



Taxonomy (L4)

Done by:

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استعن بالله ولا تعجز

Bacterial taxonomy rank

Kingdom

Division **Keep Dishes Clean Or Family Gets Sick Soon**

Class

Order

Family

Genus

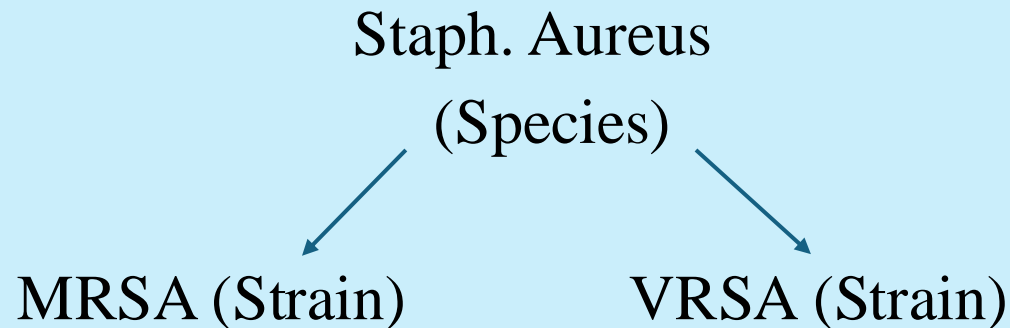
Species(group of strains sharing many properties)

Strains

How to know if these strains are within the same species ?

(DNA homology $\geq 70\%$)
(16S rRNA $>97\%$ identical)

- Ex:

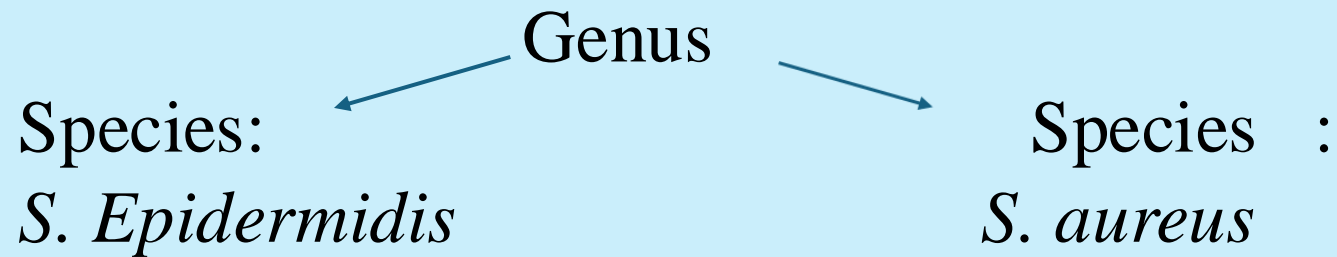


| | |
|---------|--------------------|
| Domain | -Bacteria |
| Kingdom | -Eubacteria |
| Phylum | -Firmicutes |
| Class | -Bacilli |
| Order | -Bacillales |
| Family | -Staphylococcaceae |
| Genus | -Staphylococcus |
| Species | -S.aureus |

How to know if these species are within the same genus ?

DNA < 93% new genus

Ex :



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* Naming:

→ capital
Example
↓
Genus

small letter
example
↳ species

option 2 →

Short form.
↓
E. example

Should be in italic

Shape classification :

- 1) Cocci (كروي) (see slide 7)
- 2) Bacilli (rod) (see slides 8 and 9)
- 3) Spiral (حلزوني)

Examples : Treponema, Borrelia and Leptospira

- 4) Miscellaneous (more than 1 shape)

