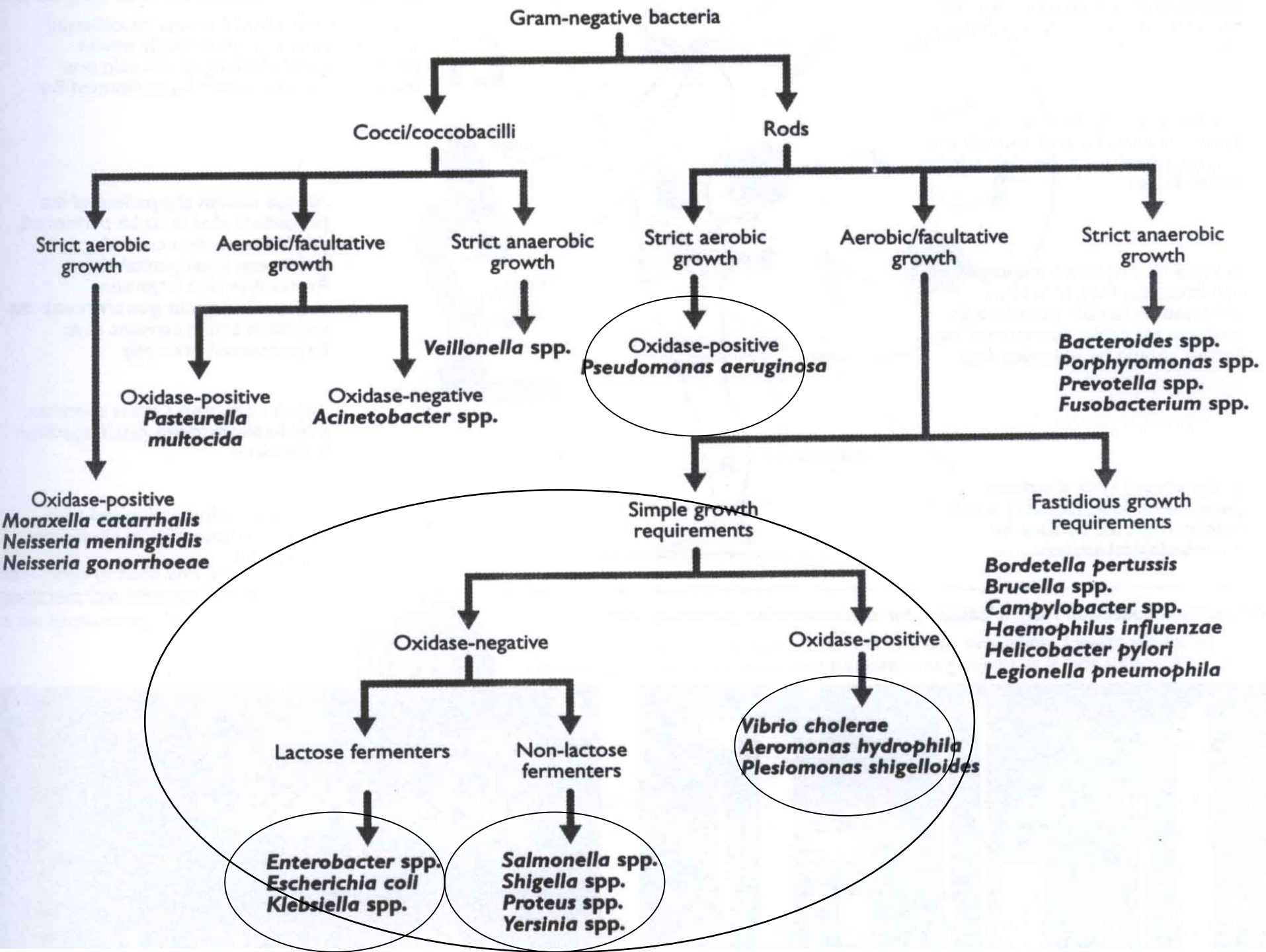


Blok pencernaan
Praktikum Mikrobiologi



Gram-Negative
bacteria

Rods

Cocci
(Neisseria, Moraxella...)

Non fastidious

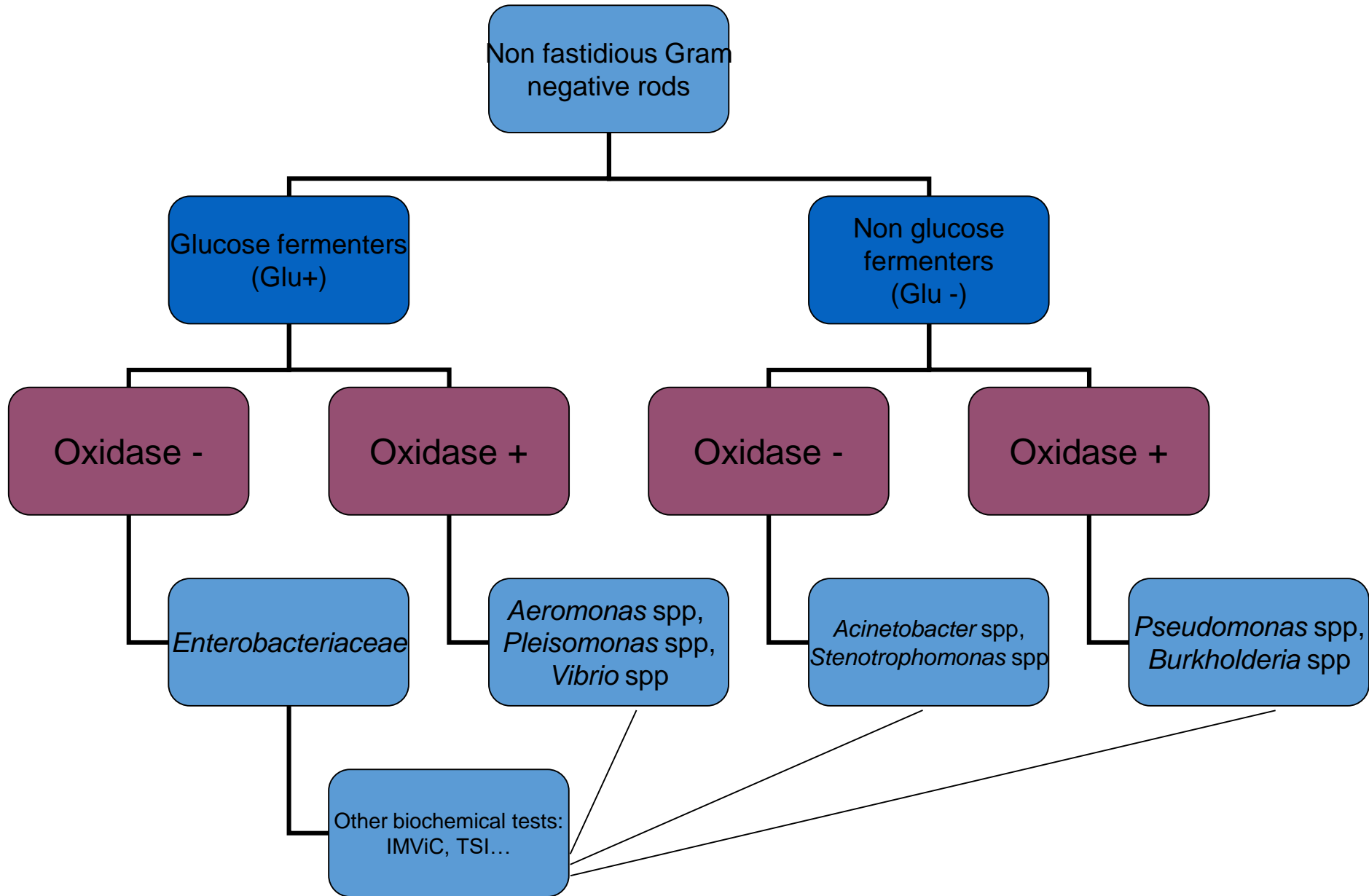
Fastidious

Non fermenters

*Haemophilus, Bordetella,
Campylobacter, Helicobacter,
Legionella...*

Enterobacteriaceae

Others
(Vibrio, Aeromonas, Plesiomonas...)



