Course

Medical Microbiology

Unit VII

Laboratory Investigations and Identification of Causative Agents

Essential

Question How do you identify an unknown organism

TEKS

1A,B 2A,B,C,D,E,F,G 3D 4F

Prior Student Learning

This should be used as a culmination lesson in the Medical Microbiology course.

Estimated time

П.

2-5 hours

The ability to identify unknown organisms is an integral part of working in a medical laboratory.

Objectives

Rationale

Upon completion of this lesson, the student will be able to:

- Apply knowledge to investigate an unknown organism
- Identify an unknown organism

Engage

Discuss the following case study:

Susie Q., a 39-year old woman with a history of kidney infections, visited the OP clinic because she had malaise for the last few weeks. Her other complaints were a bloated feeling and a decrease in urination. The clinic PA noticed abdominal swelling.

Key Points

Teacher note: Explain to the students that they will be given an unknown organism to identify. Include the unknown organism within a case study presentation. The students will use notes and knowledge gained throughout the course to identify the unknown organism and write their case study presentation. If time permits, students may then present their findings to the class as a medical grand rounds presentation.

I. Case study sample one:

The patient is a 25 year old male with chief complaints of abdominal cramps, vomiting, diarrhea and loss of appetite for two days. The patient admits to eating two hamburgers and potato salad at a family reunion picnic one day prior to the start of his symptoms. On examination, the physician found the patient to be febrile and appearing dehydrated. The stool sample specimen tested negative for ova and parasites.

Case study sample two:

The patient is a 75 year old non-smoking female presenting with a productive cough and thick sputum for one week duration. The patient has a history of no previous respiratory illnesses. On examination, the physician found the patient to be febrile and appear weak. The sputum specimen appears bloody.

Activity

- I. Identify the unknown specimen bacteria
- II. Prepare a written Case Study Presentation

Assessment

Case Study Presentation Rubric

Materials

Case Study Presentation Rubric

Accommodations for Learning Differences

For reinforcement, the student will review materials and repeat the identification of the unknown.

For enrichment, the student will present the findings to the class using medical grand rounds.

National and State Education Standards National Healthcare Foundation Standards

HLC01.01 Academic Foundations #1: Health Science 1: Introduction to Health Science Academic Courses: Health Care workers will know the academic subject matter required for proficiency within their area. They will use this knowledge as needed in their role.

TEKS

130.207(c)(1)(A) Demonstrate safe practices during laboratory and field investigations

130.207(c)(1)(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.

130.207(c)(2)(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;

130.207(c)(2)(B) know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;

130.207(c)(2)(C) know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;

130.207(c)(2)(D) distinguish between scientific hypotheses and scientific theories;

130.207(c)(2)(E) Plan and implement descriptive, comparative and

experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology.

130.207(c)(2)(F) Collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, various prepared slides, stereoscopes, metric rulers, electric balances, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or

samples of biological specimens or structures;

130.207(c)(2)(G) analyze, evaluate, make inferences, and predict trends from data;

130.207(c)(3)(D) evaluate the impact of scientific research on society and the environment; and

130.207(c)(4)(F) discuss the results of laboratory procedures that are used to identify microorganisms.

Texas College and Career Readiness Standards

English Language Arts

II. B. Understand new vocabulary and concepts and use them accurately in Reading, writing and speaking.

Science

1.E.1. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

1.E.2. Use essential vocabulary of the discipline being studied.

3.A.1. Use correct applications of writing practices in scientific communication.

Cross-Disciplinary Standards

I. Key Cognitive Skills: C. Problem Solving 1. Analyze a situation to identify a problem to be solved 3. Collect evidence and data systematically and directly relate to solving a problem E. Work habits 1. Work independently 2. Work collaboratively

Case Study Presentation

Each student will present a case study as approved by their instructor. The presentation must include a poster board, multimedia presentation, or a handout of the presentation. A ten minute oral presentation will be given to the class. The presentations are due _____.

A standard rubric will be used to assess the material and the communication skills employed during the presentation (see case study presentation rubric).

