

The role of cow milk in reducing the number of streptococcus mutans

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Abstract

Objective: This research aims to provide an overview of chewing gum casein effect on the number of bacteria streptococcus mutans and profile saliva. Casein is one of the elements in cow milk that has 70-80% of the total protein and function to prevent bacterium and other saliva sticking on the enamel surface of teeth. Consuming free sugar gum after eating can help to remineralise enamel, increase saliva and decrease the number of streptococcus mutans. Mouth work on mastication increases salivary flow rate. Therefore saliva production will increase and will change its acidity (pH).

Material and Methods: The research design used was experimental research conducted in two groups where the control group by giving xylitol gum and the second group was given

chewing casein gum. A total of 20 participants who match the criteria of research subjects chewed gum for 9 consecutive days and calculated the amount of streptococcus mutans, volume and pH of saliva.

Results: The number of streptococcus mutans bacteria experienced a decline mainly in the group 69.60 in the first day to 22.80 in the ninth day. Thus, independent examination was done and $p < 0.005$ was indicated, meaning that there was significant difference of casein gum in terms of decreasing streptococcus mutans bacteria, compared with xylitol gum.

Conclusion: Casein gum made from cow milk can reduce the number of streptococcus mutans bacteria.

Keywords: Cow milk, Streptococcus mutans, pH saliva, The volume of Saliva

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Introduction

Tooth decay or caries is one of the most common diseases in the oral cavity. Caries is a process in which dental plaque develops over a period of time on hard tissue of teeth (enamel, dentine and cementum).¹ Caries is caused by the interaction of four factors, ie microorganisms, carbohydrates, time and host. Microorganism is a major role in the occurrence of cavities because it adheres to the surface of the teeth and ferment carbohydrates into acids that dissolve hard tissue.^{2,3}

There are has many products made to prevent caries. One is xylitol which is formed in toothpaste gum products, mouthwash and suction tablets. Xylitol is one of the proven ingredients to prevent caries. In a previous study, xylitol may increase saliva pH to prevent caries.⁴ Recent studies have shown that casein can prevent caries by suppressing the activity of streptococcus mutans. Casein can be obtained from cow's milk.⁵

Material and Methods

This research was conducted in July-August 2017. This study is a experimental research using pretest-posttest with control group design. This study was conducted in Makassar involving 20 people as a sample aged between 14-16 years old and had low

to moderate OHI-S index, divided into 2 (two) groups, ie treatment group (chewing gum casein) and control group (chewing gum xylitol). This research was started with OHI-S examination of the research sample and the inclusion criteria were subject with low to moderate OHI-S values. Then continued with casein isolation from cow's milk and chewing gum casein made at Pharmaceutics Laboratory of Hasanuddin University Faculty of Pharmacy. After obtaining the subject according to the inclusion criteria and the manufacture of casein gum, researchers will clean oral cavity of the sample by scalling.

Subsequently, the sample was instructed to chew the casein gum (as treatment group) and xylitol gum (as control group) for 9 days and every day to chew three times ie morning 08.00-09.00; noon 12.00-13.00; and 17:00 to 18:00 o'clock. Sampling was done using swab technique and spitting method done on day 0, 3rd, 6th and 9th. Sampling using swab technique on the upper and lower mandibular molar 1 and molar 2 teeth to calculate the amount of Streptococcus mutans microorganism. spitting method was used to calculate salivary pH and salivary volume. Casein chewing gum from cow's milk is chewing gum containing casein, which is obtained from cow milk isolate. Gum xylitol is a gum containing xylitol, where xylitol is one of the essential non-acidogenic and non-cariogenic

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sugar substitutes. *Streptococcus mutans* is one of the bacteria that cause cavities. Saliva is a complex and colorless oral fluid which consists of mixed secretions of major and minor salivary glands. The degree of saliva acidity (salivary pH) is saliva acidity which can be known by using pH meter. Volume saliva in ml is the amount of saliva produced in the presence of stimuli mechanical and chemical.

