Detecting the Presence of Pathogens in the Human Throat:
A Qualitative Study

Introduction

As you learned in an earlier experiment, bacteria are ubiquitous. That even includes being in or on the human body. In the throat of the average human being, there are all sorts of neat little critters just waiting to get hold of the appropriate conditions and go wild. Examples of the microbes present in our throats include *Staphylococci, Neisseria, Branhamella, Bacteroides, Non- and α-hemolytic Streptococci, Haemophilus* and *Mycoplasma*, to name a few. The more common bacteria that "get involved" in infectious diseases include *Streptococci, Staphylococci, Haemophilus, Branhamella* and *Mycoplasma*.

It is very difficult to get Haemophilus to grow under standard laboratory conditions (requires the presence of *Staphylococci* for good growth). Mycoplasma is difficult to grow, period. *Branhamella*, a gram negative diplo-coccus, usually affects the ears more than the throat. This leaves *Streptococcus* and *Staphylococcus* as two of the offensive disease-mongers that can be grown with great ease in the laboratory. Indeed, this is where we shall focus our attention.

Both *Streptococci* and *Staphylococci* grow on blood agar. Both bacteria excrete proteins called hemolysins. These proteins destroy red blood cells. Because of this property, we may use it against the bacteria to identify them. This is because different bacteria hemolyze blood differently. When speaking about hemolytic patterns in the *Staphylococci*, we are only concerned about two hemolytic patterns: α- and β-hemolysis. Bacteria that perform α-hemolysis only partially hemolyze blood cells leaving a pukish greenish yellow zone around the bacteria. β-hemolysis is complete hemolysis of the blood cells around the colony of the bacteria. This leaves a straw or media-colored zone around the bacteria. *Staphylococcus* also grows well on mannitol salts agar, growing red colonies. **Table 1**, below, summarizes several kinds of media used for the growth of pathogens in the human throat; the table also presents several all-purpose media for general bacteriological use.

When speaking about the *Streptococci*, we recognize three hemolytic patterns: α-, β- and γ-hemolysis. The former two hemolytic patterns are identical with those of the *Staphylococci*. The latter hemolytic pattern is specific for the *Streptococci*. This pattern of hemolysis is that there is no hemolysis at all. The zone around the bacteria, therefore, is/are red, i.e., no red blood cells are hemolyzed. *Streptococci* that are β-

hemolytic include *S. pyogenes*, which causes strep throat. *Streptococci* that are α-hemolytic include *S. pneumoniae*, which causes diplococcal pneumonia.

Medium	Use/Comment
Nutrient Agar (NA)	General purpose medium; grows small colonies
Blood Agar	Used in the detection of hemolytic properties of bacteria: 1) α-hemolysis = partial hemolysis; pukish green/yellow 2) β-hemolysis = complete hemolysis; straw or media colored 3) γ-hemolysis - no hemolysis at all (used ONLY when talking about *Streptococcus*) Generally, 5-10% whole blood cells
Chocolate Agar	Heated blood agar; for delicate organisms; requires CO_2
Staphylococcus Agar	Specific for *Staphylococcus*; 9% salt
Mannitol Salts Agar	Specific for *Staphylococcus*; red colonies grow
Tryptic Soy Agar (TSA)	General purpose agar; grows larger colonies

Table 1. Some media for growth of throat pathogens.

The purpose of this experiment is to learn how to utilize some of the various agars in **Table 1** and how to interpret the results from these plates when pathogens are observed.

Materials and Methods

Materials

Mannitol salts agar	Staphylococcus agar	Blood agar	Cotton swabs
Candle jar	Incubator	Loop	Bunsen burner and striker
Biohazard bag			

Methods

Obtain, as assigned by your instructor, either *E. coli* or a cotton swab and one plate of each kind of medium (total of three plates). Streak the plates with the appropriate sample and place them in the incubator. Dispose of the cotton swabs in the coffee cans for future sterilization. Examine the plates next lab period.

In the spaces below, sketch and label the appearances of your three plates:

Appearance of Mannitol Salts medium	Appearance of Blood medium	Appearance of *Staphylococcus* medium

Based upon your observations, what do you conclude about the bacteria grown on your media in this experiment?

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