How to Build a Better YOUgurt

Determining Which Store Bought Yogurts Have the Most Probiotics

By Amelie Kaiser

Catalina Foothills High School, 4300 E Sunrise Dr, Tucson, AZ

February 25, 2026

Abstract

Most yogurt brands include the label “Live and Active Cultures” this means that they include living probiotics. These probiotics help support gut health and balance the body's natural process by getting rid of toxins. Probiotics are obtained through fermentation, a method that has been around for thousands of years. This research studies popular yogurt brands and determines the real concentration of “Live and Active Cultures” that each yogurt contains. Yogurts were serial diluted with Phosphate Buffered Saline and the 10^{-7} CFU/mL sample was tested for probiotic concentration. After varying amounts of incubation time, the samples were run through a colony forming units test. This test accurately determines how many active colonies are present. When incubated for 48 hours, Chobani had the most bacterial growth. Based on the Colony Forming Units (CFU) test, after 96 hours Activa had the most amount of active bacteria. Silk Soy has the highest probiotic count after 168 hours. The results show significant levels of bacterial growth after 96 hours. In total, Chobani yogurt has the highest amount of bacteria and showed growth through all three trials. The most expensive yogurt was Siggi’s and this also had a high concentration of probiotics. Silk Soy and Silk Almond, two non-dairy yogurts, had high amounts of probiotic growth during the trials.

Acknowledgements

The researcher would like to thank the Career and Technical Education (CTE) program for sponsoring this project. I would also like to thank Viktoriya Yurkiv for her guidance and aid when completing this research. Thank you to the Catalina Foothills school board and Ms. Tellez for approving this project as well as the taxpayers of Pima County Arizona for funding this research. I would also like to thank Bailey Moffett and Felix Leblanc for taking photos of the petri dishes. Additionally, I am thanking the brand probiotic yogurt brand Coconut Cult for being my inspiration for this project.

Table of Contents

Abstract **2**
Acknowledgements 2
Table of Contents **3**
Introduction **4**
Prior Literature Review 6
Global Impact 7
Risk Analysis 7
Materials and Methods **8**
Materials 8
Instruments 8
Methods 9
Results **11**
Discussions **15**
Conclusions **21**
Literature Cited **22**

Introduction

Probiotics are used to support gut health, immunity, digestion, and more. Without enough probiotics in an individual's diet, one can be very vulnerable to infection, illness, and intense digestive issues. There are many different kinds of probiotics that each serve a different purpose in the body, although all of them are important for regular bodily functioning. Probiotics are live microorganisms that aid the body in processing foods and responding to outside threats. In order to have healthy gut flora, one should have several billion probiotic microorganisms within their body. Most people respond well to probiotics and often take probiotic supplements to make up for a lack of natural consumption. Although some people find probiotics to have no effect on their body, this is because some people are not receptive to certain probiotic strains and the usefulness of probiotics fluctuates between species (Toedter Williams, 2010).

The market for probiotics is growing very quickly as people realize the benefits they have. Some of the most common probiotics are bifidobacteria, enterococci, and lactobacilli (Holzapfel, 2002). These three strains of probiotic are all found in yogurts. Yogurt has its own bacteria, although the naturally occurring yogurt bacteria is not homologous with intestinal bacteria. Because of this, people add other strains of bacteria into yogurt starter cultures therefore making it considered a probiotic that aids the body in functioning. Products that contain high amounts of probiotics, including dairy and non dairy alternatives help people’s gut flora thus promoting immunity in the body. Most people consume probiotics after they are sick, this helps to boost their immune system and aid in faster recovery, but studies show that it is more beneficial to make probiotics a regular part of one's diet. Technological advancements continue to be made in the probiotic field, drastically growing the research and probiotic food supplied (Soccol, 2010).

Probiotics have a long history and were likely some of the most early forms of life on earth. Some of the first records of probiotics are in 1200 BC by mentions of soured milk, kefir, dahi. These were popular products of the time because the weather conditions made them easy to make and store. Although bacteria was not a known thing in this time period, the cultured dairy goods all contained probiotics and were even used as common remedies. Many more recent scholars have expanded on the primitive ideas of probiotics by doing research on breast fed babies and the longevity of people in Bulgaria. A 1908 Nobel Peace Prize winner, Ilya Ilyich Metchnikoff, can take much of the credit for the discovery of probiotic health benefits. In his studies he found that by introducing probiotic bacteria, the body gets rid of natural toxic bacteria,

helping to keep people healthier. This research partially was done in the intestines, an organ that is not used today, and would be very harmful to modern humans if not for probiotics (Soccol, 2010).

Lactic acid bacteria is a common strand of probiotic that is the catalyst for most fermentation processes. Most things can be fermented including meats, plants, and most commonly, dairy products. Fermentation is important because it increases preservation of many foods, it can also help the body to digest complex foods or things that have toxins, and makes some foods more texturally appealing or changes the taste. Fermented dairy products and most other ferments need to have a starter culture, this is a fermented blueprint for the product being created and includes all of the probiotics needed. Technological advancements have allowed people to use starter cultures for a variety of goods and on a large scale. It is also possible for someone to have an individual starter in their home. Fermentation works when sugar carbohydrates are oxidized and produce energy, lactic acid, alcohol, and carbon dioxide. These products allow good microorganisms to grow and add to the nutritive value of a substance. The process is also referred to as glycolysis and happens in the body as a form of anaerobic respiration. Fermentation happens without oxygen and lowers the pH of a substance so only good bacteria and probiotics can be created. Yogurt uses lactic acid fermentation, which produces specific lactic acid probiotics. Similarly, alcohol is created by fermentation but instead of bacteria, yeast is the catalyst for sugar oxidation (Caplice, 1999). All yogurt is fermented and contains some amount of probiotics, although some brands of yogurt are more probiotic rich. Probiotic rich yogurts are often very expensive and many people cannot afford the health benefits. This project examines the probiotic concentration of different store bought yogurts. These yogurts are a range of different brands, including ones that are more affordable, more expensive, and claim to contain higher probiotic counts. There are also non-dairy yogurts tested, these include soy milk yogurt and almond milk yogurt. The goal of this research is to find what yogurt has the most probiotics and therefore the best health benefits.