The criteria for selection of sample for the presents studi were as follows: age 14-16 years, has no caries or maximal superficial carious teeth in the maxillary and mandibular upper molars, not consuming other gum and not eating 60 minutes before the research, not undergoing drug therapy, healthy body condition, willing to be a research sample, willing to follow the instructions of the researcher.

The total number of research results collected and recorded, and performed processing and data analysis. The research data were measured using paired t-test statistical analysis.

Results

Table 1 in the xylitol group showed the average number of microorganism on day 0 (pre-test) that

is 60.00 and continue to decrease the number of microorganism up to 30.44 on the ninth day. In the casein group showed the average number of microorganism on day-0 (pre-test) that is 69.60 and continue to decrease the number of microorganism up to 22.80 on the ninth day.

Thus, when compared between the xylitol group and the casein group that was most effective in reducing the amount of *streptococcus mutans* microorganism, the treatment group was due to the average number of microorganism on the ninth day of the treatment group was 22.80 compared to the control group of 30.44 **figure 1**.

Table 2 in the xylitol group the mean of salivary pH on day 0 (pre-test) was 7.15 then decreased mean salivary pH on the next day. However, the mean salivary pH difference on the 3rd, 6th and 9th days did not decrease or increase. The same thing happened in the casein group, the average pH of saliva casein group on the day-0 that is 7.20 which then decreased on the next day.

So when compared between xylitol group and casein group saliva pH average did not experience difference. However, salivary pH in the xylitol group and the casein group was still in a normal state of 6.9-7.2 **figure 2**.

Table 1 Comparison of the amount of streptococcus mutans in the xylitol group and the casein group

Groups	Days	Streptococcus mutans (CFU)	Normality test	Comparison test
		Mean ± SD	p-value*	p-value**
Xylitol	0	60.00 ± 0.77	.51	0.00
	3	38.00 ± 0.63	.27	
	6	32.80 ± 0.60	.99	
	9	30.44 ± 0.16	.98	
Casein	0	69.60 ± 0.73	.79	0.00
	3	58.40 ± 0.80	.47	
	6	33.20 ± 0.54	.90	
	9	22.80 ± 0.35	.74	

Table 2 Comparison of saliva pH in the xylitol group and casein group

Groups	Days	Saliva pH	Normality test	Comparison test
		Mean ± SD	p-value*	p-value**
Xylitol	0	7.15 ± 0.08	.36	0.00
	3	6.96 ± 0.11	.90	
	6	6.89 ± 0.05	.51	
	9	6.96 ± 0.04	.64	
Casein	0	7.20 ± 0.12	.72	0.00
	3	6.59 ± 0.06	.96	
	6	6.82 ± 0.12	.78	
	9	6.92 ± 0.07	.65	

Table 3 Comparison of Saliva volume in xylitol group and casein group

Groups	Days	Saliva volume (ml)	Normality test	Comparison test
		Mean ± SD	p-value*	p-value**
Xylitol	0	3.38 ± 0.36	.25	0.00
	3	4.20 ± 0.84	.31	
	6	5.20 ± 0.15	.69	
	9	6.70 ± 0.15	.69	
Casein	0	3.30 ± 0.57	.81	0.00
	3	4.10 ± 0.74	.78	
	6	5.20 ± 0.91	.83	
	9	6.70 ± 0.84	.31	

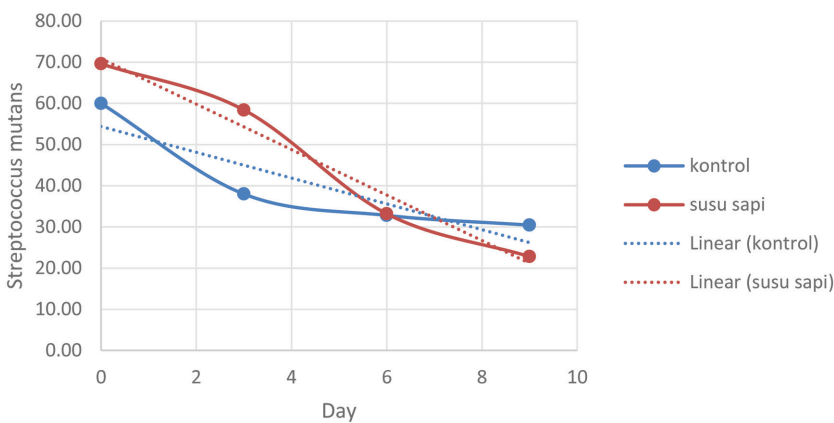


Figure 1 Graph of the difference in the number of streptococcus mutans bacteria in the control group and the treatment group

