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Review on Medicinal and Nutritional Values of Goat Milk

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Abstract: Goats are important component of livestock industry having adaptability to harsh climates which make them suitable for landless and marginal farmers. The contribution of goats in supplying milk and milk products is high and it has significant role in rural economy and health. Goat rank third in terms of global milk production from different species. Goat milk contains higher amount of calcium, magnesium and phosphors than cow and human milk. Medium chain triglycerides (MCT) and proteins which are more in goat milk have been recognized as unique lipid and protein with unique health benefits. The soft curd of goat milk may be an advantage for adult humans suffering from gastrointestinal disturbances and ulcers. Goat milk is important for prevention of cardiovascular disease, cancer, allergy and microorganism and used for stimulation of immunity. Goat milk is recommended for infants, old and convalescent people. The consumer acceptance of goat milk and its products is reported to be excellent. Despite this fact, goat has remained neglected in research and development. Goat now has to be fully exploited to get maximum benefit, particularly meat, milk and milk products having medicinal values.

Key words: Goat Milk · Medicinal Values · Nutritional Values

INTRODUCTION

Goats were among the first farm animals to be domesticated. As indicated by the archaeological evidence, they have been associated with man in a symbiotic relationship for up to 10,000 years [1]. Goats are important component of livestock industry having adaptability to harsh climates which make them suitable for landless and marginal farmers. Accurate statistics are required to determine the future outlook of the goat populations and their productivity. Goats are present in all of the continents and the world total numbers of goats were 861.9 million. The largest number of goats is observed in Asia, followed by Africa, in Asia 514.4 million, Africa 291.1 million, Northern America 3.0 million, Central America 9.0 million, Caribbean 3.9 million, South America 21.4 million, Europe 18.0 million and Oceania 0.9 million [2].

The goat sector has increased significantly during the last decades. From 1980 till 1999 the numbers of goat farm have increased by 55% and the goat milk production by 58%. However, these numbers are likely to be much greater, because of the large amounts of unreported home consumption especially in developed countries [3].

Goat milk is usually compared with cow milk. Cow milk production is much cheaper and the volumes are much larger and so cow milk has a lower market price [4]. Commercial goat milk production is more expensive because of lower productivity, seasonal variations and the need of bigger animal herds. The goat milk and its products are therefore an essential niche in the total dairy industry sector besides production differences, goat milk differs from cow milk in having better digestibility, alkalinity, buffering capacity and certain therapeutic values in medicine and human nutrition [5].

Goat milk contains protein, lipid, carbohydrate, vitamin and mineral. The superior digestibility of goat milk, the proper composition of fatty acids and its content of bioactive compounds seem to give properties suitable for treating or preventing certain medical conditions. Major role of milk proteins is to supply amino acids and nitrogen to the young mammals and constitute an important part of dietary proteins for the adult. Intact milk proteins have also specific functions such as micelle formation. Furthermore, milk proteins have physiological importance, they facilitate uptake of several important nutrients such as trace elements and vitamins and contain a group of proteins which perform a protective function [6].

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Milk derived bioactive peptides play vital roles in human health and nutrition. Many researchers are interested to solve the question about the importance of bioactive foods are as food constituents or as drugs and it needs careful examination. Angiotensin converting enzyme (ACE) inhibitor peptides, immune modulating peptides and casein phospho-peptides are the most favorite bioactive peptides for application to foodstuffs formulated to provide specific health benefits. Casein derived peptides have already found interesting applications as dietary supplements and as pharmaceutical preparations [7].

Even though numerous review has been carried out in different milking animals in the world, the importance and use of goat milk is not reviewed which created scarcity of information in the area. Therefore the objectives of this seminar paper were to review available information on the nutritional and medicinal values of goat milk and to recommend further investigation concerning nutritional and medicinal value of goat milk.

Nutritional Values

Milk Lipid: Lipids are the most important components of milk in terms of cost, nutrition, physical and sensory characteristics that impart to dairy products [5]. The biggest component, about 97%, of the lipid fraction of goat milk is triacylglycerol (TAG), including a larger number of esterified fatty acids [8]. The lipid fraction also contains simple lipid such as diacylglycerols, monoacylglycerols and cholesterol esters, complex lipids such as phospholipids and liposoluble compounds such as sterols, cholesterol esters and hydrocarbons [5].

