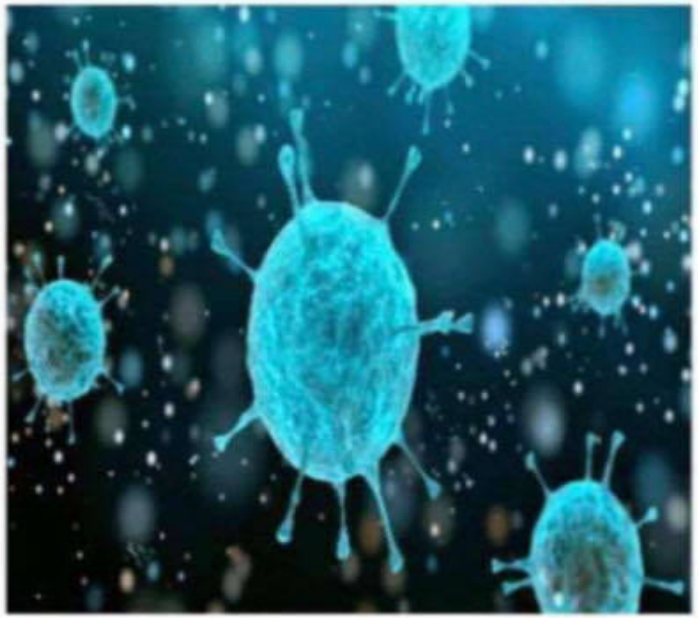
Lecture 6

Second Year

Passion Batch



MICROBIOLOGY

Salam abu shanab

Sawsan Radi

Oncogenic Viruses

- Viruses that cause cancer are called oncogenic viruses or oncoviruses

- Viruses were shown to be the cause of various types of cancers in rodents, frogs, and cats.

أهم انواع الـ oncogenic viruses

- Epstein–Barr virus = nasopharyngeal carcinoma, Burkitt lymphoma, and B-cell lymphoma

- Human papillomaviruses (HPV) = cancers of the cervix and other parts of the genital tract.

**هذا الفايروس genetical tract virus
**مرتبط بشكل رئيسي بـ cervix cancer

مشكلة الـ HPV انه Silence (noSymptoms)
وهو sexually transmitted virus

Human Immunodeficiency Virus

- HIV is an enveloped, single-stranded RNA virus.

هذا الفايروس محتل مركز المقدمة في الاهتمام بالـ priorities
في الـviruses ، لإنه still without treatment .

- It is a member of a genus of viruses called lentiviruses, in a family of viruses called Retroviridae (retroviruses)

كل الدراسات والابحاث التي تعمل على HIV
Still under trying

- AIDS is caused by HIV.

Mimivirus and Megavirus

- An extremely large double-stranded DNA virus can be observed using a standard compound light microscope called Mimivirus, was recovered from amebas.

- The virus was given the name Mimivirus because it "mimics" bacteria

Minivirus ➡ similarity with bacteria الاسم جاي من الـ
This virus is very similar to bacteria ➡ Mimic bacteria

- Mimivirus may be the cause of some cases of human pneumonia

*Normally size of virus doesn't exceed 300nm, But some viruses (exception cases) can exceed this number and reach more than that .

**Megavirus ➡️ Large virus known ever (huge virus)

- Megavirus chilensis, although it is most often referred to simply as Megavirus.

Recently discover , one of the largest virus known discovered in the cost of chili لإنه Chili من الاسم جاي

- Discovered in 2010 off the coast of Chile
- Its genome is larger than that of some bacteria.
- Megavirus was isolated in a French laboratory by co-cultivation with amebas.
- Its natural host is not known.

Megavirus associated with clinical case in respiratory tract called ➡️ Pneumonia

Plant Viruses

- More than 1,000 different viruses cause plant diseases
- Plant viruses are usually transmitted via insects mites; nematodes (round worms); and contaminated tools .
- These diseases result in huge economic losses, estimated to be billions of dollars per year worldwide

We talked specifically about the negative economically effect of the viruses

Plant viruses ➡️ مشاكل في الانتاج النباتي ➡️ very low production

هل ينتقل virus من الـ plants للـ humans ؟
This is not proved

Viroids and Prions

- Viroids are infectious RNA molecules that cause a variety of plant diseases.

Viroids : a small number of nucleotide but they are (مع انهم صغار) make disease

- Viroids consist of short, naked fragments of single-stranded RNA (about 300–400 nucleotides)

Protein-particle ,small piece of the protein , can cause a serious disease.
Viroids cause a disease
Prions cause a serious disease .

- Prions are infectious protein molecules that cause a variety of animal and human diseases.

الامراض الي بسببها الـ prions مرتبطة بـCentral nervous system

- Prions are small infectious proteins cause fatal neurological diseases in animals, such as scrapie in sheep and goats; bovine spongiform encephalopathy

Scrapie : like Parkinson's Disease but in animals , but the same symptoms
الحيوان بصيبو رعاش

- In humans, kuru, Creutzfeldt–Jakob (C–J) disease, Gerstmann–Sträussler–Scheinker (GSS) disease, and fatal familial insomnia.

