

THE EFFECT OF FERMENTED SOUR MILK CONSUMPTION ON THE HEALTH CONDITIONS AND THE RECOVERY FROM DIARRHEA OF ELEMENTARY SCHOOL PUPILS

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Abstract

Calpico is a drink made of fermented sour milk cultured with lactic acid bacteria (*Lactobacillus helveticus*). Calpico drink contains 10^{10} cells of lactic acid bacteria for one cup serve, although it is not alive. The purpose of this study is to investigate a possible effect of Calpico ingestion on prevention or recovery from diarrhea. The pupils of the 4th grade of two elementary schools were subjected. Pupils were requested to answer the questionnaire about social and health conditions of their own. After measuring body weight, pupils for Calpico group were given 200 ml of one-fifth diluted Calpico every morning at 9 AM. Pupils of control group were given nothing. More over half of pupils who drunk Calpico for one month increased one to two kg of their body weight after test period. The frequency of diarrhea of Calpico group was markedly decreased. It was shown in Jakarta that Calpico ingestion had a dramatically effect on recovery from diarrhea and improvement of health condition noted by the increase of body weight of the pupils.

Keywords: fermented milk, elementary school, diarrhea, recover

Introduction

Family health survey on 1992 showed those 15.8% children between 5 to 14 years old were died by diarrhea in Indonesia¹. According to the research which have been done on several diarrhea endemic area, the cause of 25% of the diarrhea on children were enteropathogenic *Escherichia coli*². The other research found the relationships among the incidence of enteropathogenic *E. coli* and the other factors like, nutritional status, personal hygiene, environmental health condition, and social-economical conditions. According to the research, 14.7% of elementary school pupils were positive in enteropathogenic *E.coli*³

The exogenous lactobacilli have been expected to play a positive role in prevention and treatment of gastrointestinal disorder. It is well established that high amounts of lactobacilli, counteract many pathogenic and potential pathogenic bacteria^{4,5}. If lactobacilli would be present in high numbers on the mucous membrane in intestine, they would directly contact with the body. They might act as antigens, which stimulate gastrointestinal immune system. Lactobacilli have been reported to have mitogenic activity on murine lymphocytes⁶ and murine peyer's patch cell⁷. Moreover, lactic acid bacteria have been shown in vitro to inhibit adhesion of diarrhea-genic *E.coli* even after heat treatment⁸.

Calpico is a drink made of fermented sour milk cultured with lactic acid bacteria (*Lactobacillus helveticus*). Calpico drink contains 10^{10} cells of lactic acid bacteria for one cup serve, although it is not alive. The effects of Calpico fermented sour milk on health have been investigated for a decade in Japan. Several animal studies indicated that ingestion of Calpico sour milk prolonged the life span, stimulated immune system and suppressed the tumor development⁹. The purpose of this study is to investigate a possible effect of Calpico ingestion on prevention or recovery from diarrhea, this is a crucial problem in public hygiene in Indonesia.

Methods

Material

The Calpico sour milk was sour milk manufactured by P.T. Ajinomoto Calpis Beverage Indonesia at Bekasi. Fermented with *Lactobacillus helveticus* and pasteurized, it was added 50% sugar and kept at room temperature before use.

The Calpico sour milk is diluted one fifth with water to serve. One cup (200 ml) of diluted Calpico sour milk (Calpico drink) contains 0.6g of protein, 23.8g of carbohydrate, 95Kcal of energy and 8×10^9 cells of sterilized lactic acid bacteria.

Subjects

The pupils of 4th grade of two elementary schools at Setia Budi Sub district, South Jakarta were subjected. Fifty-seven (57) pupils of one school were given the Calpico drink and forty-nine (49) pupils of the other school were subjected as control. Pupils were requested to answer the questionnaire about social and health conditions of their own.

Before the start of the test, each subject was shown the protocol and explained the sample and the method in details. All subjects were provided the informed consent before the test. Whenever a subject expressed the will to discontinue the test during the period, a medical doctor should stop the test and exclude the subject without any condition.

Ingestion Schedule

After weighing the body weight and measuring the height, pupils for Calpico group were given 200 ml of one-fifth diluted Calpico every morning at 9 AM except on Sunday. Pupils of control group were given nothing, especially.

Measurement of Health Condition

The weight of pupils of each group was measured and the incidence of diarrhea was asked before and after ingestion period. Frequency of stool defecation and teacher at school recorded conditions of stool daily. The inspections of feces by rectal swabs were conducted to detect enteropathogenic *E. coli* using polyvalent antiserum before and after ingestion period.

