

### Chapter 1: Microbial World

#### What are the properties of all cells?

Structure, Metabolism, Growth, and Evolution

#### What properties of the cell changes as it gets smaller?

High metabolic rates can be maintained in small prokaryotic cells without a need for complex cellular structures.

#### How are viruses different from Bacteria, Archaea, and Eukarya?

Viruses lack a cytoplasmic membrane and ribosomes. They don't carry out metabolic processes.

#### What four bacterial phyla contain the largest number of well-characterized species?

Actinobacteria, Firmicutes, Proteobacteria, and Bacteroidetes

#### What phylum of Archaea is common worldwide in soils and the oceans?

Thaumarchaeota important contributors to global nitrogen cycle

#### How old is Earth and when did cells first appear?

About 4.6 billion yrs old      Cells first appeared 3.8–4.3 billion yrs ago

#### How do microbes contribute to the nutrition of animals?

Human enzymes lack the ability to break down complex carbs so we rely on our gut microbiome

The "rumen" in ruminant animals (like cows) contains a dense microbiome that digests and ferments cellulose.

#### Describe ways in which microbes are important in the food and agriculture industries.

### Chapter 1: Microbial World (cont)

Agriculture benefits from the cycling of nitrogen, sulfur and carbon compounds; which is performed by microbes

While some microbes can cause foodborne disease and spoilage, others are useful for improving food and preservation

#### What is wastewater treatment and why is it important?

It relies on microbes to treat water contaminated by human waste so it can be safely returned to the environment.

#### How did the pasteur flask disprove spontaneous generation?

The flask had a swan neck that air could enter but not particulate matter including microbes.

The result was that the nutrient solution remained sterile until particulate matter was allowed to enter.

#### What 2 methods does Pasteur use to make solutions sterile?

1. Porcelain filter to remove cells      2. Heating w/ fire and sealing

#### What are Koch's postulates?

1. The suspected pathogen must be present in all cases of the disease and absent in healthy animals.

2. The suspected pathogen must be grown in pure culture

3. Cells from pure culture must cause disease in healthy animal

4. Suspected pathogen must be reisolated and shown to be same as original

#### What color will a gram-negative cell be after gram staining by conventional method?

Pink

#### How can cells be made to fluoresce?

They can be stained with a fluorescent dye, such as DAPI

### Chapter 2: Structure and Function

#### What is different about the cytoplasmic membrane of Archaea?

In the lipids of Bacteria and Eukarya, the hydrophobic **fatty acid** tails are bound to glycerol by **ester** linkages.

The lipids of *Archaea* have hydrophobic **isoprenoid** tails which are bound to glycerol by **ether** bonds.

#### Functions of the cytoplasmic membrane

1. Permeability
2. Protein anchor
3. Energy conservation

#### What is the periplasm?

It is a space of about 15nm between the outer surface of the cytoplasmic membrane and the inner surface of the outer membrane.

#### What are endospores?

Highly differentiated dormant cells that function as survival structures and can tolerate harsh environments.

Dormant stage of bacterial life cycle.

#### How is the outer membrane of an endospore formed?

Engulfment of the foreshore by the mother cell results in formation of the outer membrane.

It is formed from part of the mother cell's *cytoplasmic membrane*.



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