بأدي بالنهاية الى مشاكل في الـ memory and orientation
ما في قدرة على الـ control في الحركة
وهذه الامراض موجوده عادة في كبار السن بصير عندهم الزهايمر والـ باركنسون

- Kuru, C–J, and GSS diseases involve loss of coordination and dementia.

- Dementia, a general mental deterioration, is characterized by disorientation and impaired memory, judgment, and intellect.

- The 1997 Nobel Prize for Physiology or Medicine was awarded to Stanley B. Prusiner, the scientist who coined the term prion and studied the role of these proteinaceous infectious particles in disease

Prions : Causative agent of major disease

- Possible relationships between prions and Alzheimer disease, Parkinson disease, Huntington disease, amyotrophic lateral sclerosis (ALS), some types of cancer, and type II diabetes

من الأمراض الشائعة اللي كثير بنصاب فيها الناس وسببها ممكن يكون prions مرتبط بالـ (مرض السكري) ، رغم انه small protein ولكن

➡️ Can cause a serious threat of the human health

Bacteria

Most important human disease causative an agent

- Bacteria are divided into three phenotypic categories (i.e., categories based on their physical characteristics):

According to shape

(a) Gram-negative

(b) Gram-positive

(c) Cell walless

كلها مرتبطة بالـ gram
reaction of bacteria

Depending on the structure of the cell wall

Cell Morphology

- The size, shape, and morphologic arrangement of various bacteria are easily observed using compound light microscope.

Microbiology we used the two major characteristic of the bacteria as a close of a classification of the bacteria : 1-shape , 2-arrangement of the cell .

- Bacteria vary in size from 0.1 µm in diameter to 10.0-µm-long spiral-shaped bacteria, to even longer filamentous bacteria.

- A bacterium's Gram reaction (Gram positive or Gram negative)

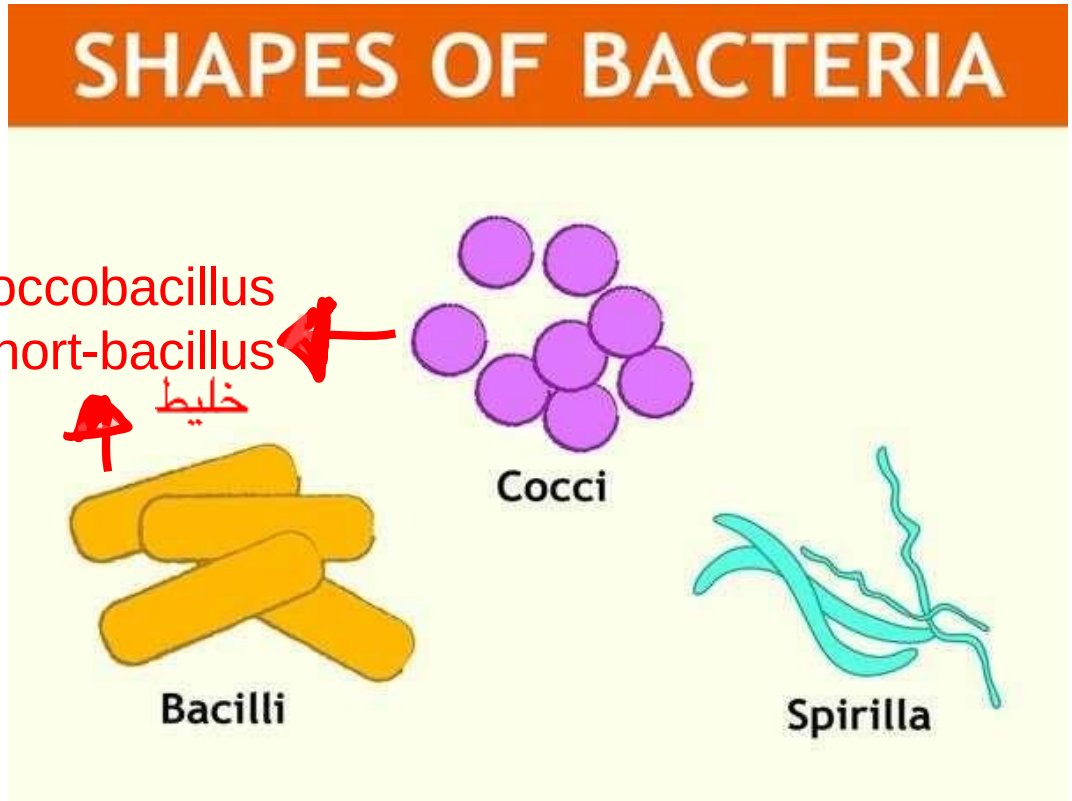
- Basic cell shape, and morphological arrangement of the cells are very important clues to the organism's identification.

The shape of the bacteria divide into three major types or categories of shapes : 1- cocci ,2-bacilli ,3-spiral

- The three general shapes of bacteria are round (cocci), rod-shaped (bacilli), and spiral-shaped.

The major but not only shapes of bacteria
في اشكال اخرى جاية بين الثنين او الثلاثة .

