

## The Benefit and The Content of Lactic Acid Bacteria “*Lactobacillus casei* Shirota Strain” in Yakult

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### Abstract

The purpose of this article is to determine the content of lactic acid bacteria in a probiotic beverage (Yakult) with a starter fermentation of *Lactobacillus casei* Shirota strain and to find out its benefits for digestion. In this study, the library research method was used by obtaining data and materials from journals. The author tries to describe the content of lactic acid bacteria “*L. casei* Shirota strain” in Yakult and its benefits for the digestive system. The results showed that the levels of *L. casei* Shirota strain in fermented milk were 1.27-1.70% with an average of 1.42%. In the Indonesian National Standard 01-2891-2009, the lactic acid bacteria content of *L. casei* Shirota in fermented milk was 0.5-2.0%. *L. casei* Shirota can produce lactic acid and acetic acid, so that, it can decrease intestinal pH and prevent pathogens bacteria's growth. Probiotic beverage from fermented milk using *L. casei* is beneficial for consumption for its ability in inhibiting the growth and development of pathogenic bacteria in the gastrointestinal tract, help the absorption of vitamins and antioxidants, eliminate toxic components contained in food, as well as producing several vitamins through the synthesis of digestive enzymes.

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### Introduction

Microorganisms are commonly found everywhere, such as: in the soil, aquatic environments, and atmospheres (Pelczlar and Chan, 2008). Microorganisms have a role as producers, consumers, and reducers (Utomo, 2012). The microorganisms were divided into two groups unicellular and multicellular. Microorganisms have the characteristics of plant cells, animal cells, and both. The main character of microorganisms can differentiate based on their cellular material compositions (Pelczlar and Chan, 2008).

Bacterias are one of the groups of prokaryotic microorganisms (single-celled). That life is colonized and does not have a core-sheath but can live anywhere (Jawetz *et al.*, 1996). Bacteria are the most numerous organisms compared to other living things. Some bacteria can be beneficial or harmful. That can cause disease/harm in humans are called pathogens, while beneficial bacteria in humans are called probiotics. One example of beneficial bacteria in humans is lactic acid bacteria (Khanifah, 2012).

Lactic acid bacteria (LAB) are coccus and stems, gram-positive bacteria, aerobic to anaerobic. LAB does not have spores and cytochromes. LAB has required complex nutrients such as amino acids, vitamin

B1, B6, B12, biotin, purines, and pyrimidines (Kasi, [2017](#)). There are two groups of LAB, that is homofermentative and heterofermentative bacteria. Homofermentative is a group of fermentative bacteria that final main product is lactic acid. Heterofermentative is a group of fermentative bacteria that final main product is not lactic acid. The final product from heterofermentative is ethanol and CO<sub>2</sub> (Surono, [2004](#)). LAB has been widely used as a starter culture for various fermentation of meat, milk, vegetables, and retain (Kusumawati, [2012](#)).

The main role of these bacteria is to preserve foodstuffs by producing lactic acid, acetic acid, ethanol, CO<sub>2</sub>, and bacteriocin (Desmazeaud, [1996](#)). LAB has a preservation effect because it produces compounds that can inhibit the growth of various microbes. Most of these antimicrobial effects are caused by the formation of lactic acid and acetic acid as well as the resulting decrease in pH. In addition, lactic acid bacteria also produce other inhibitory compounds such as hydrogen peroxide, diacetyl, carbon dioxide, reuterin, and bacteriocin (De Vuyst & Vandamme, [1994](#)).

Bacteriocin is an antimicrobial compound produced by LAB that can be used as a natural preservative in inhibiting harmful pathogenic bacteria (Savadogo et. al., [2006](#)). LAB is potentially bio preservative because it can inhibit the growth of pathogenic and destructive bacteria, such as *Lactobacillus casei* (Azizah, [2018](#)). *L. casei* is one of the beneficial LAB species in the gastrointestinal tract because it can maintain the balance of the intestinal microflora (Widedianto et al., [2017](#)). These bacteria include gram-positive bacteria, have no spores, have a rounded form of stem, and produce lactic acid as the majority of the final product during carbohydrate fermentation. *L. casei* is a species of *Lactobacillus* sp. which is often used as a probiotic because it is a non-pathogenic and safe bacterium (Suryani, et al., [2019](#)).

Nowadays, there are many processed foods and probiotic beverages that are favored by the public because of their benefits for health. Yakult is a type of probiotic beverage fermented milk with strains of bacteria *L. casei* (Sunarlim, [2016](#)). Consuming foods as well as drinks containing probiotics can help in binding to oral microorganisms. Through its direct interactions, probiotics compete with existing oral microorganisms. Probiotics produce chemicals to inhibit oral bacteria that can damage oral hygiene (Koesoemawati, [2019](#)).

