PROMOTING INQUIRY-BASED LEARNING IN THE VIRTUAL CLASSROOM

INBRE SYMPOSIUM

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PATHOGENIC BACTERIOLOGY

- **400-level course**
  - Lecture + Lab
- **Lab learning outcomes:**
  - Demonstrate **aseptic technique** and **biosafety practices**
  - Describe the **principles of laboratory tests**
  - Demonstrate **how testing is used** to identify bacteria

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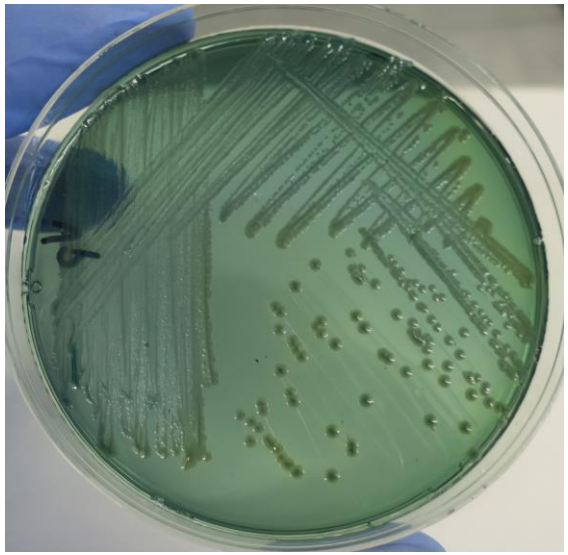
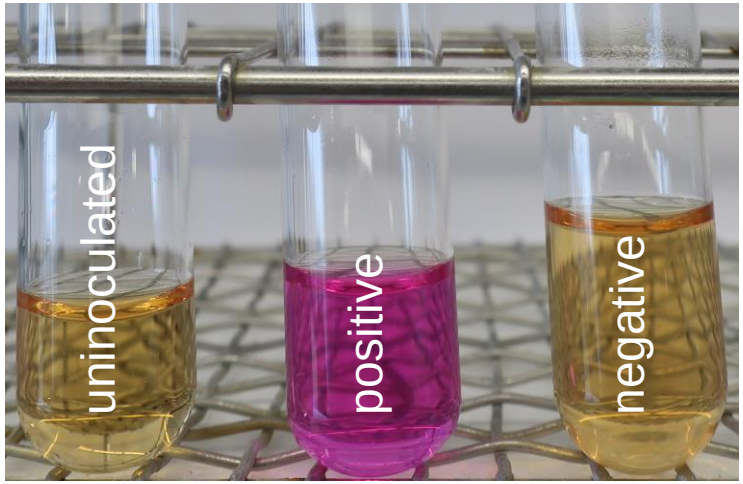
- **Spring 2020**
  - 41 students
  - 2.5 TAs
  - In-person until mid-semester then transition to virtual

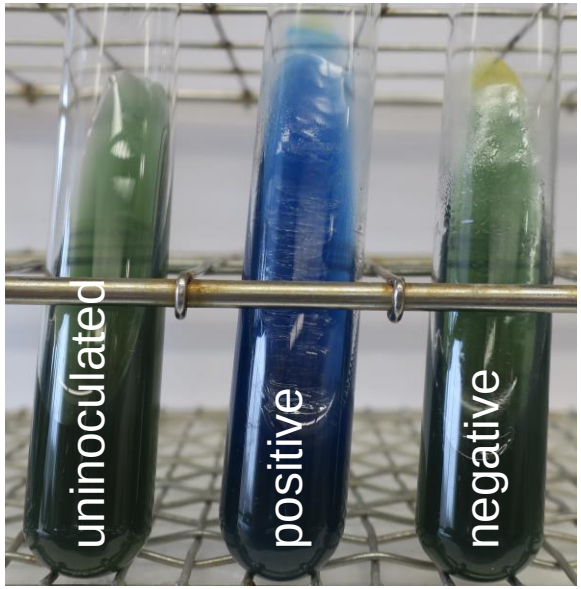
PATHOGENIC BACTERIOLOGY



Isolation streak of *Vibrio parahaemolyticus* on TCBS agar



Urea broth



Citrate agar slant

UNKNOWN ASSIGNMENTS

Goal: Apply knowledge of lab tests and procedures to identify unknown bacteria from a sample