Curved خلية شكلها
Cup خليه شكلها
Thread خلية



- Bacteria reproduce by binary fission.

- Generation time= The time it takes for one bacterial cell to split into two

Shape is cocci but arrangement can be different :

- Cocci may be seen singly or in pairs (diplococci), chains (streptococci), clusters (staphylococci), packets of four (tetrads), or packets of eight (octads),

  ↳ Number of cell attach together حسب

- Cell wall–deficient (CWD) bacteria or L-forms.

- Some CWD bacteria revert to their original shape

- Pleomorphic.

الـ gram negative و cocci diplococci فقط بالـ
neisseria الـ بكتيريا انه اشخص بقدر gram stain

اذا اخذنا من مريض عينه اعملنا smear ⬅️ و we stain it with gram stain ⬅️ وشفنا gram
هاد بكون ⬅️ negative diplococci inside polymorphonuclear cell in WBC
Diagnostic

وهذا بينطبق على كل انواع الاخرى من البكتيريا بقدر اشخصها من gram stain only .

مثلا:
بتعمل الـ acid fast stain in 10 Minutes ⬅️ ال هيه gram negative Bacteria ⬅️
وبكون this is tuberculoses micro-bacterium ⬅️ ومنه this Patient has TB

طبعًا بالاضافة لبعض المعلومات المساعدة يعني من ناحية الـ history ,
انت كطبيب لما يدخل عندك مريض بتاخد منه تاريخو المرضي بعض الـ Physical and clinical
يعني الـ characteristic Sign and symptoms الموجوده ، الـ Clinical picture , عندو حرارة
عندو wight lost عندو Anson مع الـ gram stain
(((This is Confirmatory)))

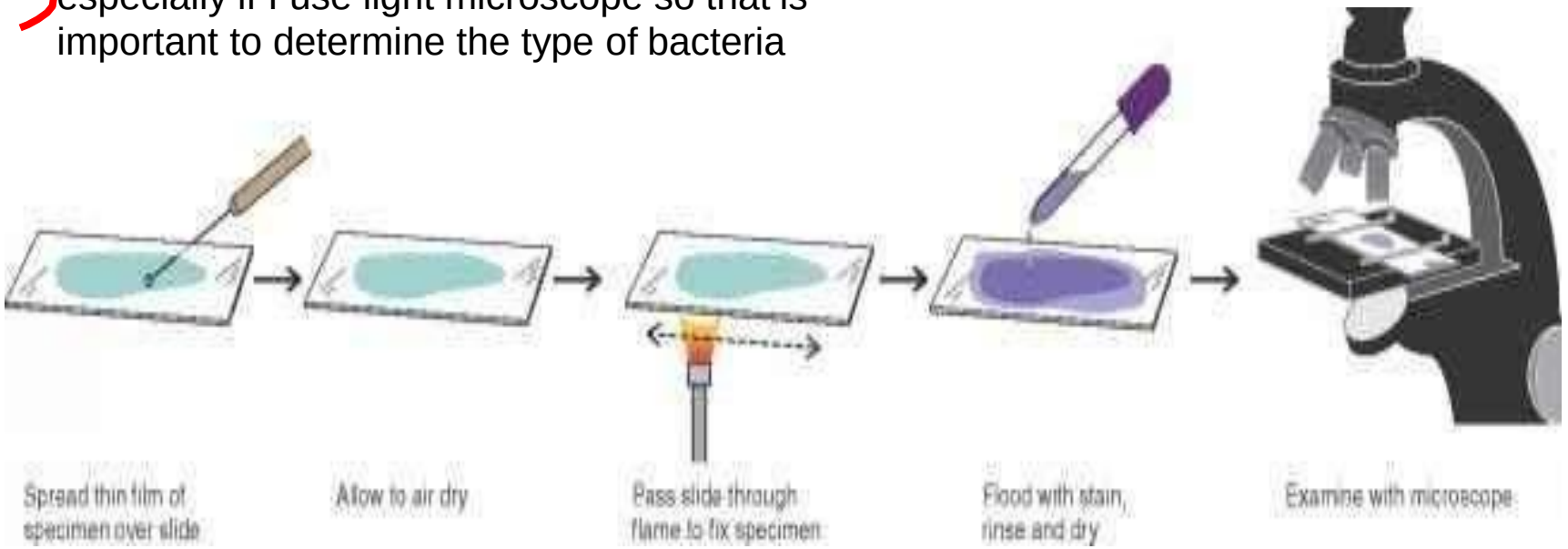
المواصفة المهمه الاخرى هي الـ cell wall deficient : عدم وجود cell wall بالبكتيريا
بعطيهاا صفة مهمه جدًا بنسميها الـ Elasticity ,, بتكون البكتيريا فيها مرونه اذًا بطلع منها
اشكال مختلفة this is what we call the pleomorphic
هاي البكتيريا ممكن تظهر بعدة اشكال ،، نفس البكتيريامرة cocci ومرة bacillus ومرة
cup ،، بتعتمد على الـ environment .

