

MICROBIAL GROWTH REQUIREMENTS AND MEDIA

7/14/83, 7/1/88, 2/28/96, 7/16/97, 12 July 00, 16 July 01, 16 July 03, 19 July 04, 18 July 05, 24 July 06, 16 July 07, 21 July 08, 17 July 09, 18 July 11, 31 Jan 13
 Alcamo (5th), pp.106-112, TFC 7th: 156-179, 8th: 155-179, Black 6th: 143-169, Bauman 2nd, pp 165-192, 3rd: 163-193, 4th 163-192

NUTRITIONAL REQUIREMENTS:

Water, *sine qua non*.

p 167

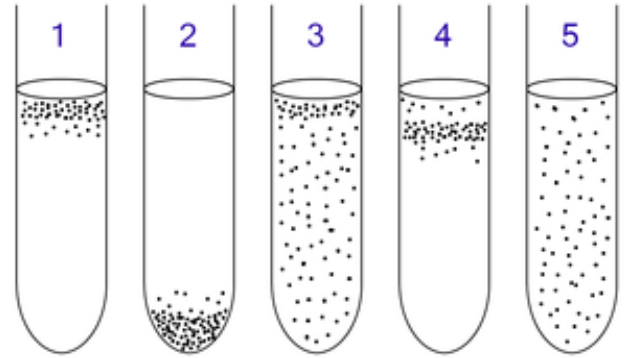
CHNOPS, TRACE ELEMENTS (esp Na, K, Ca, Mg, Mn, Fe)

FACTORS AFFECTING GROWTH:

OXYGEN: (166)

suspend in agar, show growth:

- | | | |
|---|----------------------|-------------------------------|
| 1 | Obligate aerobe | <i>Pseudomonas</i> |
| 2 | Obligate anaerobe | <i>Clostridium</i> |
| 3 | facultative anaerobe | <i>Escherichia</i> |
| 4 | microaerophile | <i>Rhizobium, Neisseria</i> |
| 5 | Aerotolerant | <i>Streptococcus pyogenes</i> |



TEMPERATURE: (169) draw graph, temp vs growth

- | | |
|---------------|---|
| psychrophiles | <i>Pseudomonas</i> |
| mesophiles | <i>Escherichia</i> , etc |
| thermophiles | <i>Thermophiles aquatica</i> (PCR's Taq enzyme) |

pH: pH optimum for enzymes determines optimum. Acid pH due to *Lactobacillus* in yogurt, pickles, cheese vagina.

MOISTURE water..., osmosis,

OSMOTIC halophiles (can tolerate hypertonic conditions), hypertonic solutions preserve foods

CULTURING (p 175) Colony morphology (p 175)

Inoculation (insert an eye) to add cells to a medium for growth

Growth of pure cultures (177) (**NOTE:** Koch's potato, Hesse's agar, Petri's dish.)

CULTIVATION

Nutrient broth, agar, enriched media, blood agar, chocolate agar, peptone, tryptone

CHEMICALLY DEFINED (SYNTHETIC), per Liter

p 176:

(From Alcamo's Fund, p 144)

Salt or C source:

- 1 g NH₄H₂PO₄
- 5 g NaCl
- 1 g K₂HPO₄
- 0.2 g MgSO₄,
- 5 g glucose

function:

- N and PO₄ source, pH buffer
- osmolarity
- K and pH buffer
- Mg and S
- C source, energy

COMPLEX (NATURAL) MEDIA:

DIFFERENTIAL media:

(P 178: A: Gm + vs Gm -, B: Lac +, vs Lac-)

EMB Lac (179)

eosin and methylene blue inhibit Gm+, 1% lactose. Lac + = purple

MacConkey agar (180)

lactose, neutral red, crystal violet, bile salts, kills Gm +, Lac+ are red

Blood Agar (178)

differentiates classes of hemolysis: alpha, **beta** and gamma

SELECTIVE MEDIA

5% NaCl

Inhibits most, selects for halophiles: *Staphylococcus aureus*

EMB lac (181)

Inhibits Gm+ bacteria, selects for Gm- bacteria,

Sabouraud dextrose agar (179) acid inhibits most bacterial growth

ENRICHMENT MEDIA

selenite broth for *Salmonella*

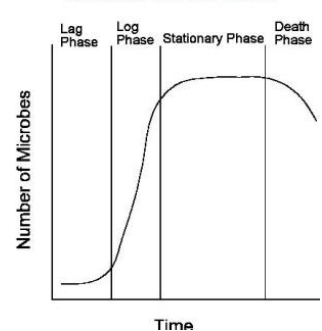
GROWTH PHASES (184)

lag, log, stationary, decline (= death phase)

GENERATION TIME

replication of DNA, time to double number of cells, bacterial fission
 semi-log graphs vs linear graphs (p 186)

Bacterial Growth Curve



ENUMERATION:

- | | |
|---------------------------------|-------|
| plate count, serial dilution | p 175 |
| Filtration | p 189 |
| Petroff-Hauser counting chamber | p 190 |
| Most Probable Number | p 191 |
| Turbidity A ₆₆₀ | p 189 |
| Direct Counts | p 188 |
| Activity | |
| Dry weight | |