Prior Literature Review

Tests were run to show how different fermentation processes and probiotic types affect the overall quality (chemical properties, taste, smell, and consistency) of yogurt. Many different fermentation methods were also discussed and how they can impact the final yogurt. Based on the data collected, non dairy milk affects the yogurt quality and makes it less appetizing for many people. Inspiration can be drawn from this research about different additives that can be included in yogurt production to increase probiotics, taste, or overall nutritive value (Farag, 2022). A similar study compared two different probiotic dairy substances to see how they differ in nutrients and fermentation. The researchers compared production methods, chemical makeup, and probiotic value of yogurt and yakult. Yakult is a probiotic drink, similar to liquid yogurt. They used a variety of different fermentation techniques as independent variables in the study. After the research was conducted, possible health benefits were determined and compared between the two substances. Things that were compared specifically were carbohydrate, protein, and probiotic content. Yogurt and Yakult both have a large amount of probiotics and similar fermentation methods, but yakult generally has a higher nutritive value. Many types of probiotics that are common in yogurt were explained and analysed based on their individual health benefit (Ruikar, 2024).

In a recent study, 4 different yogurts with varying ratios of rice milk to cows milk were tested for probiotics over varying amounts of time. Researchers concluded that rice milk helped to make the yogurt thicker, although it lowered the texture and didn't have very good overall results when sampled by the public. The properties of non-dairy milk are discussed and how they may cause yogurt to be less desirable and harder to produce. It also demonstrates the effect of non-dairy yogurt at lowering probiotic concentration. This study was done to enforce the idea that non-dairy alternatives, especially rice milk, are not suitable for yogurt production (Uzuner, 2016). Similar research has been done with bananas instead of rice milk. Banana marmalade can contain lots of probiotics and this was used to make yogurts, the probiotic count of these yogurts were taken in different samples and over many days. Researchers identified the many different probiotic variants that were present in the yogurts. The probiotic concentration was also measured throughout the fermentation process, to determine the effects of long and short term storage on probiotic viability in this yogurt. The research explains the optimal time for probiotic concentration in yogurts and how other probiotic bases (non-dairy) will change the yogurt (Çakmakçi, 2012).

Probiotics are very good for your health and a lot of people today are looking for good lactose free alternatives to yogurt. This study examines the probiotic concentration of many different lactose free foods, like fruit and vegetables. Many common foods have probiotics because they go through anaerobic respiration that produces such probiotics, although it is important for consumers to be eating foods with high levels of probiotics in order to reap the benefits. By rating foods based on probiotic concentration, consumers were able to be more educated. The data can aid in determining what other additives could be used to enhance probiotic count in non-dairy yogurt (Şanlıbaba, 2023).

Global Impact

This research will help to educate people about why probiotics are important and how to best add probiotics to their diet. The results collected in this study will help people to be more aware of what they are putting into their bodies. Since probiotics are needed for gut health, this research can be very important for persons with gut issues or infection because it will guide them to making the right choices for their health (Gupta, 2009). One of the goals is to create a high probiotic, low cost yogurt, this will help many people economically because it will provide affordable nutrition options. This research could also help companies to develop new yogurts that have more health benefits, or make changes to their existing yogurt based on the findings.

Risk Analysis

Hazardous bacterial agents could possibly be created. To avoid doing this, all procedures will be followed exactly and care will be taken when handling bacteria. The petri dishes and anything that touches bacteria will be put into a biohazard bag immediately after use and then go into the autoclave so bacteria can be neutralized. In this bag, the bacteria will be soaked in bleach to neutralize bacteria and get rid of hazards. The source of possible hazardous biological agents is the yogurt bacteria and probiotics. While working with probiotics and bacteria it is possible the researcher could create hazardous substances, which is why proper personal protection equipment will be worn. In order to protect researchers, goggles and gloves will be worn throughout the experiment and proper hygiene measures, including hand washing, will be taken before and after. All surfaces were also sanitized with 70% ethanol spray to ensure there was a limited amount of contamination. Information about the possible hazards and safety regulations for the materials that will be used during this study can be found on Carolina Biological. It is

recommended that this research be performed at a biosafety 1 level. All researchers have OSHA training and are CTE bioscience certified, making them prepared to deal with bacteria and other substances.

Materials and Methods

Materials

Seven yogurts were tested in this experiment, all purchased from Bashas (local grocery store): Chobani vanilla, Yopalit light vanilla, Siggi's vanilla, Activia probiotic vanilla, Dannon light + fit vanilla, Silk soy milk vanilla, Silk almond milk vanilla. It's important to have price variety and and all the yogurts the same flavor, this adds reliability to data and is used as a control variable. Carolina Biological Yeast Extract Dextrose (YED) agar powder was to make agar for the petri dishes. Deionized water was added to agar powder to create a liquid substance. 10x Phosphate Buffered Saline (PBS) with pH 7.2 from Gibco was used as a buffer. Distilled water was added to the PBS to make a 1x solution that would be a suitable buffer for the yogurt.

