



Development of the Potential of Traditional Cheese Dangke of Enrekang Regency in the Health Sector: Literature Review

Ahmad Ahyar^{1*}, Marhaen Hardjo¹, Syahrijuita Kadir²

¹Department of Biomedical Sciences, Graduate School of Hasanuddin University, South Sulawesi, Indonesia; ²Department of Biochemistry, Hasanuddin University, South Sulawesi, Indonesia

ABSTRACT

Dangke is one of the dairy products in Indonesia using raw materials for buffalo milk and cow's milk, the clumping process uses the help of the enzyme papain as a protein hydrolysis agent taken from papaya fruit sap. Dangke has a nutritional content rich in proteins, fats, macro and micronutrients. This Literature Study aims to examine the various benefits of dangke on health. Article searches using electronic databases include google scholar, SINTA indexed journals and SCOPUS published in 2012-2022. The search uses several keywords: Dangke, Dangke benefits, and Dangke intervention. Obtained 7 articles, 5 articles came from national journals while 2 of them came from international journals. From the results of the article search, it can be concluded that Dangke has a positive effect on health, Dangke has various types of lactic acid bacteria that have the potential to be probiotics, anti-cholesterol and antibacterials that can inhibit the growth of pathogenic bacteria such as *E.coli* and *S.aureus*, besides that the consumption of Dangke can increase calcium and phosphate levels in saliva, form remineralization of tooth enamel, improve the nutritional status of children and can significantly increase hemoglobin levels in pregnant women in Trimester 2 with Anemia.

Keywords: Cheese; Benefits of Dangke cheese; Nutritional benefits

Abbreviations: CLC: Conjugated Linoleic Acid; SCFAs: Short Chain Fatty Acids

INTRODUCTION

Milk is a high-nutrient food ingredient is also a source of animal protein with various beneficial contents and is increasingly favored by the community [1]. Cow's milk, consisting of about 87% water, 3%-4% fat, 3.5% protein, about 5% lactose, and 1.2% minerals, with some variations depending on the type of dairy cow, the environment, and the shelf life of milk [2]. The high nutritional content in milk has a positive impact on human health, milk can act as a protection from the risk of postpartum depression, Osteoporosis, reduce the risk of fractures and help the formation of a solid skeletal system in infancy and adolescence, Antiobesity, Type 2 antidiabetes, reduced risk of stroke, Prostate anticancer, colorectal cancer, and consumption of low-fat milk can change the prognosis of breast cancer patients [2-7].

Fresh milk has various types of nutritional content that allow it to be a growth medium for bacteria that cause decay so as to shorten the shelf life of milk. One of the efforts to extend the shelf life of milk without reducing its taste and nutritional content is to process it into processed products. There are various types

of dairy in Indonesia that have a positive impact on health such as curd functions as an ACE-Inhibitor, Fermented camel milk has benefits as an antioxidant, antidiabetic, ACE-inhibitor, and antiproliferative, goat milk probiotic yogurt functions as an antidiabetic by inhibiting alpha-Glucosidase, synbiotic yogurt has Antibacterial and Antiproliferative effects on cells cancer. Goat milk yogurt is an antioxidant, and Dangke, is one of the traditional dairy products that have various health benefits [8-12].

Dangke is a type of traditional cheese produced by the community in Enrekang Regency, south Sulawesi, Indonesia. There is no definite standardization of the dangke-making process, dangke making still uses the traditional method by adding papaya sap as a hydrolysis enzyme, milk is further heated at a temperature of 50°C -60°C, after the separation of the lumps with yellow liquid (whey), the lumps are placed on the coconut shell which is used as a mold [13].

The process of adding papain enzymes during the Dangke manufacturing process in addition to functioning in the clumping

Correspondence to: Ahmad, Department of Biomedical Sciences, Graduate School of Hasanuddin University, South Sulawesi, Indonesia, E-mail: ahmad17.unhas@gmail.com

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process, papain enzymes also hydrolyze complex proteins in milk into a more simple protein or what is called a bioactive peptide so that it is more easily absorbed by the body [14]. The nutrient content in Dangke is arginine 3.6%, histidine 2.3%, isoleucine 5.1%, leucine 9.2%, lysine 7.3%, methionine 4.1%, tryptophan 1.3%, calcium 216 mg, 101 grams phosphorus, 0.2 grams iron, 80 grams of vitamin A, 0.8 grams of vitamin B2, Fat content 5-10%, protein 16-17%, lactose 4-8% and caloric value 362-380 kcal [15]. In terms of the content possessed, Dangke has the potential to be a potential dietary supplement for various health problems in Indonesia, so in this study, we trace the extent of the development of Dangke potential in the health sector.

LITERATURE REVIEW

This review literature was carried out by searching for research articles which are the main types of experimental studies that intervene in Dangke, both *in vivo* and *in vitro*. Article searches using

electronic databases include Google Scholar, SCOPUS-Indexed Journals, and SINTA in 2012-2022.

The articles used were searched with various keywords, namely Dangke, benefits of Dangke, and intervention of Dangke. Article searches are carried out in national and international journals that can be accessed openly and in full text.