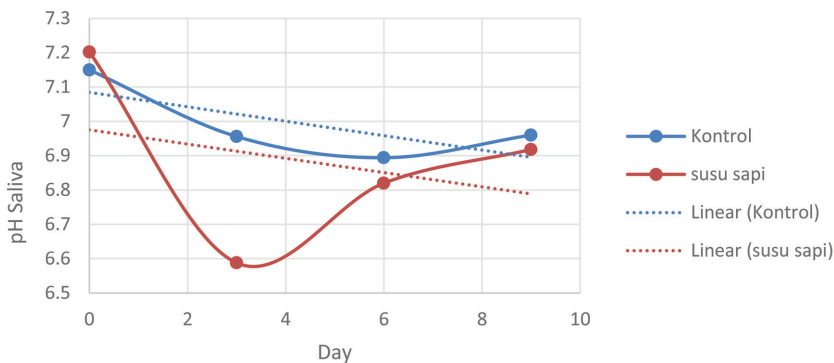


Figure 2 Graph of salivary pH difference in control group and treatment group

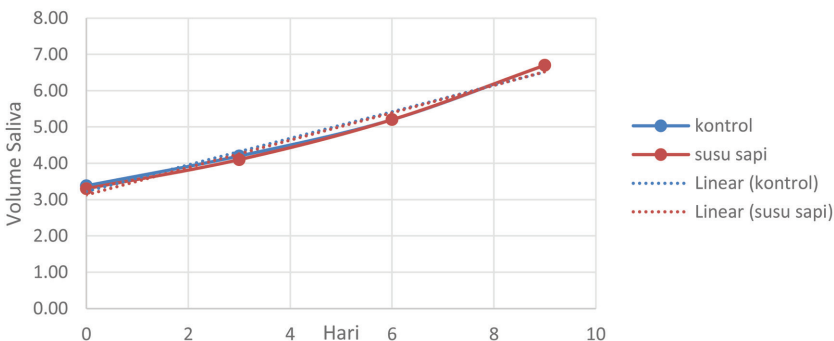


Figure 3 Graph of salivary volume difference in the control group and treatment group

Table 3 in the xylitol group the average salivary volume on day 0 (pre-test) was 3.38 and then continued to increase the average saliva volume up to 6.70 on the ninth day. In the casein group also showed an average increase of salivary volume on a daily basis of 3.30 on days 0 to 6.70 on the ninth day.

So that the xylitol group and the casein group have the same ability to increase salivary volume. This is because the average saliva volume in the xylitol group and the casein group continued to increase the salivary volume and the average saliva volume on the ninth day was also the same ie 6.70 figure 3.

Discussion

This research is true experimental research which aims to know the influence of chewing gum from cow milk to the amount of streptococcus mutans bacteria, saliva pH and salivary volume. Based on saliva pH in the control group and treatment group. The increase in salivary volume in this study is a growth hormone that is influenced by chemical and mechanical stimuli. Thus, an increase in salivary volume will be followed by an increase in salivary pH. Based on other studies conducted stating that chewing gum xylitol quickly increases salivary flow rate because it is a combination of stimulus and mechanical stimulus.^{6,7}

The results showed that there were differences in the amount of streptococcus mutans bacteria, salivary pH and salivary volume on the 0th, 3rd, 6th and 9th days. The samples were divided into two groups: control group (chewing xylitol gum) and treatment group (chewing on casein gum).