Examples: Mycoplasma, Chlamydia, Rickettsia, Coxiella and Actinomyces

Note: Miscellaneous group →

- 1) Have no cell wall
- 2) Is not stained by gram
- 3) Must be intracellular

Scheme of medical bacteria

Cocci

Gram stain

Positive

Negative

Cluster

Chain or Pairs

Pairs

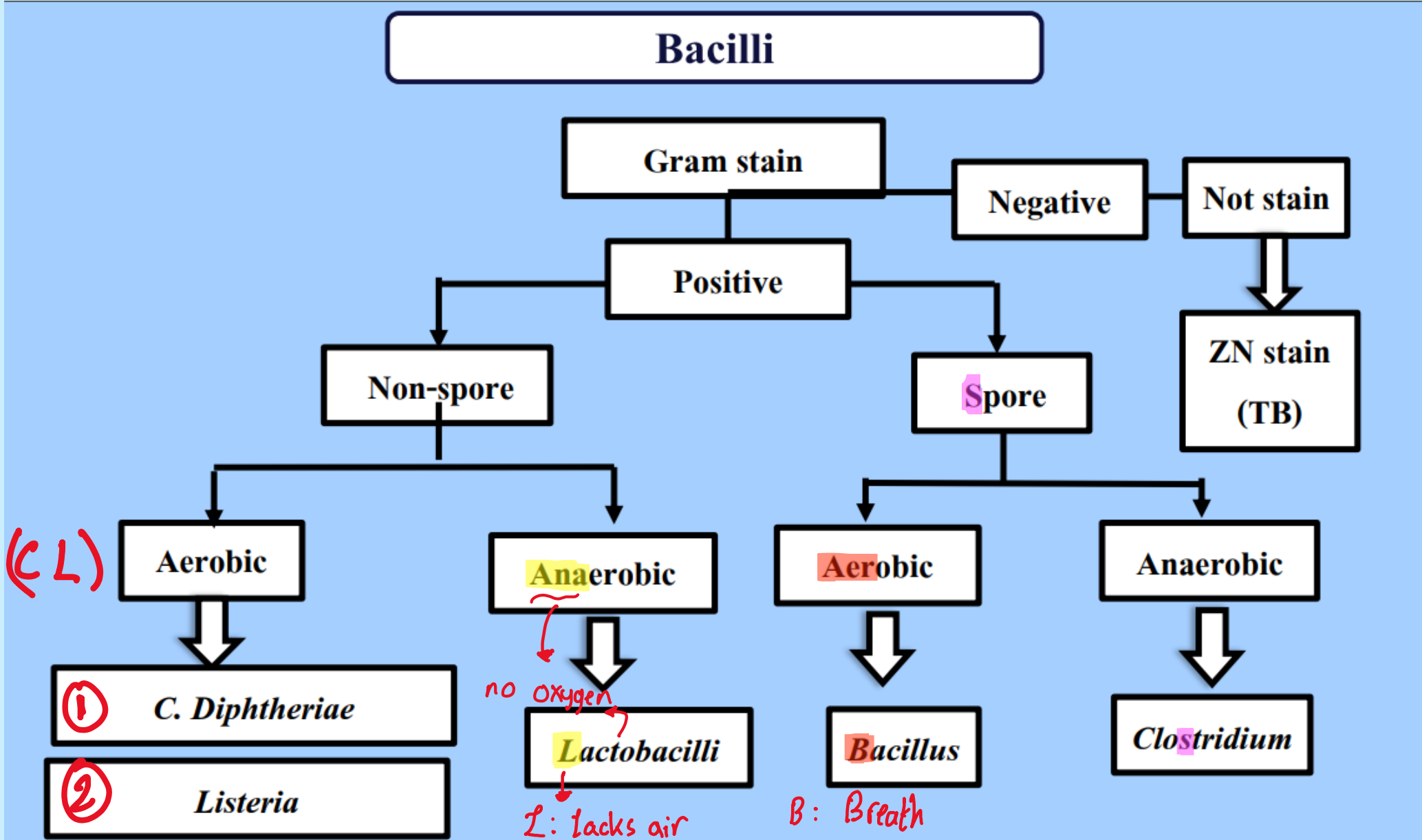
Staphylococci

Streptococci

Enterococcus

Neisseria
(*Diplococci*)

the only medically important



Gram negative bacilli

Enterobacteriaceae

Vibrio

Campylobacter

Helicobacter

Pseudomonas

Haemophilus

Bordetella

Brucella

Legionella

Gram -ve anaerobes

Biochemical Reactions

4) Citrate utilization test

Citrate (in medium) with bromothymol Blue. (Green)

bacteria → CO_2 → Reacts with sodium → Sodium carbonate → alkaline; Blue.