Staining Procedures

Most bacteria are colorless, transparent, and difficult to see

* اهم خطوه في ال staining هي fixation

And that's why we do staining to the cell especially if I use light microscope so that is important to determine the type of bacteria



* without fixation the smear will be split of the slide after washing

- Fixation serves three purposes:

1. It kills the organisms.
2. It preserves their morphology.
3. It anchors the smear to the slide.

*we take the bacteria and spread it in the slide and then fixed it by heat to kill the organism

وهذا مهم اثناء التعامل مع pathogens في التعامل معها وهي على قيد الحياه قد يكون خطيرا جدا

We have many types of stains:

- A simple stain is sufficient to determine bacterial shape and morphologic arrangement(have one color)

  اذا عندي بكتيريا مرتبة ب cocci أو cluster

- The procedures used to observe bacterial capsules, spores, and flagella are collectively referred to as structural staining procedures. لكلّ شيء صبغة معينة

- The Gram and acid-fast staining procedures are referred to as differential staining procedures

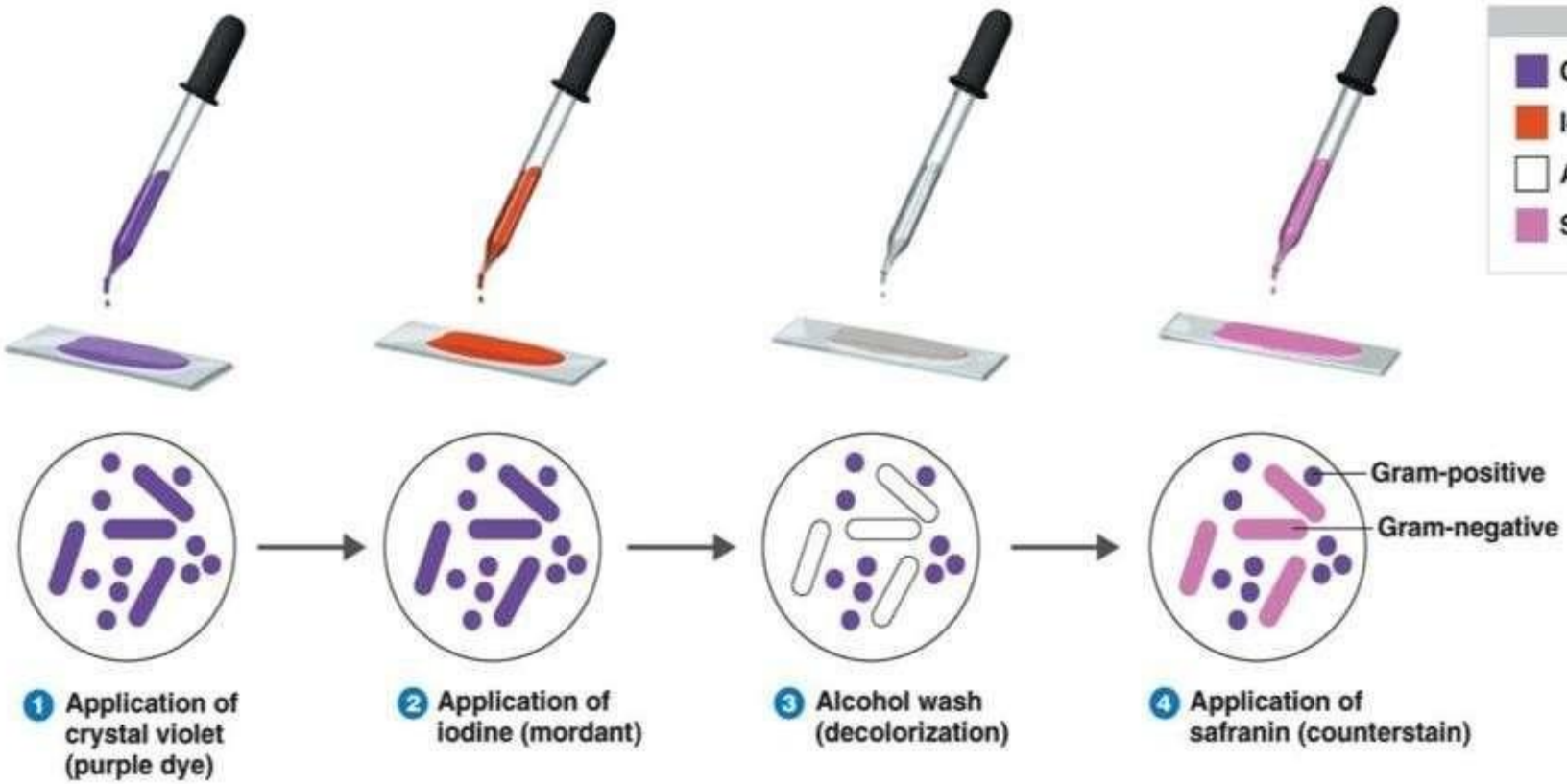
- The Gram stain differentiates between "Gram positive" and "Gram-negative" bacteria Also we have two stains: primary and secondary