Instruments

The yogurts and all the dilutions were stored in the fridge to prolong shelf life. A Fisher Brand Steril Elite 40 Automatic Steam Sterilizer autoclave was used when making the agar, to sterilize the substance ensuring all microorganisms were eliminated. The agar was held in a Pyrex 1000 mL media bottle and before going into the autoclave the top was wrapped in tinfoil and autoclave tape was put on. The YED powder and distilled water mixture had to be autoclaved to sterilize it before use. Six centimeter petri dishes were used to hold the bacteria during the experiment. Additionally, the empty agar plates were wrapped tightly in parafilm and put in the fridge to sit overnight when there was not enough time to plate bacteria the same day. The Carolina Biological Digital Incubator was used to grow the yogurt bacteria so that the probiotic concentration could be determined in each dilution and yogurt brand. When creating the dilutions of yogurt, a Carolina Biological stirring plate and stir rod were used to combine the yogurt PBS mix for the first dilution. Additional dilutions were much smaller, so a Carolina

Biological vortex mixer was used to combine the materials. The first dilution was placed into a 250 ml sealable media bottle, and the smaller dilutions were held in 1.7ml vials. A Carolina Biological scale and weight boats were also used to measure the original amount of yogurt used in dilutions and agar powered when making more agar plates. To get the yogurt, a scoopula was used and washed thoroughly with dish soap and water in between uses so as to not cross contaminate the yogurt colonies. The vials, containers, and yogurt samples were labeled with a permanent marker so that they could be properly identified during research. When making the first dilution, a graduated cylinder was used because the amount of buffer needed was too much for a micro pipette. For all subsequent dilutions, a Labnet Bio Pette Plus p1000 micro pipette was used in addition to VWR p1000 Universal Pipet Tips that were sterilized in the autoclave. When plating bacteria, a Bio Rad p200 micropipette was used with Fisher Brand p200 Sure One pipet tips. A type A2 Biological Safety Cabinet- Laminar Flow Hood was used to dry the petri dishes before they went into the incubator, this made sure that the results were accurate and the biological material was spread evenly through the agar. Additionally, 70% ethanol spray and paper towels were used before and after use to sanitize the work surface, incubator, and other materials.

Methods

Sanitize all work spaces with 70% ethanol spray to limit the amount of cross contamination. To make the agar, Dissolve the contents of a Carolina Biological YED agar 100g bag into 2L of deionized water in a 1 liter bottle with a lid. Mix this thoroughly via shaking the bottle. Loosen the cap of the bottle but do not remove it, wrap the top in tin foil and put a strip of autoclave tape onto the tinfoil. Autoclave at 121 degrees celsius for 40 minutes, or using the liquid setting on a standard autoclave. Once the cycle is done, cool the mixture to 55 degrees celsius and remove from the autoclave. If the agar solidifies, loosen the top of the container and microwave in increments of 30 seconds until liquid. Using a sharpie label 21 petri dishes with the type of yogurt and dilution type, ex. Silk Almond 10^{-7} CFU/mL or Yoplait 10^{-5} CFU/mL. Pour the agar into petri dishes so dishes are ⅓ full. Let sit with the tops resting ¾ on top until dishes are solidified. In order to make sure dishes have no bubbles, tap them against the table. Wrap plates in parafilm and store prepared plates at 4 degrees celsius.

The next step is making a PBS dilution. Take 100mL of 10x PBS solution and mix with 900mL of distilled water in a 1000ml glass container with a lid. To make the dilutions, add 90 ML of 1x Phosphate Buffered Saline to a 250 ml sealable glass container.

Then, using a scale and weighboat measure 10g of yogurt sample. Add this sample to the PBS buffer in the sealable container. Label with the container type of yogurt used so there is no confusion. Turn on the stirring plate and place the 250 ml container on it. Put a medium stir rod into the container and let it stir for 30 seconds. Remove the container from the stir plate. With a sterile pipet tip, take .1 ml of solution and .9ml of PBS and put into a vial labeled 10^{-1} CFU/mL. Mix the vial for 30 seconds using a vortex and place in a vial holder for stabilization. Then take .1ml of the 10^{-1} CFU/mL solution and .9ml PBS in a new vile labeled 10^{-2} CFU/mL. Mix this in the vortex for 30 seconds and repeat process with each subsequent dilution until dilution 10^{-7} CFU/mL. Repeat the dilution process for each yogurt.