5) Urease test

Urea (in medium) with urease → ammonia (Alkaline; Pink)

↳ slightly acidic to neutral with phenol Red indicator.

6) TSI; triple sugar iron

Gelatinous med. → 0.1 GIU ↓ 1% sucrose ↓ 1% lactose ↓ serious sulfate

① glucose → Produces Acid Phenol Red → yellow.

② Lactose/sucrose → Produces Acid yellow

iP (1+2) → A/A (yellow over yellow)

iP (1 and not 2) → K/A (Red over yellow)

iP (neither) → K/K (Red medium)

Catalase test:

Adding of H_2O_2 → production of gas by catalase enzyme

Differentiate: staphylococci (positive) vs streptococci (negative)

Coagulase test:

Conversion of fibrinogen to fibrin by coagulase enzyme

Differentiate: Staphylococcus aureus (positive) vs staphylococci (negative)

Detected by slide or test tube method

Oxidase test:

Adding of oxidase reagent → deep purple indicates oxidase enzyme

Differentiate: Enterobacteriaceae (negative) vs pseudomonas (positive)

1) Indole test

tryptophan (in medium) with Kovac's Reagent → bacteria → Still tryptophan (indole (-ve) bacteria)

bacteria [have tryptophanase] → broken down (Red) (no tryptophan) (indole (+ve) bacteria)

2) Methyl red test (MR)

Glucose → Fermentation → Acids (Acetic, Lactic and succinic) MR+, RED

no fermentation → no Acids ↑ PH MR-, yellow

using Methyl red indicator

3) Voges-Proskauer test (V.P)

Glucose → Fermentates by bacteria → Acetoin → α-naphthol 40% / 10% → Diacetyl (Red) (VP (+ve))

no fermentation → VP (-ve) Bacteria (But MR (+ve))

* sulfur → Reduction by bacteria → H_2S ↓ Fe → Ferric sulfide (Black medium)

↳ the medium doesn't only have sugars, but also iron and sulfur.

7) Phenylalanine deaminase

Phenylalanine (in medium) with (Phe-) deaminase → bacteria → Phenylpyruvic acid + NH_3 → Ferric chloride → Green color.

