Game Plan

Lecture

Taxonomy
Identification and classification of microbes
Dichotomous keys

APO-4: Bergey's Manual and dichotomous keys

Lab

DNA Fingerprinting

Next Lab

Lab Exam

Scientific names and meanings

Scientific binomial	Source of Genus name	Source of Specific epithet
Klebsiella pneumoniae	Honors Edwin Klebs	The disease
Pfiesteria piscicida	Honors Lois Pfiester	Disease in fish
Salmonella typhimurium	Honors Daniel Salmon	Stupor (typh-) in mice (muri-)
Streptococcus pyogenes	Chains of cells (strepto-)	Forms pus (pyo-)
Penicillium notatum	Tuftlike (penicill-)	Spores spread in wind (nota)
Trypanosoma cruzi	Corkscrew-like (trypano-, borer; soma-body)	Honors Oswaldo Cruz

Organisms within a genus share **93%** similar rRNA
Organisms within a species share **97%** similar rRNA

Hierarchy of classification

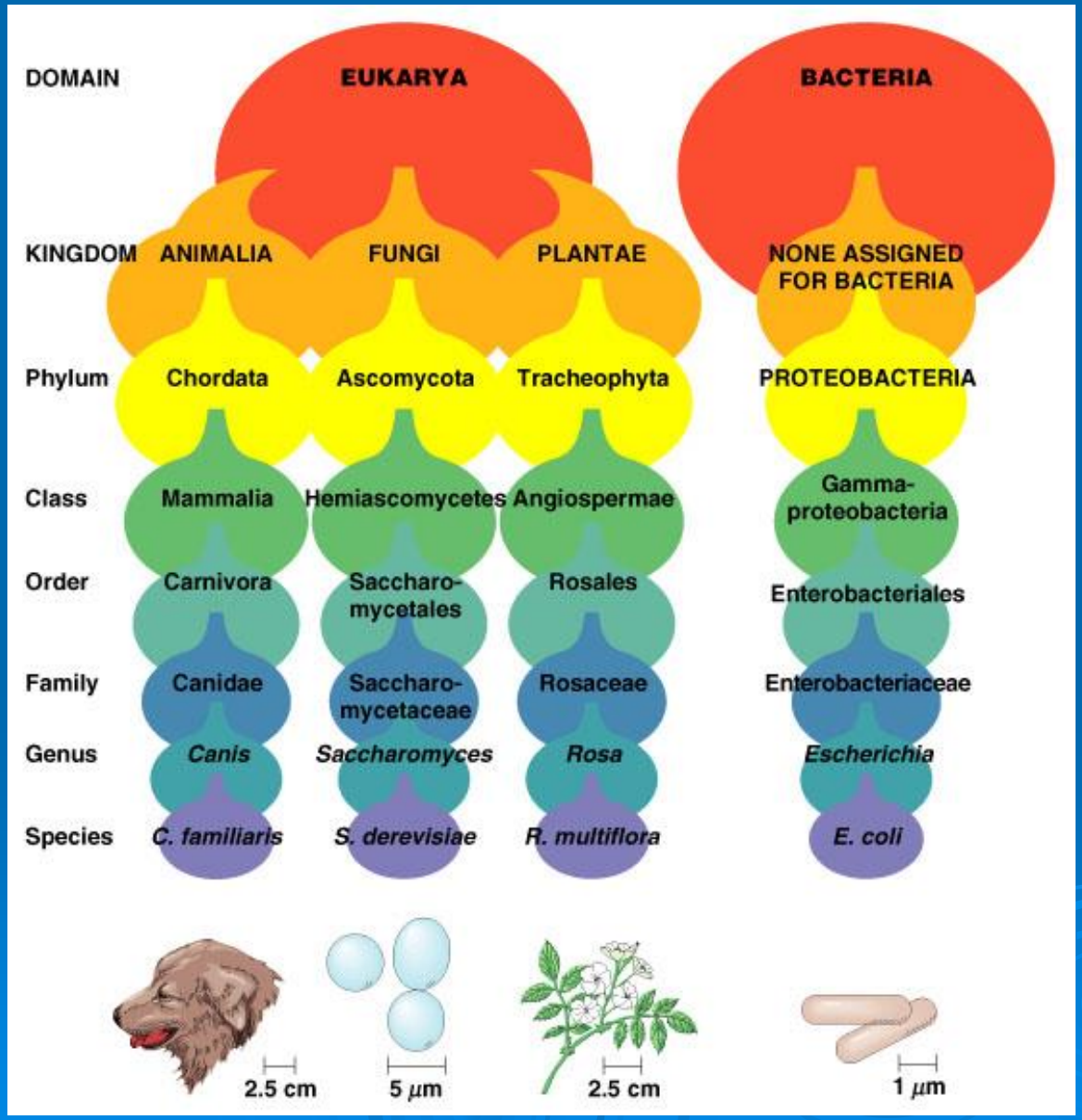


Figure 10.5 (2 of 3)

