Life Sciences 11 **Bacteria: The Details**  Name: Date:

** Types of Bacteria**

**A) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Bacteria**

* Have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with lots of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; especially to Penicillin
* Appear \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**B) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Bacteria**

* Have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ so are more

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ especially Penicillin.

* Appear \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in Gram stain.

*Penicillin, and other antibiotics, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecules*

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**Reproduction**

* Bacteria reproduce asexually via \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* However, bacteria can create new combination of genes through:
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: genes introduced \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to bacteria
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of genes between bacteria
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: genes taken up \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Modes of Nutrition**

*Prokaryotes need a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to survive.*

* **Carbon source**: - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (requires **fixation** of *inorganic* C source: CO2)

 - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (requires *organic* C source: glucose)

* **Energy source**: - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (from light)

 - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (from chemicals)

*1. Autotrophic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* *(require fixation of inorganic CO2)*

A) Photoautotrophs (photo = light, auto = self, troph = nourishment)

* Use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy with CO2 to make organic compounds (ex. Carbohydrates – glucose)
* Ex. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (blue-green algae)

B. Chemoautotrophs (chemo = chemical, auto = self, troph = nourishment)

* Use CO2 as a carbon source and energy from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (instead of light) to make organic compounds (ex. Carbohydrates - glucose).
* Examples include:
* Using H2S, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bacteria - Using CH4, methane fixers
* Using NH3, \_\_\_\_\_\_\_\_\_\_\_\_\_\_ bacteria - Using Fe+3, iron fixers.

*2. Heterotrophic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ require an organic C source – glucose*

A) Photoheterotrophs: (photo = light, hetero = (an)other, troph = nourishment)

 - require light energy to make ATP (cell usable energy) and an organic food source; very few prokaryotes do this!

B) Chemoheterotrophs: (chemo = chemical, hetero = (an)other, troph = nourishment)

 - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; most widely used method by bacteria!

|  |  |  |  |
| --- | --- | --- | --- |
| Mode of Nutrition | Energy Source | Carbon Source | Types of Prokaryotes |
| Photoautotrophs |  |  |  |
| Chemoautotrophs |  |  |  |
| Photoheterotrophs |  |  |  |
| Chemoheterotrophs |  |  |  |



**Chemoheterotrophs and Oxygen**

***Believe it or not, but not all bacteria require O2 to live!***

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to grow and for cellular respiration
2. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: will use O2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ but can grow by fermentation (without O2)
3. **­­­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_! Grow by fermentation

**Importance of Bacteria**

* Importance of bacteria can be divided into two categories from a human prospective: Pros and Cons

**1. Beneficial Aspects (Pros) 2. Harmful Aspects (Cons)**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ A. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ B. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Industrial Uses C. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Part of animals first line of defense
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Importance of Bacteria: Pros**

 A) Decomposition:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ so the nutrients can be reabsorbed by other living organisms

 B) Recycle Inorganic Nutrients

* N2 fixers are bacteria that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and use to make proteins and nucleic acids

 C) Industrial Uses

a) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ c) Tobacco curing

b) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ d) Antibiotics

 D) Part of the first line of defense

* Bacteria \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Bacteria also live in our gut

 E) Genetic research

* Bacteria are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - ideal for genetic studies
* Used to figure out many biochemical pathways and basic patterns of gene control

**Importance of Bacteria: Cons**

 A. Destruction of Food

* Bacteria \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (one of our two main competitors)
* We have learned to use technology to reduce bacteria food spoilage

 B) Rotting Structures

* Bacteria destroy many things we want preserved

 C) Diseases: Bacteria can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ex. Botulism - 1 g of botulism toxin could kill one million people!

Other examples, Can cause \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, damage to circulatory system and sometimes fatal allergic reactions (ex salmonella, *E.coli*)

**Bacterial Resistance**

* A classic **example of evolution** is unfolding today as we wage war against bacteria
* Due to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, bacteria have developed an

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to antibiotics (HOW?)

**Can You …**

**… describe the difference between Gram positive and Gram negative bacteria?**

**… describe how bacteria reproduce?**

**… describe 3 methods of horizontal gene transfer between bacteria?**

**… describe bacteria modes of nutrition & oxygen use?**

**… describe the pros and cons of bacterial existence?**

**… explain why and how bacterial resistance occurs?**