20th century resulted from better sanitation and hygiene practices, the widespread implementation of childhood vaccination programs against many deadly diseases, and the development of many types of antimicrobial drugs.

Question 2: According to figure 2, the top three in 1900 were pneumonia, TB, and diarrheal diseases. These are all infectious. In 1997, the top three were heart disease, cancer, and stroke, all noncommunicable diseases.

Question 3: Even with the great advances of the 1900—1999 time period, there was still the deadly influenza pandemic of 1918, killing over 20 million people in less than one year. Also, HIV appeared on the scene, resulting in about 14 million deaths. This pandemic is still not fully under control. Finally, drug resistant strains of TB emerged and continue to be a major health issue today.

Question 4: Serological testing, viral growth in tissue cultures, viral visualization, and many different molecular techniques led to some major advances in the detection and monitoring of infectious disease. The article explains several examples of how each advancement improved the control of infectious disease in the 20th century.

Question 5: Box 3 in the article specifies some examples of increased disease transmission due to technological advancements of the 20th century.

### Reading Assignments Week 1 Day 1

CH1: Introduction to Microbes and Their Building Blocks

CH2: Tools of the Laboratory: Methods for the Culturing and Microscopic Analysis of Microorganisms

### Reading Assignments Week 1 Day 2

CH2: Tools of the Laboratory: Methods for the Culturing and Microscopic Analysis of Microorganisms.

CH3: Bacteria and Archaea.

### Homework Week 1 Day 2

CH1: Homework 5 points.

Ch2: Homework 5 points.

## Week 2: Eukaryotic Cells, Viral Structure and Multiplication, and Microbial Nutrition and Growth

### Discussion 2

## Discussion 2: Using the Five I's with Strep Throat Infections

*Read this case file and complete the activities that follow.*

As an LPN working on a medical floor, I read the order for my patient that the physician had just written: "Obtain throat culture for C&S." I knew that this meant the physician wanted a throat swab collected for culture and sensitivity testing. Culturing refers to identification of the bacteria causing the patient's symptoms, while sensitivity will determine what antibiotic the bacteria identified will be sensitive to—in other words, which antibiotic has the ability to kill the bacteria.

I gathered the necessary items, including the appropriate culture materials—in this case, a sterile swab that comes with a container filled with a transport medium that will keep the bacteria alive until they are processed in the lab. I entered the patient's room, introduced myself, and informed the patient what I was going to do. I asked the patient not to close her mouth when the specimen was being taken, so as not to contaminate the specimen. I washed my hands, donned gloves, and

asked Mrs. S. to open her mouth. I noted that her throat was very red and there was pus visible on her tonsils. I introduced the swab into her throat and gently swabbed the areas where pus was visible. I removed the swab and placed it into the provided container filled with transport medium, ensuring the lid was secure. I thanked Mrs. S., labeled the swab with her name and identification information, and carried the swab to the lab. I then removed my gloves and washed my hands.

In the lab, the laboratory technician received the patient's throat culture and logged it in. Being careful not to contaminate the specimen, the lab tech inoculated a blood agar plate using the swab supplied by the nurse. The blood agar plate was covered and stored at 35°C to 37°C for 48 hours.

After 24 hours, the lab tech observed that the majority of colonies were surrounded by clear zones in which there was no red pigment, indicating that hemolysis had occurred. Based on this characteristic appearance, the lab tech identified a group A hemolytic streptococcus as being the cause of the patient's symptoms.

The lab tech then re-streaked a different agar plate, containing small discs of different antibiotics, to determine which antibiotic would be effective in treating the organism identified. Penicillin was identified as being the antibiotic most effective for treating the patient's strep throat. After a 10-day course of penicillin, the patient was fully recovered.

## Research and Review

Locate this article in a library collection or through a database: *Martin JM et al. 2002. Erythromycin-resistant group A streptococci in schoolchildren in Pittsburgh. N Engl J Med 346: 1200-1206.* Read the article thoroughly and then answer the questions that follow here linking the case file, the chapter content, and this case report.