In goat milk the lipid globules are significantly smaller than in cow milk ("Natural homogenized"). They have both a smaller diameter and the size distribution of globules has a larger proportion of smaller particles than in cow milk. Total fat content and fat globules size and distribution affects the viscosity of milk and are of importance for the preprocess and manufacturing of milk products. The large number of fat globules with small diameter makes the goat milk more digestible. This is because the total surface area of the globules is very to effectively get in contact with the lipids [9].

Goat milk contain much higher proportion of short and medium-chain fatty acids, especially butyric,caproic,caprylic,capric, lauric, myristic, palmitic, linoleic acid and α-linolenic acid [10] with the chain lengths of 4-18 carbon atoms. Three of these (Caproic, caprylic and capric acids) have actually been named after goats, because of their predominance in goat milk [3, 10].

Goat milk also has higher proportions of polyunsaturated fat acid (PUFA) as well as conjugated linoleic acid (CLA). Short and medium chain fatty acids, as well as medium chain triacylglycerols (MCT), have become established medical treatments for several clinical disorders. The MCT are absorbed intact in the intestine and do not undergo degradation and re-esterification processes. Micelle formation is not required for absorption, since the molecules are taken up directly into the portal vein [9,10].

Bioactive lipids in goat milk also influence the immune system. First, conjugated linoleic acid (CLA) has many beneficial and bioactive functions on human health. CLA is a general term for all isomers of linoleic acid, with cis-9, trans-11 (c9, t11) and trans10, cis12 (t10,c12) as the two most common forms. CLA is naturally found in ruminant milk and meat and is an important bioactive component in goat milk. In terms of immune response stimulation, CLA has been found to modify mediators of immunity such as cytokines, eicosanoids, prostaglandins and immunoglobulins. Furthermore, CLA has the ability to reduce the allergy related immunoglobulin IgE in humans, suggesting the anti-allergic potential of the lipid. CLA has also been shown to exert anti-inflammatory effects by decreasing the production of pro-inflammatory cytokines associated with irritable bowel disease, atherosclerosis, cancer and other immunopathologies in the body [11].

Goat milk is also rich in medium chain triglycerides (MCTs), which is one of the primary reasons that it facilitates improved nutrient absorption and energy production in the body. In addition, the medium chain triglyceridescapric, caproic and caprylic acids, the most abundant forms found in goat milk, have been shown to possess antimicrobial activity. Numerous studies have shown the antibacterial activity of short chain fatty acids (SCFA). However gram- negative, MCTs appear to have a greater benefit than SCFAs for preventing bacterial infection of gram-positive and negative bacteria, as well as Salmonella [12].

Goat milk contains minor lipids including gangliosides, glycolipids, glycosphingolipids and cerebrosides, among others. These minor lipids are also considered bioactive components in goat milk exert similar effects to that of cow and human milk. These functions include cell-to-cell interaction, immune recognition and receptor functions for protein hormones and bacterial toxins such as enterotoxin and cholera toxin [11].

Milk Protein: There are two distinct phases of milk proteins; an unstable micellar phase composed of casein and a soluble composed of whey proteins. The caseins

constitute about 80% of the proteins and are classified as αs1, αs2, β and κ-caseins, while the major whey proteins are -lactoglubulin and α-lactalbumin [13] and the antigenicity of β-lactoglobulin can be partially eliminated by certain treatments [14].

Goat milk contains lower amounts of the αs-casein, higher amounts of the β-casein fractions and approximately equal amounts of the κ-casein fractions compared to cow milk. The major protein in cow milk is αs1casein, while in goat milk it is β-casein. Goat milk also contains some αs1-casein, but the amount and genetic variants differ between goat populations [15]. The different genetic types give rise to difference in digestibility. The more αs1-casein in milk the longer digestion, which depends on that α1-casein is only partly digested by gastric juice enzymes. It is not totally hydrolyzed until_it reaches duodenal enzymes [10, 16, 17]. The casein micelles in goat milk differ from those in cow milk in having greater β-casein solubilization, more calcium and phosphorus and lower heat stability [18]. The curd is also weaker which directly influence the digestibility in the gastrointestinal tract. The acidic environment in the gastrointestinal tract causes the formation of smaller and less dense clusters in goat milk compared to cow milk [19].

