

Drinking yogurt reduces colony of cariogenic bacteria in young adults saliva (Meminum yogurt menurunkan jumlah koloni bakteri kariogenik dalam saliva pada usia remaja)

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ABSTRAK

Program pencegahan karies pada masyarakat saat ini memiliki tujuan utama untuk menurunkan jumlah koloni bakteri kariogenik, khususnya bakteri golongan *Streptococcus*. Salah satu cara yang sedang dikembangkan adalah metode probiotik melalui yogurt. Penelitian ini merupakan penelitian eksperimen laboratorium dengan menggunakan desain *cross over with control group*. Sampel diambil secara acak sebanyak 15 orang dari mahasiswa preklinik Fakultas Kedokteran Gigi Universitas Hasanuddin angkatan 2008-2010. Hasil penelitian memperlihatkan perbedaan yang bermakna antara sebelum dan sesudah meminum yogurt terhadap penurunan jumlah koloni bakteri kariogenik dalam saliva ($p < 0,05$), dan terdapat perbedaan yang bermakna antara suhu yogurt terhadap penurunan rerata jumlah bakteri kariogenik dalam saliva setelah mengkonsumsi ($p < 0,05$). Selain itu, terdapat perbedaan yang bermakna terhadap pH saliva antara sebelum dan sesudah meminum yogurt ($p < 0,05$). Disimpulkan bahwa meminum yogurt menurunkan jumlah koloni bakteri kariogenik dalam saliva pada usia remaja.

Kata kunci: efek meminum yogurt, penurunan koloni *Streptococcus*, pH saliva

ABSTRACT

The main objective of caries prevention programs in the community is to reduce the number of colonies of cariogenic bacteria, especially *Streptococcus*. A method of caries prevention that is currently developed is a method using probiotics through yogurt. This research is a laboratory based experiment using the *cross over with control group* design. Fifteen samples were collected randomly from a population of preclinical dentistry students of Hasanuddin University from entry year 2008 until 2010. The results showed a significant difference between before and after drinking yogurt where the number of colonies of cariogenic bacteria in saliva reduced ($p < 0.05$) and there is also a significant difference between the temperature of the yogurt in reducing the average number of cariogenic bacteria in the saliva after six and nine days yogurt consumption ($p < 0.05$). In addition, there is a significant difference pH of saliva between before and after drinking yoghurt ($p < 0.05$). It is concluded that drinking yogurt reduces colony of cariogenic bacteria in young adult saliva

Keywords: effects of drinking yogurt, *Streptococcus* colonies decreased, pH of saliva

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INTRODUCTION

Caries is a disease that attacks hard tissues of the teeth.^{1,2} This occurs because of the acidogenic bacteria in the oral cavity that potent to metabolize carbohydrates and produce acids that can dissolve into the organic tissue, and damages the enamel and the teeth. Therefore, the main purpose of caries prevention programs should be able to reduce the number of colonies of cariogenic bacteria, especially *Streptococcus* sp.^{1,3}

There are many ways of reducing the number of colonies of bacteria in the oral cavity. One method being developed now is the method of probiotics. This method is an artificial method that aims to replace the pathogenic bacteria in the mouth with commensal bacteria which is not harmful to certain body parts, including the oral cavity.³

Probiotics which are used in the food industry and has been proven to inhibit the growth of cariogenic

bacteria, primarily using lactic acid bacteria such as *Lactobacilli* and *Bifidobacteria*. One type of probiotic products easily found in Indonesian is yogurt or fermented milk.^{3,4} Traditionally, the manufacture of yogurt starter cultures used a mixture of *Lactobacillus* sp. and *Streptococcus thermophilus* with a ratio 1:1.¹³

Based on the findings of previous studies, the benefits of probiotics have been developed to prevent dental caries; for example a yogurt that contains certain bacteria such as *Lactobacillus bulgaricus*. The ability to prevent dental caries can be obtained through the ability of the probiotic bacteria to adhere on the oral mucins and dental plaque, and to affect supragingival plaque. In addition, probiotic bacteria will compete to have the local nutrients and other metabolite interactions.^{3,18}

Based on these considerations, the researcher wants to know whether yogurt can decrease the number of cariogenic bacteria in saliva. In addition,

based on habits of young adults who often consume yogurt packaged in different temperatures, the study is considered important to find out if storage temperature may have anti-cariogenic-bacterial effects.

MATERIALS AND METHODS

This study was a laboratory based experiment using cross over design with control group. The number of samples is 15 people aged 18 to 19 years who have a maximum one caries and four restored teeth. Before the study, the pH of yogurt was measured and the composition was recorded. Then, the study is divided into two stages.

