

MICROBIOLOGY 102 – EXPERIMENT 14

A “virtual” enteric plating demonstration that can go along with discussion of MacConkey Agar is at <http://www.jlindquist.net/generalmicro/dfentericplate4.html>

GENERAL CHARACTERISTICS OF THE “ENTERICS” with comparison to *Pseudomonas* and the “lactics” (Experiment 12)

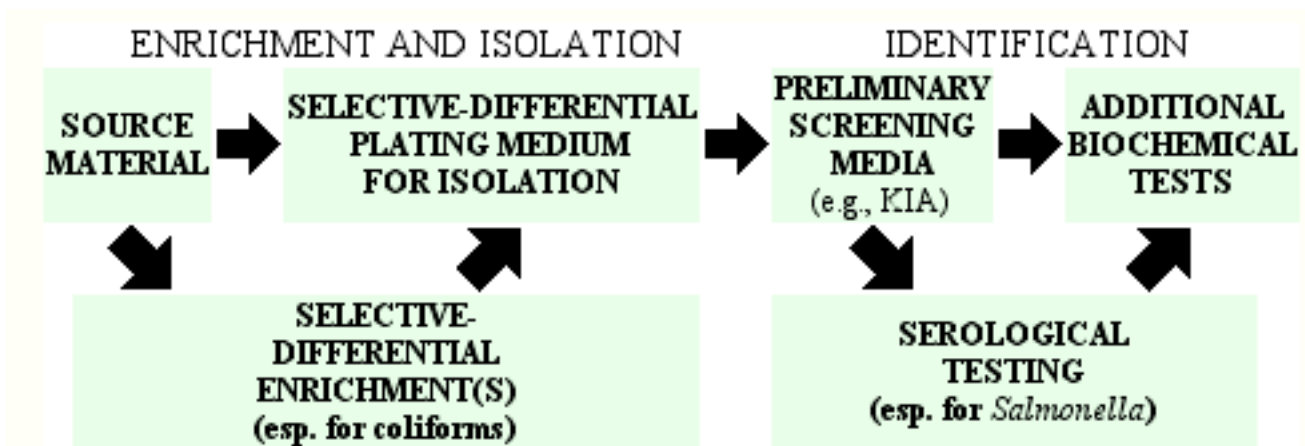
PARAMETER	ENTERIC BACTERIA (or “enterics”) Family <i>Enterobacteriaceae</i>	<i>Pseudomonas</i> (a strictly aerobic non- enteric which tends to be isolated on the same media)	LACTIC ACID BACTERIA (or “lactics”)
Gram Reaction	–	–	+
Morphology*	rod (generally short)	rod	coccus or rod
Carbo-Metabolic Type	chemoheterotroph	chemoheterotroph	chemoheterotroph
Catabolism**	aerobic respiration; anaerobic respiration (with nitrate); fermentation	aerobic respiration	fermentation
Oxygen Relationship***	facultative anaerobe	strict aerobe	aerotolerant anaerobe
Catalase Reaction	+	+	–
Glucose Fermentation	+	–	+
Fermentation Types	mixed acid & butanediol	none	homofermentative & heterofermentative
Motility	usually +	+	–
Need for Growth Factors	none or minimal	none or minimal	generally extensive
Primary Consideration for Isolation	selection against Gram+ bacteria	selection against Gram+ bacteria	azide tolerance with aerobic incubation

* The enterics generally shorten during extended growth of the culture such that the rod-shaped cells assume an oval shape. In the lactic acid bacteria, the cocci sometimes elongate and also appear oval-shaped!

** Recall the **five general types of catabolism**: Aerobic respiration, anaerobic respiration, fermentation, anoxygenic phototrophy and oxygenic phototrophy.

*** Recall how “**oxygen relationship**” relates to **glucose fermentation** and the **catalase reaction**.

GENERALIZED ENTERIC ISOLATION PROCEDURE



(This handout was revised 3/27/12)

REVIEW OF FEATURES WHICH MAY BE NOTED FOR MANY DIFFERENTIAL MEDIA

AEROBIC OR ANAEROBIC	SUBSTRATE	MICROBIAL ACTIVITY	REACTION	SOME EXAMPLES
AEROBIC	various amino acids in peptones, etc.	deamination*	alkaline	MacConkey Agar, O/F Medium, Fermentation Broth, KIA, MIO
ANAEROBIC	specific sugar in small amount	fermentation	acid	KIA, Lysine Broth and MIO (glucose for all 3)
	specific sugar in large amount**	fermentation	ACID	MacConkey Agar, O/F Medium, Fermentation Broth, KIA
	specific amino acid in large amount	decarboxylation	ALKALINE	MIO (ornithine), Lysine Broth
	thiosulfate	reduction with H₂S formation	black color (with Fe)	KIA, Microbiology 102's special Modified MacConkey Agar

* All enterics (like most common chemoheterotrophs) will deaminate amino acids in peptones, yeast and beef extract, and similar materials.

** A relatively large amount of glucose along with a much smaller than usual amount of peptone accounts for the ability to detect the **small amount of acid associated with respiration of the sugar** (glucose) in Glucose O/F Medium which can be seen for certain gram-negative, strictly aerobic organisms like *Pseudomonas*.

A RELEVANT THOUGHT QUESTION

You wish to exploit certain properties of the difficult-to-isolate bacterium *Excalibacterium* (an enteric) in order to help you detect and isolate it from samples which are highly-contaminated with other enterics. You decide to start with MacConkey Agar which you know contains **lactose** as the only fermentable sugar. **Peptone** is another medium ingredient which you recall; it contains a mixture of various amino acids – none in any especially high amount. Following is a table showing important organisms to consider in this situation:

genus	fermentation of					decarboxylation of	
	glucose	maltose	lactose	sucrose	mannitol	lysine	arginine
<i>Edwardsiella</i>	+	+	–	–	–	+	–
<i>Aquamonas</i>	+	+	–	–	–	+	+
<i>Excalibacterium</i>	+	–	–	+	–	+	–
other enterics	+	+	+ or –	+ or –	+ or –	+ or –	+ or –

- On MacConkey Agar, what would you expect the net pH reaction would be for any of the three genera specifically listed on the table above? (Circle one) **ACID** **ALKALINE**
- As these three genera do not ferment or respire lactose, how can they grow on MacConkey Agar? (Consider a likely source of energy and how they might utilize it.)
- What would be the best choice for a sugar to add to MacConkey Agar which will assist greatly in the differentiation of *Excalibacterium* colonies from the others on the table? (Circle one) **GLUCOSE** **MALTOSE** **SUCROSE** **MANNITOL**
- If lysine were to be included in the medium in a relatively large amount, what effect would this have on the pH reaction associated with *Excalibacterium* colonies? (Circle one)

MORE ACIDIC

MORE ALKALINE