Taurine is the most representative free amino acid in goat milk [20, 21] and the concentration is much higher than in cow milk [22]. Taurine is involved in many different roles in the human body, such as growth and brain development, formation of bile salts, modulation of calcium flux and the stabilization of membranes as an osmoregulation and/or by attenuating toxic substances. Taurine deficiency in human tissues may lead to cardiomyopathy, epilepsy, lack of growth among others [23].

The concentrations of folate-bindning protein in goat milk are higher than those of cow milk. The protein has high affinity to bind folate and thereby makes it unavailable for humans to digest and absorb. In addition, the actual folate content is lower in goat milk. Goat milk is a source of complete protein that contains all essential amino acids without the heavy fat content and mucus-producing components of cow milk [15, 24]. The whey and casein milk proteins as well as their bioactive peptides and include immunoglobulin, lactoferrin, lactoperoxidase, folate binding protein and more recently, α-lactalbumin and β-lactoglobulin [24].

Biological Function B-Lactoglobulin Carrier of retinol, fatty acids and triglycerides; transfer of passive immunity; Immunomodulatory activity; Anti-carcinogenic activity α-Lactalbumin Lactose synthesis; treatment of chronic stress-induced diseases; Anticarcinogenic activity Serum albumin Synthesis of lipids; Antioxidant activity; Anti-carcinogenic activity Lactoferrin Antimicrobial activity; Antifungal activity; Anti-proliferative activity; Antiviral activity; Immunomodulatory activity; Anti-thrombotic activity Immunoglobulins Immunomodulatory activity; Growth and development [25].

Similarly, another whey protein, α-lactalbumin has been studied for its role in killing tumor cells in patients with skin and bladder cancers. In addition, studies have found that serum albumin, a whey protein present in milk following its passive transfer from the blood, has an inhibitory effect against the growth and development of breast cancer cells Peptides derived from casein also exert antihypertensive, antioxidant and antimicrobial effects. Antihypertensive and immuo-stimulating peptide can be generated from caprine β-caseins. Goat milk has been found to provide a good source of ACE-inhibitory peptides following the hydrolysis of goat milk caseins and animal and human studies have shown their beneficial effects on blood pressure regulation [26].

Proteolytic enzymes also release antioxidant peptides from caseins and peptides derived from α-casein scavenge tissue damaging free radicals and inhibit lipid peroxidation in the body. Additionally, fragments of goat milk-caseins have also been found to be a source of antimicrobial peptides, showing strong activity against gram-negative bacteria [11].

Milk Carbohydrate: Lactose is the major carbohydrate in goat milk and the content is slightly lower than in cow milk [19]. It is synthesized from glucose and galactose in the mammary gland, where the milk protein α-lactalbumin plays an important role [27]. Lactose is a valuable nutrient, because it favors intestinal absorption of calcium, magnesium and phosphorous and the utilization of vitamin D [10]. It also is of major importance during milk synthesis and during secretion of milk into the duct system of the udder [3].

Other carbohydrates found in goat milk are oligosaccharides, glycopeptides, glycoproteins and nucleotides in small amounts. Goat milk is significantly rich in lactose-derived oligosaccharides compared to cow milk [19]. Milk oligosaccharides are thought to be beneficial to human nutrition because of their prebiotic and anti-infective properties [28]. In animal models, goat milk oligosaccharides have been shown to have anti-inflammatory effects in induced colitis [29, 30]. These results could be useful in the management of inflammatory bowel disease [31].

Nucleotides in milk are also of interest since they are the glycosyl donors for glycosyl transferase in milk and mammary gland and are the precursors of glycoproteins, glycolipids and oligosaccharides in the biosynthesis of milk. Goats have remarkably high nucleotide content in their milk [32].

Goat milk contains a lower concentration of oligosaccharides in comparison to human milk, it is greater than in bovine and ovine (Sheep) milks and the oligosaccharide structures identified in goat milk are most similar to that of human milk. This is particularly significant for infant nutrition as human milk oligosaccharides are greatly beneficial for the infant due to their prebiotic and anti-infective properties. The mechanisms behind their inflammation-fighting effects include increased production of butyrate and the reduction of pro-inflammatory bacterial species by inhibiting their adhesion to the epithelial membrane, reducing bacterial translocation and promoting selective growth of beneficial Lactobacillus and Bifidobacteria species [25, 30].

