



FAMILY : ENTEROBACTERIACEAE I

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FAMILY: ENTEROBACTERIACEAE

General characteristics

- Gram negative non spore forming rods
- Most of them are motile with **peritrichous flagella**
- Some are capsulated and some don't
- Aerobic or **facultative anaerobic**
- All organism ferments glucose
- Organism reduce **nitrate to nitrite** except some strains of *Erwinia*
- Catalase positive except *Shigella dysenteriae*
- They are **oxidase negative** (difference from other Gram negative bacteria)
- Organism usually seen in the GI tract of man and animals



COLONIES ON MACONKEY AGAR

- ✚ Fermentable sugar: lactose
- ✚ pH indicator: netral red (pale straw at pH 8 and pink at pH 6.8)
- ✚ Inhibitors: bile salts and crystal violet (anti Gram positive)
- ✚ Reactions: if organism can ferment the lactose and acidic metabolic products are produced the medium and colonies are pink (lactose fermenter)
- ✚ If the organism is unable to utilise lactose, then it attacks peptone (nitrogen source) in the medium resulting in alkaline metabolic products and the medium and colonies are pale straw coloured (non lactose fermenter)



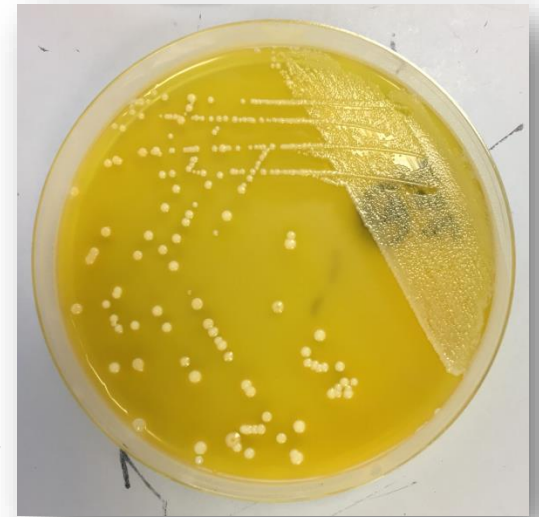
COLONIES ON BGA

- **Brilliant Green agar (BGA) :**
- fermentable sugar : Lactose and sucrose
- PH indicator: Phenol red (red at pH 8.2 and yellow at pH 6.4)
- Inhibitor: brilliant green dye that to some extent inhibits the growth of most enterobacteria except salmonella species
- Reactions: Similar to those occurring on MaConkey agar except that the bacteria may ferment one or both of the sugars with an acid reaction (yellowish green) or unable to ferment either sugar and attack peptone instead with an alkaline reaction and red colonies



COLONIES ON XLD AGAR

- XLD agar (Xylose lysine deoxycholate agar)
- Fermentable sugars: lactose, sucrose and xylose
- pH indicator: phenol red (red at pH 8.2 and yellow at pH 6.4)
- Other substrates: lysine and chemicals for detecting hydrogen sulphide production
- Inhibitors: bile salts (sodium deoxycholate)
- Reactions: Salmonellae will first ferment the xylose creating a temporary acid reaction, but this is reversed by subsequent decarboxylation of lysine with alkaline metabolic products
- Super imposed the red (alkaline) colonies is the production of hydrogen sulphide, so most salmonellae have red colonies with black centre
- The large amount of acid produced by enterobacteria that can ferment either lactose or sucrose or both prevents the reversion back to alkaine even if the bacterium is able to decarboxylate lysine



REACTIONS ON TSI AGAR SLANT

- Triple sugar iron agar
- It is an indicator medium and does not contain an inhibitor
- Fermentable sugars: glucose 0.1% lactose 1% and sucrose 1%
- Other substrates: chemicals to indicate hydrogen sulphide (H_2S) production
- PH indicator: Phenol red (red at pH 8.2 and Yellow at pH 6.4)
- Reactions: All members of *Enterobacteriaceae* are capable of fermenting glucose and the small amount will be attacked preferentially and rapidly. So at the early stage both butt and slant will be yellow due to acid production from glucose fermentation