Statistical Analysis

Statistical analysis for the difference of variable average value between Intervention group and control group was conducted according Mann-Whitney U-test and the frequency of incidence of diarrhea, enteropathogenic *E. coli* and parasites on each Groups were analyzed by chi-square test.

Results and Discussion

The mean and standard deviation of age, body weight and height of control group were 9.5 ± 1.1 , 24.4 ± 4.7 , 128.6 ± 15.4 , and those of Calpico group were 9.2 ± 0.9 , 23.9 ± 4.3 , 131.0 ± 7.1 , respectively. There was no significant difference on age, body weight and height between two, groups before the test.

Table 1 shows the numbers of pupils and percentage according to the ranges of weight changing from the levels of before the study. More over half of pupils who

drunk Calpico for one month increased 1 to 2 kg of their body weight after test period. On the contrary, the body weights of control pupils were changed only slightly during one month.

Table 2 shows frequency of incidence of diarrhea on both groups before and after test period. The percentage of diarrhea positive pupils of both groups was almost the same ranges before the study. One to three or four pupils seemed to have diarrhea usually. One month later, after the test period, the frequency of diarrhea of Calpico group was markedly decreased.

The results of detection of enteropathogenic *E. coli* using polyvalent antiserum after the test period was shown in Table 3. Unfortunately, as we used specific antiserum to *E. coli* 0157 to detect *E. coli* from stool specimens before the test period, we could not detect enteropathogenic *E. coli* at all. The percentage of enteropathogenic *E. coli* positive pupils of both groups were not significantly different after the test period. One third or fourth pupils were entero-pathogenic *E. coli* positive in their intestine. The ratio was almost as same as the frequency of diarrhea in the volunteers before test period.

The result of the frequency of parasites in feces before and after test period was shown in Table 4. There was marked difference between Calpico and control groups. Parasite positive pupils increased after Calpico ingestion.

Table 5 showed social and economical aspect of volunteer pupils according to questionnaire answered by pupils. Moreover, Table 6 showed personal cleanliness aspect asked by Public Health Center Officer. Both results showed there was no differences of social background between two groups. Half of pupils drink well water and most of them use home toilet. Although more over half pupils, have dirty nail, most pupils wash hand before, after meals, and after defecation.

Calpico is a drink made of fermented milk, sucrose, and flavor. The fermented milk is prepared by culturing skim milk with a starter that consists of lactic acid bacteria. The effects of Calpico sour milk ingestion on health have been studied using mice and rats. The animal experience completed for lifelong showed the prolonged life span in the Calpico group compared to the control mice⁹. Further studies indicated the suppressing effect on tumors and immune stimulating effect in mice¹⁰. While many people have consumed Calpico drink for 80 years in Japan, no safety concern

Table 1. Number of Weight Changing Pupils After Test Comparing Before Test

Weight Change (Kg)	Calpico Grup*		Control Group	
	Number	%	Number	%
- 2,5	0	0,0%	1	2,0%
- 2	0	0,0%	1	2,0%
- 1	2	3,5%	6	12,2%
- 0,5	1	1,8%	1	2,0%
0	9	15,8%	27	55,1%
0,5	4	7,0%	4	8,2%
1	15	26,3%	3	6,1%
1,5	13	22,8%	2	4,1%
2	8	14,0%	2	4,1%
2,5	2	3,5%	1	2,0%
3	1	1,8%	0	0,0%
5	1	1,8%	0	0,0%
Not Tested	1	1,8%	1	2,0%
Total	57	100%	49	100%

*. Significantly different from the weight of before test, $p < 0,05$.

Table 2. Frequency of Diarrhea In Pupils Before and After Test Period

Group	Before		After	
	Diarrhea	%	Diarrhea	%
Calpico	17*	29,8	7	12,3**
Control	12	24,5	14	28,6

*. The number of positive pupils.

** . Significantly different from the percentage of diarrhea positive pupils of before test period, $p < 0,05$

Table 3. Frequency of Enteropathogen *E. coli* in Feces After Test Period

Group	Enteropathogenic <i>E. coli</i>			
	Positive		Negatif	
	Number	%	Number	%
Calpico	14	24,6	43	75,4*
Control	11	22,5	38	77,5*

*. Significantly different from the percentage of positive number of each group, $p < 0,05$

Table 4. Frequency of Parasite In Feces Before and After Test Period

Group	Frequency of Parasite			
	Before		After	
	Positif	%	Negatif	%
Calpico	23	40	39	68,4*
Control	17	34,7	3	6,1*

*. Significantly different from the percentage at the level of before test periode of each group, $p < 0,05$

was foreseen but beneficial effect was expected by the ordinary consumption of Calpico.