A Spanish study investigating the effect of goat milk oligosaccharides on rats with colitis found them to have anti-inflammatory effects, thereby proving to be potentially useful in the management of inflammatory bowel disease (IBD) [30]. Another Spanish study also found that rats with colitis fed goat milk oligosaccharides exhibited less severe lesions in the colon and a more favorable gut microbiota, demonstrating that goat milk oligosaccharides helps reduce inflammation and promotes recovery of damaged colonic mucosa [11].

Milk Vitamin: Goat milk has a higher vitamin A content than cow milk because goats convert all β-carotene from foods into vitamin A in the milk [33]. For the same reason, goat milk is always whiter than cow milk. Both goat and cow milk have low concentrations of vitamin B6 and vitamin D, which are both important during infancy [19, 32].

Goat milk contains a similar amount of vitamin A as human milk. Vitamin A is important for both innate and adaptive immune responses, including cell-mediated immunity and antibody responses. A deficiency in this vitamin has been shown to lead to increased as well as a decreased innate immunity affecting NK cell function and phagocytic activity. Similarly, vitamin D plays an important role in the immune system and may help prevent infections, autoimmune diseases, cancer and diabetes, in addition to its role in bone health maintenance. Vitamin D deficiencies seem to interfere with NK cell function, resulting in decreased infections. Finally, vitamin C is a well-known water-soluble antioxidant that is found in greater amounts in goat milk than in cow milk. This vitamin has been shown to affect many aspects of the immune system including the regulation of immunity via antiviral and anti--oxidant properties [34].

Milk Mineral: Goat milk is reported to have higher content of Potassium, Calcium, chloride, Phosphorus, Selenium, Zinc and Copper than cow milk [35, 36]. However it is important to know that the goat feed may have big effects on the mineral content of the milk. Potassium is important for the acid/base balance and also for the function of muscles, nerves and kidneys. Chloride maintains fluid balance, blood $_{p}$H and osmotic pressure. It also affects the liver function and is a substantial component in hydrochloric acid (HCl) in the gastric juice of the stomach. Calcium is of importance for building up the bone structure, but also affects function of muscles, nerves and blood coagulation. Similar to calcium, phosphorous is involved in building bone structure, muscle and nerve functions, but it also participate in energy production. Selenium is involved in the cell protection against free radicals. It affects some immune cells (Leukocytes) in a positive way and it protects the body against heavy metals. Zinc is a key component in several enzymes that are involved in transport of carbon dioxide, protein production and it also cooperate with the hormone insulin which regulates metabolism of carbohydrates. Copper is also needed by many enzymes. It affects the metabolism of iron and oxygen and also the cell defense against free radicals. Iodine is a vital component in two thyroid enzymes that regulate metabolism and stimulate growth and development of the body [34].

Goat milk also contains a larger amount of zinc compared to human milk. Zinc is an important mineral for the maintenance of healthy skin, wound healing and is directly involved in both innate and adaptive immunity. Zinc also has antioxidant activity and helps eliminate reactive oxygen species through its role as a cofactor for the antioxidant enzyme, superoxide dismutase (SOD). Similarly, selenium is a key mineral offering immune benefits as it also affects innate and adaptive immunity. Selenium acts as a key cofactor for the functioning of the antioxidant enzyme glutathione peroxidase (GPX), which is important for scavenging harmful free radicals in the body, as well as for macrophage activation [34].

Medicinal Properties

Antimicrobial Properties: Redundancy failures in antibiotic treatment to emerging diseases caused by bacteria and viruses has led to the rise of studies, researches and development of antimicrobial from natural

products includes plants derived source and the most sought after in these two decades were probiotic and prebiotic products from the lactic acid bacteria. Extensive work has been carried out on bacteriocin like inhibitory substance [37] and also on the producing strains of lactic acid bacteria (LAB) for potential use as bio-preservatives [38].

Milk proteins have also been proved to be precursors for antimicrobial peptides. The most well known peptides are those derived from lactoferrin. Lactoferrin is an iron-bind which main function is iron transport. It is involved in many physiological functions, including regulation of iron absorption and immune responses. It also exhibit antioxidant activity and has both anti-carcinogenic and anti-inflammatory properties. However, its antimicrobial properties are its most widely studied function [39]. Antimicrobial activity has also been detected in αs2casein that has went through degradation by the gastrointestinal enzyme pepsin [11]. The results obtained in this work suggest that Bifidobacteriumlongum Bb-46 grows better in goat milk than in cow milk [19, 13].