Family Enterobacteriaceae

Primary Pathogens

Organisms capable of causing disease in anyone

Shigella

Salmonella

Yersinia

Escherichia coli

Klebsiella pneumoniae

Opportunistic Pathogens

Organisms that can only cause disease under certain conditions or in certain hosts

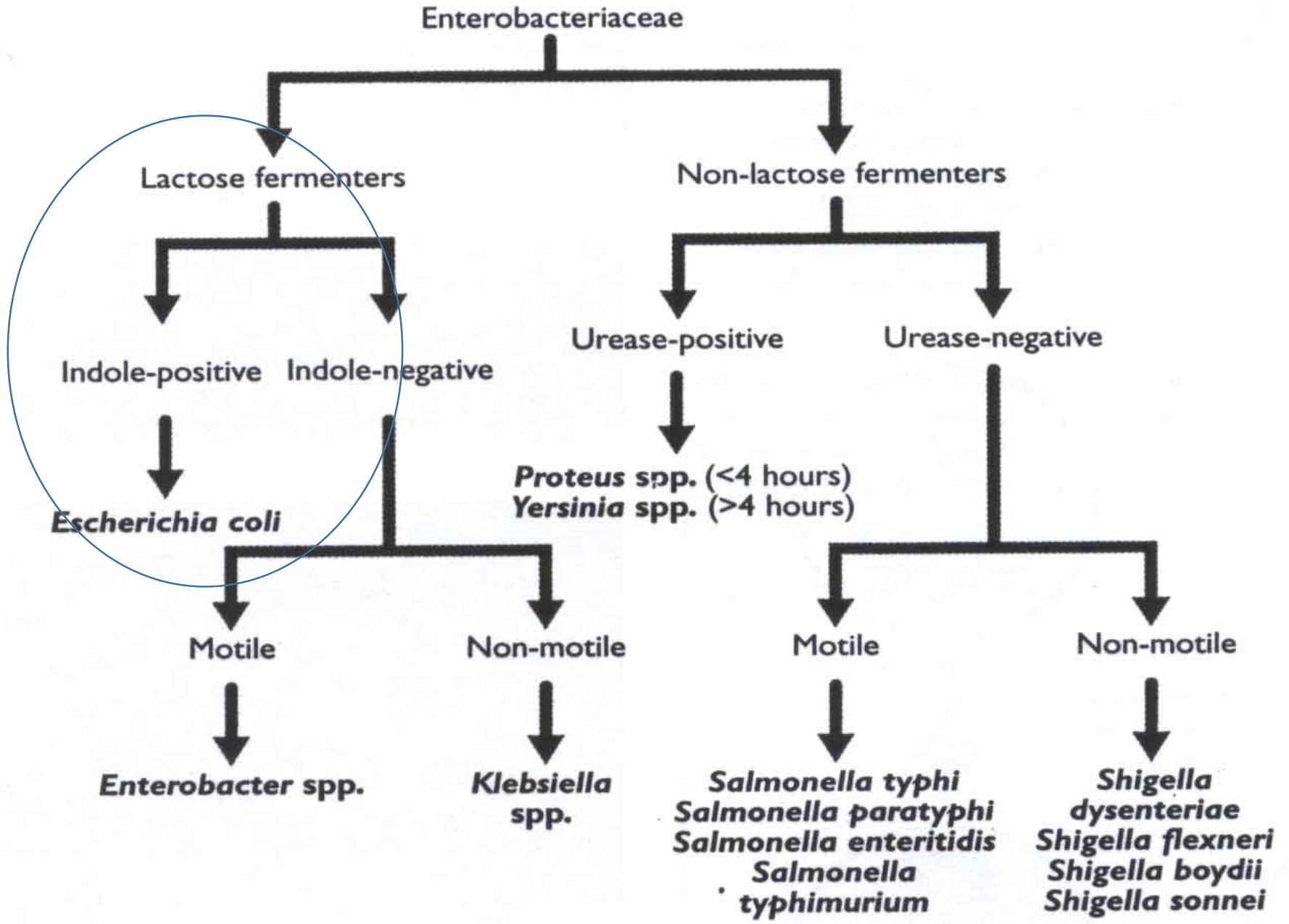
Providencia

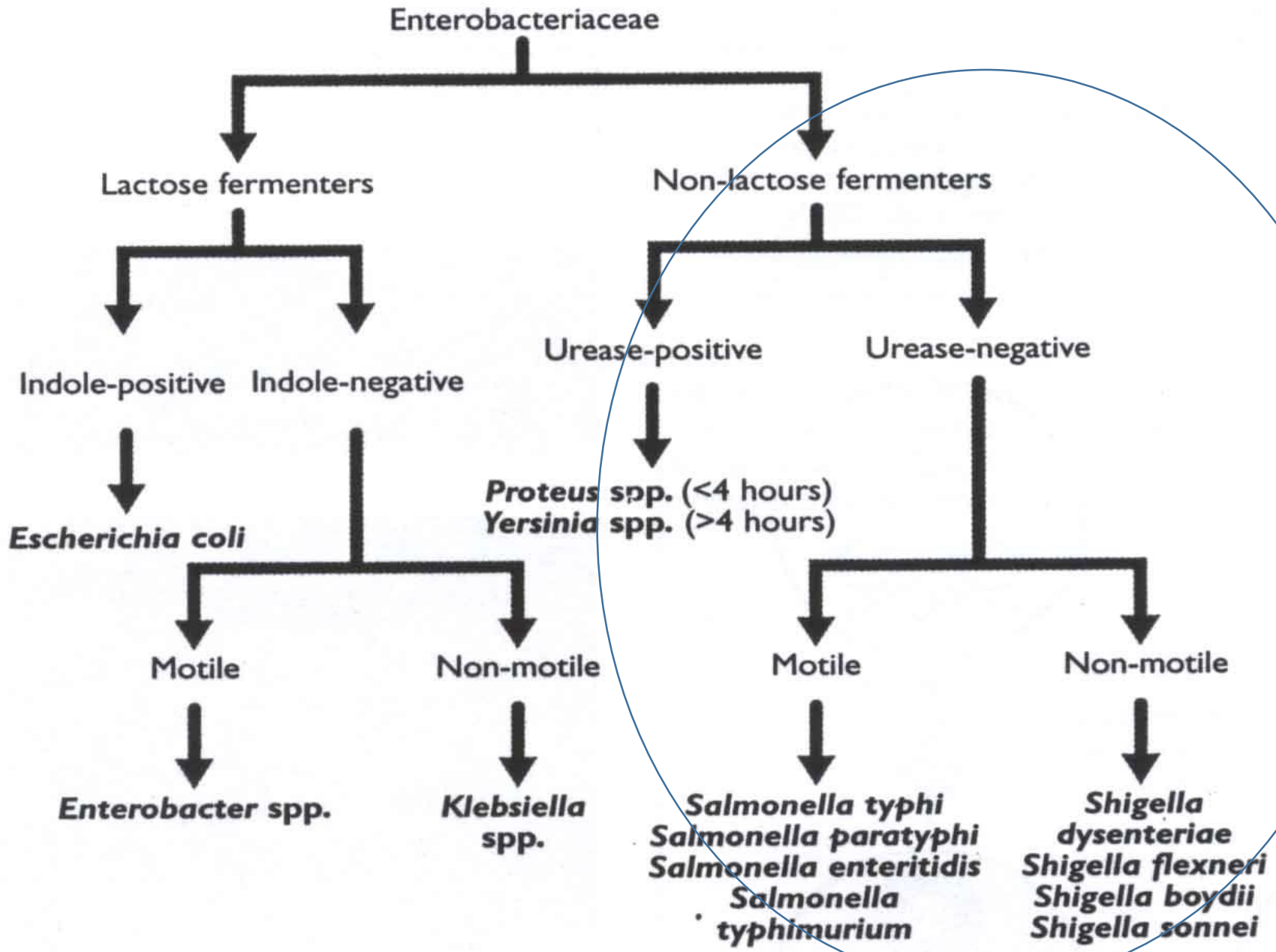
Morganella

Proteus

Enterobacter

Serratia





DIAGNOSA LABORATORIUM

- Specimen : sputum, pus, jaringan, cairan tubuh, rectal swab, feces
- Harus cepat dikultur / transport medium : Stuart's atau Amies
- Non fecal specimens → setiap enteries, tetapi menghambat bakteri gram positif (MacConkey)
- Fecal specimens → mencari intestinal pathogen : Salmonella , Shigella → enrichment medium

DIAGNOSA LABORATORIUM

Pewarnaan Gram

Perbenihan “differential” media :

- EMB
- Mc Conkey
- Deoxycholate Medium

Membedakan Lactose-fermenting (berwarna)

Dengan Nonlactose-formenting (tidak berwarna)

DIAGNOSA LABORATORIUM

Selective differential medium :

- Agar SS
- Xylose-Lysine-Desoxycholate (XLD) agar
- Hektoen enteric (HE) agar
- Sorbitol-MacConkey (SMAC) agar

