Funky Fomites and Aseptic Microbiology Techniques for Bacterial Isolation

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Annotation:
This laboratory exercise includes both a lecture on the purpose of practicing aseptic technique as well as an explanation of how to practice aseptic techniques. Students will actually practice aseptic technique by plating bacteria in order to isolate individual colonies of bacteria. In addition, students will hypothesize which fomites* they believe will have the most bacterial contamination and take swabs of their fomites to check for bacteria.

***Fomites:**- any inanimate object such as a desk, table, floor etc. that is capable of being a breeding ground for bacteria*

Primary Learning Outcome:
Students should understand the significance of aseptic techniques in the clinical and microbiological laboratory. Students should demonstrate knowledge about the tools used in aseptic technique, understand how to isolate bacterial colonies, identify specific types of bacterial organisms, understand differences in bacterial morphologies, differentiate between gram negative and gram positive bacteria, and understand how selective and differential media enable scientists to identify specific bacteria based on the bacteria's characteristics.

Additional Learning Outcome:
Students should understand how prevalent bacterial contamination is and be able to conceptualize how fomites can be contaminated through physical contact or aerolized contamination. Students should understand how to streak for bacterial isolation and identify individual bacterial colonies.

Assessed QCC's:
15.2 Describes common diseases caused by bacteria and their treatments.
15.3 Describes methods of bacterial control in food preparation, handling, and storage.
15.4 Lists beneficial effects of monerans.

Non-assessed QCC's:
1.1 Demonstrates proficiency in the use of science process skills in laboratory.
1.3 Uses laboratory equipment to conduct safe and accurate laboratory work.
3.2 Explains the use of biology in daily life.

Local and/or National Standards:
S.9-12.15 Describes characteristics and examples of monerans.

Materials:

1) petri dishes
2) agar
3) non-virulent bacterial source in broth medium suspension
4) wire loops
5) Bunsen burner with gas source
6) Sterile cotton swabs
7) Incubator
8) Permanent markers
9) Differential and selective media types

Total Duration:

1 hr and 30 minutes during first session of experiment
20 minutes during second session of experiment

Technology Connection:

Students will view a power point lecture about aseptic techniques and the bacterial streaking for isolation.

Procedures:

Step 1	
Description	Aseptic Technique lecture
Duration in hours/minutes	30 minutes
Attachment #1 – Name and description	Funky Fomites and Aseptic Microbiology Techniques for Bacterial Isolation
Step 2	
Description	Demonstration of Laboratory Procedure for Bacterial Streaking and Isolation Using the Quadrant Streaking Method.
Duration in hours/minutes	15 minutes
Attachment #1 – Name and description	Laboratory Procedures Handout
Step 3	
Description	Hands-On Laboratory Bacterial Isolation Activity
Duration in hours/minutes	30 minutes (may vary based on number of available Bunsen burners)
Attachment #1 – Name and description	Laboratory Procedures Handout
Step 4	
Description	Selection of Fomites for Swabbing
Duration in hours/minutes	5 minutes
Attachment #1 – Name and description	List of possible fomites for swabbing
Web Site #1 – URL and annotation	http://www.epa.gov/nerlcwww/

Step 5	
Description	Swabbing of fomites and plating on agar plates
Duration in hours/minutes	5 minutes
Step 6	
Description	Assignment of Laboratory Report Questions (** teacher must incubate the fomite plates and plates streaked for bacterial isolation and bring them to the following class for the students to see whether or not they isolated bacterial colonies properly and accept or reject their hypotheses about bacterial contamination of various fomites)
Duration in hours/minutes	5 minutes
Attachment #1 – Name and description	Laboratory Write-up Questions
Web Site #1 – URL and annotation	http://www.microbes.info/
Web Site #2 – URL and annotation	http://www.microbiol.org/

Assessment:

1) Laboratory Write-up Questions
2) Assessment of whether the students were able to isolate individual bacterial colonies after incubation of the petri dishes.
3) Assessment of the students' abilities to hypothesize and accept or reject their hypotheses based on analyses of the bacterial growth that occurs from the swabbing of various fomites.

Extension:

An unknown bacterial sample could be given and a flow chart could provide students with a pathway to follow in which they could use various differential and selective media to identify their unknown bacteria. This procedure would include the concepts of bacterial isolation as well as the significance of aseptic technique in diagnosing microbial organisms.

Remediation:

Bring in properly isolated colonies of bacteria and samples of differential and selective media to show students how aseptic technique and microbiology enables clinicians and scientists to identify organisms.