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 the "lactics" (Experiment 12)

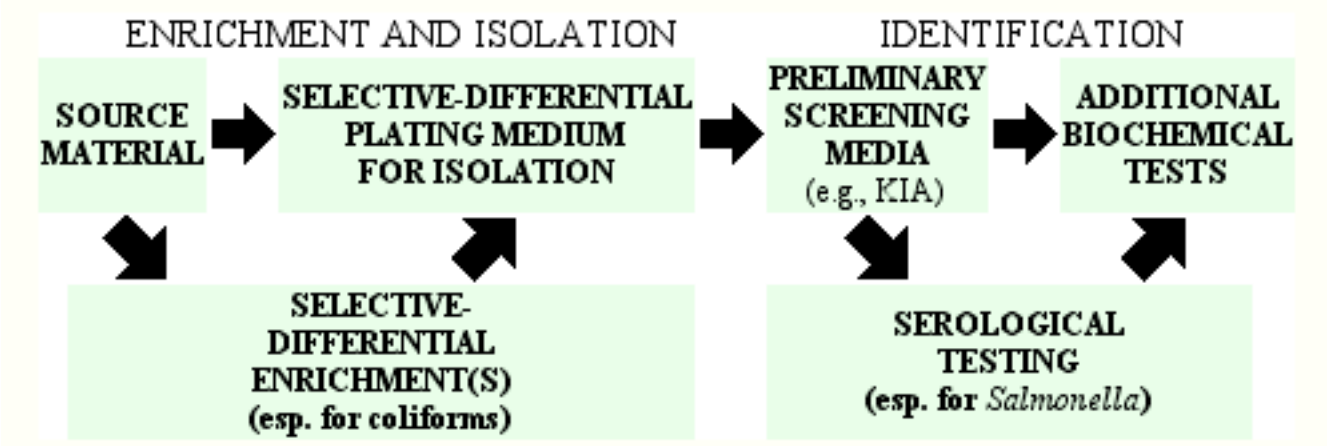
PARAMETER	**THE ENTERIC BACTERIA** Family *Enterobacteriaceae* (or "enterics")	**THE LACTIC ACID BACTERIA** (or "lactics")
Gram Reaction	–	+
Morphology *	rod (generally short)	coccus or rod
Carbo-Metabolic Type	chemoheterotroph	chemoheterotroph
Catabolism **	aerobic respiration; anaerobic respiration (with NO_3^-); fermentation	fermentation
Oxygen Relationship ***	facultative anaerobe	aerotolerant anaerobe
Catalase Reaction	+	–
Glucose Fermentation	+	+
Fermentation Types	"mixed acid" and "butanediol"	"homofermentative" and "heterofermentative"
Motility	usually +	–
Need for Growth Factors	none or minimal	generally extensive
Primary Consideration for Isolation	selection against gram-positive 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.

*** Note how this designation relates to glucose fermentation and the catalase reaction.

GENERALIZED ENTERIC ISOLATION PROCEDURE



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
ANAEROBIC	specific **sugar** in **small** amount	**fermentation**	**acid**	KIA(glucose)
	specific **sugar** in **large** amount**	**fermentation**	**ACID**	MacConkey Agar, O/F Medium, Fermentation Broth, KIA(lactose)
	specific **amino acid** in **large** amount	**decarboxylation**	**ALKALINE**	MIO (ornithine), Lysine Broth
	thiosulfate	**reduction** with **H_2S formation**	**black color** (with Fe)	KIA

* 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 glucose in Glucose O/F Medium which can be seen for many 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
Edwardsiella	+	+	–	–	–	+	–
Aquamonas	+	+	–	–	–	+	+
Excalibacterium	+	–	–	+	–	+	–
other enterics	+	+	+ or –	+ or –	+ or –	+ or –	+ or –

a. 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**

b. As these 3 genera don't ferment or respire lactose, how can they grow on MacConkey Agar? (Consider their likely source of energy.)

c. 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**

d. 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