The inclusion criterion used in choosing research articles is research on the development of cheese in health care, testing the effects of Dangke interventions, and the content isolated from Dangke to humans and experimental animals. Articles not used in the study are those that use observational study methods, review literature, systematic review and meta-analysis.

Based on the results of literature searches, 7 articles were obtained, 5 articles came from national journals while 2 of them came from international journals. Article search results are presented in Table 1 in the form of article identity, research subject, intervention methods and research results.

Table 1: Some research on the benefits of Dangke on health.

No	Source	Subject	Treatment	Results
1	Nur et al. 2015 [27]		Bacterial isolates of probiotic candidate of d=Dangke origin	This study showed that the lactic acid bacterial isolates obtained consisted of two species, namely <i>Lactobacillus plantarum</i> and <i>Lactobacillus fermentum</i> , and both could survive at pH 2. Isolates of <i>L. fermentum</i> and <i>L. Plantarum</i> in Dangke derived from buffalo milk showed potential as potential probiotic bacteria.
2	Faridah et al. 2017 [23]	<i>E.Coli</i> and <i>S.Aureus</i>		<i>L. fermentum</i> strains A323L, B323K, C113L isolated from dangke are able to inhibit the growth of pathogenic bacteria such as <i>E.coli</i> and <i>S.aureus</i> .
3	R. M. Sulmiyati et al. 2017 [28]	Broiler chickens	Giving whey-Dangke in broiler chicken drinking water	<i>In vivo</i> test results showed that giving whey Dangke in drinking water to broiler chickens at a concentration of 50% showed a decrease in cholesterol levels by up to 15%.
4	Burhan et al. 2017 [24]	<i>In vitro</i>	Lactic Acid Bacteria Isolated From Dangke and Beef as hypocholesterolemia agents	The 8 strains of lactic acid bacteria isolate in Dangke and beef t ested, which may lower cholesterol are <i>L. fermentum</i> B111K and <i>L. Plantarum</i> IIA-1A5. <i>L. fermentum</i> B111K has the ability to assimilate cholesterol by 4.10% with the amount of cholesterol assimilated in 1010 cells as much as 0.13 mg.
5	Samad et al. 2018 [29]	Humans	Administration of Dangke 50 grams twice a day	Dangke has a significant influence in increasing calcium and phosphate levels in saliva, forming remineralization of tooth enamel, reducing the depth of enamel microporosity, and decreasing bacteria in dental plaque.
6	Wijaya et al. 2021 [30]	Humans	Giving Dangke chips to children aged 3-5 years	Giving Dangke Chips for 4 weeks can improve nutritional status based on weight/age.
7	Riyandani et al. 2020 [31]	Humans	Giving Dangke crackers in II trimester pregnant women with anemia	The results of this study showed that there was a significant influence of giving Dangke crackers on increasing hemoglobin levels in mothers of II Trimester Pregnancy with Anemia at the Kabere Health Center and the Enrekang City Health Center.

Raw materials for making Dangke

Dangke is one of the dairy products in Indonesia using raw materials for buffalo milk and cow's milk, the clumping process uses the help of papain enzyme as a protein hydrolysis agent taken from papaya fruit sap [16]. Currently, the use of buffalo milk as a raw material for making Dangke has begun to be abandoned by the community and switched to using cow's milk, the availability of buffalo milk which is increasingly scarce triggers this. Data on the number of livestock populations in Enrekang Regency in 2011 shows that adult female buffalo livestock is around 2,156 heads, more than dairy cattle, unfortunately, the buffalo raised by the Enrekang community is not a dairy buffalo type, buffalo cattle in Enrekang Regency are more widely used as worker buffalo, so the availability of raw materials for making dangke in the form of buffalo milk cannot be achieved, this is referenced by Hatta, et al., To carry out the potential of cow's milk to be used as an alternative to buffalo milk [17]. The use of cow's milk in the manufacture of dangke is carried out to maintain the existence of Dangke which has become one of the icons of the Enrekang community and household-scale industry that has become the livelihood of local residents. According to Hatta, et al., There is no significant difference in nutritional content between dangke made from buffalo milk and cow's milk, in terms of the aroma of Dangke cow's milk has a more pronounced aroma and taste than cow's milk Dangke [17].

The potential of cow's milk Dangke as an alternative to buffalo milk in terms of the availability of raw materials, it is quality (water content, fat, protein, ash, and pH value) is not as different as the buffalo milk Dangke, the price is cheaper, easier to obtain, and has a taste and aroma that consumers likes [17].

Characteristics of Dangke

Dangke is a dairy product typical of Enrekang Regency that is traditionally made; this product is produced through heating and the addition of papaya sap to the raw material, namely fresh buffalo milk. The making of Dangke has been carried out since 1905 and has been passed down for generations until it has survived until now and developed into a household-scale food industry [17].