- Discuss the common antibiotics used for the treatment of group A streptococcal infections in 2001, as pointed out in the background of the article.
- Beginning in January of 2001, what phenomenon did physicians identify in group A streptococcus isolates from the throats of children?
- Which type of agar was used to culture the throat swab specimens? Based upon the information you've learned, why was this type of medium used to identify group A streptococcus isolates?
- Based upon your knowledge of the 5 I's of microbiology, which type(s) of tests were used in this study to identify the group A streptococci in the specimens collected? How were the other four I's also used in this study? Give specific examples.
- The researchers hypothesized that if resistant strains of group A streptococci existed in schoolchildren, they probably are circulating in the general public as well. Describe how they tested this hypothesis and discuss the results of this experiment.
- Conduct additional research and discuss how group A streptococcal infections are treated today based upon the information learned from this research study in 2001 and recent studies.

### Homework Week 2 day 1

CH3: Assigned Questions.

### Reading Assignments Week 2 Day 1

CH4: Eukaryotic Cells and Microorganisms.

CH5: Viral Structure and Multiplication.

### Reading Assignments Week 2 Day 2

CH6: Microbial Nutrition and Growth.

### Homework Week 2 Day 2

CH4: Assigned Questions. (5 points).

CH5: Assigned Questions. (5 points).

### Exam 1 Week 2 Day 2

Exam 1 covers chapters 1-5.

## Week 3: Microbial Nutrition, Genetics and Engineering

### Discussion 3

# Discussion 3: Healthcare-Associated Pneumonia

Read the case file and complete the activities that follow.

As a respiratory tech on a surgical ward, I helped to care for Mark, a 65-year-old man who was admitted to the hospital for a relatively routine surgery: a total hip replacement. He was told before his surgery that he would need to stay in the hospital for only 4 to 5 days, at which time he would be discharged home to continue recuperating and begin outpatient physical therapy.

On day 4 of recovery, the night before he was to be discharged, Mark began to feel unwell. He developed chills and a fever and began to cough and feel very weak. A chest X-ray was performed and blood work was drawn. The chest X-ray revealed a consolidation in his left lower lobe, while his blood work revealed an elevated white blood cell count. Mark was told that he had developed pneumonia. He was started on an antibiotic intravenously, as well as oxygen and medications given via nebulizer, which aerosolized the medications so that they could be inhaled deeply into the lungs. I performed chest physiotherapy several times a day to help loosen secretions in Mark's lungs.

Mark felt well enough to go home after 4 days of IV antibiotic therapy. He was continued on oral antibiotics for the pneumonia he developed and found that he felt quite weak for several days after returning home. He eventually fully recovered from his surgery and the respiratory complication that followed.

Mark developed a postoperative infection while in the hospital. By definition, an infection acquired during a hospital stay is termed a healthcare-associated infection. The surgery that Mark underwent weakened his immune system, rendering him more susceptible to infection. He may have been exposed to the infection via contact with an infected visitor or health care worker. Aspiration of stomach contents into the lungs during prolonged prone states is also another common cause of healthcare-associated pneumonia. Fever, cough, and weakness were the symptoms that Mark experienced as a result of his infection. An increased white blood cell count (leukocytosis) and the findings on his X-ray were the signs that confirmed his diagnosis of pneumonia.

## Research and Review

Locate this article through an online search or a library database: *Scheithauer et al. 2013. Improving hand hygiene compliance in the emergency department: Getting to the point. BMC Infect Dis.13: 367. doi: 10.1186/1471-2334-13-367.* Read the article thoroughly and then answer the questions, linking the introductory case file, the textbook content, and this article.

- Define the term healthcare-associated infection, and provide examples of the most common types of these infections and their causative agents today.
- In your own words, describe the two goals of this research study.
- List the five indications for the use of hand hygiene (HH) according to WHO guidelines.
- Summarize the changes in % of compliance through the three phases of this study. What was the likely reason for the changes between phases?
- The fast pace of the emergency room setting increases the challenge of appropriate hand hygiene compliance. Based on this study, what can be done to increase compliance in the emergency department?
- Conduct additional research, and discuss what measures healthcare facilities have recently put into place to increase adherence to hand hygiene protocols and to overall reduce healthcare-associated infections.