Species defined

Eukaryotic species:
A group of closely related organisms that breed among themselves

Prokaryotic species:
A population of cells with similar characteristics

Clone: A population of cells derived from a single cell

Strain: A subgroup within a species with one or more characteristics that distinguish it from other subgroups in the species

Viruses:
A population of viruses with similar characteristics that occupy a particular ecological niche

Species identification and classification methods

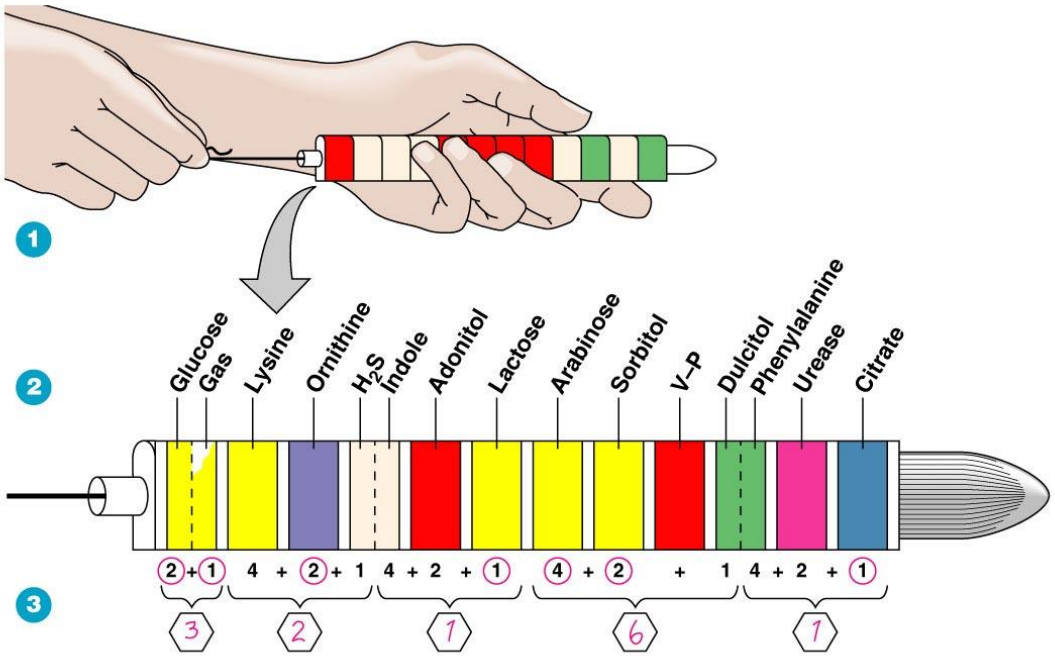
General

1. Morphological characteristics

Additional tests

1. Differential staining
2. Biochemical tests- determine presence of enzymes
   - Numerical identification
4. Genetic homology (similarity of DNA)
   - Base composition
   - DNA and RNA sequencing (16s rRNA gene)
   - DNA hybridization
5. Protein and amino acid homology (similarity of proteins)
   - Western blots
   - Amino acid sequences
6. Immunological methods
   - ELISA (enzyme linked immunosorbent assay)
   - Western blots

Numerical identification: the Enterotube



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ID Value	Organism	Atypical Test Results	Confirmatory Test
32143	*Enterobacter cloacae*	Sorbitol$^-$	–
	Enterobacter sakazakii	Urea$^+$	+
32161	*Enterobacter cloacae*	None	V–P$^+$
32162	*Enterobacter cloacae*	Citrate$^-$	

Figure 10.9 - Overview (1 of 3)

Species identification and classification methods

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   - ELISA (enzyme linked immunosorbent assay)
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Criteria for classifying/ identifying bacteria

TABLE 10.5 Taxonomic Criteria and Methods for Classifying and Identifying Bacteria

Criterion or Method	Used for	
	Classification	Identification
Morphological characteristics	No (yes for cyanobacteria)	Yes
Differential Staining	Yes (for cell wall type)	Yes
Biochemical Testing	No	Yes
Serology	No	Yes
Phage Typing	No	Yes
Fatty Acid Profiles	No	Yes
Flow Cytometry	No	Yes
DNA Base Composition	Yes	No
DNA Fingerprinting	Yes	Yes
PCR	Yes	Yes
Nucleic Acid Hybridization Techniques	Yes	Yes
rRNA Sequencing	Yes	No

Table 10.5

Classification and identification references

•• *Bergey's Manual of Determinative Bacteriology* •Provides identification schemes for identifying bacteria and archaea	•Morphology, differential staining, biochemical tests
•• *Bergey's Manual of Systematic Bacteriology* •Provides phylogenetic information on bacteria and archaea	•Based on rRNA sequencing
•• *Approved Lists of Bacterial Names* •Lists species of known prokaryotes	•Based on published articles