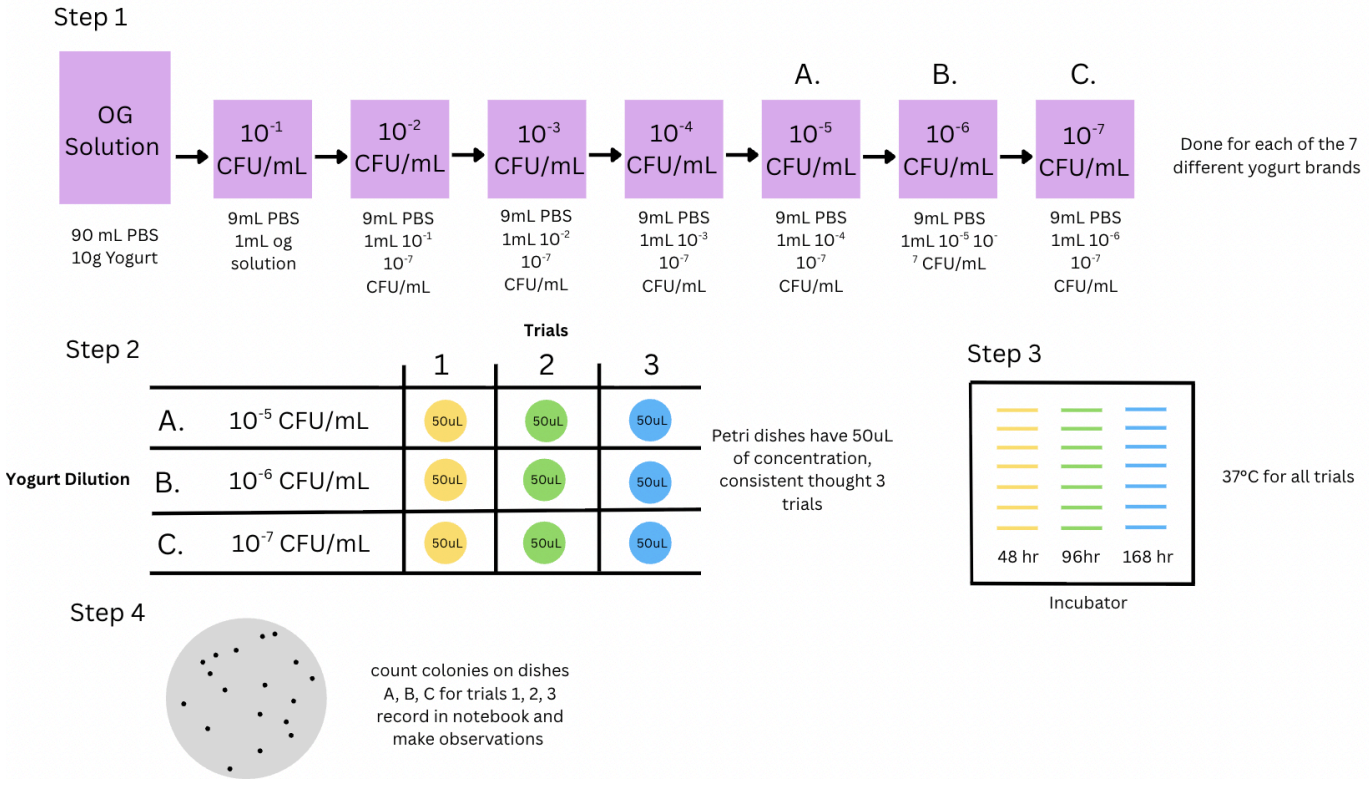

Figure 1: Schematic representation of methodology

Once all dilutions are made, pipette 50uL of 10^{-5} CFU/mL, 10^{-6} CFU/mL, 10^{-7} CFU/mL into separate petri dishes. There should be 21 petri dishes in total, 3 dilutions for each yogurt with 7 different yogurts being used. Dry the plates by putting them into the fume hood for 10 minutes. Then flip plates upside down and incubate at 37 degrees celsius. Before using the incubator clean the inside with 70% ethanol spray. Three separate tests were run on the bacteria and different plates were used for each test.

In the first test, the bacteria will be in the incubator for 48 hours. In the second test, bacteria should be in the incubator for 96 hours. And in the third test bacteria will be in the incubator for 168 hours. After the specified time, petri dishes should be removed from the incubator and put on a sterilized surface. Proper personal protection equipment should be worn when removing the bacteria from the incubator. The bacteria will then be analysed and all results should be recorded in a scientific lab notebook. The colonies of bacteria should be counted accurately. This will allow researchers to calculate the colony forming units and determine the probiotic concentration of each yogurt.

Results

The total data was collected over a period of 3 months. Photos of the bacteria were taken on an Iphone 13. The results indicate bacterial growth of yogurt samples with a 10^{-7} CFU/mL dilution over different periods of time. Three trials were conducted on the yogurt samples to test the effect of incubation time of bacteria growth. The amount of bacteria present on each plate indicates how many probiotics are in each yogurt. The data represents 7 different yogurt brands: Chobani, Dannon, Yoplait, Siggi's, Activia, Silk Almond and Silk Soy, as well as 3 different kinds of milk: almond milk, soy milk, and cows milk.

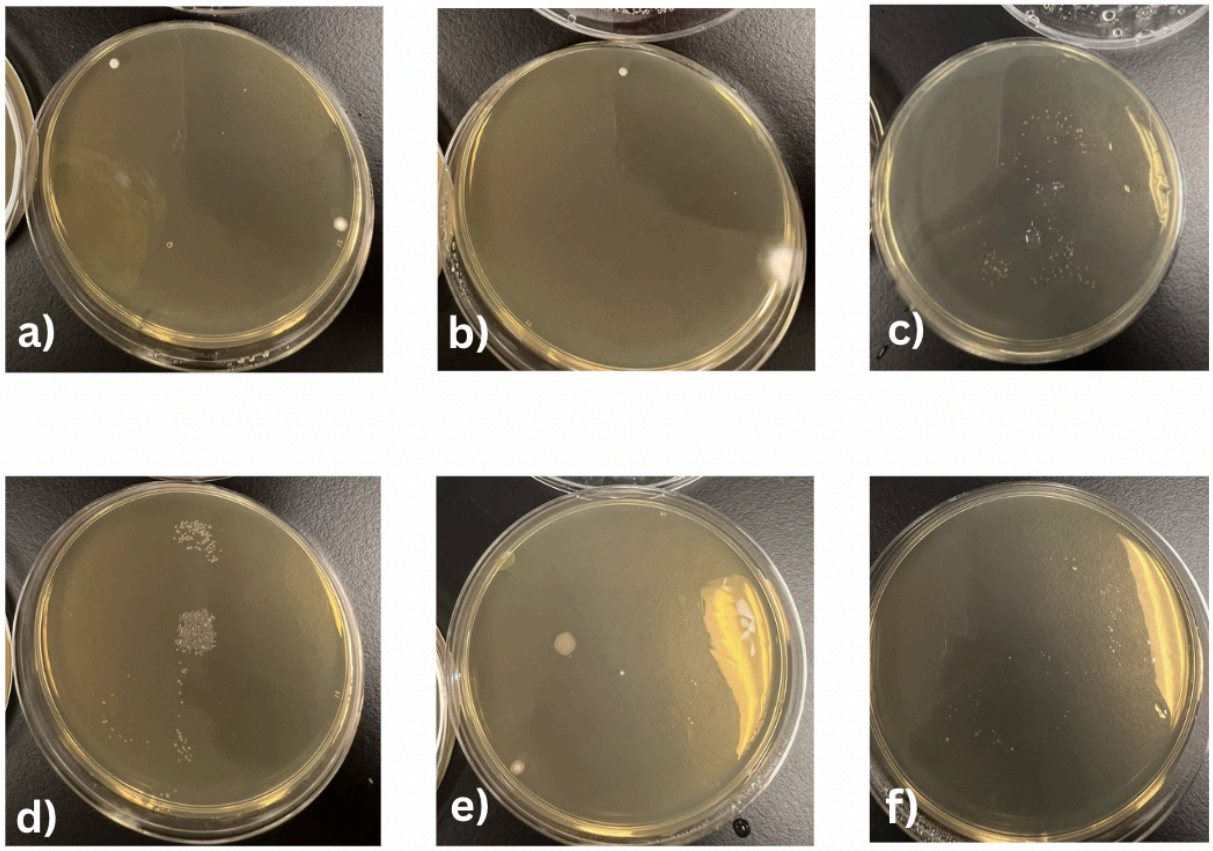

Figure 2: First trial, bacteria in incubator for 48 hours, all samples created using a 10^{-7} CFU/mL dilution, a) Silk Soy Milk Yogurt, b) Silk Almond Milk Yogurt, c) Siggi's Yogurt, d) Chobani Yogurt, e) Dannon Yogurt, f) Yoplait Yogurt

Trial 1 was conducted from November 3, 2025 to November 17, 2025. There was not much bacteria present on the petri dishes, and bacteria that were present appeared very faint. Activia was not tested in this trial because the data was forgotten in the fridge.

