



microbiology

Sheet

Slide

number

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Growth of bacteria:

Bacteria reproduce by binary fission, a process by which one parent cell divides to form two progeny cells.

-The growth (generation) depends on: species, amount of nutrients, temperature, PH, and other environmental factors.

-The growth cycle of bacteria divides into 3 phases:

1- lag: metabolic activity occurs but cells are not divided.

2-log: rapid cell division occurs.

3- stationary: numbers of new cells produced equals the number of dead cells.

4- death: decline in the number of viable bacteria.

Bacteria are found everywhere in the environment and it is very important for life because it break down the organic materials and bring it back to earth, and it's one of the oldest organisms. =

1- Energy requirements for growth:

-autotrophs ذاتية التغذية

-heterotrophs غير ذاتية التغذية

-autotrophs: can be: -

1-phototrophic

2- chemotrophic

-تحصل على غذائها من البناء الضوئي والطاقة الضوئية

phototrophic bacteria (cyanobacteria) (photosynthetic):

- عندها صبغة الكلوروفيل في انغمادات الغشاء الخلوي وليس البلاستيدات

Can do photosynthesis (sunlight +water +CO₂ to produce glucose).

Chemotrophic bacteria: like sulfur bacteria (oxidize hydrogen sulfide to produce water and sulfur) use organic sources to produce organic materials.

***Nitrogen fixing bacteria:** use the N in atmosphere to change it to nitrates, and only organisms that can do البقوليات it lives in the root modules of plants (the this process).

-**Chemoautotrophic Bacteria:** like nitrosamines

تحول الطاقة الكيميائية (كالأمونيا مثلا) لغذاء

Heterotrophic bacteria: also called **saprophytic**

مصدر الطاقة من تحليل المواد العضوية الجاهزة من الكائنات الحية مثل البكتيريا الرمية والتطفلية.

Nutrient agar is a good medium to grow **non-fastidious** bacteria (the bacteria that needs the minimum amount of nutrients to grow).

E-coli is a non- fastidious bacterium

يعني البكتيريا اللي بكفيها كمية قليلة من الغذاء عشان تنمو وتتكاثر

Streptococci is a fastidious bacterium that needs more nutrients and **can't** grow in ordinary agar but can in blood agar

***nutrient agar** is a chemically defined medium.

***blood agar** is made up of agar base with 5% RBC (it's highly nutritious).

***complex agar** is **not completely** defined agar, (rich agar).

* blood agar is used to grow a lot of bacteria (both fastidious and non-fastidious) and used to differentiate between the three types of bacteria.

***Hemolysis** is **the breakdown of RBCs.**

*Types of bacteria according to its growth on blood agar: -

- 1- **Gama hemolysis**: (non-hemolytic)
- 2- **Beta hemolysis**: (around the colony like a clear zoon).
- 3- **Alpha hemolysis**: greening around colony (partial lysis)

***Macconkey agar** :(selective for enteric gram_negative rods and differentiate between lactose fermenters and non-fermenters) it is complex agar (not nutritional defined and contains mixture of molecules)
-it helps to select a group of bacteria (gram negative enteric rods and inhibit other kinds because it contains crystal violet and bile salt).

(يعني بس سالبة جرام بتقدر تنمو فيه والباقي لأ يعني سيليكثف)

-it has differential component which are: sugar lactose and PH indicator (neutral red)

إذا المحيط صار حمضي بصير لون المستعمرة حمرا بسبب تكسير اللاكتوز , إذا لم تصيح كذلك فمعناه انو البكتيريا ما عندها الانزيمات المطلوبة وبضل لون المستعمرة زي ما هو. يعني هاد الاغار بساعدني اميز بين البكتيريا اللي بتخمر اللاكتوز واللي ما بتخمروا.

Tissue culture medium:

-Used to grow cells to grow viruses and some types of bacteria.

Sources of important elements for bacteria:-

Carbon: from organic materials.

Nitrogen: organic materials 'amino acid', inorganic 'amonia'

Sulfer: hydrogen sulfide.

Fastidious bacteria need more nutrients to grow.

***Chocolate agar**: can't show type of hemolysis, and can grow fastidious bacteria.

* blood agar **is non-selective agar**.

PH

*Most bacteria prefer **middle PH medium**

*But there are **acidophilic** bacteria that grow in **low PH** so They have proton pumps to pump protons **outside the cytoplasm** to keep its PH normal.

* Marine microbes grow in high PH

Oxygen

Obligatory aerobic: - can't survive without O₂.

Obligatory Anaerobic: can't survive in the presence of oxygen because it doesn't have catalase for peroxidase and SOD (super oxide dismutase) enzymes.

facultative anaerobic bacteria as E. Coli اختياري