

General Microbiology Project: Part I

The goals of this project are to:

- a) find and communication information about microbes to peers
- b) show understanding of microbe structure & function
- c) understand the variety of microbes in our environment

Project Part I:

Each student will choose two species of microbes for this project. These microbes *cannot be disease-causing*. One species must be a bacterium. One species must be a fungus. You cannot use the same species as another student. Once you have selected both species you wish to use, email your choices to Dr. Nesbit. **Your microbes must be *approved* by Dr. Nesbit before 11:00am on March 8th**. I recommend choosing early to avoid a scramble or late penalty for submitting the same species as another student.

The project submission should be two separate files uploaded to Blackboard by 11:00am on March 22nd. The files must be .pdf format of a one page infographic. **Any file submitted that is more than a page or not in .pdf format will receive an automatic zero.**

Rubric:

Each infographic is worth 25 points for a total of 50 points.

Infographics should be your work and meet the following guidelines:

- have good flow, design with images that is easy to read and follow
- state type of microbe (bacterium, fungus, protozoa, or archaea)
- state scientific name of microbe (Genus and species)
- provide **detailed cellular features** of microbe (shape, prokaryote/eukaryote, cell wall components, flagella, coenocytic/septate hyphae, vacuoles, additional organelles or inclusion bodies, etc.)
- provide detailed **growth & reproduction** conditions for the microbe (what environment is it found, does it need oxygen, does it grow in high temperatures or special salt, does it do binary fission or spores, what kind of spores, etc.)
- explain in detail what energy source & **metabolism** the microbe uses (For example: if the microbe uses fermentation, then say what is being fermented and what is produced during fermentation. If a microbe can use multiple metabolisms, talk about them)
- give additional special features or interesting uses of microbe (why do we care)
- provide references for where information was found (not Wikipedia or Microbewiki or Google Search)

Example Infographic (notice that this infographic is not for a single species, and it lacks much of the information that you need.....this infographic is solely to demonstrate what is an infographic)

GUT MICROBIOTA FOR HEALTH
Public information service from Luxembourg Society of Neurogastroenterology and Hepatology

GET TO KNOW YOUR BACTERIA
Lactobacilli

What are Lactobacilli?

Lactobacilli are the **healthy-promoting bacteria** also involved in fermentation process.

These bacteria were first discovered in **1905** by **Dr. Stamen Grigorov**, when he identified the bacteria *Lactobacillus bulgaricus*, which transforms milk into fermented milk products, such as yogurt.

What can Lactobacilli do for you?

Some Lactobacilli live in the human gut microbiota. They belong to the Firmicutes phylum - one of the most predominant gut bacteria groups. Specific strains of Lactobacilli have been shown to:

- Help maintain the health of the gastrointestinal tract (GI) and immune system.**⁽¹⁾
- Prevent bad bacteria** invading the body through the gut.⁽²⁾
- Inhibit the growth of bad bacteria by **producing anti-bacterial compounds called bacteriocins** and reducing gut pH.^(3,4)

Other strain-specific talents include:

- Aiding lactose breakdown:** live cultures in yogurt improve lactose digestion.⁽⁴⁾
- Helping reduce** gas, bloating, abdominal pain and stool shape in **people with IBS.**⁽⁵⁾
- Reducing the occurrence and duration of diarrhea** caused by antibiotics or illness.^(6,7)
- Digesting prebiotic fibers** to produce beneficial compounds, including lactate and short chain fatty acid acetate, which both help maintain a healthy gut barrier.⁽⁸⁾

Where can you find Lactobacilli?

- Lactobacilli are primarily found in the **lower GI tract** (small intestine and colon). They are also found in other parts of the body, such as the **vagina, mouth and stomach.**
- Lactobacilli transfers **from mom to baby both at birth and through breastfeeding**, helping to colonize the gut.^(9,10)
- Lactobacilli populations **decrease as we age or become unwell**. Maintaining levels of these good bacteria helps ensure healthy aging.⁽¹⁰⁾

How can you increase your Lactobacilli?

- The species can be found in different food and is most often consumed via **fermented milk products or probiotic foods**, such as yogurt.
- It is also possible to increase your Lactobacilli by consuming:
 - Probiotic** supplementation.
 - More **prebiotic fibers**, such as the ones found in plant-based foods (fruit, vegetables, pulses).

Wellness Tip: Eat fermented foods containing live probiotic bacteria, such as yogurt or kefir, every day!

There are many strains of Lactobacilli that are beneficial for our health. Not all Lactobacilli strains are the same:

<p>L. rhamnosus GG</p> <ul style="list-style-type: none"> Reduces antibiotic-associated diarrhea May reduce abdominal pain in children with IBS.^(11,12) 	<p>L. rhamnosus CNCM I-3690</p> <ul style="list-style-type: none"> Shown to have anti-inflammatory action in the gut. Can reduce permeability in an impaired gut barrier.^(13,14) 	<p>L. casei</p> <ul style="list-style-type: none"> Certain strains such as <i>L. casei</i> CNCM I-1518 (previously named <i>L. casei</i> DN 114 001) have been shown to reduce antibiotic-associated diarrhea and <i>C. difficile</i>-associated diarrhea.⁽¹⁵⁾
<p>L. plantarum 299v DSM 9843</p> <ul style="list-style-type: none"> Reduces abdominal pain associated with IBS. Improves stool consistency.⁽¹⁶⁾ 	<p>L. reuteri DSM 17938</p> <ul style="list-style-type: none"> Can help reduce infant colic.⁽¹⁷⁾ 	<p>L. delbrueckii subsp. bulgaricus</p> <ul style="list-style-type: none"> Helps break down lactose. Yogurt cultures help improve lactose maldigestion.⁽¹⁸⁾

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