DIAGNOSA LABORATORIUM

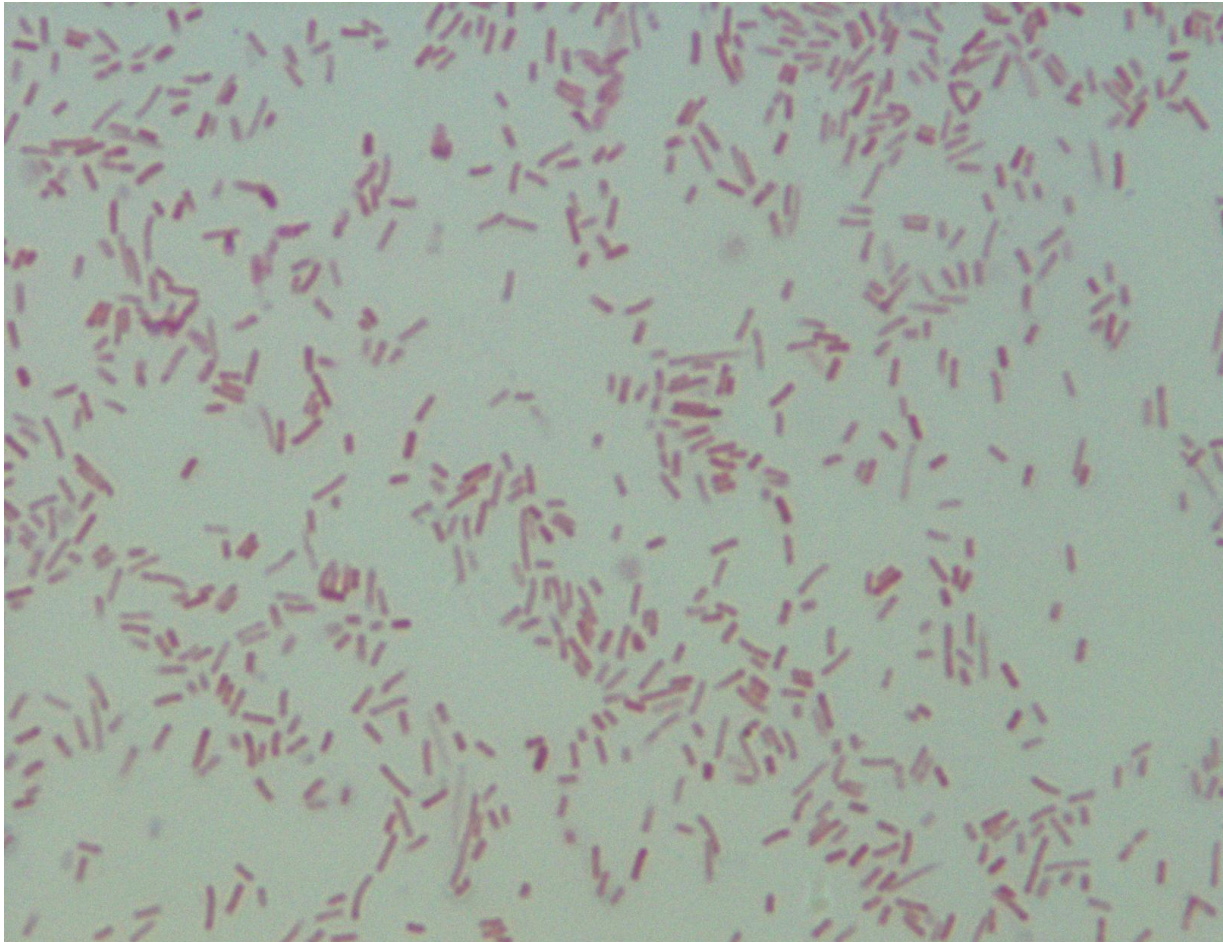
Highly Selective Medium :

- Brilliant green agar → *Salmonella*
- Bismuth Sulfite agar → *Salmonella typhi*

Enrichment medium :