The pH values of goat milk decreased more rapidly and a higher number of viable cells Bifidobacteriumlongum Bb-12 were found during the fermentation of goat milk. Some authors indicated that the higher fermentation activity of lactic acid bacteria in goat milk is due to its specific composition and structure [40-42]. A higher content of whey proteins could be significant because bifid bacteria are growing better in the presence of higher levels of some amino acids presents in lacto globulins and lacto albumins [43]. Furthermore, the possible reasons for the higher growth rate of Bifidobacteriumlongum Bb-46 in goat milk could be a higher amount of some minerals and short chain fatty acids, as well as the easier protein digestibility [44].

In recent years, many authors pointed out that fermented milk with probiotics inhibits gram negative bacteria such as *Yersinia enterocolitica*, *Escherichia coli*, Aeromonashydrophila and Salmonella species in in-vitro experiments [45, 46]. Although strong antibacterial and immunological properties of goat milk have been indicated, little is known about the influence of fermented goat milk on pathogenic and potentially pathogenic microorganisms. Exhibited a higher inhibitory effect of fermented goat milk on the growth of Serratiamarcescens colonies rather than of fermented cow milk. Goat milk has a distinct antimicrobial impact and its specific composition may result in the increased antimicrobial compounds production [4, 47].

Control of both pathogenic and spoilage microbe in *Lactobacillus* strains are an important dairy culture starter variety of foods is important to guarantee food quality and used for the manufacture of fermented food [48, 49] and safety. Recently, bio preservation has become a topic. The discovery of bacteriocins gave a new way for of interest [50]. This technique is used as an alternative to food development in better hygienic quality [48, 49]. In chemical additives for increasing self-life storage and recent years, there have been many reports on enhancing safety of food by using natural microflora and bacteriocins that are produced by lactic acid bacteria isolated from goat milk [51]. However, most reports deal with bacteriocins that are believed to be safe because they have been long produced by various lactococci, pediococci, leuconostoc,established as the normal flora in fermented food [52-54].

Treatment of Cardiovascular Diseases: Cardiovascular disease (CVD) is the most common cause of death in industrialized countries. It includes many diseases that involve heart and blood vessels; coronary heart disease, high blood pressure, arrhythmias and atherosclerosis. The main cause of CVD is atherosclerotic plaque development in blood vessels that eventually leads to cardiovascular incident. The risk factors influencing atherosclerosis are lifestyle (Smoking, diet and exercise), high blood pressure, dyslipidemia, diabetes and obesity [55].

The progress of atherosclerosis is slow and may start in childhood. The initiation of the process is unknown, but a major mechanism seems to be retention of atherogenic lipoproteins in the arterial walls. Low-density lipoprotein (LDL) is such atherogenic lipoprotein which transports cholesterol from the liver to the blood vessels and is often called “The bad cholesterol”. The “good” cholesterol is the high-density lipoprotein (HDL) which transports cholesterol from the vessels to the oxidative modification of LDL (ox-LDL) plays a pivotal role in atherosclerosis progression. This implies that antioxidants, which could inhibit LDL oxidation, should be effective in suppressing atherosclerosis [55].

Goat milk is rich in medium-chain triglycerides (MCT) including fatty acid esters of caproic, caprylic and capric fatty acids. These MCT have been shown to have a lowering effect on plasma cholesterol in rat models [56] and also to inhibit and/or limit cholesterol deposition in the tissues [57]. Altogether MCT found in goat milk act anti-atherogenic. An in-vitro study have shown that cells isolated from humans who had been drinking goat milk

from different breeds were triggered by components in the milk to release nitric oxide (NO). In turn, the NO reaches the blood stream via lymphatic route, thus provoking vasodilatation and exerts a cardio-protective and anti-atherogenic affect [27].

In 2003 performed a human intervention study to investigate the effects of fermented goat milk versus regular goat milk on oxidative stress. Humans who ate fermented goat milk had an anti-atherogenic effect from decreased LDL oxidation. In addition, both fermented and regular goat milk had an antioxidative effect when measuring total antioxidant activity and status respectively. The group who ate fermented goat milk also had lower levels of urine isoprostanes which is a further parameter showing on less oxidative stress. Thus the study shows both anti-atherogenic and antioxidative effects from fermented goat milk [58].