- Gram-positive

- Gram-negative

***ممكن تكون الباكتيريا gram_variable
لأنه ال cell wall الها
is different (has mycolic acid)
او بسبب ال aging (يعني عمرها أكثر من ٢٤ ساعة)... فلو
أخدنا باكتيريا صارلها ٤٨ ساعة مزروعة في ال culture
حتكون gram_variable

- Gram-variable bacteria = M. tuberculosis and M. leprae
We have to use a fresh culture to be able to decide if the bacteria is a gram positive or negative


KEY
Crystal violet
Iodine
Alcohol
Safranin
Gram-positive
Gram-negative
1 Application of crystal violet (purple dye)
2 Application of iodine (mordant)
3 Alcohol wash (decolorization)
4 Application of safranin (counterstain)

There are 2 methods to determine motility :

1. **Semisolid agar : it is a very sensitive**
2. **Slide method:**

We put a drop of liquid with specimen and covering it by coverslip with hanging a drop.
Then we can see the bacteria moves on the drop.

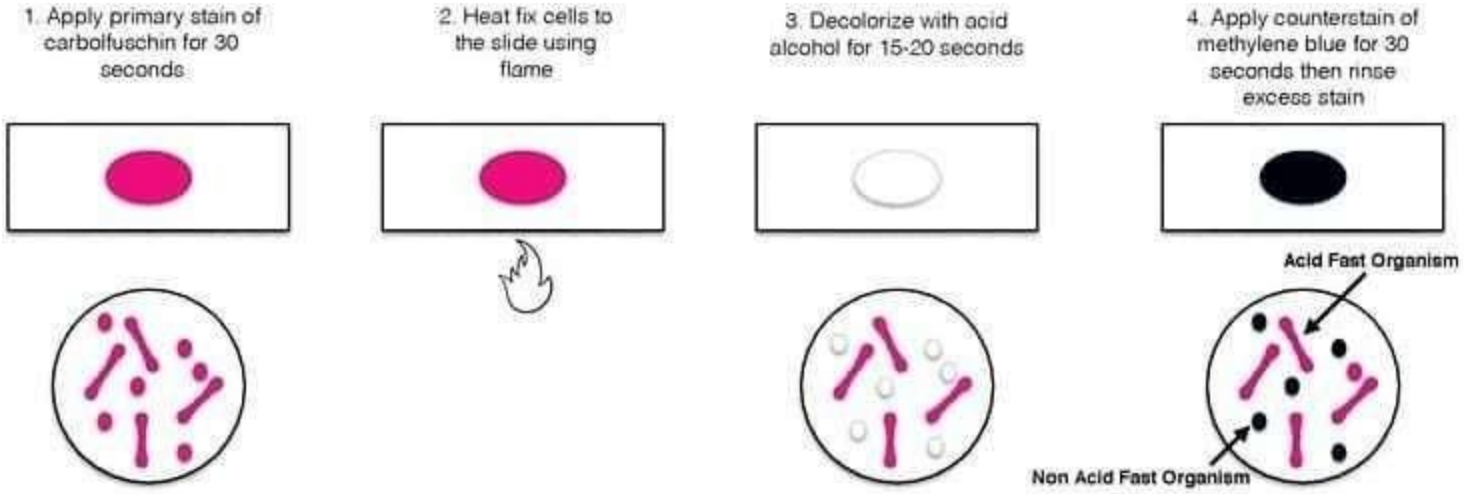
هون لازم نعتمد على النظر المباشر و لازم تضلّ متابع البكتيريا ونركّز معها لحتى تتحرك من ال start point
لل end مشان اقدر احكي عنها motile

ممكن تكون البكتيريا بتتحرك في مكانها... ..brownia motility وهون ما بنعتبرها motile لأنها بتعمل vibration مش أكثر " بتتحرك بمكانها"

- The acid-fast stain is of value in the diagnosis of tuberculosis.

  The bacteria which has mycolic acid can resist this stain, which has a 20% of the H2SO4

- Acid-fast bacteria are red at the end of the acid-fast staining procedure.