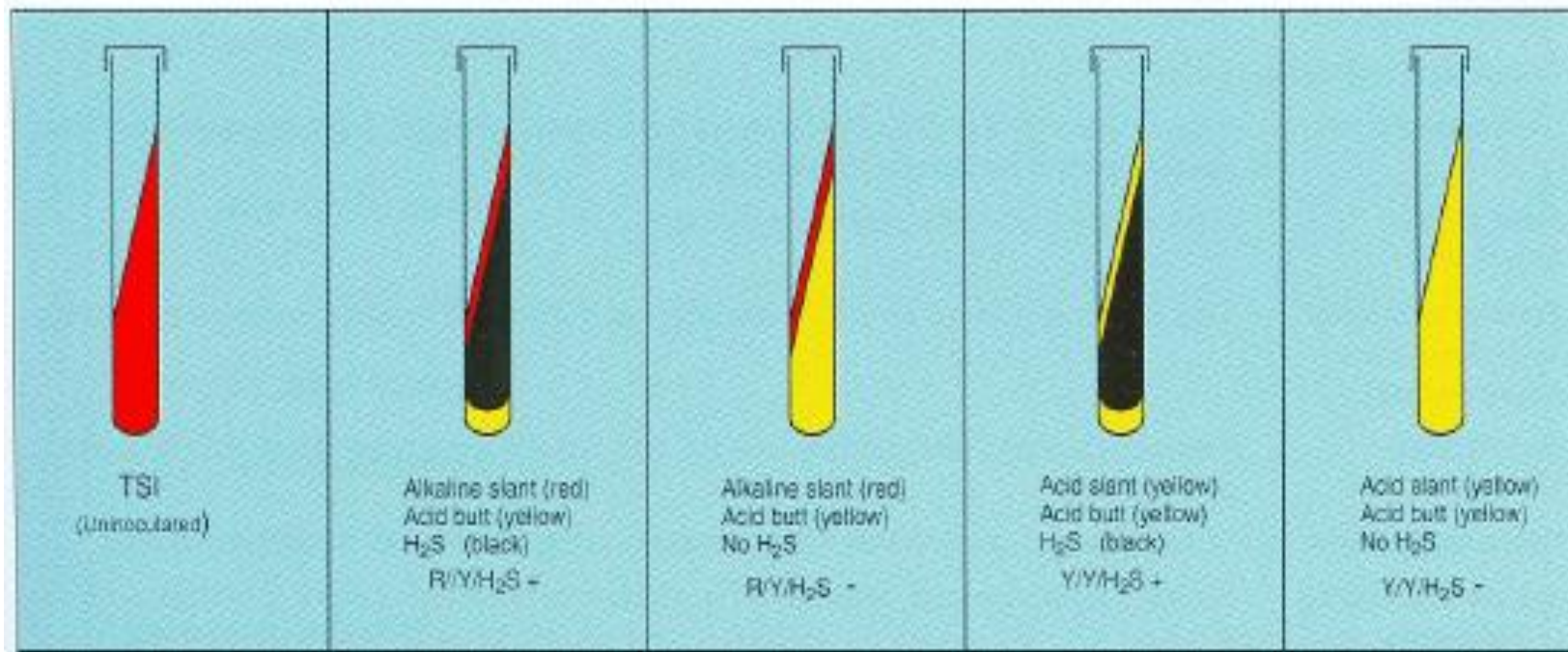


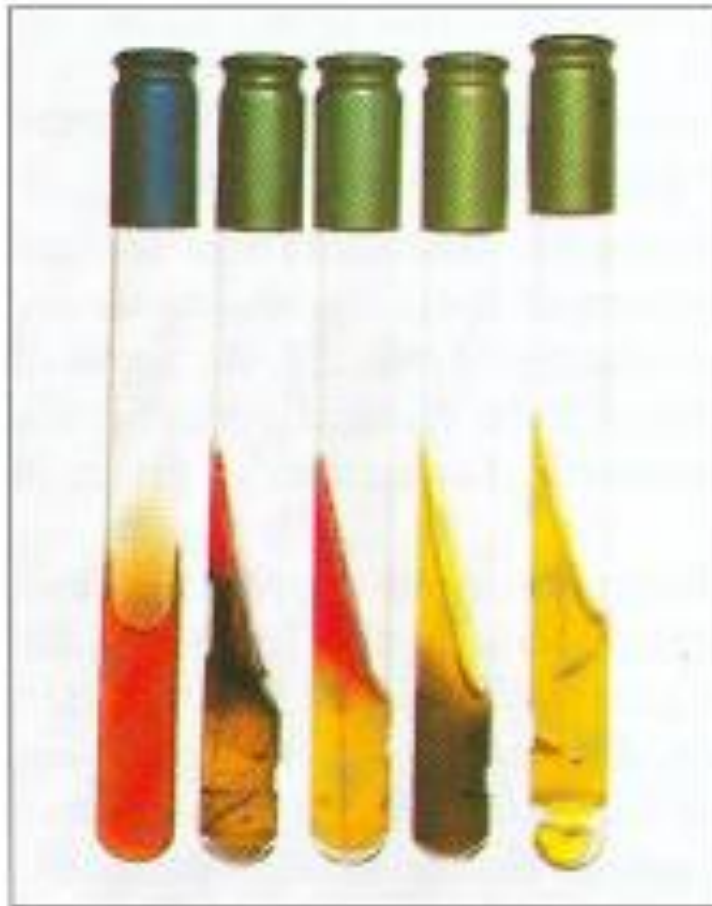
- Some bacteria attack lactose or sucrose in the medium and in this case sufficient acid is produced to maintain both butt and slant in an acid (yellow condition)
- Bacteria that are unable to ferment either lactose or sucrose, after depletion of limited amount of glucose, will utilize the peptones in the medium
- This is less efficient method of generation of energy and occurs mainly at the surface of slant in the presence of atmospheric oxygen
- The metabolites of peptone are alkaline and this causes the slant to revert back to the original red colour



- Some members of Enterobacteriaceae including most salmonella spp. are able to produce hydrogen sulphide .
- This reaction is superimposed over the sugar fermentation and is seen as blackening of the medium
- The general interpretation of the reactions as follows
- Alkaline (red) slant and acid (yellow) butt: glucose fermentation only
- Acid (yellow) slant and acid (yellow) butt: lactose and/or sucrose attacked as well as glucose
- Blackening of the medium: hydrogen sulphide production







269 TSI agar slopes showing the range of reactions from the left, uninoculated, R/Y/H₂S+, R/Y/H₂S-, Y/Y/H₂S+, Y/Y/H₂S-. See **Diagram 32** for notation.