An outline of the presentation will be provided to the instructor that includes the following:

- Name of Case Study (be creative!)
- Student Name
- Course rubric and name
- Case study scenario -- once you have chosen a disease or condition (i.e. RA, CRP), create a case study scenario giving the patient's background, history, physical, and condition
- Abnormal test results -- what were the results of the CBC, Chemistry tests, UA/BF, Coagulation, and Microbiology?
- What additional testing was required to determine the patient diagnosis?
- List the additional tests and the results for the case study patient
- Based on the patient history and laboratory results what is the probable diagnosis?
- Provide a brief description of the disease or condition; include the clinical symptoms and progression of the disease; what is the prognosis?
- Is the disease state potentially infectious? Will the disease affect certain age groups? Can the disease be prevented?
- Resources -- each student must have three resources listed in APA format

Case Study Presentation Rubric

Outline		70%	Points
Identification	Name of case study	2 points	
	Student name		
Casa study accordin	Course name	20 pointo	
Case sludy scenario	Detailed Information about the	20 points	
	current condition		
Results	Provide abnormal results with	15 points	
	reference ranges		
	List additional tests and the		
	results		
Probable diagnosis	Diagnosis based on history and	5 points	
Discoso or condition	lab results of the patient	15 pointo	
description	disease or condition Include	15 points	
description	the clinical symptoms and		
	progression of the disease.		
	Prognosis?		
	Is the disease potentially		
	infectious? Can it be		
	prevented?	0	
References	Inree-APA format	8 points	
Grammar/Spelling			
Oral Presentation	Chudent holds the attention of	30%	
Delivery	Student holds the attention of	TO points	
	with volume and inflection		
Content/Organization	Student uses visual aids to	20 points	
	enhance presentation		
	demonstrating clear		
	organization of the material		
Enthusiasm/Student	Student demonstrates	10 points	
awareness	enthusiasm for subject matter		
	during presentation		
	Student increases the		
	classmates regarding the		
	subject matter		
Total			

Comments:

Case Study Sample		
Name of Case Study	"I can't go!"	
Student Name		
Course Name		
Scenario	Susie Q., a 39-year old woman with a history of kidney infections, visited the OP clinic because she had malaise for the last few weeks. Her other complaints were a bloated feeling and a decrease in urination. The clinic PA noticed abdominal swelling	
Abnormal test results	The abnormal urinalysis results were as	
Abilonnal lest results	follows:	
	 Cloudy/frothy Protein – 3+ 0-1 renal tubular epithelial/LPF 0 to 1 granular casts/LPF 0-1 waxy casts/LPF Occasional oval fat bodies 	
Additional testing and results	Cholesterol –increased	
	Triglycerides-increased	
	Total protein-decreased	
	Albumin-decreased	
	BUN and creatining slightly increased	
	24-nour creatinine clearance-slightly	
	decleased	
Probable diagnosis	Nephrotic syndrome	
What is nephritic syndrome?	The glomerular basement membrane in the renal nephron is damaged. The damage allows an increase in the permeability of the glomerulus. Damage can be due to antigen-antibody complexes in the basement membrane (Graves, 2002).	
	A patient will have a foamy appearance of the urine, low urine protein, low blood protein levels (total protein and albumin), increased cholesterol levels, increased triglycerides levels, and swelling.	
	The patient will have swelling in the face, arms, legs, and in the belly area. The patient will have a poor appetite, but will gain weight due to water retention from	

	decreased urine output.
	Nephrotic syndrome is not a disease but a condition. The condition is based on a combination of signs and symptoms of the patient.
	The outcome of depends on the patient and the progression of the disease. The patient may choose a low-salt, low-protein diet, vitamin D supplements, and take statins to decrease the high cholesterol. The patient can also be prescribed angiotensin-converting enzyme inhibitors to decrease the blood pressure. Decreasing the blood pressure will decrease the kidney damage. Corticosteroids may also be given to suppress the immune system.
Infectious/prevention	Nephrotic syndrome is not contagious. Treating conditions, such as high blood pressure, high cholesterol, immune system
References	problems, may prevent the syndrome.

Graves, L. (2002). *Case studies in clinical laboratory science*. Upper Saddle River: Pearson Education, Inc.