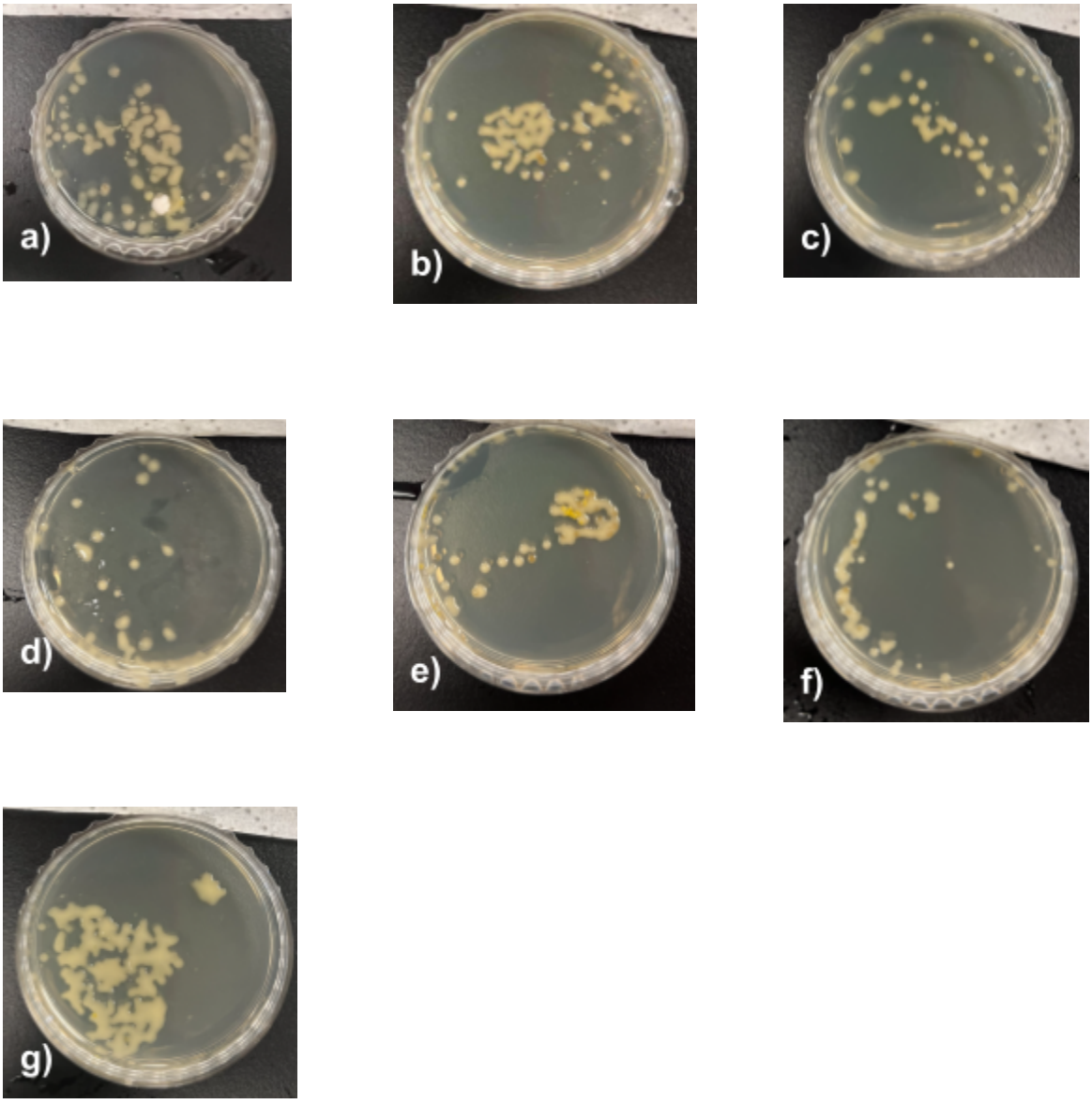

Figure 3: Trial 2 bacteria in incubator for 96 hours, all samples created using a 10^{-7} CFU/mL dilution, a) Silk Soy Milk Yogurt, b) Silk Almond Milk Yogurt, c) Dannon Yogurt, d) Siggi's Yogurt, e)Yoplait Yogurt, f) Activia Yogurt, g) Chobani Yogurt

Trial 2 was conducted from January 20, 2026 to January 26, 2026. The yogurt bacteria responds well to this time of incubation, 96 hours. All of the plates contain high amounts of bacteria, although, most of the data in this trial can not be counted because there are big sections of bacterial growth. Data from this trial can be accurately analysed by using quality

analysis, but proper CFUs cannot be calculated. All growth is one color. This trial has the most growth out of all the other timed trials.

