

# Lecture 8

## Tasks for the day:

### I. Physiological testing

#### A. Purpose

1. Help researchers \_\_\_\_\_
  - i. Different organism have different \_\_\_\_\_ that can aid in identification.
  - ii. These physiological profiles can be used to narrow down which organism might be present.
2. Determine characteristics of organisms
  - i. Because we have only scratched the surface of \_\_\_\_\_ there is still much we don't know regarding \_\_\_\_\_.
  - ii. Physiological testing allows us to discover \_\_\_\_\_ about newly cultured organisms
  - iii. Useful for tracking physiological changes brought about by \_\_\_\_\_ in well-known organisms.
  - iv. Can even be used to differentiate strains of a single species
3. Categorize organism based on physiological properties
  - i. Often group by criteria of interest based on setting
    - a. \_\_\_\_\_
    - b. \_\_\_\_\_
    - c. \_\_\_\_\_

### II. Gram positive cocci

| A. _____  |   |   |  |
|---|---|---|--|
| Key characteristics:  |   | Environments  |  |
| <ul style="list-style-type: none"> <li>• staph arrangement</li> <li>• _____</li> <li>• halotolerant</li> <li>• _____</li> <li>• non-motile</li> </ul> |   | <i>Staphylococcus</i> spp. are often found as parasites on _____ of humans and other animals.   |  |
| Representative species  |   |   |  |
| <i>S. epidermidis</i>   |   | <i>S. aureus</i>  |  |
| Known for   | Characteristics   | Characteristics   | Known for  |
| <ul style="list-style-type: none"> <li>• _____</li> <li>• Can be _____</li> <li>• _____</li> </ul>  | <ul style="list-style-type: none"> <li>• non-hemolytic</li> <li>• Coagulase negative</li> <li>• cannot ferment _____</li> </ul> | <ul style="list-style-type: none"> <li>• Coagulase positive: clots blood plasma</li> <li>• _____: Beta-hemolytic, damage red blood cells (RBCs)</li> <li>• Exfoliative toxid: Exfoliative dermatitis</li> <li>• _____: food poisoning</li> <li>• Leukocidins: kill white blood cells (WBC)</li> <li>• Ferments _____</li> </ul> | Disease: <ul style="list-style-type: none"> <li>• _____</li> <li>• abscesses,</li> <li>• food poisoning,</li> <li>• _____</li> <li>• _____</li> <li>• _____</li> </ul> |

| B. _____  |  |
|---|--|
| Key characteristics:  | Environments   |
| <ul style="list-style-type: none"> <li>• Arranged as single cells, pairs or irregular clusters</li> <li>• _____</li> <li>• Halotolerant</li> <li>• Strict aerobes</li> <li>• Non-motile</li> <li>• _____</li> </ul> | Most <i>Micrococcus</i> species colonize _____   |
| Representative species  |  |
| <i>M. luteus</i>  |  |
| Known for   | Characteristics  |
| <ul style="list-style-type: none"> <li>• _____</li> <li>• can be opportunistic pathogen</li> </ul>  | <ul style="list-style-type: none"> <li>• _____</li> <li>• produces yellow pigments colonies</li> </ul> |

| C. _____   |  |
|--|--|
| Key characteristics:   | Environments   |
| <ul style="list-style-type: none"> <li>• Arranged in pairs or short chains</li> <li>• _____</li> <li>• Facultative anaerobe</li> <li>• Can tolerate _____</li> <li>• Non-motile</li> </ul>               | Most species are localized to _____  |
| Representative species   |  |
| <i>E. faecalis</i> (group D)   |  |
| Known for  | Characteristics  |
| <ul style="list-style-type: none"> <li>• limited potential to cause disease as they lack _____.</li> <li>• commonly cause _____.</li> <li>• formerly classified <i>Streptococcus faecalis</i></li> </ul> | <ul style="list-style-type: none"> <li>• _____</li> <li>• generally non-hemolytic</li> </ul> |

| <i>D.</i> _____   |   |   |   |  |   |
|---|---|---|---|--|---|
| Key characteristics:  |   |   | Environments  |  |   |
| <ul style="list-style-type: none"> <li>• Arranged in pairs or chains</li> <li>• _____</li> <li>• _____</li> <li>• aerotolerant anaerobes</li> <li>• Non-motile</li> <li>• Often assembled according to serological properties (group A, B, etc.)</li> </ul> |   |   | Often found _____<br>_____.   |  |   |
| Representative species  |   |   |   |  |   |
| <i>S. pyogenes</i> (group A)  |   | <i>S. pneumoniae</i>  |   | <i>S. mitis</i> (group D)  |   |
| Known for   | Characteristics   | Known for   | Characteristics   | Known for  | Characteristics   |
| Disease: <ul style="list-style-type: none"> <li>• _____</li> <li>• _____</li> <li>• Acute glomerulonephritis, or rheumatic fever</li> </ul>   | <ul style="list-style-type: none"> <li>• <math>\beta</math>-hemolytic (Streptolysins)</li> <li>• Taxos A (bacitracin) sensitive</li> </ul>                  | Disease: <ul style="list-style-type: none"> <li>• Pneumonia (This organism is responsible for 70-90% of all bacterial pneumonia)</li> <li>• otitis media (ear infections)</li> <li>• _____</li> <li>• endocarditis</li> <li>• Major _____ infections (hospital acquired)</li> </ul> | <ul style="list-style-type: none"> <li>• <math>\alpha</math>-hemolytic</li> <li>• Taxos P (optochin) sensitive</li> <li>• Heavily encapsulated</li> </ul> | <ul style="list-style-type: none"> <li>• _____</li> <li>• _____</li> <li>• _____</li> <li>• _____</li> </ul> | <ul style="list-style-type: none"> <li>• <math>\alpha</math>-hemolytic</li> <li>• Taxos P (optochin) resistant</li> </ul> |
| <i>S. agalactiae</i> (group B)  |   |   | <i>S. mutans</i>  |  |   |
| Known for   | Characteristics   | Known for   | Characteristics   |  |   |
| Disease: <ul style="list-style-type: none"> <li>• _____ infections</li> </ul>   | <ul style="list-style-type: none"> <li>• <math>\beta</math>-hemolytic (Streptolysins)</li> <li>• _____</li> <li>• Taxos A (bacitracin) resistant</li> </ul> | Disease: <ul style="list-style-type: none"> <li>• _____</li> </ul>  | <ul style="list-style-type: none"> <li>• <math>\alpha</math>-hemolytic</li> <li>• Taxos P (optochin) resistant</li> </ul>                                 |  |   |