1. Each student is assigned a sample consisting of 2 unidentified bacteria
2. Students must perform appropriate lab tests to identify each species in their sample
3. Students communicate their findings in a lab report

3 different unknown assignments during the semester

- Final assignment is clinically relevant consisting of 2 organisms from a possible 30 different species

IN-PERSON VS. VIRTUAL

In-person

1. Clinical scenario and broth culture provided to student

Virtual

1. TA emails clinical scenario and specimen to student

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Example scenario:

A throat swab of a patient complaining of pain when they swallow. Clinician noted that the patient had swollen lymph nodes in the neck region.

IN-PERSON VS. VIRTUAL

In-person	Virtual
2. Student selects appropriate growth media and attempts to isolate each organism	2. Student replies by requesting growth media and describes how it should be inoculated to isolate each organism

Example scenario:

A throat swab of a patient complaining of pain when they swallow. Clinician noted that the patient had swollen lymph nodes in the neck region.

IN-PERSON VS. VIRTUAL

In-person

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2. Student replies by requesting growth media and describes how it should be inoculated to isolate each organism

Student:
Use the swab to **streak for isolation** on a blood agar plate.

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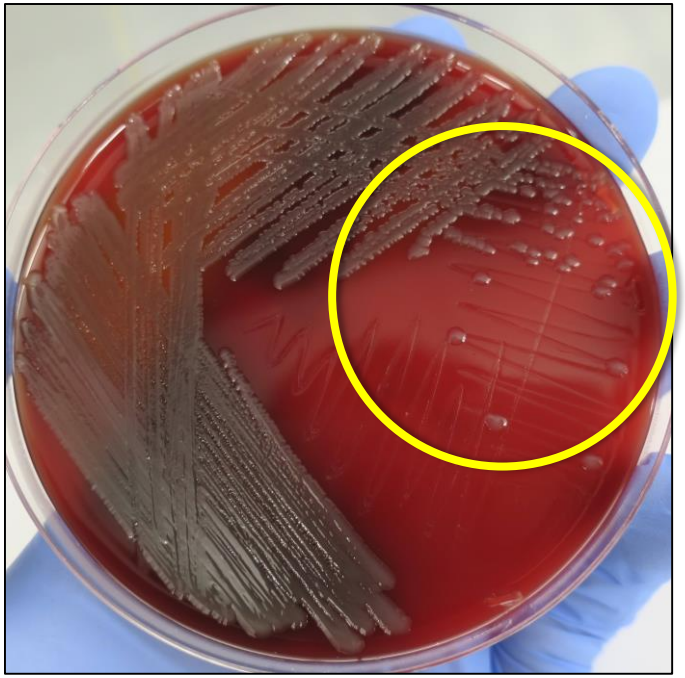

Student:
Use the swab to **streak for isolation** on a blood agar plate.

TA reply:
Individual colonies observed.

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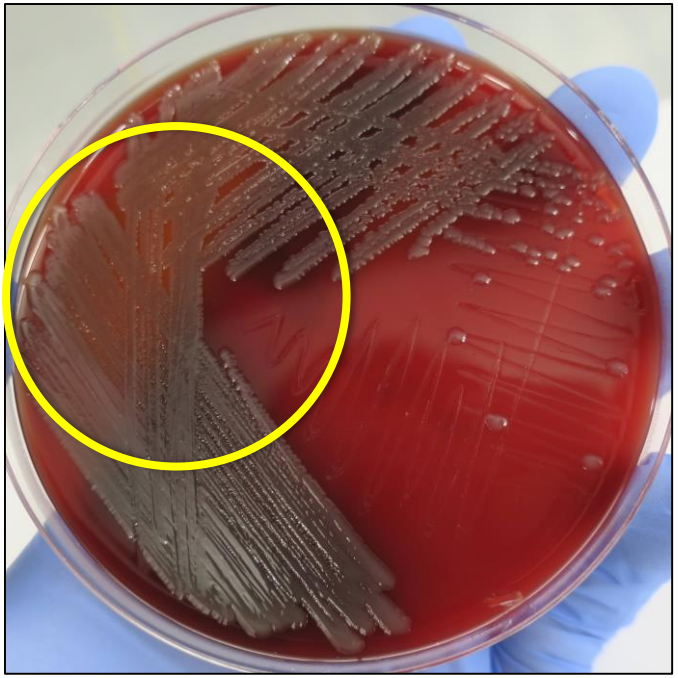

Student:
Use the swab to **inoculate** a blood agar plate.