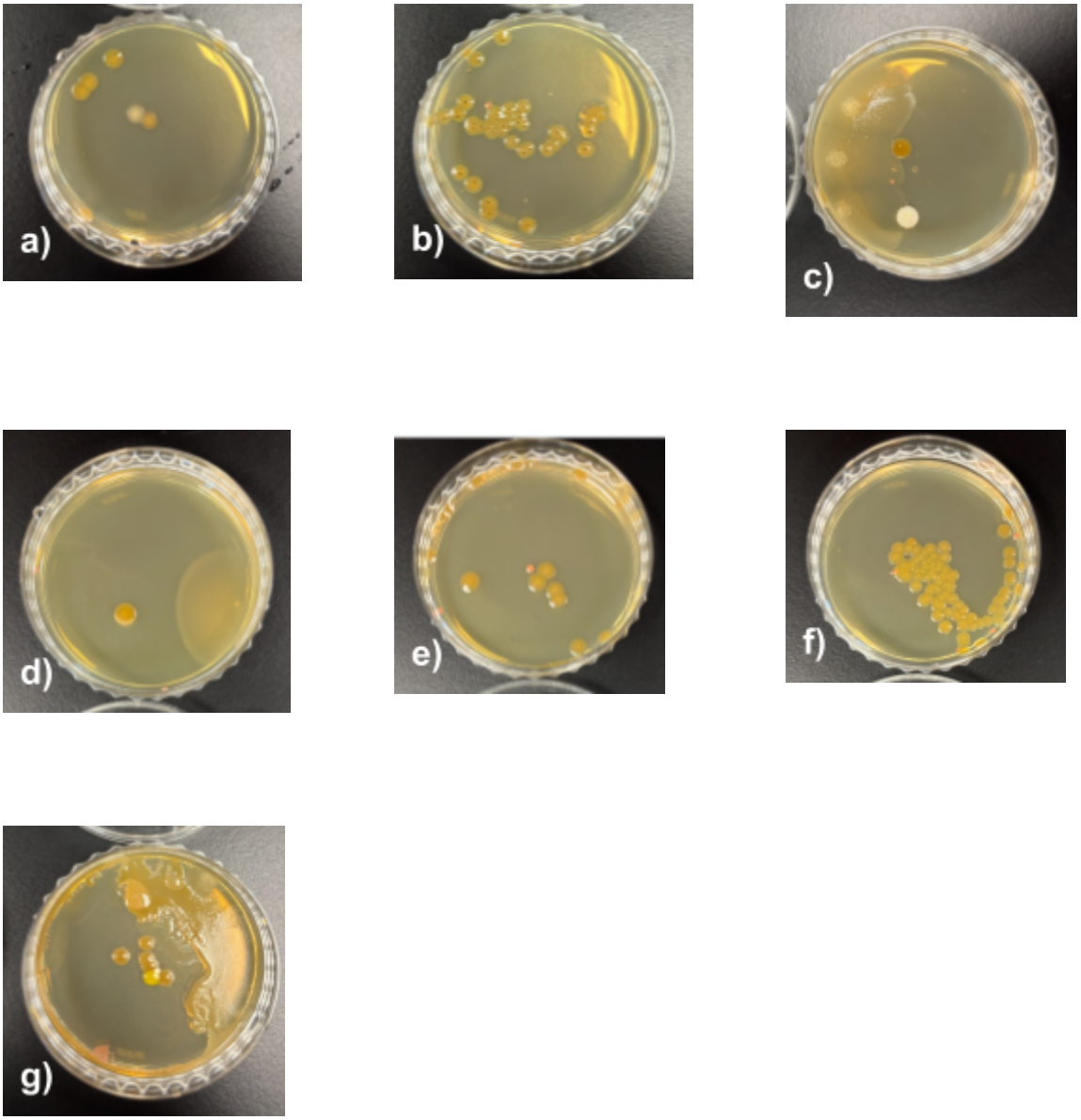

Figure 4: Trial 3 bacteria in incubator for 168 hours, all samples created using a 10^{-7} CFU/mL dilution, a) Chobani Yogurt, b) Silk Almond Milk Yogurt, c) Yoplait Yogurt, d) Dannon Yogurt, e) Activia Yogurt, f) Silk Soy Milk Yogurt, g) Siggi's Yogurt

Trial 3 was completed between November 21, 2025 to December 10, 2025. Data shows a significant amount of data on the petri dishes. There are also different colors of bateria, mainly orange, red, and yellow. Most of the data is clear, although some dishes have inconclusive data due to large combined, splotch-like, sections of bacteria.

Discussions

The results show that all the yogurts have live bacteria cultures in them. The bacteria in yogurt responds best to being grown at 37 degrees celsius for 96 hours. Although much of these petri dishes could not be used to perform a CFU test, via qualitative data analysis there was the most amount of bacteria grown during this trial. Quantitative data is the data that includes numbers and calculation, in this research the colony forming units calculation and counting was quantitative data. Qualitative data is data obtained based on visuals or other sensory aspects. In regards to yogurt, qualitative data can be a petri dish visually having a lot of colonies or the characteristics of bacteria. Research in this project focuses on quantitative data so that there can be a quantified number of probiotics for each yogurt. Sometimes, the data was too numerous to count or not spread out enough to perform a CFU. In these cases, visually qualitative analysis was implemented.

In the first trial, where yogurt bacteria was incubated for 48 hours, no significant growth was detected. This indicates that the bacteria in yogurt does not respond well to lower amounts of incubation time. This data can also be used to make assumptions about the recommended time of fermentation for these yogurts. This indicates that the bacteria present in yogurt needs more time to ferment in order to achieve maximum levels of probiotics.

Table 1: Results analysis from trial one, related to figure 2

1A, Silk Soy	Not enough data present for CFU. Visually, very little data, although there is one larger colony and 5 small colonies.
1B, Silk Almond	Not enough data present, one larger colony and a small colony.
1C, Siggi’s	Determined as having 135 colonies after a CFU was performed. Bacteria are easily identifiable and spread out. The bacteria present is small.

1D, Chobani	187 colonies were counted, although there was also a large clump of bacteria that remained uncounted, this could have impacted the counting process and changed the final number. Visually, most bacteria are in 2 areas and very close together, colonies on this plate are very small.
1E, Dannon	Not enough data present, 4 medium sized colonies that are spread throughout the plate.
1F, Yoplait	60 colonies, this number falls within the range of viable data for a live probiotic count. Bacteria are very faint and small but still present.

