Identification of Pathogenic Bacteria-Case Studies

Student Handout

Materials

24 well culture plates containing Test Substrates Test Solution

Protocol

Add 5 drops of "Test Solution" to each well in the test rows for Cases A, B, C and D. A positive result is if the solution turns blue-green. Record your findings. Using the charts provided for identifying gram-positive and gram-negative bacteria, determine the bacteria causing the symptoms noted in each case study.



Gram-Positive Bacteria

Organism	Gram Stain	Cellular Morphology	Capsule	Motility	Hemolytic Activity	Catalase Activity	Coagulase Activity	PYR Activity	Hippuricase Activity
Clostridium tetani	Positive	Bacilli-rods	Positive	Positive	Positive	Negative	Negative	Negative	Negative
Staphylococcus aureus	Positive	Cocci- clusters	Positive	Negative	Positive	Positive	Positive	Negative	Negative
Staphylococcus epidermidis	Positive	Cocci- clusters	Positive	Negative	Negative	Positive	Negative	Negative	Negative
Streptococcus agalactiae	Positive	Cocci-chains	Positive	Negative	Positive	Negative	Negative	Negative	Positive
Streptococcus pneumoniae	Positive	Diplococci	Positive	Negative	Positive	Negative	Negative	Negative	Negative
Streptococcus pyogenes		Cocci-chains	Negative	Negative	Positive	Negative	Negative	Positive	Negative

Gram-Negative Bacteria

Organism	Gram Stain	Cellular Morphology	Capsule	Motility	H2S Production	Urea Production	Lactose Metabolism	Lysine Metabolism
Escherichia coli	Negative	Bacilli-rods	Negative	Positive	Negative	Negative	Positive	Positive
Shigella sonnei	Negative	Bacilli-rods	Negative	Negative	Negative	Negative	Negative	Negative
Salmonella enteritidis	Negative	Bacilli-rods	Negative	Positive	Positive	Negative	Negative	Positive
Salmonella typhi	Negative	Bacilli-rods	Positive	Positive	Positive	Negative	Negative	Positive
Yersinia enterocolitica	Negative	Bacilli-rods	Negative	Positive	Negative	Positive	Negative	Negative
Yersinia pseudotubercul osis	Negative	Bacilli-rods	Negative	Positive	Negative	Positive	Negative	Negative

Case A

A 54 year old woman presents with sudden onset of chills, cough, fever, and severe chest pain. She is feverish and coughing up sputum. Wheezing sounds are heard in her lungs.

Preliminary Lab Results:

Gram positive diplococci Capsule positive Hemolytic activity positive Motility negative

					Test 1	Test 2	Test 3	Test 4
Gram Stain	Cellular Morphology	Capsule	Motility	Hemolytic Activity	Catalase Activity	Coagulase Activity	PYR Activity	Hippuricase Activity

Identification:

Case B

An 8 year old girl comes into the doctor office for a skin infection on her face. Areas of skin can be easily removed and she has a small boil in her nose.

Preliminary Lab Results:

Gram positive cocci-clusters Capsule positive Hemolytic activity positive Motility negative

					Test 1	Test 2	Test 3	Test 4
Gram Stain	Cellular Morphology	Capsule	Motility	Hemolytic Activity	Catalase Activity	Coagulase Activity	PYR Activity	Hippuricase Activity

Identification:

Case C

A 40 year old flight attendant comes into the hospital with complaints of bloody diarrhea, abdominal pain, fatigue and fever. The gastrointestinal symptoms had appeared quickly. Physical examination revealed a skin rash.

Preliminary Lab Results:

Gram negative bacilli-rods Capsule negative Motility positive

				Test 1	Test 2	Test 3	Test 4
Gram Stain	Cellular Morphology	Capsule	Motility	H ₂ S Production	Urea Production	Lactose Metabolism	Lysine Metabolism

Identification:

Case D

A group of fraternity brothers show up at the student health clinic with complaints of abdominal cramping and diarrhea. There is no history of recent travel. A few days ago, the fraternity hosted a picnic with one of the sororities on campus. The main dish was barbecue chicken.

Preliminary Lab Results:

Gram negative bacilli-rods Capsule negative Motility positive

				Test 1	Test 2	Test 3	Test 4
Gram Stain	Cellular Morphology	Capsule	Motility	H ₂ S Production	Urea Production	Lactose Metabolism	Lysine Metabolism

Identification:

Simulation of Transmission

Student Handout

Purpose

Working as a team of BRASS scientists, we will use our epidemiological skills to trace a disease back to "Patient Zero".

Materials

15 mL blue capped Stock Tube containing the Stock Solution15 mL orange capped "Working Tube", empty5 mL "Reagent Tube", 2 per studentDisposable plastic transfer pipets, 3 per studentTest tube racks

Methods

Write down the number of your unknown solution (Blue cap). I have TUBE #_____.

Take the BLUE capped tube containing the **Stock Solution** and transfer 5 ml into the empty orange capped tube using the graduations marked on the tube. Return the BLUE capped tube to your test tube rack for later testing. The orange capped tube is now your **Working Solution**. Handle the solutions carefully. Remember, you may be handling an infected sample!

Spreading the disease

Each person can **transmit (donor) or receive (recipient)** the "disease". You will have a chance to interact with a **total of four people**. You should try to donate twice and receive twice. To transmit, transfer **1 ml** of your **Working Solution** into another person's Working Solution tube, trying not to touch their liquid. Mix the solutions after each interaction by shaking gently. **Write down the name of the person with whom you interacted on the table and put a check mark next to the appropriate statement. It is very important that you keep an accurate record of your interactions.** We will do one round of interactions at a time. Leave your desk and interact with one person. Return to your desk and record the interaction on the table.



When everyone has recorded the data on their table, the instructors will then allow you to start the subsequent rounds of interactions.

Leave your desk and interact with one person. Return to your desk and record the interaction in the table. When everyone has recorded the data on their table, the instructors will then allow you to start the second round of interactions.

Identification of the infected, but asymptomatic persons



Transfer 5 drops of your Working Solution (Orange capped tube) into one tube of the test reagent. The instructors will hand out the test reagent tubes when required. Mix gently and note the color change, if any. **Red – uninfected; Yellow – infected.** If the persons you have interacted with are infected, write YES in the column labeled "Infected???", otherwise, write NO.

Identification of patient zero

The class will use their logic to identify the first person that was infected and transmitted the disease.



Verification of the result

Retrieve the Blue capped tube containing your remaining 5 mL of **Stock Solution**, a new tube of test reagent, and a new pipet. Transfer **5 drops** of the **Stock Solution** into the new tube of test reagent using the new transfer pipet. Note color change. Did the class guess the correct person as being patient zero?