### Reading Assignments Week 3 Day 1

CH6: Microbial Nutrition and Growth.

CH7: Microbial Metabolism.

### Reading Assignments Week 3 Day 2

CH8: Microbial Genetics and Genetic Engineering.

### Case Study 1 Week 3 Day 1

### Homework Week 3 Day 2

CH6: Assigned Questions. (10 points).

CH7: Assigned Questions. (10 points).

## Discussion 4

# Discussion 4: Vancomycin-Resistant Enterococci

Members of the *Enterococcus* genus have incredibly versatile metabolic abilities. This enables them to colonize the gastrointestinal tract of humans as well as most other animals. While most of the time these bacteria are commensals, several multidrug-resistant strains have emerged. One type, vancomycin-resistant enterococci (VRE), has become a public health threat as well as a concerning cause of healthcare-associated infections (HAIs).

Locate this article to learn about the threat of VRE and the suggestions for preventing HAIs caused by these and other antibiotic-resistant bacteria: *Weiner LM, Fridkin SK, Aponte-Torres Z, et al. Vital Signs: Preventing Antibiotic-Resistant Infections in Hospitals—United States, 2014. MMWR Morb Mortal Wkly Rep 2016;65:235–241. DOI: <http://dx.doi.org/10.15585/mmwr.mm6509e1>*

- Of the eighteen antibiotic-resistant bacteria identified as public health threats, how many cause healthcare-associated infections?
- Of the different facilities that reported HAI data, which type of facility had the highest rates of antibiotic-resistant HAIs?
- According to the 2014 data presented in this report, what was the general trend for HAI incidence?
- Across all settings, what percentage of enterococci isolates were vancomycin-resistant?
- What are the three common types of HAIs?
- What strategies for controlling the threat of antibiotic-resistant HAIs are presented in this report?

### Explanation:

Question 1: Six of these 18 bacteria are known to cause HAIs, with VRE being one of the six.

Question 2: Long-term acute care facilities had the highest rates, with one in four HAIs caused by one of the six antibiotic-resistant bacteria.

Question 3: The general trend was a reduction in incidence, although this is not true across all HAIs. Progress still needs to be made.

Question 4: Across all settings, 29.5% of enterococci isolates were vancomycin-resistant.

Question 5: Central-line associated bloodstream infections, catheter-associated UTIs, and surgical site infections are the three common types of HAIs.

Question 6: The article suggested following recommended practices and guidelines for the insertion of devices such as catheters and central lines. It also suggested the implementation of antibiotic stewardship programs to minimize the inappropriate use of these drugs. Preventing cross transmission is also important, and therefore hand washing practices, facility cleaning regimens, and the use of personal protection equipment must be improved. Finally, coordinated efforts have greater success rates than facilities working independently on this issue.

### Reading Assignment Week 4 Day 1

CH9: Physical and Chemical Control of Microbes.

CH10: Antimicrobial Treatment.

### Reading Assignment Week 4 Day 2

CH 11: Interactions Between Microbes and Humans.

### Homework Week 4 Day 1

CH8: Assigned Questions (10 points).

### Homework Week 4 Day 2

CH9: Assigned Questions. (10 points).

CH10: Assigned Questions. (10 points).

### Exam 2 Week 4 Day 2

Exam 2: Chapters 6-10.



Discussion 5

## Discussion 5: Norovirus

Read the case file below and complete the activities that follow.

I was an LPN working in a long-term care unit. My duties included supervising the certified nursing aides (CNAs), administering medications, changing dressings, and providing any other required treatments that fell within my scope of practice. One day, one of the CNAs reported that two of the residents were experiencing vomiting and diarrhea. I checked on them and determined that their symptoms had started suddenly, without warning. One of the residents had a low-grade fever, and both patients were weak and experiencing abdominal discomfort.

I reported their condition to my supervising nurse, who saw the patients herself. She was concerned that their symptoms could be contagious. We placed the affected patients on contact isolation, and the infection-control nurse was consulted. She recommended that we obtain stool samples for culture and maintain isolation precautions until the stool sample reports came back. We notified the physician that one of the patients was becoming dehydrated due to vomiting and diarrhea. The patient was started on intravenous fluids.