In a 10^{-7} CFU/mL dilution, 30- 300 colonies indicate a good, healthy amount of probiotics. The CFU test accurately identifies the amount of live bacteria that each yogurt has. The amount of bacteria in each is also equivalent to the amount of live bacteria cultures. In this test the data was all quite faint, but most could be counted. Based on the results from trial 1, Chobani yogurt has the highest concentration of live probiotics when grown for 48 hours. This indicates that Chobani yogurt has the most health benefits.

Table 2: Results analysis from trial two, related to figure 3

2A, Silk Soy	Inconclusive due to crowding. A lot of bacteria are present but it does not have circular shapes.
2B, Silk Almond	Inconclusive due to crowding. Bacteria are not very circular and most of it is in the middle of the plate. A high amount of data is present.
2C, Dannon	39 colonies present. Bacteria are mostly circular and spread over the entire plate.
2D, Siggi's	25 colonies of bacteria, this amount is not within the usable range of data and therefore Siggi's 10^{-7} CFU/mL dilution is inconclusive. Although, the 10^{-6} CFU/mL dilution can be used to determine the overall viability of this yogurt. At 10^{-6} CFU/mL this sample had 147 cultures. That means that the sample does have live cultures that experience growth at 96 hours, but the overall amount cannot be used because the 10^{-6} CFU/mL dilution does not compare to the other

	dilutions being tested. There is not a lot of data on the plate visually, most of it is crowded along the edges making it undefined.
2E, Yoplait	Inconclusive due to crowding. There are some circular colonies but a large portion of data can not be counted.
2F, Activia	53 bacterial colonies, data is not spread out evenly, although it can still be identified.
2G, Chobani	Inconclusive due to crowding. The data is very squished together and cannot be quantified due to a lack of defined circular shapes. Most of the data on this is blended into one big splotch. There is a lot of data present.

In figure 2, much of the data can not be counted because large clumps are present that hinder the counting process when collecting CFU data. Samples A, B, E, and G can not be counted because the data is inconclusive. This inconclusivity could be a result of bacterial plating. It is possible the researcher did not let the bacteria dry long enough or move the bacteria around the plate enough. The amount of bacteria on these petri dishes can be estimated, although data will not be included for accuracy purposes and therefore no CFU will be performed. With the data that can be collected via CFU calculation, sample F, Activa is the most probiotic rich. Although, when looking at the photos of petri dishes, it is clear that all of them have an immense amount of probiotics when grown at this temperature. When looking at the photos, Silk Soy milk yogurt and Chobani look like they have the highest concentration of probiotics. All the yogurts grown at this time had high amounts of bacterial concentration, indicating that 96 hours is an optimal amount of time for fermentation of yogurts. Additionally both of the non-dairy yogurts showed bacterial growth, this demonstrates that non-dairy yogurts do contain a significant amount of probiotics.

Table 3: Results analysis from trial three, related to figure 4

3A, Chobani	6 colonies, this is lower than the countable range and so this dilution cannot be included. All of the other dilutions of chobani also contained low amounts of colonies. This means that chobani is not a very probiotic rich yogurt and does not respond well to 168 hour incubation time.

3B, Silk Almond	41 colonies, the colonies are spread nicely throughout the entire plate and very easy to count. Medium sized, circular bacteria with little to no crowding.
3C, Yoplait	2 colonies and an uncountable area. This invalidates the data from this dilution, although the 10^{-6} CFU/mL dilution of Yoplait had 50 colonies. This yogurt does contain live bacteria, although they were not present in a smaller dilution. One area of the plate has an odd shaped colony, visually there is not much data that is viable and the plate is sparse.
3D, Dannon	No enough to count, additionally, the 10^{-6} CFU/mL dilution of Dannon was inconclusive due to a large amount of colonies in one area and a patch of bacteria in the middle of the plate. Overall, Dannon was not the best yogurt. Visually, there is one very large bacteria that is ⅕ of the plate, one other colony that is very defined.
3E, Activia	11 colonies, which is not enough to be included for a CFU. The 10^{-6} CFU/mL dilution also did not have viable data. Colonies were easy to count and a large size, although not enough present.
3F, Silk Soy	102 colonies. This was an impressive amount of bacteria and the most growth seen during trial 3. Colonies have defined circular shapes, mostly in one area of the plate. A small amount of crowding was present, but bacteria was still able to count.
3G, Siggi's	Inconclusive due to crowding. The plate had an oddly shaped large bacteria that covered a lot of it. There is a decent amount of growth but it is an unquantifiable amount due to the absence of circular colonies.

The soy milk non-dairy yogurt had the most live cultures grown in this test than any other yogurt, thus making it the most probiotic rich. This result is surprising because non-dairy yogurts often lack the probiotic nutrients of cow milk yogurts.

Over all of the trials, Chobani had a significant amount of bacteria present. Additionally, both of the non-dairy yogurts had high amounts of probiotics when tested for more than 48 hours. This indicates that non-dairy is a good alternative because they exhibit similar probiotic properties and amount to dairy yogurts.

The CFU values above that are in the range of 30-300 on each plate can also be measured to show CFU/mL in each yogurt. This is done by dividing CFU calculated by volume of sample plated and multiplying this number by the dilution. For Silk Soy milk yogurt in trial three, this would be 102/.05 x 10,000,000 or 2040 x 10,000,000.

Table 4: Price of Yogurts

Activia	$1.32
Chobani	$2.39
Dannon	$1.69
Siggi’s	$2.79
Yoplait	$0.99
Silk Almond Milk	$3.39
Silk Soy Milk	$3.39

The yogurts used in this test were all purchased from Bashas, a local grocery store in Tucson, Arizona. The price of yogurts could vary due to sales or the store that they are bought from.

