Activity 5.1.5: Bacterial Identification

Introduction

The identification of a bacterial species is based on many factors, including cell and colony morphology, chemical composition of cell walls, biochemical activities, and nutritional requirements. You have now streaked a bacterial culture onto an agar plate in order to isolate individual colonies, which can be used in identification tests. You then grossly examined the bacterial colonies. In the last activity, you began your preliminary identification by comparing the basic morphology of the bacterial cells and completing a Gram stain reaction. The final step in determining the bacterial species plaguing Anna is to perform biochemical tests.

Biochemical tests are the most definitive way to identify bacterial species. They determine what growth media the bacteria will grow on and identify the end products of their metabolic processes, such as the wastes they excrete. Many tests often need to be performed in order to positively identify a bacterium. In the last activity, you identified that Anna's bacterial sample is a Gram negative rod-shaped bacteria. In this activity you will analyze the results of various biochemical tests in order to identify the unknown bacterial species infecting Anna Garcia.

Equipment

- Laboratory journal
- PBS Course File
- Activity 5.1.5 Student Resource Sheet
- Activity 5.1.5 Gram Negative Bacterial Identification Flowcharts Resource Sheet
- Activity 5.1.1 Medical History Resource Sheet
- Career journal
- PLTW Biomedical Science Documentation Protocol

Procedure

1. Obtain and read an Activity 5.1.5 Student Resource Sheet to familiarize yourself with the different biochemical tests performed on Anna's sample.
2. Obtain an Activity 5.1.5 Gram Negative Bacterial Identification Flowcharts Resource Sheet. Use the flowcharts and biochemical test results documented in the data table below to determine the bacterial species infecting Anna Garcia.

Biochemical Tests Performed on Anna's Sample	
Type of test performed:	**Result:**
Ornithine Decarboxylase Test	Positive
Citrate Test	Positive
VP test	Positive

Oxidase Test	Negative
Lysine Decarboxylase Test	Positive
H_2S Test	Negative
Pigmentation	Red
Glucose Fermentation Test	Positive
Lactose Fermentation	Negative
Indole Test	Negative
Urease Test	Negative
Nitrate Reduction	Positive
Arabinose Test	Negative
Motility Test	Positive
Gelatin Hydrolysis	Positive
Catalase Test	Positive

3. Refer to the Activity 5.1.1 Medical History Resource Sheet.
4. Write that various biochemical tests were performed under the *Tests* section of your Medical History document. Fill in the results you determined for Anna's sample under the *Results* section.
5. Complete the *Diagnosis* section on the Activity 5.1.1 Medical History Resource Sheet.
6. Brainstorm any new ideas of possible causes of death and include this information as you update your classroom evidence board.
7. Follow the Career Journal Guidelines and complete an entry in your Career Journal for the following two careers.
    - Microbiologist
    - Medical Laboratory Technician
8. Follow the PLTW Biomedical Science Documentation Protocol to correctly document or cite the sources of information you used.
9. Answer the Conclusion questions.

Conclusion

1. Why was it necessary to complete the Gram stain in order to determine the bacterial species infecting Anna?

2. How do biochemical tests help identify an unknown bacterial species?

3. Given what you know about genetics and molecular biology, describe another way you might be able to identify specific bacteria.

4. In what ways might Anna's infection have played into her untimely death?

5. Describe the role a microbiologist and a medical laboratory technician would play in solving this case of the unknown bacteria.