- Selenite broth
- Tetrathionate broth
- GN broth

Pewarnaan Gram

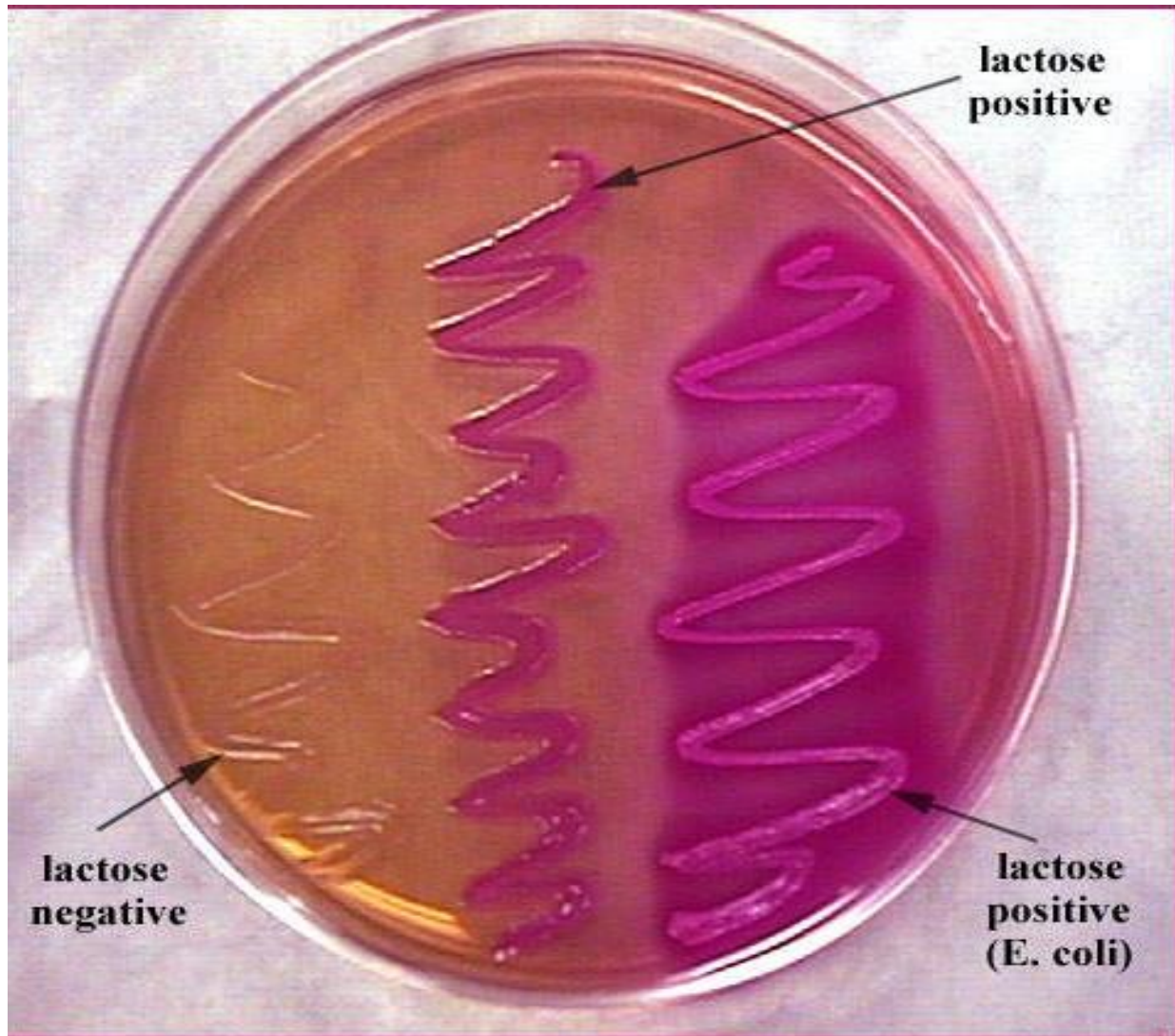


PERBENIHAN DIFFERENTIAL MEDIUM

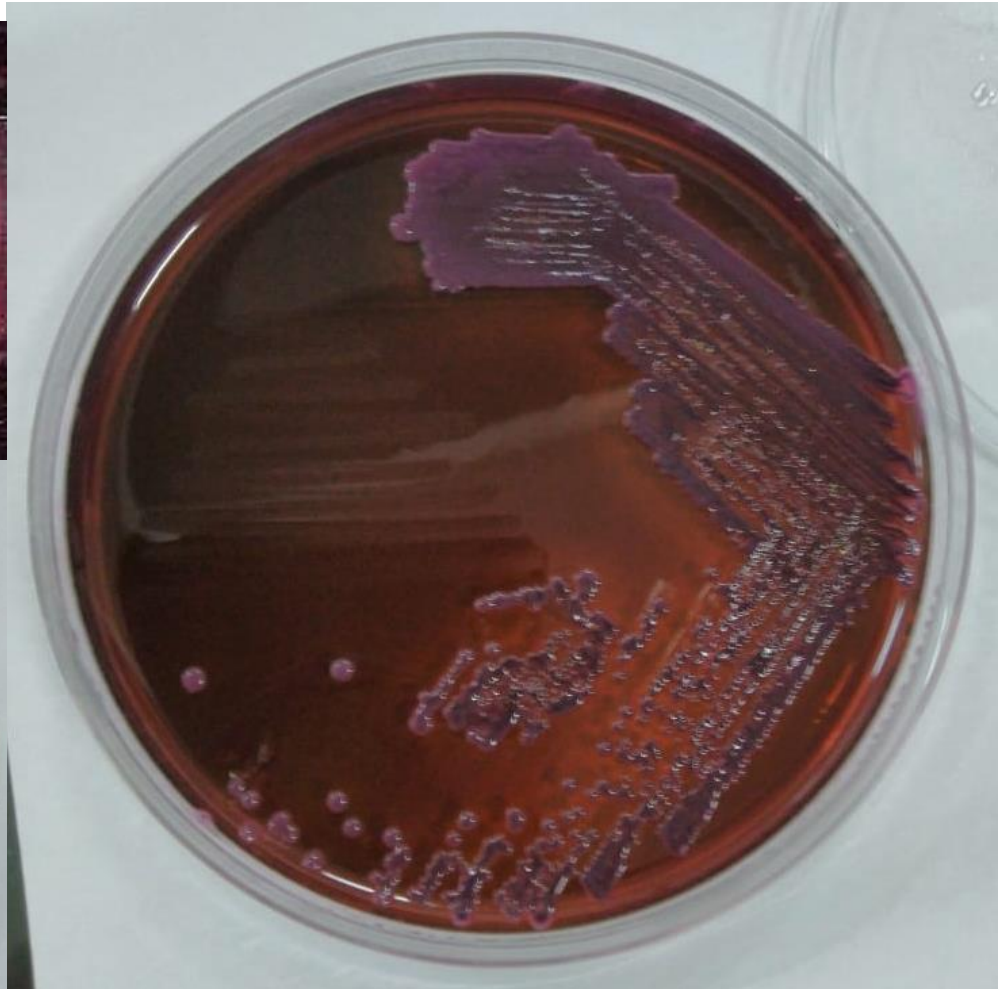
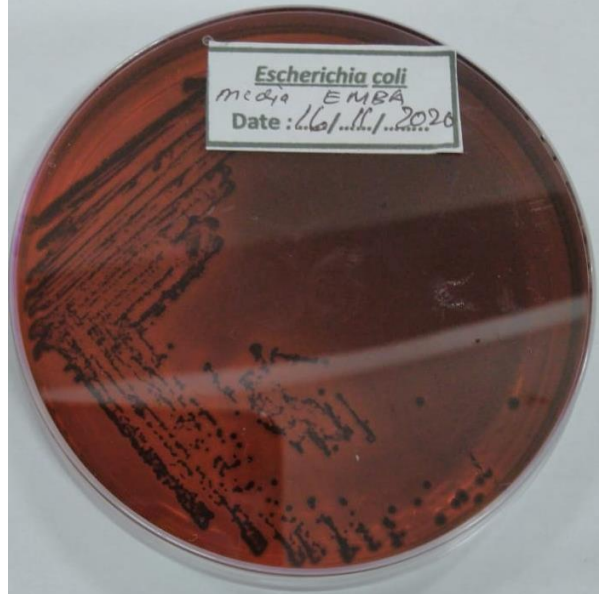


Mc Conkey
Laktose/non laktose fermentasi

PERBENIHAN DIFFERENTIAL MEDIUM Mc.Conkey



PERBENIHAN DIFFERENTIAL EMB

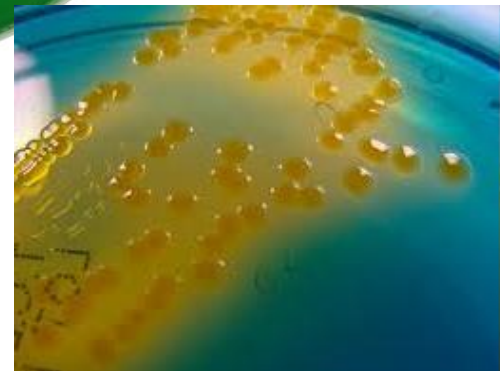
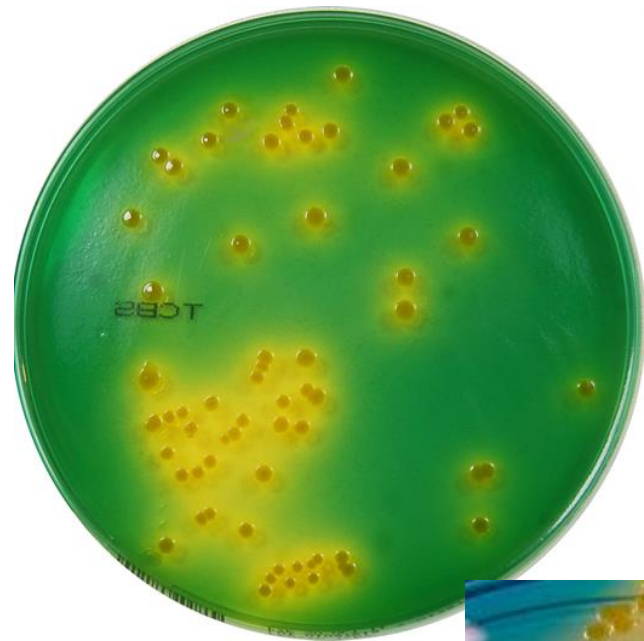


PERBENIHAN SELECTIVE DIFFERENTIAL MEDIUM : Hektoen enteric (HE) agar

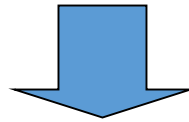


Salmonella growing on HE agar produces colonies with black centers (produces hydrogen sulfide).

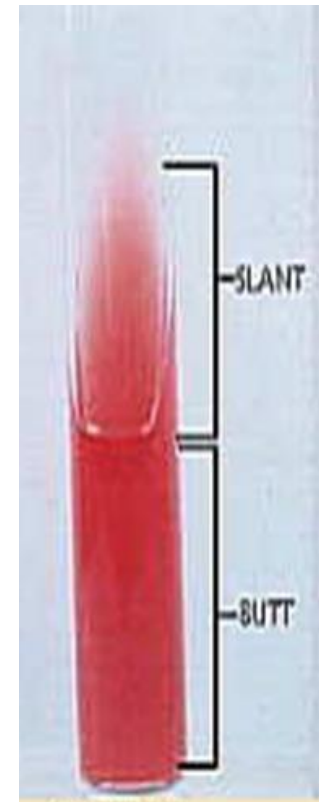
PERBENIHAN SELECTIVE DIFFERENTIAL MEDIUM : Thiosulfat-citrate bile salts-sucrose TCBS



Triple Sugar Iron (TSI) agar :
0.1% glucose, 1% sucrose, 1% lactose,
ferrous sulfate, tissue extract, phenol red



Agar miring : slant/butt
Alk / AS, H₂S, Gas



TSI

- Cek TSI setelah 18 jam dan 48 jam
 - Gluc +, Lac -, Suc -
- TSI : kuning (acid),
18 jam → Gluc + 0,1% Slant :
amino acid/ dipecah O₂
pepton + (merah),
48 jam → Slant : merah
(basa), butt : kuning (asam)



