MICROBIAL GROWTH REQUIREMENTS AND MEDIA

7/14/83, 7/1/88, 2/28/96, 7/16/99, 12 July 00, 16 July 01, 16 July 03, 17 July 09, 18 July 11, 31 Jan 13

NUTRITIONAL REQUIREMENTS:  
Water, *sine qua non.*

FACTORS AFFECTING GROWTH:  

OXYGEN: (166) 
1 Obligate aerobe  *Pseudomonas*
2 Obligate anaerobe  *Clostridium*
3 facultative anaerobe  *Escherichia*
4 microaerophile  *Rhizobium, Neisseria*
5 Aerotolerant  *Streptococcus pyogenes*

TEMPERATURE: (169) 
psychrophiles  *Pseudomonas*
mesophiles  *Escherichia, etc*
thermophiles  *Thermophiles aquatica* (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

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

CHEMICALLY DEFINED (SYNTHETIC), per Liter  
(From Alcamo’s Fund, p 144)

<table>
<thead>
<tr>
<th>Salt or C source</th>
<th>function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 g NH₄H₂PO₄</td>
<td>N and PO₄ source, pH buffer</td>
</tr>
<tr>
<td>5 g NaCl</td>
<td>osmolarity</td>
</tr>
<tr>
<td>1 g K₂HPO₄</td>
<td>K and pH buffer</td>
</tr>
<tr>
<td>0.2 g MgSO₄</td>
<td>Mg and S</td>
</tr>
<tr>
<td>5 g glucose</td>
<td>C source, energy</td>
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</tbody>
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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)

ENUMERATION:  
plate count, serial dilution  p 175
Filtration  p 189
Petroff-Hauser counting chamber  p 190
Most Probable Number  p 191
Turbidity A₆₆₀  p 189
Direct Counts  p 188
Activity
Dry weight