In stage I, subjects were instructed to spit into a plastic pot for review, and were given 26°C yogurt to be drunk every day. On the first day, samples were instructed to drink the yogurt together and then asked to spit into a container. Saliva pH was measured after 10, 20, and 30 minutes and then the yogurt was drunk. Salivary measure was taken again after 3, 6 and 9 days. After that, samples entered the wash-out period for 3 days, then followed by the second stage.

In stage II, the samples were instructed to spit into a plastic pot for review, and were given 4°C yogurt to be drunk every day. On the first day, subjects were instructed to drink the yogurt together, and then asked spit into a container. Saliva pH was measured after 10, 20, and 30 minutes. Salivary measures were taken again after 3, 6 and 9 days.

The results of this research, which was conducted at the Faculty of Dentistry Hasanuddin University, were analyzed using dependent t-test on SPSS version 16.0 and measured at the Laboratory of Microbiology, Faculty of Medicine Hasanuddin University.

RESULTS

Table 1 shows that there are differences in the

average number of colonies of cariogenic bacteria in saliva before and after consuming the 26°C and 4°C yogurt after three, six, and nine days with all the $p < 0.05$. It means that there is a significant difference between before and after drinking yogurt on reducing average number of colonies of cariogenic bacteria in saliva (Pict.1). The reduction of cariogenic bacteria colony occurs most commonly in yogurt which consumed on the ninth day temperature 26°C with a mean value 69,00 CFU.

Table 2 shows differences in the mean number of colonies of cariogenic bacteria in saliva after drinking yogurt with two different temperatures of 26°C and 4°C. In the second test, it was obtained $p > 0.05$ which means there is no significant difference between the temperatures of the yogurt on reducing the average number of cariogenic bacteria in saliva after drinking yogurt for three days. The third and fourth tests shows the $p < 0.05$ which means that there is a significant differences between the temperature of the yogurt on reducing the average number of cariogenic bacteria in saliva after consumption of six and nine days. There was a decrease in the average number of cariogenic bacteria in the saliva with a greater consumption of yogurt at 26°C temperature than the temperature at 4°C yogurt.

Table 3 shows a decrease in pH after consuming yogurt with the temperature of 26°C and 4°C, with six p -values < 0.05 that means that there are significant differences between the pH of saliva before and after drinking yogurt after the tenth, twentieth and thirtieth minutes. The lowest point of the pH of saliva is located in the tenth minute after drinking yogurt with a value of 6.1793 26°C temperature. Also visible is a larger pH changes in the consumption of yogurt compared with yogurt 4°C and 26°C.

Table 1 The average number of colonies difference of cariogenic bacteria in the saliva before and after drinking yogurt with the temperature of 26°C and 4°C

Yogurt	test	Time Period	Mean (CFU)	Std. Deviation	P / Sig.
26°C	Test 1	Before	130.00	5.451	.000*
		After 3 days	117,60	5.816	
	Test 2	After 3 days	117,60	5.816	.000*
		After 6 days	79.07	5.675	
	Test 3	After 6 days	79,07	5.675	.000*
		After 9 days	69.00	6.222	
4°C	Test 4	Before	129.40	6.322	.000*
		After 3 days	123.27	6.296	
	Test 5	After 3 days	123.27	6.296	.000*
		After 6 days	104.53	6.885	
	Test 6	After 6 days	104.53	6.885	.000*
		After 9 days	98.73	6.787	

* $p < 0,05$ = Significant



Picture 1 Colony bacteria; **A** before drink of of yogurt, and **B** after drink of yogurt

Table 2 The average number difference of cariogenic bacteria colonies in saliva before and after drinking yogurt with the temperature of 26° and 4°

Test	Time period	Yogurt	Mean (CFU)	Std. Deviation	P
1	Before	26 ^o	130.00	5.451	.783
		4 ^o	129.40	6.322	
2	After 3 days	26 ^o	117.60	5.816	.016
		4 ^o	123.27	6.296	
3	After 6 days	26 ^o	79.07	5.675	.000*
		4 ^o	104.53	6.885	
4	After 9 days	26 ^o	69.00	6.222	.000*
		4 ^o	98.73	6.787	

*p<0.05 = significant

Table 3 Difference in mean pH of saliva before and after drinking yogurt temperature of 26° C and 4° C

Yogurt	Test	Time period	Mean	Std. Deviation	P / Sig.
26 ^o	1	Before	6.923	.18180	.000*
		After 10 minutes	6.179	.19170	
	2	After 10 minutes	6.179	.19170	
		After 20 minutes	6.434	.21791	
	3	After 20 minutes	6.434	.21791	
		After 30 minutes	6.680	.18655	
4 ^o	4	Before	6.919	.18730	
		After 10 minutes	6.596	.19475	
	5	After 10 minutes	6.596	.19475	
		After 20 minutes	6.777	.17560	
	6	After 20 minutes	6.777	.17560	
		After 30 minutes	6.906	.17691	

*p<0.05 = significant

DISCUSSION

Yogurt is effective to reduce the number of cariogenic bacteria in the oral cavity, especially saliva. In addition, the longer consumed, the decrease in the number of colonies of bacteria that occur will also increase. The effectiveness of yogurt is caused by *Lactobacillus* in yogurt competes with *Streptococcus*, to obtain local nutrients in the oral cavity. The action of probiotic bacteria in the oral cavity through a local combination of this activity that is an inherent ability to attach to the dental plaque and affect the supragingival plaque, as well as through systematic

effects via the immune responses of the oral cavity tissue.