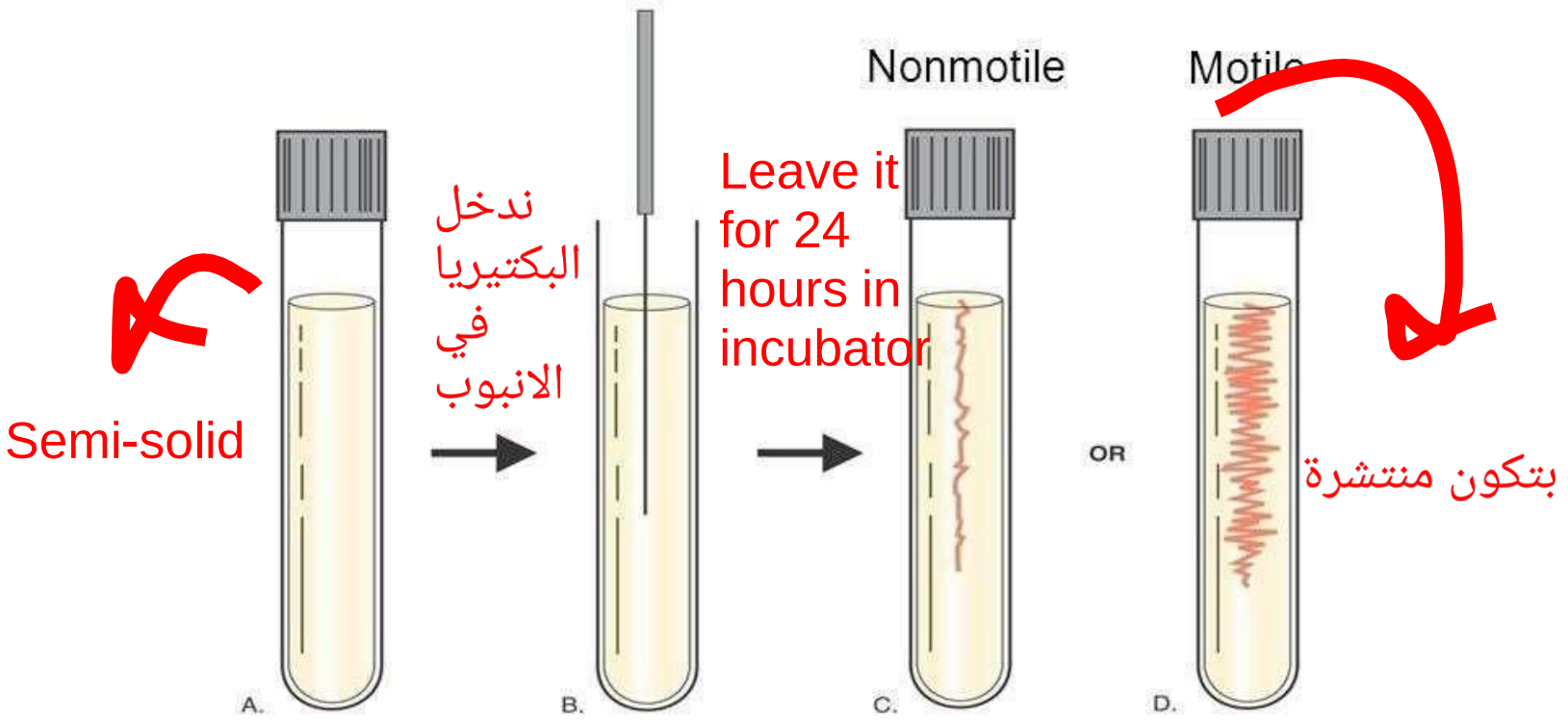
البكتيريا ممكن تكون motile او non motile

Motility

Helicobaactor pylori is fast and stronge flagella, make it has able to break through stomach Matrix which is mucus so it can reach to stomach wall and attach to it causing disease

- Motile bacteria = Swim
  = more pathogenic.. " لانها بتحتاج تتحرّك لحتى تعمل غزو..
- Bacterial motility = flagella or axial filaments
  سرعة البكتيريا وقوة ال flagella بتزيد ال pathogenecity
- Gliding motility = No flagella
- A flagella stain = demonstrate the presence, number, and location of flagella on bacterial cells.
- Motility = stabbing the bacteria into a tube of semisolid agar or by using the hanging drop technique

Semisolid Agar Method for Determining Motility



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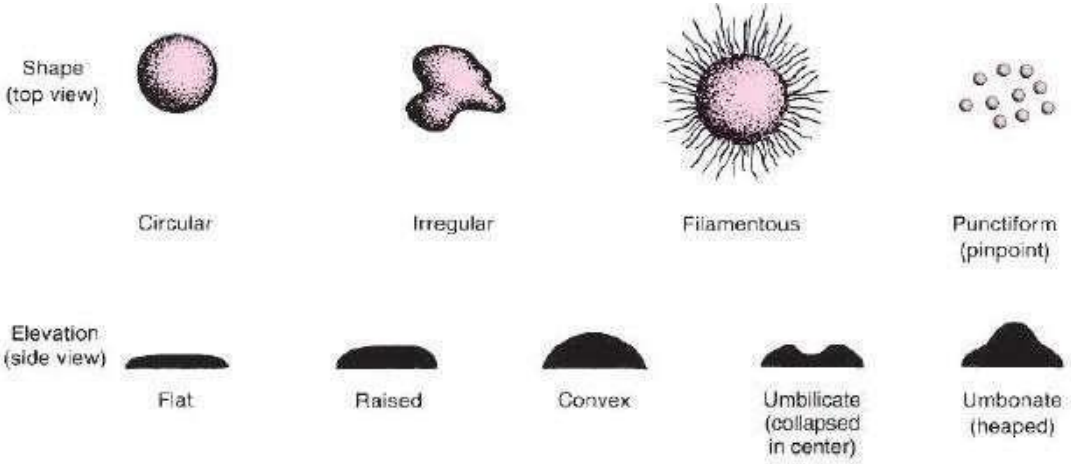
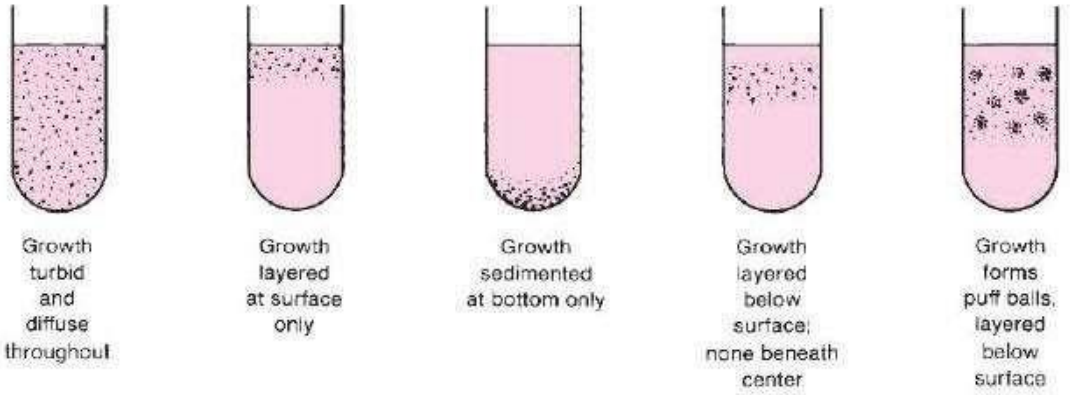
Colony Morphology