Tools of identification: the dichotomous key

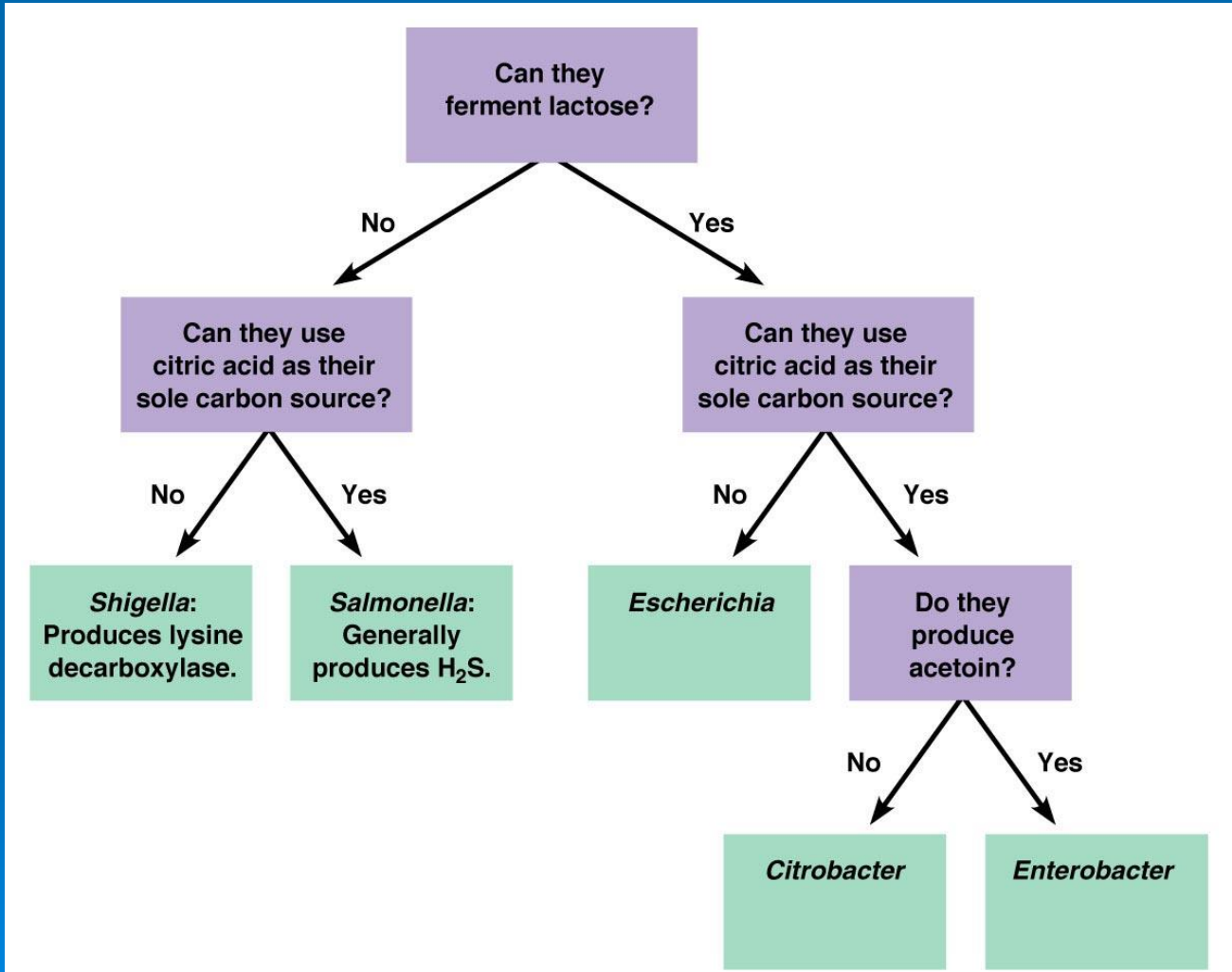

Figure 10.8

Tools of identification: the dichotomous key

I. Gram–positive
  A. Catalase+
    1. Acid from glucose..... *Staphylococcus*
    2. Glucose–..... *Micrococcus*
  B. Catalase–
    1. Coccus..... *Streptococcus*
    2. Rod..... *Lactobacillus*

II. Gram–negative
  A. Oxidase–
    1. Acid from lactose
      a. Uses citric acid..... *Citrobacter*
      b. Citric acid–..... *Escherichia*
    2. Lactose–
      a. H_2S produced
        (1) Urease positive..... *Proteus*
        (2) Urease negative..... *Salmonella*
  B. Oxidase+
    1. Rod..... *Pseudomonas*
    2. Coccus..... *Neisseria*