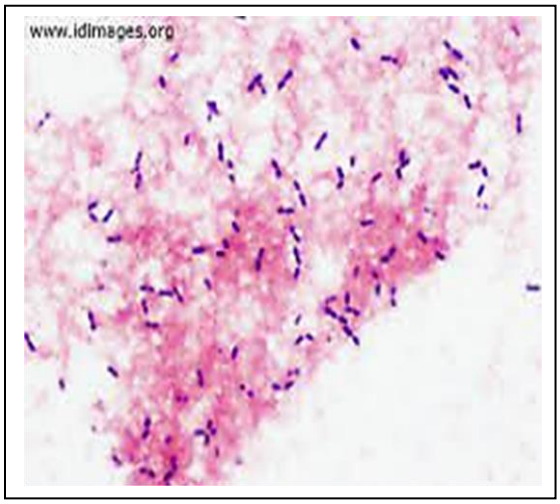
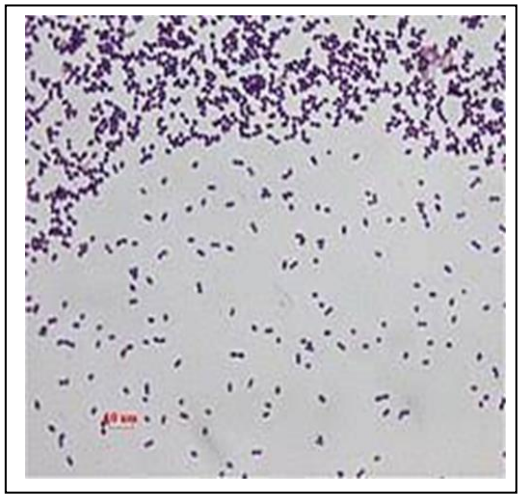
Enterococcus

Enterococcus is a large genus of lactic acid bacteria of the phylum Bacillota. Enterococci are gram-positive cocci that often occur in pairs (diplococci) or short chains, and are difficult to distinguish from streptococci on physical characteristics alone.[4] Two species are common commensal organisms in the intestines of humans: E. faecalis (90–95%) and E. faecium (5–10%). Rare clusters of infections occur with other species, including E. casseliflavus, E. gallinarum, and E. raffinosus.

Enterococcus characteristics:

1) Enterococci are facultative anaerobic organisms, i.e., they are capable of cellular respiration in both oxygen-rich and oxygen-poor environments.
2) enterococci are tolerant of a wide range of environmental conditions: extreme temperature (10–45 °C), pH (4.6–9.9), and high sodium chloride concentrations.
3) Gram-positive spherical or ovoid cells arranged in pairs or chains.
4) They are non-spore-forming and obligatory fermentative chemoorganotrophs.
5) catalase-negative.





Bile Esculin Test:

- Esculin is a glycosidic coumarin derivative (6-beta-glucoside-7-hydroxy-coumarin). The two moieties of the molecule (glucose and 7-hydroxycoumarin) are linked together by an ester bond through oxygen.
- Thus, the bile esculin test is based on the ability of certain bacteria, notably the group D streptococci and Enterococcus species, to hydrolyze esculin in the presence of bile (4% bile salts or 40% bile).
- Bacteria that are bile-esculin positive are able to grow in the presence of bile salts and the hydrolysis of the esculin in the medium results in the formation of glucose and a compound called esculetin.
- Esculetin, in turn, reacts with ferric ions (supplied by the inorganic medium component ferric citrate) to form a black diffusible complex.

Principle

Gram-positive bacteria other than some streptococci and enterococci are inhibited by the bile salts in this medium. Organisms capable of growth in the presence of 4% bile and able to hydrolyze esculin to esculetin. Esculetin reacts with Fe^{3+} and forms a dark brown to black precipitate. Thus the tolerance to the presence of bile and the hydrolysis of esculin provide the means to presumptively identify organisms. If an organism can hydrolyze esculin, the media will turn dark brown or black.

Esculin + Acid → β-D-glucose + Esculetin

Esculetin + Fe3+ → Dark Brown Color

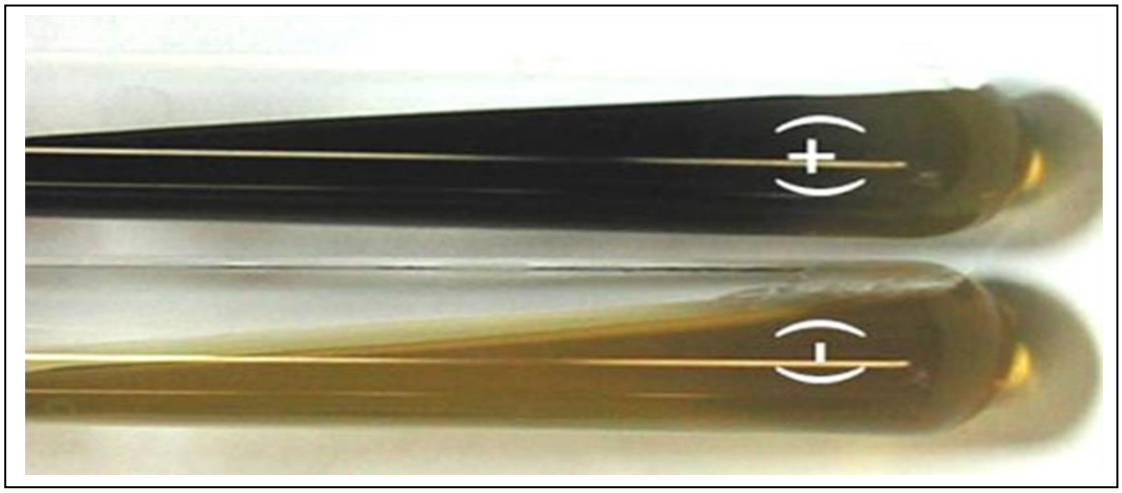
Media:

Bile esculin agar is a selective and differential medium which is used to presumptively identify enterococci and group D streptococci based on the ability of an organism to hydrolyze esculin.

Beef extract (11 g), enzymatic digest of gelatin (34.5 g), esculin (1 g), ox bile (2 g), ferric ammonium citrate (0.5 g), agar (15 g), per 1000 mL, pH 6.6.

Method

1. Inoculate one to two colonies from an 18- to 24-hour culture onto the surface of the slant.
2. Incubate at 35°-37°C in ambient air for 48 hours.
3. Observe for growth and blackening of the medium.

Expected Results

- **Positive:** Growth and blackening of the agar slant
- **Negative**: Growth and no blackening of medium ; No growth