*L. casei* can provide beneficial effects for health because the probiotic bacteria can decompose lactose (Mulyani et al., [2008](#)). Lactic acid content produced by LAB species *L. casei* can decrease the growth of pathogenic bacteria, for example, *Escherichia coli* bacteria because in the small intestine there is competition LAB and *E. coli* to obtain nutrients, where LAB can be attached to intestinal epithelial cells that then form colonies and produce anti-microbial substances, so pathogenic bacteria can't multiply. LAB is also able to produce short-chain fatty acids that play a role to stimulate the multiplication of intestinal epithelial cells, resulting in increased absorption of nutrients in the body (Kadir, [2016](#)).

## Methods

This research was qualitative. The technique used was descriptive analysis with library research (literature studies). Library research (literature studies) is one type of literature research that uses the necessary data and materials in completing research derived from books, encyclopedias, dictionaries, journals, documents, magazines, and other scientific sources (Harahap, [2020](#)). In this study, using the library research method, the authors tried to describe the lactic acid content in lactic acid bacteria in *Lactobacillus casei* strains of Shirota in the probiotic beverage Yakult and its benefits for the digestive system.

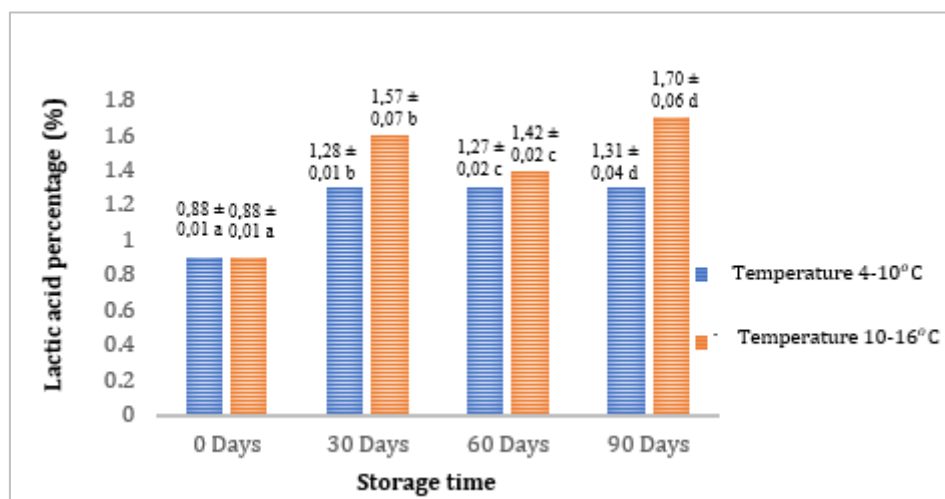
## Results and Discussion

Lactic acid bacteria (LAB) are a group of Gram-positive bacteria, cocci or round-shaped, do not form spores, do not produce catalase, do not have cytochromes, their growth is anaerobic to facultatively anaerobic, requiring complex nutrients such as amino acids, vitamins B1, B6, B12, biotin, purines, and pyrimidines (Kasi, [2017](#)). The main role of these bacteria is to preserve foodstuffs by producing lactic acid, acetic acid, ethanol, CO<sub>2</sub>, and bacteriocin (Desmazeaud, [1996](#)). LAB has the potential to be bio preservative because it can inhibit the growth of pathogenic and destructive bacteria. One of the LAB species is *Lactobacillus casei* (Azizah, [2018](#)).

*L. casei* is a species of *Lactobacillus* sp. which is often used as a probiotic because it is a non-pathogenic bacterium and safe to use in food (Suryani et al., [2019](#)). *L. casei* used as a starter in probiotic beverage products includes a type of homofermentative lactic acid bacteria, which are bacteria that transfer glucose into lactic acid in large quantities (90 percent). *L. casei* is usually isolated from dairy products and human intestinal lumens (Robinson, [1981](#)). The results of ex vivo experiment, it is known that *L. casei* can

live in the range of pH 3.0 to 7.0. This bacterium has properties resistant to gastric acid and bile acids (Coste in Suseno & Sutarjo, [2012](#)).

*L. casei* is rarely found in the gut, so this bacterium needs to be given in the diet in both human food and beverages (Waspodo, [1997](#)). In addition, *L. casei* has the advantage of using sugar as a source of carbon for a long period compared to other groups of probiotic bacteria, so that the product has a long shelf life (Salminen, [1993](#)). Some probiotic beverages from fermented milk using *L. casei*. The following are the lactic acid levels in fermented milk using *L. casei* with different temperatures and storage periods (Ayuti et al., [2016](#)).



**Figure 1. Lactic Acid Content**  
 Source: Ayuti et al. ([2016](#))

The lactic acid content of fermented milk *L. casei* (Figure I) ranges from 1.27-1.70% with an average of 1.42%. The lactic acid levels of fermented products with *L. casei* correspond to the range of the Indonesian National Standard 01-2891-2009 which is 0.5-2.0% (Ayuti et al., [2016](#)).