Streptococcus mutans, saliva pH and salivary volume are among the factors that lead to caries. Streptococcus mutans is a bacterium normally obtained in the oral cavity. However, in special conditions, these bacteria can be opportunistic pathogenic bacteria that can damage the host. Based on existing research indicates that the bacterium

streptococcus mutans is a bacteria that play a role in the beginning (initiation) in the occurrence of caries, so that required a material to prevent the bacterial attachment.^{2,3,8}

Saliva pH and salivary volume are the host factors that cause caries. saliva in the oral cavity has a function, namely: cleansing of bacteria; buffer action; antibacterial; and remineralization. In this study, salivary secretion is obtained by a simple reflex from chewing gum that normally amounts in the stimulus range from 3-4 ml / min.^{3,9,10}

The influence of chewing gum casein from cow milk to the amount of streptococcus mutans bacteria because it can reduce the number of bacteria. In addition, the casein chewed gum from cow's milk was more effective than xylitol gum because the number of bacteria on the ninth day for the chewing sample of less casein gum was cheaper than the sample chewing xylitol gum.^{11,12}

This is consistent with research conducted by Vacca-Smith et al. Which has proved that casein prevents bacterial attachment and salivary components on enamel and pellicle surfaces and reduces glucosyl transferase activity, thus reducing glucose formation and plaque attachment.¹²

The graph of salivary pH differences in the control group and the treatment group showed that casein chewed gum from cow's milk has the same ability as xylitol gum as it can neutralize salivary pH. On the third day, however, salivary pH in the treatment group experienced a dramatic decline of 6.6 but returned to normal on the sixth and ninth day. This may be due to the difference in pH of the sample between one individual to another and the condition of the oral cavity and the condition of one's health. One example based on existing research sample is the period of menstruation either pre or post experienced by a woman. Based on the research conducted by Syamsudduha et al showed that there are differences in saliva pH in pre-menstruation female adolescents compared with post-menstrual women adolescents.^{13,14} Other factors that may affect the non-compliance of the sample of instructions that have been described.

The graph of salivary volume difference in the control group and the treatment group showed that casein chewed gum from cow's milk has the same ability as xylitol gum because it can increase saliva volume on the 0th day until the ninth day. Based on the results of the study showed that the increase of salivary volume followed by saliva pH in the control group and treatment group. The differences in salivary flow rate and pH that is influenced by chemical and mechanical stimuli. From the results of this study, found an increase in pH after mechanical stimulus and decrease after chemical

stimulus. Thus, an increase in salivary flow will be followed by an increase in salivary pH. Based on other research conducted by Polland et al.⁷ stated that chewing gum xylitol rapidly increases salivary flow rate because it is two combinations of flavor stimulus and mechanical stimulus.^{15,16}

This research found that xylitol and casein gum had the same ability to increase salivary volume and neutralize salivary pH. This is because gum xylitol and casein gum have two combinations that can stimulate salivary secretion that is combination of taste stimulus and mechanical stimulus.⁷

That casein gum and xylitol gum have the same ability to increase salivary volume and neutralize salivary pH. This is because chewing gum xylitol and casein gum have two combinations that can stimulate salivary secretion that is a combination of taste stimulus and a mechanical stimulus.¹⁶

That casein gum is more effective in reducing the amount of streptococcus mutans bacteria than xylitol gum. This is because the content of casein gum chewing casein from cow's milk is able to prevent the attachment of bacteria and salivary components on enamel and pellicle surfaces and reduce the activity of glucosyltransferase. In addition Weiss and bibby have demonstrated the most effective protection of milk that is the content of casein capable of being a buffer system.^{11,12}

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Conclusion

Based on the research that has been done then it can be concluded that: casein gum from cow's milk is effective in decreasing the amount of streptococcus mutans that is with the number of microorganism on day 0 as much as 69.60 cfm to 22.80 cfm, casein gum has the same ability as xylitol gum in maintaining salivary pH, casein gum has the same ability with xylitol gum in increasing salivary volume.

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Conflict of Interest

The authors report no conflict of interest.

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