TSI

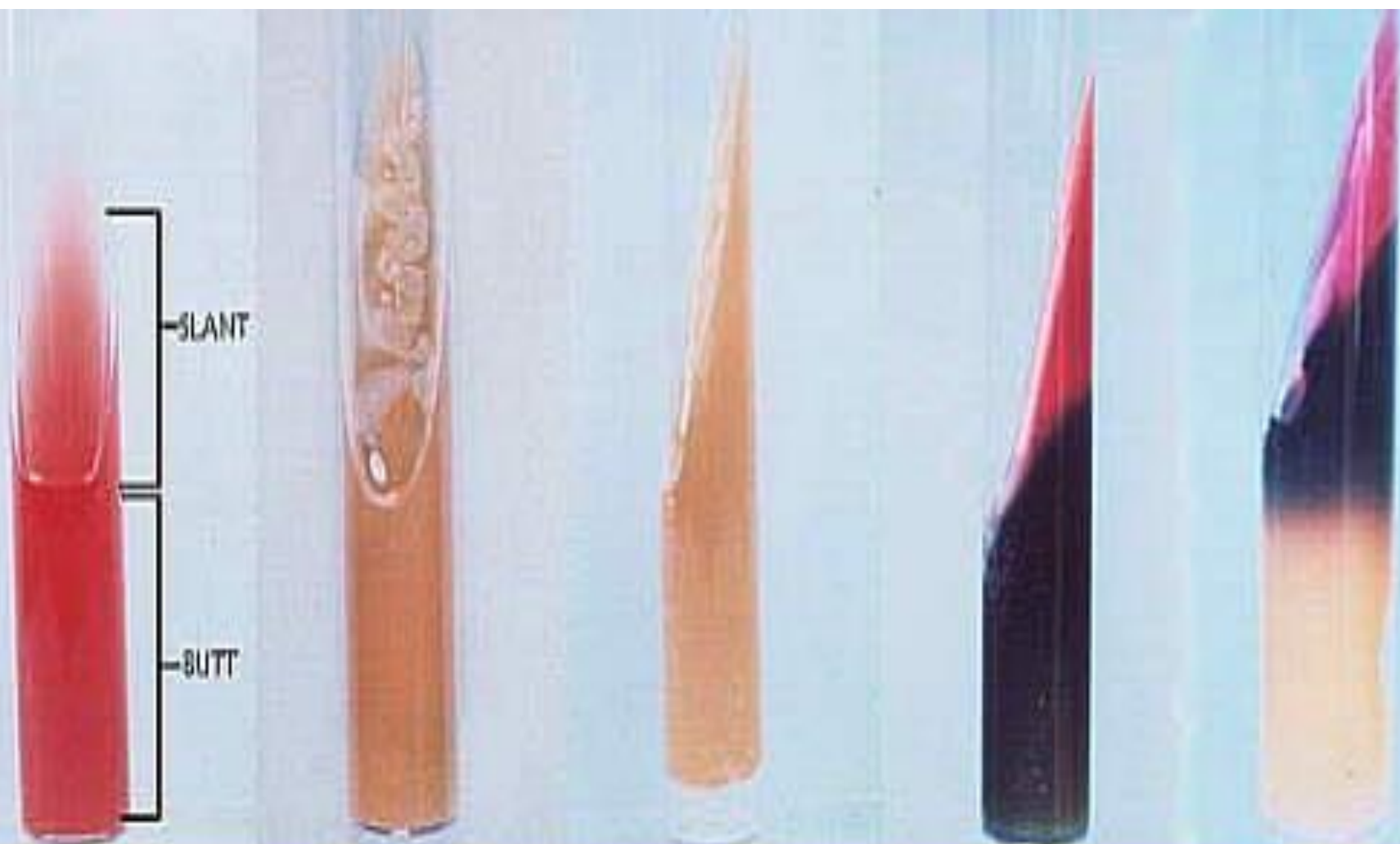
- Cek TSI setelah 18 jam dan 48 jam
 - Gluc +, Lac -, Suc +
TSI : kuning (acid),
18 jam Gluc +, Suc + Slant :
kuning,
48 jam Slant : kuning (asam),
butt : kuning (asam)



TSI

- Cek TSI setelah 18 jam dan 48 jam
 - Gluc -, Lac -, Suc –
TSI : tidak berwarna,
18 jam Slant : merah, butt :
tidak berwarna,
48 jam Slant : merah (basa),
butt : merah (basa)





TUBE 1

TUBE 2

TUBE 3

TUBE 4

TUBE 5

TSI



TSI Reactions of the *Enterobacteriaceae*

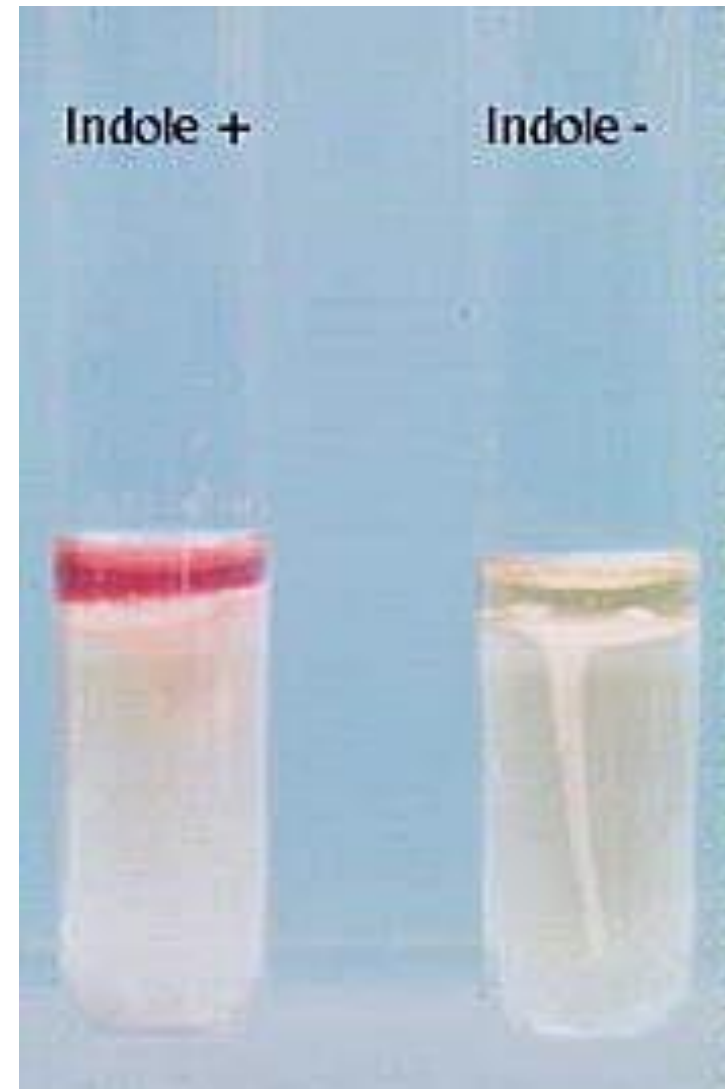
A/A + g	acid/acid plus gas (CO ₂)
A/A	acid/acid
A/A + g, H ₂ S	acid/acid plus gas, H ₂ S
Alk/A	alkaline/acid
Alk/A + g	alkaline/acid plus gas
Alk/A + g, H ₂ S	alkaline/acid plus gas, H ₂ S
Alk/A + g, H ₂ S	alkaline/acid plus gas, H ₂ S (weak)

IMViC MU

- Indole test : produksi indole dari tryptophan
- Methyl Red test : pembentukan asam pada glucose-peptone broth (acid)
- Voges-Proskauer test : sebagai sumber carbon (acetone)
- Citrate test
- Motility test
- Urease test : amonia, pH meningkat (positif : pink)

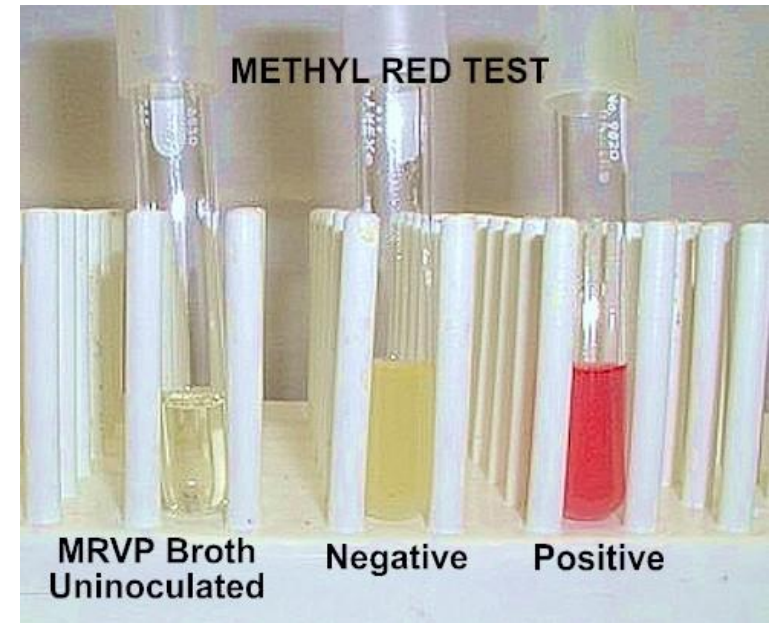
Indole test

- Bakteri produksi indole
→ pemecahan asam amino tryptophan (enzim tryptophanase) → sumber karbon
- Reagen erlich/kovak → indole bereaksi dng aldehyde → cincin merah (lapisan alcohol)