TA reply:
Lawn of growth with no individual colonies observed.

IN-PERSON VS. VIRTUAL

In-person	Virtual
3. Student observes test results, makes interpretations and performs the most useful tests	3. TA replies with a description of appropriate observations 4. Student interprets data and replies with a request for the most useful tests

Student reply:

Use an inoculation loop to transfer a colony from the plate into a urea broth.

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In-person

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Virtual

3. TA replies with a description of appropriate observations
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Student reply:
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TA reply:
The urea broth was pink.

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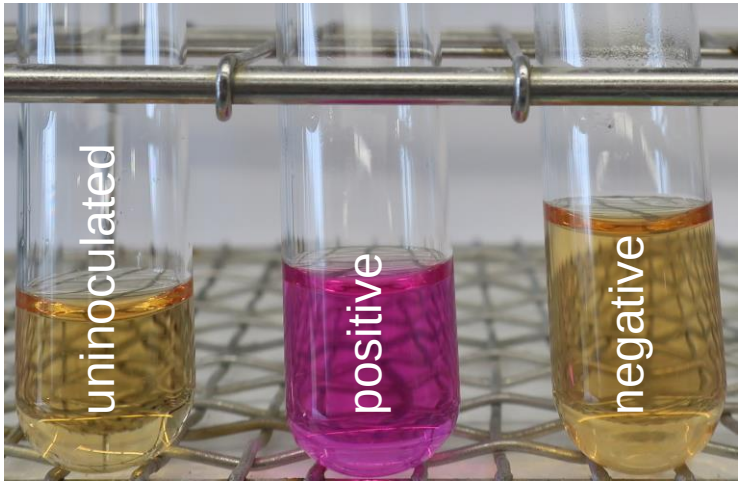

IN-PERSON VS. VIRTUAL

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1. Clinical scenario and broth culture provided to student
2. Student selects appropriate growth media and attempts to isolate each organism
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4. **Repeat step 3**
5. **Write lab report**

Virtual

1. TA emails clinical scenario and specimen to student
2. Student replies by requesting growth media and describes how it should be inoculated
3. TA replies with a description of appropriate observations
4. Student interprets data and replies with a request for the most useful tests
5. **Repeat steps 3 and 4**
6. **Write lab report**

REFLECTIONS

The virtual experiment:

- engages students in the scientific process that closely mimics in-person experience
- requires students to be thoughtful, intentional, organized, logical and descriptive
- allows students to make mistakes and learn from them
- is generally faster than in-person
- is safer than in-person
- is most useful if students have some prior hands-on experience
- requires significant preparation and troubleshooting ahead of time to run smoothly

DIAGNOSTIC MICROBIOLOGY

- **400-level course**
  - Lecture only
- **Fall 2020**
  - 24 students
  - Online – synchronous
- **Relevant learning objectives**
  - Research and integrate information from primary sources
  - Perform peer review
  - Communicate independent research in written and oral formats

DOH INTERNSHIP PROJECT

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    2. Topic summary
    3. Literature review
    4. Primary paper analysis
    5. Final report
    6. Infographic

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Eli Review used to facilitate feedback and revision

*assignment developed with help from Heather Johnson, PhD (Writing Across URI)

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    6. Infographic ⟵ Presented to the class

REFLECTIONS

- Students appreciated having several opportunities for feedback
- Eli Review was helpful for organizing peer reviews, enhancing self-reflection and promoting revision
- Scaffolding was useful but resulted in many deadlines
- The infographic prompted students to consider their audience and convey the most essential elements of their topic
- Students enjoyed making and presenting their infographics
- Internship is adaptable – NIH, NSF, WHO

OTHER STRATEGIES

- Zoom breakout rooms
  - prompts for group discussions
  - jigsaw activity
  - think – pair – share
  - homework check
  - case studies
- Discussion forums
  - In the news

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