- Bacterial colony. Has a wide range of morphology
- Colony morphology includes the size, color, overall shape, elevation, and the appearance of the edge or margin of the colony. Some of it it's convex and some is concave
- Colony features serve as important "clues" in the identification of bacteria

Microbiologist can determine the type of bacteria by morphology of colony or smell



(a) Some colonial characteristics on agar media*



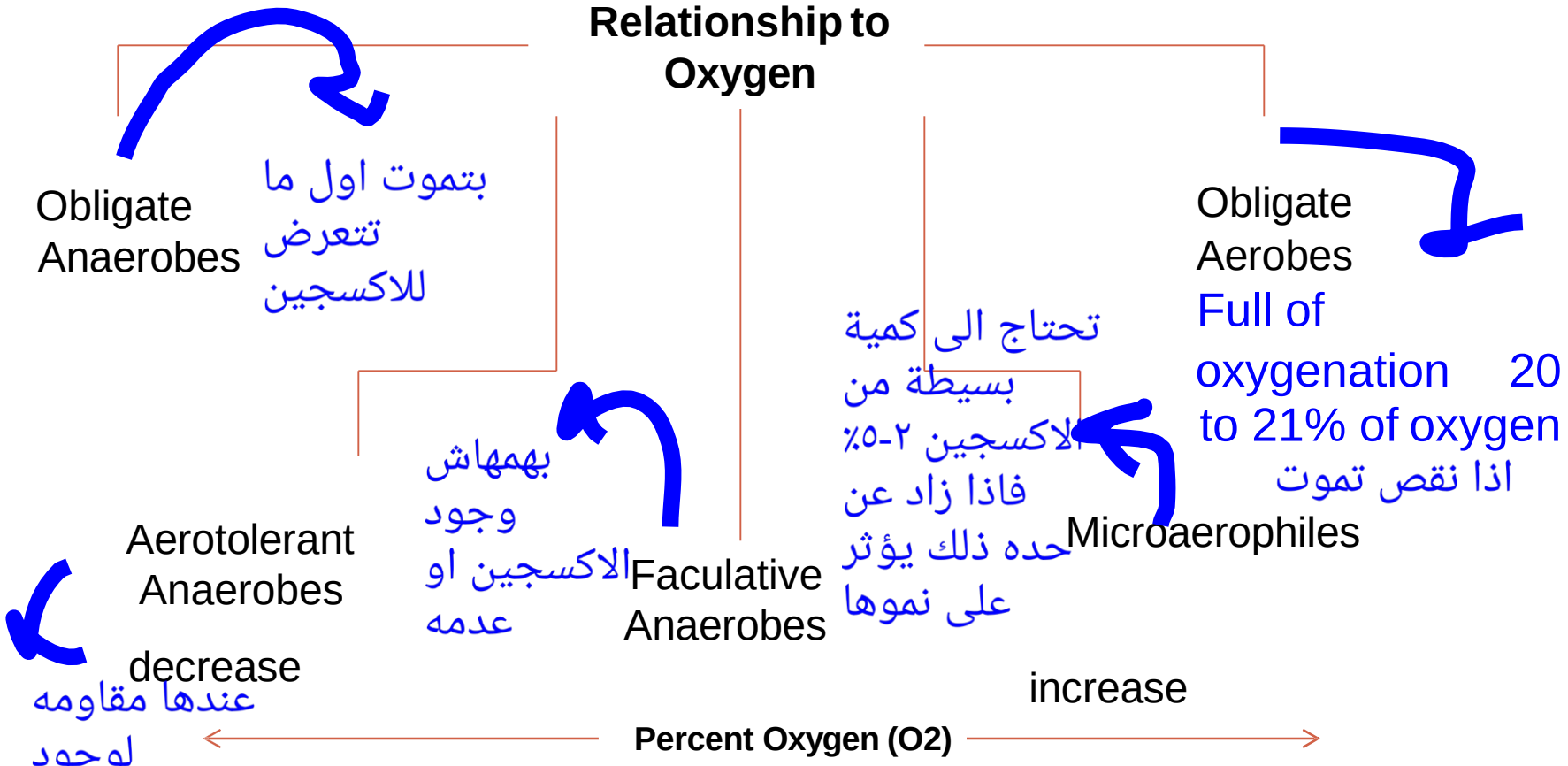
(b) Some growth patterns in broth media

*Note: Shapes and elevations shown in this diagram are not intended to be matched.