Dangke is the result of lumps of buffalo or cow milk that are produced from heating and the addition of papaya sap. A good Dangke is grayish-white, tender texture, smooth and non-sticky. The quality of Dangke is determined by the raw materials used, according to the survey Hatta, et al., Dangke made from buffalo milk has a higher fat content than Dangke made from cow's milk, this results in the texture of buffalo milk Dangke being more solid, tender and smoother than Dangke from cow's milk [17]. According to consumer satisfaction surveys, Most consumers choose to consume cow's milk Dangke because it is easier to obtain than buffalo milk, besides that the price of cow's milk Dangke is more affordable than buffalo milk Dangke.

In the process of making Dangke, it does not use rennet enzymes as coagulant ingredients but uses papain enzymes derived from papaya sap [18]. This enzyme plays a role in the protein hydrolysis process by breaking down protein bonds into peptides, then breaking down peptides into amino acids, at the time of making Dangke the addition of 0.5% crude papain and a heating temperature of 750°C can produce Dangke with the highest protein content, fat content, and lactose content [19].

The nutritional content of Dangke varies, the results of proximate

analysis (water content, ash, fat, and protein) Dangke obtained varying results. The moisture content of Dangke ranges from 49.3%-62.4%, the ash content ranges from 1.9%-2.4%, the fat content is between 8.8%-21.6% and the protein content is between 15.7%-33.3%, these varying values are thought to be due to the milk and varying cooking duration after the whey slicing of the curd only occurs naturally. This happens because there is no standardization of Dangke processing so that people make Dangke according to habits obtained for generations [19].

In addition to taste and appearance, the nutritional content is also an important aspect for consumers in the product selection process. The high nutritional value of Dangke offered is expected to have a positive impact on public health, claims that milk and dairy products affect the improvement of several types of metabolic diseases, cardiovascular, cancer, and various other types of diseases have been scientifically proven.

Health benefits of Dangke

Various Dangke ingredients that have health benefits

Probiotics: Probiotics are non-pathogenic microorganisms that can survive in an acidic environment of the stomach, attached and colonized in the intestines functioning to balance the microflora in digestion. Probiotics composed of lactic acid bacteria produce lactic acid from the fermentation of carbohydrates [20]. Beneficial therapeutic effects of probiotic bacteria for certain diseases with the gastrointestinal tract such as lactose intolerance, diarrhea, colon cancer, inflammatory bowel disease and bacterial infections, probiotics also provide a protective effect against enteric infections and chemically inhibit carcinogens in the gastrointestinal tract [21,22].

According to Nur, et al., dangke has several types of bacteria that have the potential to be probiotics. Lactic acid bacteria that were successfully isolated from dangke were *Lactobacillus plantarum* and *Lactobacillus fermentum* [22]. Lactic acid bacteria of dangke origin have an anti-bacterial effect on the growth of *E.coli* and *S.aureus* [23]. In addition according to Burhan, et al., lactic acid bacteria isolate dangke can assimilate cholesterol by 4.10% [24].

Prebiotics: Prebiotics are indigestible foodstuffs that have beneficial effects on both the host and the host by stimulating the growth of digestive tract microflora. Prebiotics can stimulate the growth of probiotic bacteria in the digestive system. Prebiotics consist of undigested and unabsorbed carbohydrates in the form of oligosaccharides, dietary fiber and inulin [20].

Short Chain Fatty Acids (SCFAs) such as acetic, propionate and butyric acid are the result of the fermentation of prebiotics in the digestive tract that can stimulate the growth of beneficial bacteria in the intestine that have health effects such as boosting the immune system, vitamin synthesis, decreasing cholesterol and suppressing the growth of pathogenic bacteria [20].

Bioactive peptides: Bioactive peptides are the result of enzymatic hydrolysis, heating and proteolytic degradation of microorganisms from proteins that have a molecular weight of 3 to 10 amino acids only and are hydrophobic. Physiologically and physicochemically bioactive peptides of milk have several benefits for health [25]. Bioactive peptides derived from milk proteins are components of food that in addition to their nutritional value, retain many biological properties and have a therapeutic effect on some health disorders. Health Benefits of milk-derived bioactive

peptides released by enzymatic proteolysis such as antithrombotic, antihypertensive, anti-inflammatory, anti-oxidative, antimicrobial and antiobesity properties [26].

Conjugated Linoleic Acid (CLA): Conjugated Linoleic Acid (CLA), Linoleic (omega-6) and conjugated linolenic are predominantly found in food derived from animals. In general, the function of CLA can lower cholesterol levels and can prevent cardiovascular disease. CLA is found naturally in animal fats and dairy products and their derivatives function as anticancer and anti-atherogenic in addition CLA can increase lipolysis and beta oxidase of fatty acids so that triglyceride synthesis decreases [20]. The following research on the function of Dangke in health can be seen in Table 1 [27-31].

CONCLUSION

Dangke is a typical cheese of Enrekang Regency which has the potential to be developed into a functional food that can have a positive effect on health. Dangke has various types of BAL that have the potential to be probiotics, anticholesterol and antibacterials that can inhibit the growth of pathogenic bacteria such as *E.coli* and *S.aureus*, besides that the consumption of Dangke can increase calcium and phosphate levels in saliva, form remineralization of tooth enamel, improve the nutritional status of children and can significantly increase hemoglobin levels in pregnant women in the II Trimester with Anemia.

CONFLICT OF INTEREST

None to report

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