When I returned to work the next day, three more residents had fallen ill with the same symptoms. At that time, we closed the unit to visitors and unnecessary personnel, suspecting an infectious cause, and worried that more residents could become ill. By the next day, two staff members and other residents had also become ill. It seemed we had an epidemic on our hands! The unit remained closed for 2 weeks. In total, 11 residents and 4 staff members fell ill. We suspected a viral illness, based on how quickly symptoms had developed and spread. We were not surprised when it was determined that Norwalk virus was the culprit.

Norwalk virus (Norovirus, from the Caliciviridae family) is responsible for approximately 90% of nonbacterial epidemic gastroenteritis outbreaks worldwide. The virus is extremely contagious—only 20 virus particles are needed to cause illness (the infectious dose), which explains how the virus spreads so easily. The virus may be spread by direct contact or through ingestion of contaminated water or food (salads and shellfish are often implicated). The virus can also be aerosolized (i.e., when an individual in close proximity to an infected person who is vomiting breathes in virus particles). Symptoms include nausea, vomiting, abdominal pain or cramping, watery diarrhea, weakness, headache, muscle aches, and low-grade fever. Symptoms occur 24 to 48 hours after exposure to the virus and subside within 24 to 60 hours. The elderly, the very young, and individuals with weakened immune systems can quickly become very dehydrated. Although death is rare, Norwalk virus is responsible for approximately 300 deaths per year in the United States. Outbreaks occur in closed communities where people interact in close proximity, such as schools, long-term care facilities, camps, prisons, and cruise ships.

### Research and Review

Using an online search or database, locate the following article: *Repp, K. K., & Keene, W. E. (2012). A Point-Source Norovirus Outbreak Caused by Exposure to Fomites. The Journal of Infectious Diseases, 205(11), 1639–1641. <http://doi.org/10.1093/infdis/jis250>*. Read the article carefully and then answer the questions below.

- Describe what is meant by transmission through exposure to fomites. Why is this method of transmission a common route for noroviruses?
- What was the source of the outbreak for the nine soccer players? Describe how this source was contaminated with norovirus.
- Why was the Sunday lunch implicated as the most plausible time of exposure to the virus?
- Based on this brief report, what are some important considerations for preventing the spread of norovirus on cruise ships, in nursing homes, and other crowded settings?

#### Reading Assignments Week 5 Day 1

CH11: Interactions Between Microbes and Humans.

CH12: Host Defenses I: Overview and Nonspecific Defenses.

#### Reading Assignments Week 5 Day 2

CH13: Host Defenses II: Specific Immunity and Immunizations.

CH14: Disorders in Immunity.

#### Homework Week 5 Day 2

CH11: Assigned Questions. (10 points).

CH12: Assigned Questions. (10 points).

## Week 6: Diagnosis Infections: Infectious Diseases Affecting the Skin, Eyes and the Nervous System.

### Discussion 6

# Discussion 6: Diagnosis of Surgical Infections

*Read the case file, and conducting additional research as needed, complete the questions that follow to make connections between important concepts in microbiology.*

As a nurse in a hospital inpatient surgical unit, an important part of my role is to assess patients for any complications related to their procedure. Many of my patients have incisions from their surgery. Some have implanted equipment, drains, and intravenous (IV) lines. Others are predisposed to developing infection because of the injury that caused them to need surgery. Because of these risks, one of the most important things I look for in my patients is any sign of infection.

I was caring for a 24-year-old male after his orthopedic surgery. He had been involved in a car accident and had a complex fracture in his lower leg. The surgery team had repaired the injury in the operating room. The patient now had implanted rods and screws to stabilize the bones. He had a large incision from the procedure. Two days after his surgery, the patient developed a high fever. He was reporting increased pain in his leg. I called the provider and we discussed my concern that the patient may have an infection. Blood work was sent to the lab to look at the patient's complete blood count (CBC) with white blood cell differential, electrolyte panel, and a sample to be cultured for microorganism growth. I collected the blood culture in a sterile manner to ensure there was no contamination from the patient or environment that would alter the results.