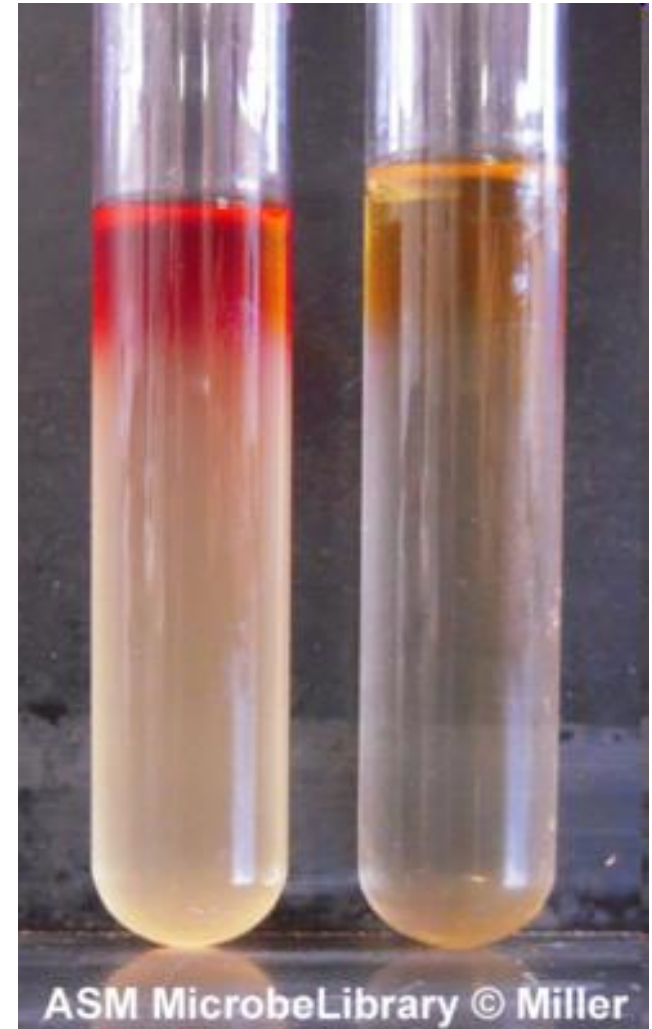
Methyl Red test

- Bakteri memproduksi dan menstabilkan asam dari proses fermentasi glukosa
- Inokulasi medium glucose phosphate broth → inkubasi 37°C (48jam) → 5 tetes reagen MR → pH asam (4,4) → merah



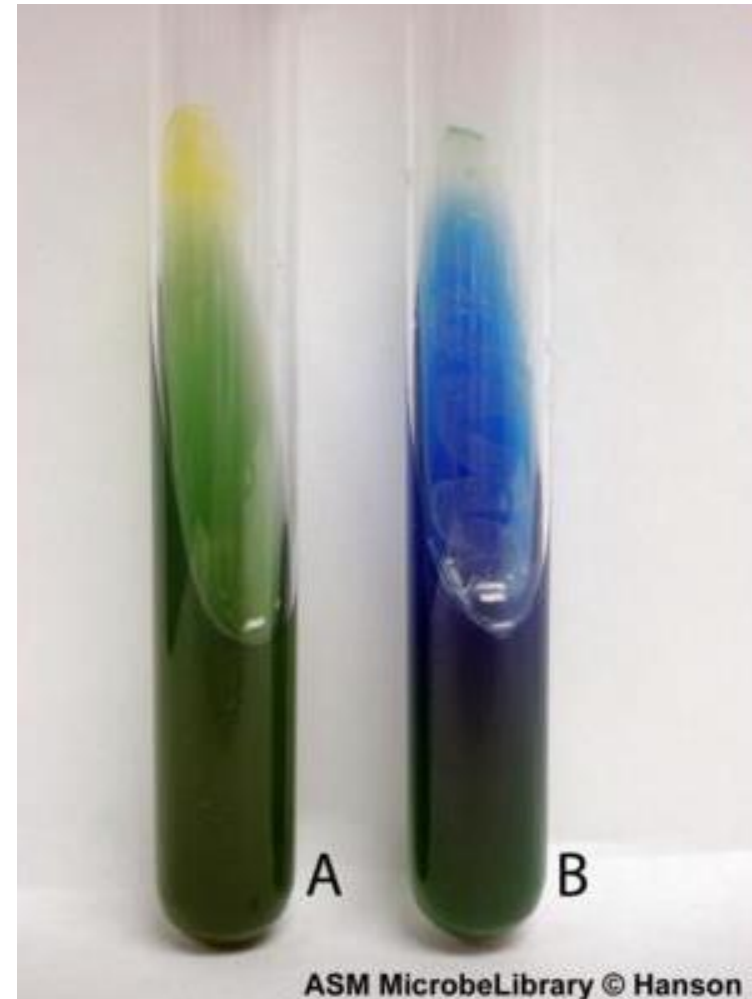
Voges-Proskauer test

- Bakteri memproduksi butylene glycol → acetyl-methyl carbinol (acetoin) → KOH → diacetyl bereaksi guanidine → alpha-naphtol → merah
- Inokulasi medium glucose peptone broth → inkubasi 37°C (48jam) → 0,6ml alpha-naphtol + 0,2ml KOH 40% → diacetyl → merah



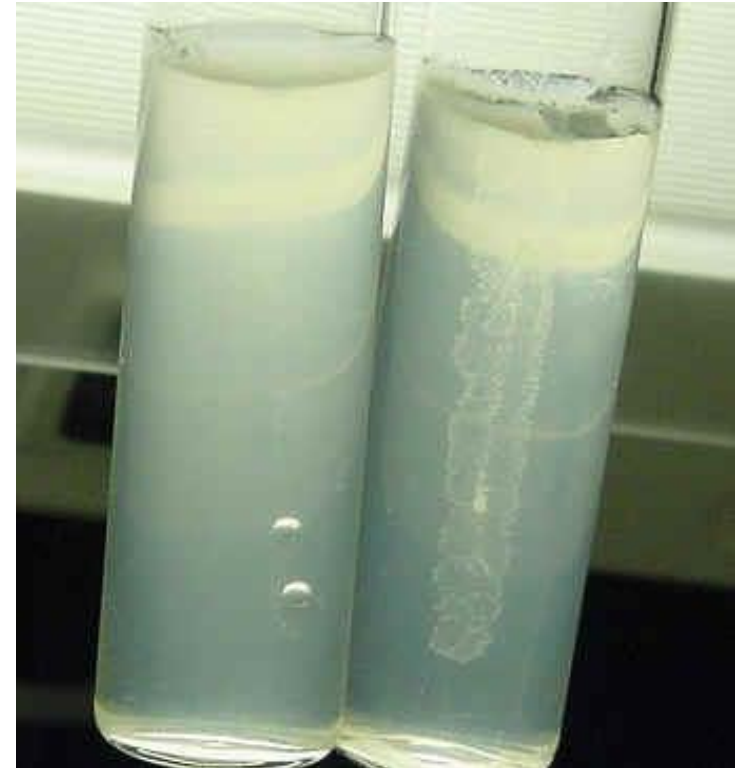
Citrate Test

- Bakteri menggunakan citrate (sumber karbon & energy) → enzim citritase → oxaloacetate dan acetat → piruvat & CO₂ → Na₂CO₃ & pemanfaatan NH₃ dari natrium sitrat dan ammonium garam → pH basa
- Inokulasi medium simmon citrat agar → inkubasi 37°C (24jam) → biru



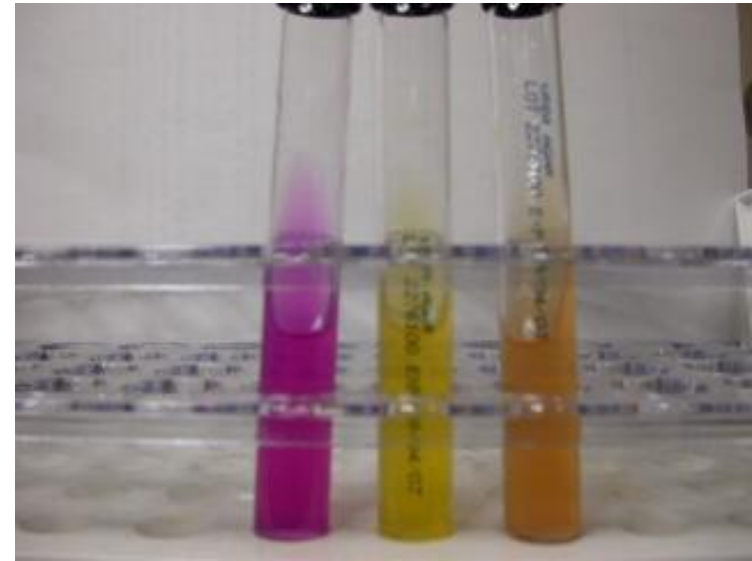
Motilitas test

- Bakteri memiliki flagela
- Inokulasi media semi solid: motilitas omitin (MO) atau sulfide indol motility (SIM) → penyebaran warna putih (tes indol dan H₂S)



Urease test

- Bakteri mempunyai enzim urease → urea menjadi amoniak
- Inokulasi medium urea indicator phenol red → pink/merah jambu



Enterobacteriaceae . Salmonella

- Key biochemical tests are
 - Catalase +, Oxidase -, Glucose +
 - Non-Lactose Fermenting colonies: McConkey's agar
 - TSI:
 - K / A, gas, H₂S (*S. typhi* produces a little H₂S, and no gas)