B. Biochemical properties

1. \_\_\_\_\_
  - i. tests an organism's ability to utilize a specific nutrient
    - a. \_\_\_\_\_
    - b. Proteins and amino acids
    - c. Triglycerides
2. \_\_\_\_\_
  - i. tests an organism's ability to produce/secrete enzymes for various functions
    - a. \_\_\_\_\_
    - b. Nutrient break-down
    - c. Defensive enzymes
    - d. \_\_\_\_\_
3. Fermentation \_\_\_\_\_
  - i. tests organism's ability to ferment a specific sugar
  - ii. determines which fermentation \_\_\_\_\_

4. Motility
  - i. tests if organism has flagella and is capable of movement
5. \_\_\_\_\_
  - i. tests if an organism can tolerate certain substances
    - a. \_\_\_\_\_
    - b. Salts
    - c. Other substances with antimicrobial properties
6. Growth properties
  - i. tests conditions required for growth of organism
    - a. \_\_\_\_\_
    - b. pH
    - c. \_\_\_\_\_
    - d. Osmotic pressure
7. Structures
  - i. looks for distinguishing structures
  - ii. \_\_\_\_\_
    - a. Cell wall structures (Gram reaction, Acid-fast)
    - b. Flagella
    - c. \_\_\_\_\_
    - d. \_\_\_\_\_

### III. Biochemical tests for Gram positive organism

\*Note that we will be learning about a few tests each day. You will be responsible for understanding the basis each test and how to read each test. In the second half of the semester you will be using these tests to help identify unknown organisms.

#### A. \_\_\_\_\_ (BAP)

1. This is a very rich medium that allows for the growth of most organisms but is also able to differentiate organisms based on their \_\_\_\_\_.

- i. Gamma ( $\gamma$ )—\_\_\_\_\_ (no clearing zones)
- ii. Alpha ( $\alpha$ )—partial hemolysis (\_\_\_\_\_ surround the colonies)
- iii. Beta ( $\beta$ )—complete hemolysis (\_\_\_\_\_ surround the colonies)

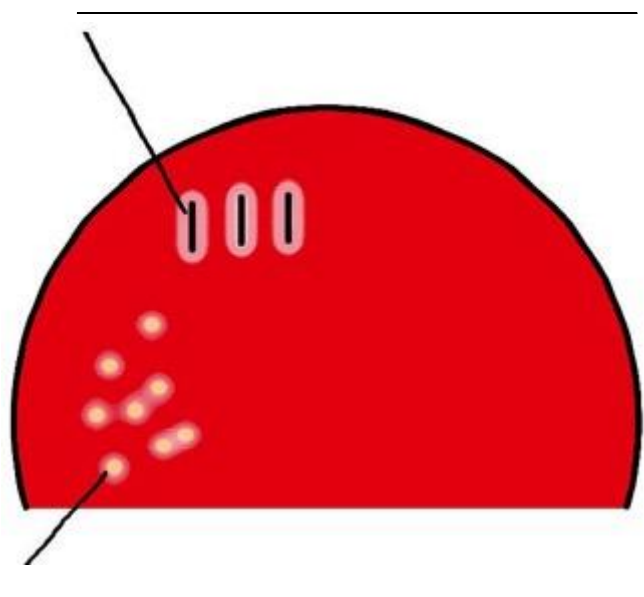
2. The streak-stab technique

- i. The stab allows us to detect \_\_\_\_\_, which is a specific hemolysin produced by *Streptococcus pyogenes*. This hemolysin is \_\_\_\_\_ and thus is only seen in anaerobic environments (stab bottom).
- ii. *Streptococcus pyogenes* also produces \_\_\_\_\_, which is a hemolysin that causes  $\beta$ -hemolysis in an \_\_\_\_\_ environment. This is easily seen around a single colony on the surface of the plate.

#### B. Mannitol Salt Agar (7.5 % NaCl)

1. Selects for organisms that can live in the \_\_\_\_\_ and differentiates organisms that can \_\_\_\_\_. The agar will turn \_\_\_\_\_ if the organism is able to ferment mannitol due to the acidic byproducts of the fermentation.

### The Streak-Stab Technique



C. Coagulase test

1. Coagulase is an enzyme that can \_\_\_\_\_ or coagulate human or rabbit \_\_\_\_\_.
2. Used to differentiate between *S. aureus* ( \_\_\_\_\_ ) or other *Staphs* ( \_\_\_\_\_ ).