One of the probiotic products from fermented milk with the raw ingredients of the bacteria *L. casei* Shirota strain is Yakult. Yakult is a probiotic fermented milk beverage that contains beneficial bacteria that are beneficial for human health. Yakult does not contain preservatives, all Yakult raw materials are made from natural (Albaari & Murti, [2003](#)). The bacteria contained in Yakult's beverage must be kept alive. Yakult should be stored in a cold place at a temperature below 10°C, while at a temperature between 10°C–40°C Yakult bacteria are active, and above 40°C the bacteria will die (Putri, [2009](#)).

**Table 1. The Composition of the Substances Contained in Each Bottle of Yakult**

Composition	Content
Calories	48,0 Kcal
<i>Lactobacillus casei</i> Shirota strain	6,5 billion
Fat	0,1 g
Protein	0,8 g
Lactose and glucose	11,3 g
Other ingredients	0,2 g
Water	57,2 g

Source: PT Yakult Indonesia Persada

Generally, Yakult products in one millimeter contain more than  $10^8$  *L. casei* bacterial cells (Salminen, [1993](#)). Based on research conducted by Indarto dan Sutarjo, ([2012](#)) the average number of lactic acid bacteria present in probiotic beverages during 0-30 days storage is between  $1.96 \cdot 10^9$  -  $6.77 \cdot 10^9$  mo/ml. The composition of the substance of each bottle of Yakult beverage can be seen in Table I.I.

Yakult is a probiotic beverage that uses bacteria of the species *L. casei*. This probiotic beverage has many benefits for health, especially indigestion. In the human gastrointestinal tract, there are as many as 100 trillion living bacteria. These bacteria account for 30% of the weight of the feces which can be known as the gastrointestinal microflora. There are two types of bacteria found in the gastrointestinal tract, beneficial bacteria, and pathogenic bacteria. Beneficial bacteria can play a role in various aspects of

nutrition and disease prevention. Beneficial bacteria can produce important nutrients such as vitamins and organic acids, which will later be absorbed through the gastrointestinal tract and will be utilized by epithelial cells and vital organs such as the liver. Organic acids can also act as natural antibacterials by suppressing the growth of pathogens that occur in the gastrointestinal tract (Lestari & Helmyati, 2018). *L. casei* is a group of homofermentative lactic acid bacteria (Lestari & Helmyati, 2018). Homofermentative bacteria using glycolysis pathways will produce pyruvate which will later be converted into lactate. These bacteria then use the pentose phosphate pathways and will produce lactic acid, acetic acid, and CO<sub>2</sub> (Lestari & Helmyati, 2018).

*L. casei* can help in limiting the growth of pathogenic bacteria present in the gut. The species contained in this probiotic beverage can also assist in the absorption of vitamins and antioxidants and can eliminate toxic components contained in food (Widiyaningsih, 2011). *L. casei* bacteria can produce lactic acid and acetic acid so that they can lower the intestinal pH and prevent the growth of pathogens. These microorganisms can also stimulate the absorption of minerals such as iron, magnesium, calcium, and zinc. The study also showed that *L. casei* bacteria have a contribution to improving food nutrition by producing several vitamins through the synthesis of digestive enzymes such as casein phosphatase or lysozyme. Probiotics can also affect changes in the gastrointestinal tract and systemic immune system. *L. casei* bacteria is the largest colony organism in the gastrointestinal tract, it can modify allergic and inflammatory reactions (Bardosono & Sutanto, 2015).

The mechanism of action of probiotics is by utilizing the ability of the organism in the process of breaking down long chains of proteins, fats, and carbohydrates. The ability of these microorganisms is obtained from the presence of special enzymes possessed by microorganisms to break bonds. The breakdown of macronutrients into micronutrients will facilitate absorption in the human gastrointestinal tract. Microorganisms that break down these molecules will also benefit in the form of energy from the breakdown of macronutrients into micronutrients (Widiyaningsih, 2011).

## Conclusions and Recommendations

Based on the results of the literature study can be concluded that in one bottle of fermented probiotic beverage *L. casei* (Yakult) there are several contents, including calories 48 Kcal; *L. casei* Shirota strain 6.5 billion; fat 0,1 g; protein 0,8 g; lactose and glucose 11,3 g; other ingredients 0,2 g; and water 57.2 g. Probiotic beverage from fermented milk using *L. casei* can help in inhibiting the growth and development of pathogenic bacteria in the gastrointestinal tract. *L. casei* can also help in the absorption of vitamins and antioxidants and can eliminate toxic components contained in food, in addition, *L. casei* has contributed to improving food nutrition by producing several vitamins through the synthesis of digestive enzymes such as casein phosphatase or lysozyme.

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