The results of Calpico ingestion study in Indonesia showed the dramatically effect on recovery of diarrhea, and improvement of health condition as increasing body weight of pupil volunteers. However, the frequency of enteropathogenic *E.coli* after ingestion period has not decreased in Calpico group compared with control group.

The evidence indicated that Calpico ingestion did not directly affect enteropathogenic *E.coli* in intestine. We speculated that ingestion of Calpico would improve the integrity of the mucosal epithelium of intestine. When the physical integrity of mucosal barrier would be compromised because of malnutrition so on, enteropathogenic *E.coli* could easily caused intestinal infection. The level of lactobacilli decreases on an inflamed mucous membrane in humans and rats¹¹.

As animal studies with Calpico sour milk showed the increase of bifidobacteria in intestinal⁹, Calpico ingestion would improve bacterial compositions and induce acidic conditions in intestine. Calpico drinks contains some lactose, which are fermented by intestinal bacteria resulting to decrease intestinal pH. Lower pH

might also, stimulate mucus production¹². The short chain fatty acid in the colon content is one of the major energy source of mucosal cells^{13,14}. An increased level of short fatty acids in the lumen are beneficial for the condition of the mucosa.

Furthermore, Calpico drink contains about 10^{10} cells of lactic acid bacteria per 200 ml. Nevertheless those bacteria are not alive, animal studies showed the immune stimulating effects of Calpico sour milk, which is the base of Calpico drink¹⁰.

Lactic acid bacteria in Calpico drink are supposed to stimulate gastrointestinal immune system and inactivate enteropathogenic *E.coli*. On the contrary, the marked increase of the frequency of parasites was observed after Calpico ingestion. At this time, the effect of Calpico ingestion on the incidence of parasites has not been clear yet. The cause of parasite infection has not been known.

Conclusions Calpico ingestion study in Indonesia showed the dramatically effect on recovery of diarrhea, and improvement of health condition as increasing body weight of pupil volunteers. It is easy and useful way to have Calpico drink at school for improvement health conditions of elementary pupils.

Table 5. Frequency (%) of Social and Economical Aspects According to the Questionare*

Group	Sex		Home Condition		Drinking Water		Toilet	
	Male	Female	Luxury**	Poor	City Water	Well	Home	Public
Calpico	49,1	50,9	7	93	54,4	45,6	93	7
Control	51	49	2	98	42,9	57,1	79,6	20,4

*. Questionares were asked by Public Health Center Officer.

**.. Home status; floor. wall, roof electricity capacity; kind of valuable good owns

Table 6. Frequency (%) of Personal Cleanliness Aspects According to the Questionare*

Group	Nail**		Washing Hand		Using Fottwear		Cleaning up After Defection	
	Clean	Dirty	Before Meal	After meal	At Home	Out of Home	With Soap	Without Soap
Calpico	49,1	50,9	89,5	80,7	54,4	98,2	91,2	8,8
Control	22,5	77,5	98	98	10,2	91,8	93,9	6,1

*. Questionares were asked by Public Health Center Officer.

**.. Checked by. Public Health Center Doctor.

Acknowledgments

Our thanks are extended to:

1. Agustinus Uyka Slamet Santoso: Faculty of Medicine, University of Indonesia, 16, Pegangsaan Timur, Jakarta 10320, Indonesia
2. Ketut Suata: Department of Microbiology, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia.
3. Sulasmi Adnil Basha: Setia Budi Public Health Center, Jakarta, Indonesia.
4. Stevanus Disman dan Yamada Kazuhisa: Ajinomoto Calpis Beverage Indonesia, EJIP 7c, Cikarang, Bekasi 17550, Indonesia.
5. Watabe Junko: Calpis co. Ltd., R & D Center, 11-10, 5-chome, Fuchinobe, Sagamihara, Kanagawa, 229-0006, Japan.
6. Ueno Kazue: Gifu College of Medical Technology, 795-1, Nagamine, Itihiraga, Seki-shi, Gifu, 501-3822, Japan

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