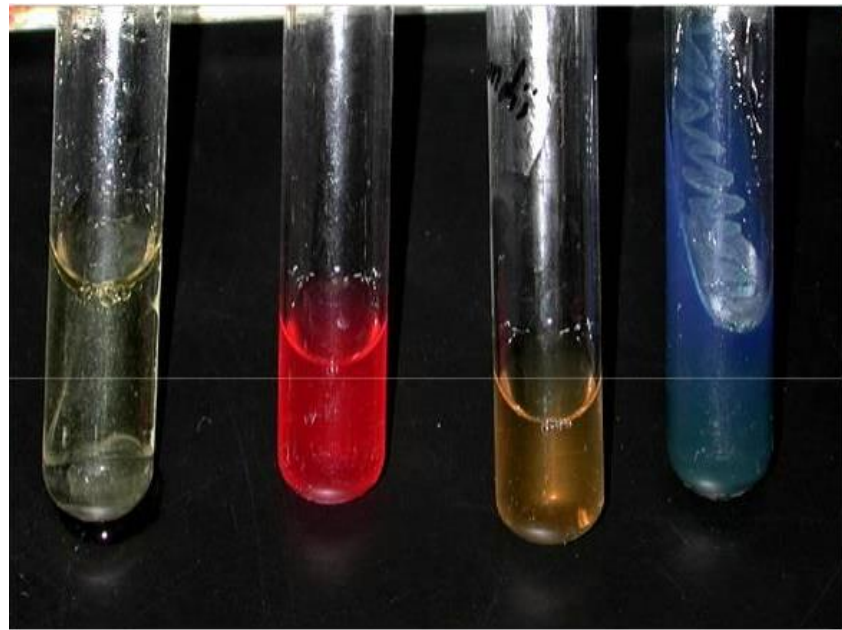


Enterobacteriaceae . Salmonella

- Key biochemical tests are

- IMViCMU

- Indole test negative
- Methyl Red positive
- Voges-Proskauer negative
- Citrate positive
- Motile
- Urease negative



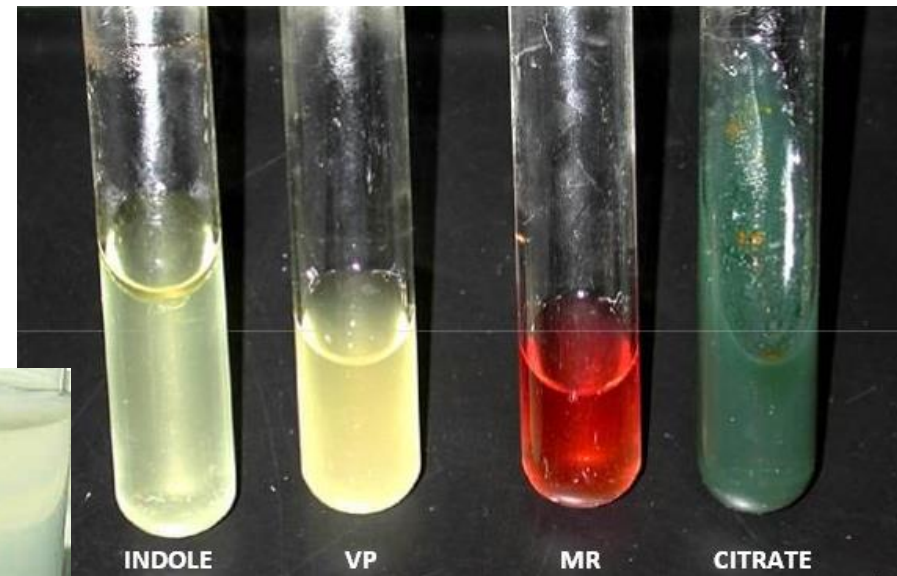
Enterobacteriaceae : Shigella

- Key biochemical tests are
 - Catalase +, Oxidase -, Glucose +
 - Non-Lactose fermenting colonies (*S. sonnei* is slow lactose fermenter)
- TSI:
 - K / A no gas, no H₂S



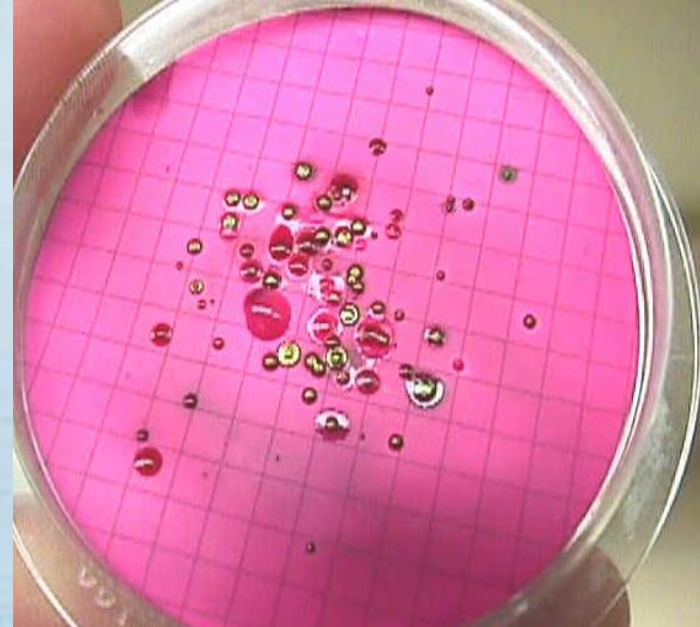
Enterobacteriaceae : Shigella

- Key biochemical tests are
 - IMViCMU
 - Indole test negative
 - Methyl Red positive
 - Voges-Proskauer negative
 - Citrate negative
 - Non motile
 - Urease negative



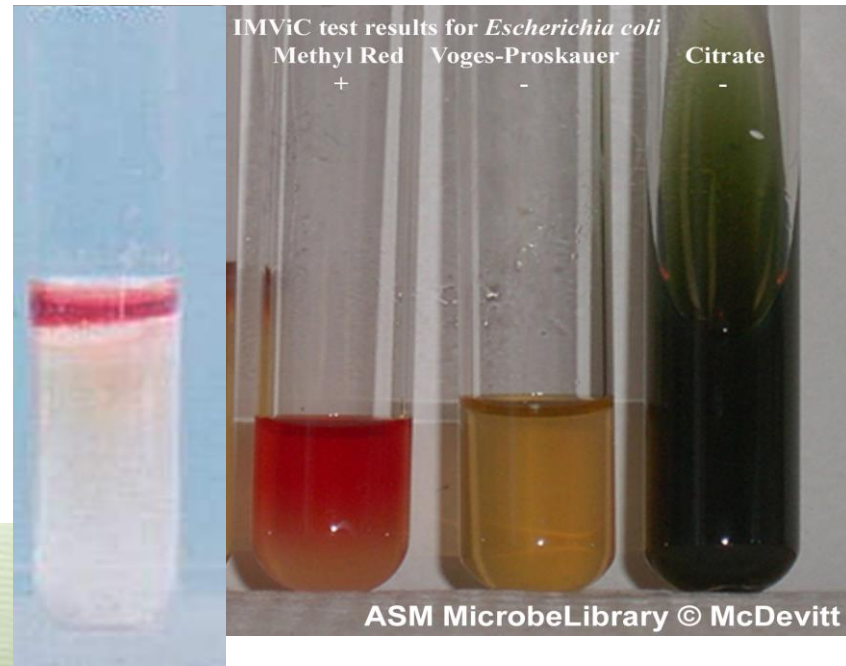
Enterobacteriaceae : E.coli

- Key biochemical tests are
 - Catalase +, Oxidase -,
Glucose +
 - Lactose fermenting colonies
 - TSI:
 - A / A, gas, no H₂S



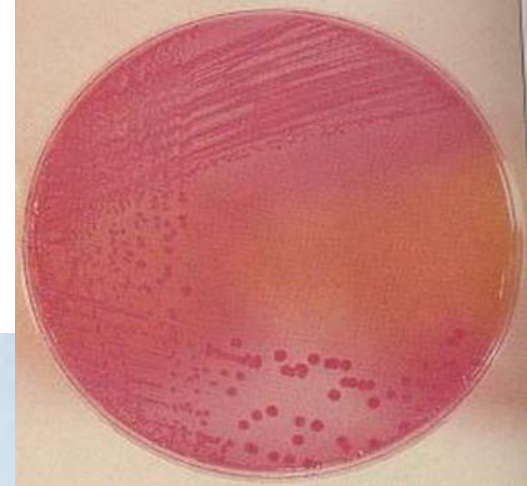
Enterobacteriaceae : E.coli

- Key biochemical tests are
 - IMViCMU
 - Indole test positive
 - Methyl Red positive
 - Voges-Proskauer negative
 - Citrate negative
 - Motile
 - Urease negative