While I waited for the lab results, I carefully assessed the patient for other signs of infection. His heart rate was high but his blood pressure was normal. The surgical incision appeared red and was warm to the touch. His leg was swollen. There was a small amount of green drainage from the surgical incision. The patient's white blood cell count was elevated and the differential white blood cell count indicated infection, so the physician ordered the start of IV antibiotics and, to take a closer look at the surgical site itself, an X-ray of the leg.

Identification of microorganisms in the laboratory can take several days to allow for culture growth. Patients with clinical signs of infection, such as fever, rapid heart rate, low blood pressure, high white blood cell count, or localized signs of infection (tenderness, redness, swelling, heat, purulent drainage) are often started on treatment to curb infection. Some antibiotics, referred to as broad-spectrum antibiotics, treat a wide variety of bacterial infections. Based on the suspected source of infection, antifungal or antiviral treatment may also be started. As more information emerges from the lab regarding the culture, the antibiotic treatment is modified to treat more specific types of microorganisms, and eventually, the exact organism may be identified from the culture.

The patient's fever did not initially improve with broad-spectrum antibiotics. The X-ray of the patient's leg revealed an abscess, or pocket of pus. The patient returned to the operating room to have the surgical site washed out. A sample of fluid from the abscess was collected and sent to the lab for culture. In just a few hours, the wound culture had already been identified as gram-positive bacteria. The provider changed the antibiotic prescription to one known to specifically treat gram-positive organisms. After 3 days, the laboratory confirmed that there were no bacteria seen in the patient's blood culture. The specimen in the abscess fluid was identified as *Staphylococcus epidermidis*. Through further testing, the lab was able to recommend the antibiotics that would best treat the organism. The source of infection had been recognized and effective treatment initiated.

- List the signs and symptoms found in this patient two days after orthopedic surgery. Describe the underlying basis for each of these (in other words, what is going on in the body to cause these to occur).
- How would the RN minimize the chance of contamination while collecting the patient sample for a blood culture?
- What would you expect to see in the blood cultures if no current infection was present? Alternatively, what would expect to see if a blood infection was present?
- Why does culturing in the clinical lab often take several days?
- Explain why broad-spectrum antibiotics were used in the initial treatment of this patient when clinical signs of infections were detected.
- Describe the steps that were used to determine that the patient's wound culture contained gram-positive bacteria,

including observations that one would expect to see in this situation.

- Describe *Staphylococcus epidermidis*, the specimen located in the wound culture. Compare and contrast this organism with another important member of the same genus, *S. aureus*.
- Summarize examples of where the Five I's were used for diagnosis in this case patient.

### Reading Assignment Week 6 Day 2

CH16: Infectious Diseases Affecting the Skin and Eyes.

CH17: Infectious Diseases Affecting the Nervous System.

### Reading Assignments Week 6 Day 1

CH15: Diagnosing Infections.

### Homework Week 6 Day 1

CH13: Assigned Questions.

CH14: Assigned Questions.

### Homework Week 6 Day 2

CH15: Assigned Questions. (10 points).

### Exam 3 Week 6 Day 1

Exam 3: Chapters 11-15.

## Week 7: Diseases of the Cardiovascular System, Lymphatic System, Respiratory System, Genitourinary System, and Gastrointestinal System.

### Discussion 7

# Discussion 7: Coccidioidomycosis

Read this case file and complete the activities that follow.

Working as a newly graduated radiology technologist in a rural hospital in California, I encountered a case that would prove to be a challenge for everyone involved. The patient was a male migrant farm worker in his mid-30s who presented to the ER with common flu-like symptoms: fever, chills, weakness, cough, muscular aches and pains, and headache. He also had a painful red rash on his lower legs.

It was summertime, so influenza was unlikely. The emergency room physician believed that the patient likely had pneumonia, but she found the rash puzzling. She asked me to obtain a chest X ray. I performed anterior, posterior, and lateral views of the chest, which revealed two nodules approximately 2 cm in size in the patient's left upper lobe. The physician stated that the nodules were consistent with pneumonia, but the possibility of cancer could not be ruled out. The patient's age and the fact that he was a nonsmoker, however, made a diagnosis of lung cancer much less likely than pneumonia.

