

MICROBIAL GROWTH & CONTROL

Living organisms require “nutrients” to grow and reproduce.

What are some of the common nutrients required by a microorganism? *

Chemical elements required in “large” amounts: C, H, O, N, S, P and

Chemical elements required in “small” amounts: K, Ca, Mg, Fe

Chemical elements required in “trace” amounts: Mn, Zn, Co, Mo, Ni, Cu

Based on the source of C, H, and energy, microorganisms are divided into various categories: Table 5.1 *

Know the definitions:

Autotrophs

Heterotrophs

Phototrophs

Chemotrophs

Lithotrophs

Organotrophs

Prototrophs

Auxotrophs

What are the major nutritional types of microorganisms? Table 5.2*

Photolithoautotrophs

Chemoorganoheterotrophs

How does a microorganism acquire nutrients from its environment?

(We did this when talking about plasma membrane and transport)

Facilitated diffusion, active transport, ABC transporter, group translocation,

What are the different types of media used to grow microorganisms? **

Culture media:

Synthetic

Complex

Types of Media

Selective

Differential

What is a pure culture? **

Spread plate fig 5.7

Streak plate fig 5.8

Pour plate fig 5.10

Colony morphology and growth figs 5.11, 5.12 **

* Need to read on your own. You will be tested on these.

** Good idea to look these over. These are covered in BIO 126L.

MICROBIAL GROWTH

What is meant by microbial growth?

Increase in: cellular constituents, mass, size or number.

How do microorganisms divide?

Binary fission

Budding

Mitosis

How do we follow the growth of microorganisms?

Microbial population:

Growth curve in a "batch culture": Fig 6.1

Lag (unbalanced growth)

Log/Exponential (balanced growth)

Stationary

Death

Exponential growth and generation time: Table 6.1, figs 6.3, 6.4

Number of generation = Time in hours / Time (in hours) taken to double the number of microorganisms

What are the different factors that influence microbial growth?

Table 6.3

Solute and water activity

pH

Temperature

Oxygen

Pressure

Radiation

Effect of temperature on growth: figs 6.12, 6.13 and hand out from Brock

Psychrophiles

Mesophiles

Thermophiles

Hyperthermophiles

Effect of oxygen on growth: fig 6.14

Obligate aerobe: Superoxide dismutase (SOD) and catalase positive. O₂ used as final electron acceptor

Facultative anaerobe: SOD and catalase positive. O₂ used as final electron acceptor

Aerotolerant anaerobe: SOD +, catalase -. Cannot use O₂ as final electron acceptor

Obligate anaerobe: Both SOD & catalase negative. Cannot use O₂ as final electron acceptor

Microaerophile: SOD +, catalase +/- . O₂ used as final electron acceptor

How does the environment as a whole affect microbial growth?

Quorum sensing (microbial population) Fig 6.19

CONTROL OF MICROORGANISMS

Know the definitions of terms used frequently*

Sterilization

Pasteurization

Sanitization

Disinfection

Antiseptic

Bacteriocidal

Bacteriostatic

Microbial death follows the same pattern as microbial growth*

Conditions affecting the activity of an antimicrobial agent*

Population size

Population composition

Concentration of the agent

Duration of exposure

Temperature

Local environment

Different physical and chemical methods used to control microorganisms: hand out from Tortora

Physical:

Heat: Dry heat, Pasteurization, Tyndallization, Autoclaving

High osmotic pressure

Filtration

Radiation

Chemicals:

Disinfection, antiseptics, bacteriostatic agents, bacteriocidal agents, acids, alcohol, phenols, halogens etc

Antibiotics: Tables 35.1, 35.4