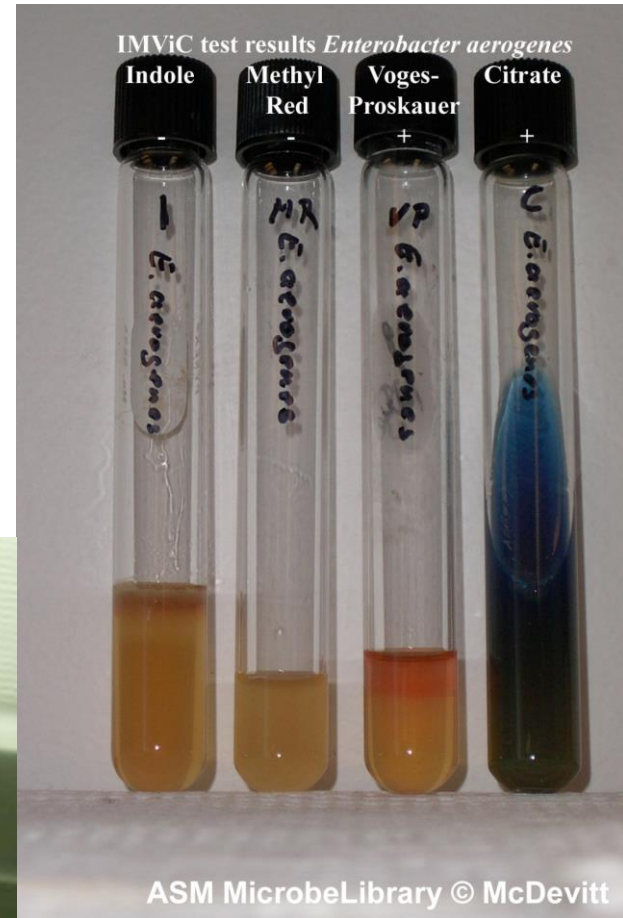
Enterobacteriaceae : Enterobacter

- Key biochemical tests are
 - Catalase +, Oxidase -, Glucose +
 - Lactose fermenting colonies
 - TSI:
 - A / A, gas, no H₂S



Enterobacteriaceae : Enterobacter

- Key biochemical tests are
 - IMViCMU
 - Indole test negative
 - Methyl Red negative
 - Voges-Proskauer positive
 - Citrate positive
 - Motile
 - Urease negative

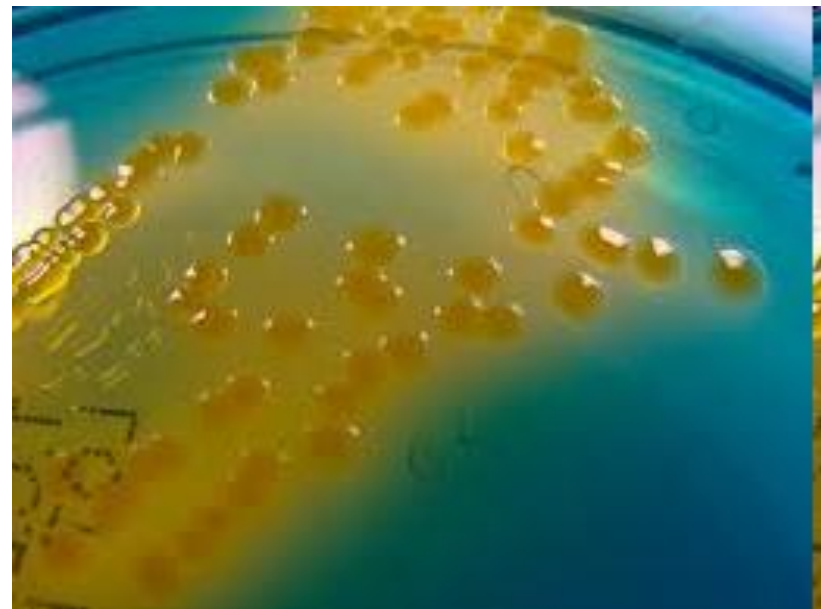
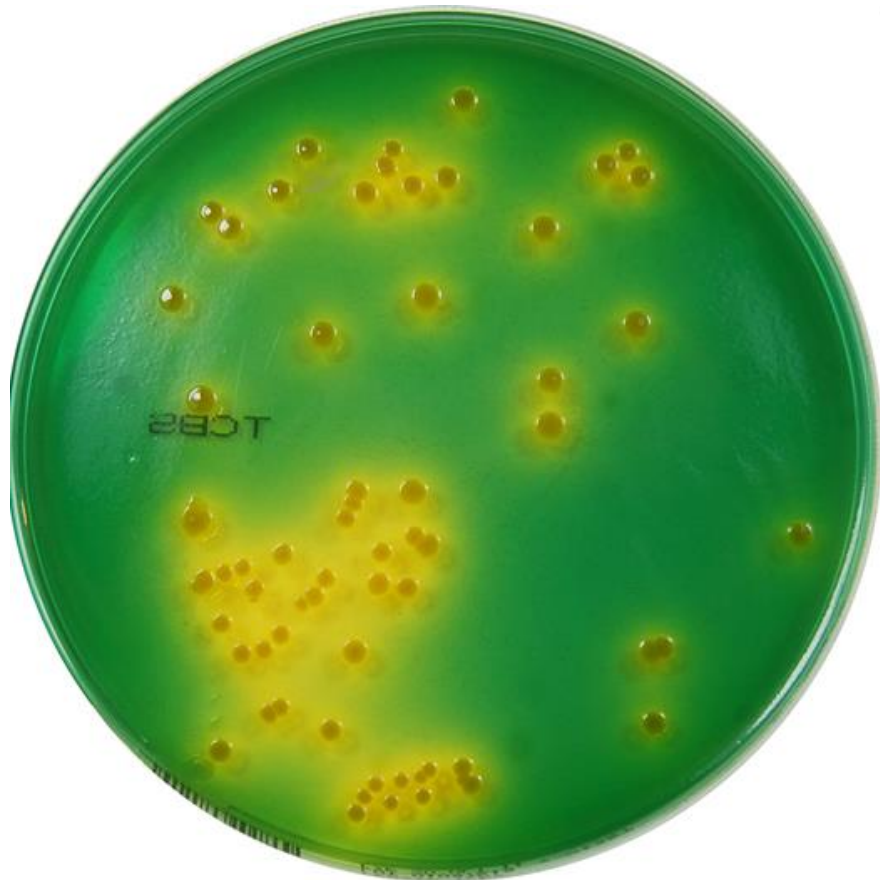


Organism	TSI	H2S	IND	MR	VP	CIT	URE	MOT
<i>Enterobacter</i> spp	A / A, gas	-	-	-	+	+	-	+
<i>Escherichia coli</i>	A / A, gas	-	+	+	-	-	-	+
<i>Klebsiella pneumoniae</i>	A / A, gas	-	-	-	+	+	d	-
<i>Salmonella paratyphi</i> B	K / A, gas	+	-	+	-	+	-	+
<i>Salmonella typhi</i>	K / A	w	-	+	-	-	-	+
<i>Shigella sonnei</i>	K or A / A	-	-	+	-	-	-	-
Other <i>Shigella</i> spp.	K / A	-	-	+	-	-	-	-

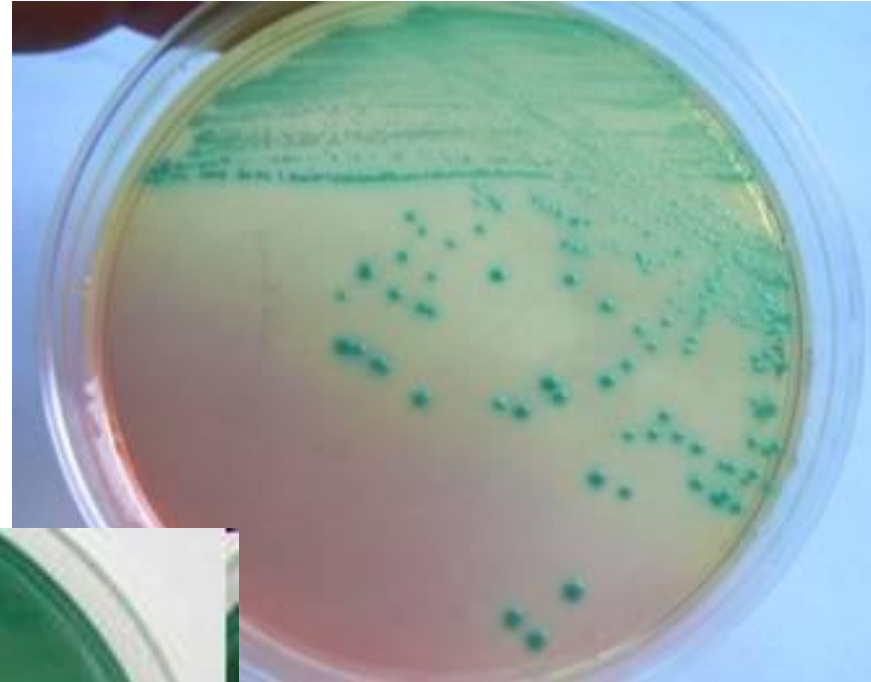
Vibrio parahaemolyticus



Vibrio cholerae



Pseudomonas aeruginosa



Mueller Hinton Ag

tenmakash