The patient was admitted to the hospital for IV antibiotic treatment. Before the antibiotic therapy was started, a sputum sample was collected and sent to a larger center for culture and sensitivity (C&S) testing. Despite IV fluids, rest, and broad-spectrum antibiotics targeting both gram-positive and gram-negative bacteria, the patient showed no improvement. After receiving the C&S report, I understood why the intravenous antibiotics were not working: The patient had a fungal infection, not a bacterial infection as first suspected. I notified the physician, who immediately started the patient on amphotericin B, a potent antifungal medication that would properly treat the patient's case of coccidioidomycosis.

Coccidioidomycosis develops when an individual inhales spores produced by the fungus *Coccidioides immitis*. This disease, which is often called Valley fever, is endemic to the desert regions of the southwestern United States, and cases are commonly seen in both South and Central America. Most people who become exposed to the fungus never exhibit any signs or symptoms of illness. Others develop flu-like symptoms or pneumonia that may persist for months. Individuals with weakened immune systems tend to experience the most severe forms of Valley fever, and in some cases the disease is fatal.

As a farm worker, this patient likely inhaled spores while working outdoors, because California is one of the states where *Coccidioides immitis* can be found. His chest X ray revealed the lung nodules typical of this disease (which may be mistaken for cancer), and the patient's blood tested positive for the fungus. Microscopic evidence of the fungus was identified in his sputum sample. Once the patient was started on an antifungal medication, he began to gradually improve

and fully recovered from the disease.

## Research and Review

Locate this article through an online search or through a database collection: *Wilken, J.A. et al. 2014. Coccidioidomycosis among cast and crew members at an outdoor television filming event—California, 2012. MMWR, 63(15): 321—324.* Read the article thoroughly and then answer the questions that follow.

- Infection with *Coccidioides immitis* is usually associated with what types of activities? Explain the possible source of exposure in the cases discussed in this article.
- How did the California Department of Public Health first recognize a potential outbreak, and how did they track other possible cases of coccidioidomycosis related to the same source?
- List the typical occupations at highest risk for contracting coccidioidomycosis. Because this particular outbreak did not involve one of those occupations, what should clinicians learn from this case report?
- Conducting additional research if needed, summarize the signs/symptoms of coccidioidomycosis.

### Reading Assignments Week 7 Day 2

CH20: Infectious Diseases Affecting the Gastrointestinal Tract.

CH21: Infectious Diseases Affecting the genitourinary System.

### Reading Assignments Week 7 Day 1

CH18: Infectious Diseases Affecting the Cardiovascular System and Lymphatic System.

CH19: Infectious Diseases Affecting the Respiratory System.

### Homework Week 7 Day 1

CH16: Infectious Diseases Affecting the Skin and Eyes.

CH17: Infectious Diseases Affecting the Nervous System.

### Homework Week 7 Day 2

CH18: Infectious Diseases Affecting the Cardiovascular System and Lymphatic System. (10 points).

CH19: Infectious Diseases Affecting the Respiratory System. (10 points).

## Week 8: One Health: The Interconnected Health and Environment, Humans and Other Animals/

### Discussion 8

## Discussion 8: Urinary Tract Infections

*Read this case file and complete the activities that follow.*

As a nurse working in a busy obstetrics and gynecology practice, my job often included instructing pregnant women in collecting urine samples. Every expectant mother who attended the clinic provided a urine sample at every visit. A pregnant woman is at higher risk of developing urinary tract infections (UTIs) due to the increasing weight of her growing uterus, which compresses the bladder and prevents the bladder from draining completely. Urine left behind in the bladder becomes the perfect medium for bacterial growth. I instructed a young mother how to properly collect a midstream urine sample. I told the patient to first wash her hands. I emphasized that she should ensure that her hands did not come in contact with the rim of the collection container. I further instructed her on how to cleanse the external genitalia with a disposable wipe saturated with povidone-iodine, a potent antimicrobial solution.