Atmospheric Requirements

- Obligate aerobes and microaerophiles require oxygen.
  Or gases
- Obligate aerobes require an atmosphere containing about 20% to 21% oxygen
- Microaerophiles require reduced oxygen concentrations (usually around 5% oxygen).

مهم نعرف نوع البكتيريا حسب رغبتها للاكسجين، للعلاج فلو كان في مريض عنده بكتيريا من ال anaerobic بندخله على غرفه غنيّة بالاكسجين فبتموت البكتيريا



بعض الحالات زي gangrene صعب توصل المضاد الحيوي لمكان الإصابة والحل الوحيد لتموت البكتيريا هو التهوية

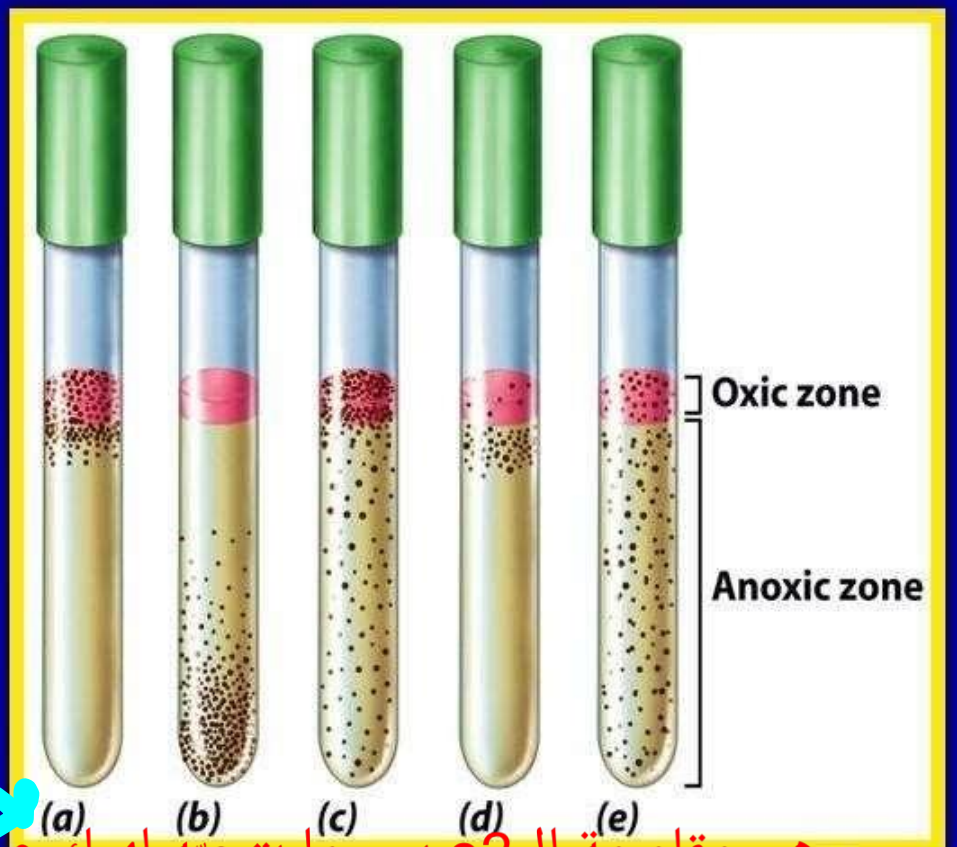
- Obligate anaerobes, aerotolerant anaerobes, and facultative anaerobes can thrive in an atmosphere devoid of oxygen.

- Capnophiles require an atmosphere containing 5% to 10% carbon dioxide.

Test for Oxygen Requirements of Microorganisms

Thioglycolate broth : contains a reducing agent and provides aerobic and anaerobic conditions

a) Aerobic
b) Anaerobic
c) Facultative
d) Microaerophil
e) Aerotolerant



على السطح

بعيد عن o2

بكل مكان

قريبة مش كتير

هي مقاو مة لل o2 بس ما بتحبّه لهيك عدد الخلايا اللي عالسطح أقلّ من c

Nutritional Requirements

- All bacteria need the elements carbon, hydrogen, oxygen, sulfur, phosphorus, and nitrogen for growth. Basel medium
- Potassium, calcium, iron, manganese, magnesium, cobalt, copper, zinc, and uranium, are required by some bacteria. Selective
- Certain microbes have specific vitamin requirements, and some need organic substances secreted by other living microorganisms during their growth.
- Fastidious organisms = especially demanding nutritional requirements Is a moody, needs a complex medium