8) Ornithine decarboxylase

ornithine (in medium) → bacteria with ornithine decarboxylase → Purple

P. rettgeri (-ve) & M. morganii (+ve)

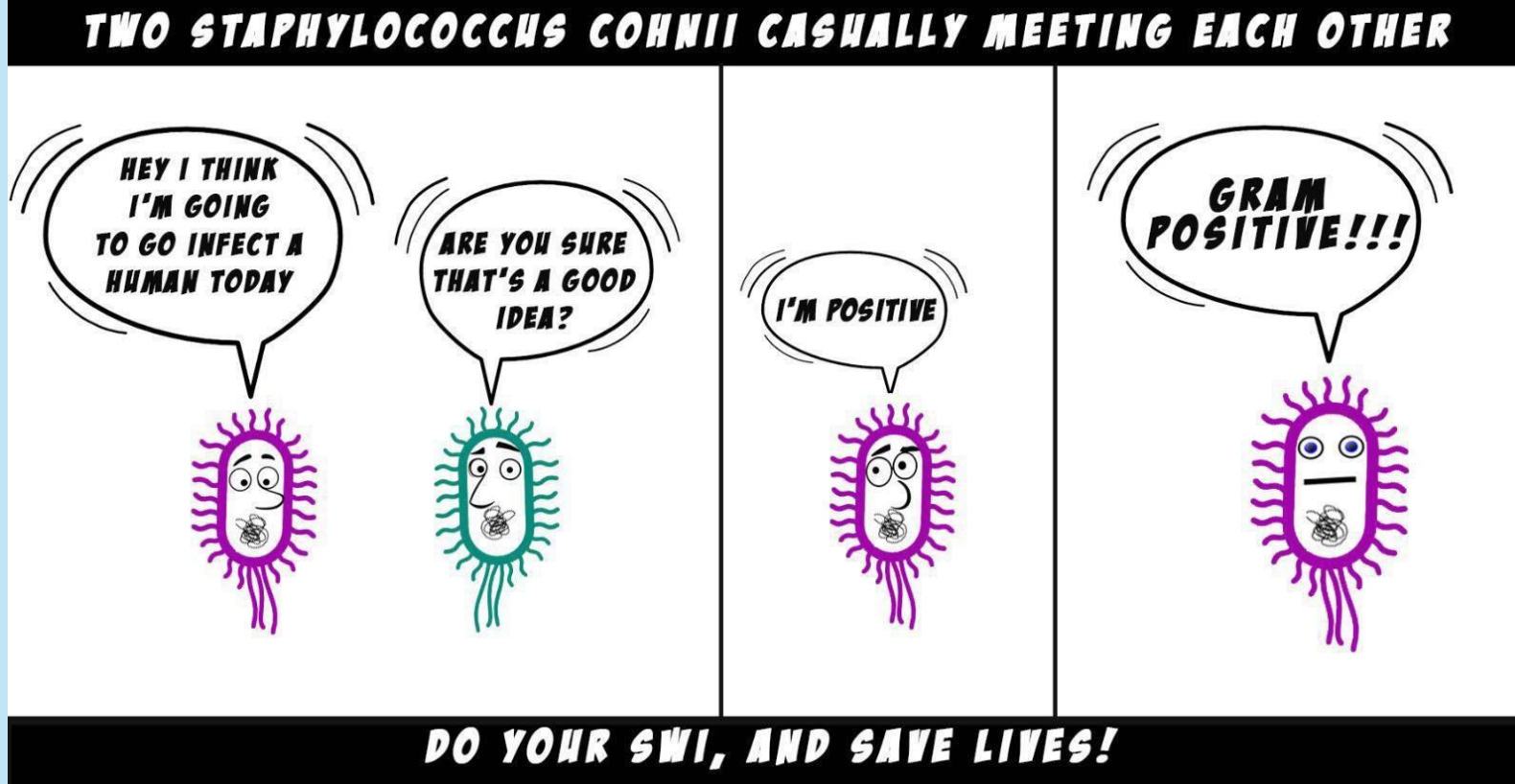
9) The analytical profile index (API)

Biochemical tests for identification.

Summary

- Kavoc's Reagent: **red** when tryptophan is degraded.
- Methyl red indicator: **red** at low PH (<4) and **yellow** at high PH (6).
- Bromothylone blue: **green** at low PH and **blue** at high PH (Alkaline).
- Phenol red indecator: **yellow** at acidic PH (= 6) and **pink** when alkaline (PH= 8).
- Ferric sulfide: causes **black** colorization
- Phenyl pyrovic acid: causes **green** colorization
- Bromocresol purple indicator: colored **purple** when orthinine is decarboxylated.
- The reaction Phenylalanine deaminase : Distinguishes Proteus from Salmonella & Shigella- they lack the enzyme.
- **Oxidase** test: distinguishes **Enterobacteriaceae** (negative) from **pseudomonas**(positive)
- **Catalase** test: distinguishes **staphylococci** (positive) from **streptococci**(negative).
- **Coagulase** test: distinguishes **Staphylococcus aureus**(positive) vs **staphylococci**(negative).

- الأهداف الكبيرة تحتاج إلى عزيمة أكبر، ولا أحد يستطيع إيقافك سوى نفسك
- ثابر وتجاوز الصعوبات لتصل إلى ما تستحقه



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