The working principle of probiotic bacteria contained in yogurt aims to enhance the mucosal immune defense and macrophage activity and to increase the number of killer cells, T-cells and interferon. In addition, probiotic bacteria are also able to adhere to the oral mucosa and tissues of the teeth to be part of the plaque and keep up with the growth of pathogenic bacteria. This incident is also described by Haukioja et al.,¹⁴ in research which was conducted in vitro using probiotic bacteria

Bifidobacterium. The results of this research showed that Bifidobacteria survive in saliva and suppress the growth of other oral bacteria, it was a typical action potential of probiotic bacteria.

The results of research show that yogurt proven effective to reduce the number of colonies of cariogenic bacteria in saliva when consumed regularly in a certain period of time. Bacteria contained in yogurt will compete with cariogenic bacteria found in the oral cavity for a space, local nutrient interactions in the presence of metabolites. Cariogenic bacteria decline is expected to give direct effect in lowering the prevalence of caries in the population, especially in the teenage years.

There is a significant difference to the mean of cariogenic bacteria in saliva after consuming a six and nine days with $p < 0.05$. This may be due to the fact that on the third day the number of probiotic Lactobacillus in the oral cavity is still small so that the capabilities and activities are still not strong enough to compete with cariogenic bacteria that do not indicate a significant difference in the effectiveness of both.

The existence of differences in the effectiveness of yogurt can depend on temperature. This is in line with studies conducted by Deviyanti dkk.³ Yogurt based anti-bacterial effect of different temperatures in vitro. The results showed that probiotic yogurt containing *L. Casei* stored in 26°C temperature has the potential anti-cariogenic bacteria were significantly larger than yogurt that is stored in 4°C.

Bacteria have specific physiological properties such as in terms of growth temperature. The best temperature for bacterial growth is called the optimum temperature. The enzyme activity will stop below or above the minimum temperature of maximum temperature so that metabolism and the growth of bacterial cells can be disrupted even cause cell death. Other studies supporting the fact was conducted by Collins and Hartlein³ which explain that the growth of Lactobacillus strains of bacteria in the milk needs temperatures between 19-51°C. Therefore, the 26°C yogurt bacteria Lactobacillus can work better when compared with the optimum temperature of 4°C yogurt, resulting in a decrease in the number of colonies greater cariogenic bacteria in yogurt consumption

in these temperatures. Use of probiotic yogurt need to consider the factor of temperature during storage will be consumed in order not to affect the potential its anti-cariogenic-bacterial. This study shows the difference in mean pH value of saliva before and after drinking yogurt, both in temperature of 26°C and 4°C after 10, 20, and 30 minutes with a value of $p < 0.05$.

Decrease in salivary pH can be caused by the fact that sometime after drinking; Lactobacillus will compete directly with cariogenic bacteria in the mouth. As a result, Lactobacillus by using the glucose content in the yogurt will produce lactic acid that affects the decrease in salivary pH. It is also suggested by Jensen¹⁰ which used yogurt to observe the decrease in pH of saliva, which was observed 20 minutes after eating yogurt.

Yogurt, though acidic, is not harmful to dental health. Based on the results, we can observe that the yogurt does not lower the pH of saliva past the critical pH of 5.5. The research was also supported by Sonmez and Aras¹² who suggests that the yogurt did not even result in decreased salivary pH below 5.7, while the pH below 6 only occurs in saliva for 3.7 minutes after the yogurt consumption. Therefore, the yogurt cannot cause demineralization of the enamel. On the contrary it can reduce the number of cariogenic bacteria colonies which are the main cause of caries.

This study used a 3.8 pH yogurt which is fermented using Lactobacillus bacteria. There is an effect of yogurt drinking on of saliva pH, where a decrease of saliva pH is seen immediately after drinking yogurt, but it is not over the critical pH of 5.5, so it does not cause enamel demineralization that can cause dental caries.

So, it is concluded that there are effects before and after drinking yogurt on decreasing the number of colonies of cariogenic bacteria in saliva in adolescence. This is due to the fact that the effects of probiotics from yogurt, where longer durations of yogurt drinking causes the greater decrease in the number of cariogenic bacteria colonies. In addition, differences in yogurt storage temperature decrease the number of cariogenic bacteria in the teenage years where the temperature 26°C yogurt has decreased the number of cariogenic bacteria more significantly than 4°C.

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