I reminded her to wipe from front to back to prevent fecal contamination. I told her she was to void a small amount of urine into the toilet, then introduce the collection container into the urine stream, collecting the midstream portion of the urine. She was instructed to put the lid on the collection container, being careful not to touch the rim or the inside of the lid, and then wash her hands. I then donned gloves, wiped the outside of the container and delivered the specimen to the lab, after labeling it with the patient's name, the date and time of collection, and additional identification information.

The laboratory staff examined a small amount of urine under the microscope for the presence of bacteria, red blood cells, white blood cells, and other abnormalities. The lab staff identified the presence of bacteria, and the urine was cultured to

identify the microorganism and to test its antibiotic sensitivity. After 48 hours, the culture result came back stating that the sample was contaminated. I informed the patient's physician, who asked that the patient return to provide another urine sample.

Urine specimens are one of the few specimens collected by patients themselves and may become contaminated easily due to poor collection technique. Failure to wash hands, accidentally touching the rim or lid of the collection container, and failure to properly cleanse the external genitalia (in female patients) prior to specimen collection are some of the ways in which specimens may become contaminated. In this case, the patient returned to provide another sample. Instructions were provided again, and the patient was asked whether she understood what was required of her. This time the sample yielded only one species, *Escherichia coli*, a bacterium that is a common causative agent of urinary tract infections. The patient was treated with antibiotics for 10 days, and a repeat culture was negative for any microorganisms.

## Research and Review

Locate this article in a database collection or through an online search: Shrestha, R. et al. *Effect of urogenital cleaning with paper soap on bacterial contamination rate while collecting midstream urine specimens*. J Lab Physicians. 2013 Jan-Jun; 5(1): 17–20. doi: 10.4103/0974-2727.115910. Read the article thoroughly and then answer the questions that follow here linking the case file, the textbook content, and this research article.

- The introduction of this article discusses the current acceptable standard for urine sampling, but it also mentions the disadvantages of this method. Summarize this information, including the purpose of their study.
- What typically causes contamination in urine samples?
- Describe the three different testing groups in this study. How many people were part of each group?
- What was variable between the three groups, and what was the same across the three groups? Which group represented the control group?
- Summarize the results of the study. Based on these results, would you recommend changes in urine collection protocols? Defend your answer.

### Reading Assignments: Week 8 Day 1

CH22: One Health: The Interconnected Health of the Environment, Humans and Other Animals.

### Homework Week 8 Day 1

CH20: Infectious Diseases Affecting the Gastrointestinal System.

CH21: Infectious Diseases Affecting the Genitourinary Tract.

### Homework Week 8 Day 2

CH22: One Health: The Interconnected Health of the Environment, Humans and Other Animals. (10 points).

### Exam 4

Exam 4: Chapters 16-22.

## + Additional Resources

Online databases are available at [library.ccis.edu](http://library.ccis.edu). You may access them using your CougarTrack login and password when prompted.

### Technical Support

If you have problems accessing the course or posting your assignments, contact your instructor, the Columbia College Technology Solutions Center, or the D2L Helpdesk for assistance. If you have technical problems with the VitalSource eText reader, please contact VitalSource. Contact information is also available within the online course environment.

- Columbia College Technology Solutions Center: [CCHelpDesk@ccis.edu](mailto:CCHelpDesk@ccis.edu), 800-231-2391 ex. 4357
- D2L Helpdesk: [helpdesk@d2l.com](mailto:helpdesk@d2l.com), 877-325-7778
- VitalSource: [support@vitalsource.com](mailto:support@vitalsource.com), 1-855-200-4146

### Online Tutoring

SmarterThinking is a free online tutoring service available to all Columbia College students. SmarterThinking provides real-time online tutoring and homework help for Math, English, and Writing. SmarterThinking also provides access to live tutorials in writing and math,

as well as a full range of study resources, including writing manuals, sample problems, and study skills manuals. You can access the service from wherever you have a connection to the Internet. I encourage you to take advantage of this free service provided by the college.

Access Smarthinking through CougarTrack at [Students -> Academics -> Resources](#).

## Columbia College Policies and Procedures

The policies set forth in the [Policy Library](#) are the current official versions of College policies and supersede and replace any other existing or conflicting policies covering the same subject matter. For more information on policies applicable to students, see [Student Policies](#). For more information on policies applicable to the entire Columbia College community, see [College-Wide Policies](#).