The most expensive dairy yogurt is Siggi's and the cheapest dairy yogurt was Yoplait. Both of the non-dairy yogurts were the same price, likely due to being the same brand. Chobani was determined as having the most probiotics, and is the second most expensive dairy yogurt tested. Although Siggi’s, the most expensive dairy yogurt, also contained a high amount of probiotics. Additionally, both of these yogurts contain the label “Live Cultures”. Yoplait was a very inexpensive yogurt in comparison to the other brands. This sample had very little bacteria throughout all of the trials. Because of this data, it can be concluded that the price of a yogurt does affect its probiotic concentration. Yogurts that are more expensive contain higher amounts of probiotics and therefore have more health benefits.

The non-dairy yogurts were much more expensive than all of the dairy yogurts tested. This is likely because milk substitutes are more expensive. Between these two yogurts, the soy milk contained more probiotics. In the first trial, no data was present on either plates, but in the second and third trial they both grew a high amount of bacteria. This further proves that more expensive yogurts contain more probiotics.

One source of error could have been the agar used. In the middle of the experiment the researcher had trouble growing bacteria. This was because the agar being used was contaminated from sitting out and being reheated many times. After this realization, the researcher made a new agar and restarted the trial, so as to not get false results.

The first time trying this experiment did not go well, proper methods were not used when measuring yogurt amount and dilutions were not used before plating bacteria. In the pre-experiment the research also did not plate bacteria in an effective and accurate way. This caused the bacteria to not grow and subsequently the experimental methods changed. The new methods developed through this project have led to much more viable research.

It is possible that there are errors based on human error when counting bacteria on the plate, measuring, and weighing. Many of the plates had inconclusive data because the bacteria was clumped or there was either too much or too little data. This was unfortunate because it invalidated much of the work that was done.

Conclusions

The results of this experiment show an interesting correlation between yogurt type and amount of probiotics. Yogurt with the highest amount of quantified probiotics is Chobani yogurt. Trial two had the most amount of growth overall, although much of it could not be quantified. This suggests that after 96 hours, four days, of yogurt consumption, probiotics are optimal in the body. Once digested, the yogurt probiotic continues to grow and has a maximum growth rate at 4 days. Non-dairy, specifically Silk Soy and Silk Almond, yogurts are an effective source of

probiotics after 48 hours, 2 days. The discovery of Chobani yogurt having the most probiotics can help people make better dietary decisions.

The hypothesis that the most expensive yogurt would have a high amount of probiotics was true because both Siggi's and Chobani had the most probiotics for all dairy yogurts.

The hypothesis that non-dairy yogurt would not contain probiotics was incorrect. Through much research it has been proven that dairy alternative yogurts do have high concentrations of probiotics. In trials two and three the non-dairy yogurts had more bacterial growth than some of the milk yogurts. This is an important finding because it shows people do not need fermented dairy yogurt to receive probiotics. Overall this discovery can help many people who have lactose intolerance or sensitivity to make healthy choices that will benefit their gut.

Serial dilutions, colony forming units calculation, and incubation time have all been important aspects of the project that helped to control the bacterial growth. It is important to research probiotics because they are a growing source of nutrients around the world. Probiotics and fermentation have been around for centuries, but the extent of their health benefits are just being discovered. As this field continues to develop, further experimentation is needed to determine the long term effects of probiotics and how to incorporate probiotics into more foods.

Literature Cited

ÇAKMAKÇI, S, ÇETİN, B, TURGUT, T, GÜRSES, M, & ERDOĞAN, A (2012). Probiotic properties, sensory qualities, and storage stability of probiotic banana yogurts. *Turkish Journal of Veterinary & Animal Sciences 36* (3): 231-237. https://doi.org/10.3906/vet-1007-2

Caplice, E. (1999, September 15). Food fermentations: role of microorganisms in food production and preservation. *Science Direct*, *vol. 50*(1-2), pp. 131-149. https://www.sciencedirect.com/science/article/abs/pii/S0168160599000823

Farag, M. A., Saleh, H. A., El Ahmady, S., & Elmassry, M. M. (2022). Dissecting Yogurt: the Impact of Milk Types, Probiotics, and Selected Additives on Yogurt Quality. *Food Reviews International*, *38*(sup1), 634–650. https://doi.org/10.1080/87559129.2021.1877301

Gupta, V. (2009, July-September). Probiotics. *Science Direct*, *Vol. 27*(3), pp. 202-209. https://www.sciencedirect.com/science/article/pii/S0255085721016273

Holzapfel, W. H., & Schillinger, U. (2002). Introduction to pre- and probiotics. *Science Direct*, *Vol. 35*(2-3), pp. 109-116. https://www.sciencedirect.com/science/article/abs/pii/S0963996901001715

Nancy Toedter Williams, Probiotics, *American Journal of Health-System Pharmacy*, Volume 67, Issue 6, 15 March 2010, Pages 449–458, https://doi.org/10.2146/ajhp090168

Ricardo Soccol, C. (2010, June 4). The Potential of Probiotics: A Review. *Food Technology and Biotechnology*, *vol. 48*(4), pp. 413–434. https://hrcak.srce.hr/en/file/92463.html

Ruikar, S. (2024, Jan.). Production, Characterization, and Nutritive Value Study of Yoghurt and Yakult: A Comparative Analysis. *Bulletin of Pure & Applied Sciences-Zoology*, *vol. 43B*, pp. 475-89. EBSCOhost. research.ebsco.com/linkprocessor/plink?id=06b1ef32-ac87-3082-805b-ee6efebc2891.

Şanlıbaba, P. (2023, Jan.). Fermented Nondairy Functional Foods Based on Probiotics. *Italian Journal of Food Science / Rivista Italiana Di Scienza Degli Alimenti*, *vol. 35*(no. 1), pp. 91-105. EBSCOhost. doi.org/10.15586/ijfs.v35i1.2279

Uzuner, A. E. (2016, Sept.). Usage of Rice Milk in Probiotic Yoghurt Production. *Carpathian Journal of Food Science & Technology*, *vol. 8*(no.4), pp. 5-25. EBSCOhost. research.ebsco.com/linkprocessor/plink?id=03022846-4a68-3f7e-9df7-e645cbc7705c.