Students are expected to read and abide by the College policies. Policies of particular interest to students include, but not limited to the following:

- Graduate Grading Policy
- Undergraduate Grading Policy
- Registration Policy and Procedures
- Withdrawal Policy
- Alcohol and Other Drugs Policy
- Family Educational Rights and Privacy Act (FERPA)

### Additional Policies:

#### Academic Integrity and Plagiarism

Academic integrity is a cumulative process that begins with the first college learning opportunity. Students are responsible for knowing and abiding by the [Academic Integrity Policy and Procedures](#) and may not use ignorance of either as an excuse for academic misconduct. Additionally, all required papers may be submitted for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers may be included in the Turnitin.com reference database for the purpose of detecting plagiarism. This service is subject to the Terms and Conditions of Use posted on the Turnitin.com site.

#### Disability Resources

If you have a disability that requires an accommodation, please speak with the instructor and consult the [Student Accessibility Resources](#) office. Student Accessibility Resources staff will determine appropriate accommodations and will work with your instructor to make sure these are available to you. To find additional information, see our [ADA and Section 504 Policy for Students](#).

#### Notice of Non-Discrimination and Equal Opportunity:

The College has a process through which students, faculty, staff and community members who have experienced or witnessed incidents of discrimination, harassment, or retaliation on the basis of protected status, can report their experiences to a College official. For more information, see our [Non-Discrimination and Equal Opportunity Policy and Complaint Resolution Procedure](#).

#### Title IX and Sexual Misconduct

The College is committed to addressing the issues of discrimination, harassment and sexual misconduct in the educational and workplace landscape and will continue to modify policies, procedures and prevention efforts as needed. For more information, see the College's [Title IX and Sexual Misconduct Policy](#).

### Course Policies and Procedures:

#### Attendance Policy

Columbia College students are expected to attend all classes and laboratory periods for which they are enrolled.

For classes with an online component, attendance for a week includes submitting any assigned online activity. Assigned activities are scheduled prior to the course commencing. Assigned activity due dates are subject to change based on actual course progression and will be adjusted as necessary. Attendance for the week is based upon the date work is submitted. A class week is defined as the period of time between Monday and Sunday (except for week 8, when the work and the course will end at 11:59 PM Central Time on Saturday.) The course and system deadlines are based on the Central Time Zone.

Students are directly responsible to instructors for class attendance and work missed during an absence for any cause. If absences jeopardize progress in a course, the College reserves the right to drop or withdraw students from classes. For additional information, see the Administrative Withdrawal for Non-Attendance heading in the [Withdrawal Policy](#).

#### CougarMail

All students are provided a CougarMail account when they enroll in classes at Columbia College. You are responsible for monitoring email from that account for important messages from the College and from your instructor.

Students should use email for private messages to the instructor and other students. The class discussions are for public messages so the class members can each see what others have to say about any given topic and respond.

### Late Assignment Policy

All classes rely on participation and a commitment to your instructor and your classmates to regularly engage in the reading, discussion and writing assignments. You must keep up with the schedule of reading and writing to successfully complete the class.

No late assignments will be accepted without the prior approval of the instructor.

Acceptance of a late assignment is at the discretion of the instructor.

Make-up examinations may be authorized for students who miss regularly-scheduled examinations due to circumstances beyond their control. Make-up examinations must be administered as soon as possible after the regularly scheduled examination period and must be administered in a controlled environment.

### Student Conduct

All Columbia College students, whether enrolled in a land-based or online course, are responsible for behaving in a manner consistent with Columbia College's **Student Conduct Code** and **Acceptable Computing Use Policy**. Students violating these policies or any other College policy will be referred to the office of Student Affairs and/or the office of Academic Affairs for possible disciplinary action. The Student Code of Conduct, the **Student Behavioral Misconduct Policy and Procedures**, and the Acceptable Computing Use Policy can be found in the Policy Library at [ccis.edu/policies](http://ccis.edu/policies). The adjunct faculty member maintains the right to manage a positive learning environment all students must adhere to the conventions of online etiquette when enrolled in a course with an online component.