Goat milk stimulates the proper anti-oxidation system in the body and recommended to slow down the aging process, for people suffering from schizophrenia and for men subject to reduced fertility. Goat milk is stronger degrading act on cholesterol that decreases concentration of cholesterol and higher concentrations on component that make cholesterol in the blood decrease to stimulates the anti-oxidation system in the body prevents overweight, prevents elderly diabetes (Type II) diminishes the formation of blood clots prevents hyperhomocysteinemia. This last action is a situation of an increased concentration of homocysteine in the blood, a risk factor for coronary diseases. The use of milk evokes the transformation of the homocysteine into the harmless amino acid: methionine. Actually, butter contains specic health improving elements that don't occur in plants and has as such a favourable act on the digestion of other fat milk [59].

Goat milk improves Zn bioavailability, a mineral with antioxidant capacity [60]. The better nutritive utilization of goat milk fat [56] provides a lower substrate for lipid peroxidation and consequently decreases the generation of free radicals in this type of milk, explaining once more the lower TBARS levels found in the groups animals consuming the goat milk. The positive role on genomic stability of the habitual consumption of goat milk, even during Fe-overloading feeding regime, fact that could be due, at least in part to the high bioavailability of Mg and Zn [61], together with its better fat quality [56]. Magnesium metabolism enhances genomic stability because of the following: DNA is continuously damaged by environmental mutagens and by endogenous processes. To keep mutation frequencies low, cells have evolved different types of DNA repair systems. Nucleotide excision repair is mainly involved in the removal of DNA damage induced by environmental mutagens and Mg is an essential cofactor in virtually all steps of nucleotide excision repair. Secondly, endogenous DNA damage is mainly repaired by base excision repair (BER) [62].

Moreover, the high quality of the goat milk fat would contribute to its positive effect on DNA stability [56]. It has a higher content of carnitine that enters the mitochondria, to increase the rate of ß-oxidation [63] and the energy production derived from fatty acids and so the substrate for lipid peroxidation would be lower, consequently reducing free radical [56].

Treatment of Gastrointestinal Diseases: Inflammatory bowel disease (IBD) comprises two different but closely related conditions, ulcerative colitis and Crohn´s disease. The hallmark of IBD is chronic and relapsing inflammation of the intestine, but there are important differences from Crohn´s disease with regard to patho-physiology and treatment. Thus, ulcerative colitis affects the large intestine at the mucosal level, whereas Crohn´s disease is characterized by transmural inflammation and may involve any segment of the gastrointestinal tract, although the majority of cases show ileo-colonic involvement [64].

IBD is an important health problem because of its effect on the patient´s quality of life and because of its high prevalence, which has increased in the past few years. Despite intense investigative efforts, the cause of IBD is essentially unknown [64].

Colitis could be compared with the intestinal inflammation that occurs in IBD. The oligosaccharides from goat milk are shown to have an anti-inflammatory effect. The expected decrease in body weight, increased colon size and extension of necrotic lesions are prevented by the oligosaccharides. They also decreased clinical symptoms (Diarrhea and bloody stools) and caused a weaker immune response with less neutrophil infiltration [30].

Treatment of Cancer, Allergy and Others: The most common antigens in foods are proteins. Milk is considered one of the most common food allergens and is the most common sensivity in young infants, with a 2-6% incidence [29].

Allergies can be acute or chronic in nature, their symptoms ranging in severity from non-life threatening reasons such as eczema, rhinitis and digestive problems to very serious life threatening reasons

including anaphylaxis, bronchospasm and urcaria [65]. Numerous studies and anecdotal evidence suggest that goat milk is a much less allergenic alternative to cow milk due to its differing protein structure, namely its casein micelle components [27].

Goat milk has demonstrated significant improvements in colic, minor digestive disorders, asthma and eczema over cow milk, as well as in infants and children with cow milk sensitizes [3, 65] indicated that treatment with goat milk typically resolves between 30 and 40% of problem cases of childhood cow milk allergy, which can be higher in some cases (One study showed improvements in 49 out of 55 children treated with goat milk). In contrast to an anger-associated allergic reason, lactose intolerance is caused by a deficiency in the lactase enzyme used to digest the milk sugar, lactose. In lactose intolerant individuals, unhydrolyzed lactose passes into the large intense, where it is fermented by microbes that produce gases such as hydrogen, methane, carbon-dioxide and short chain fatty acids leading to gastrointestinal disturbances such as flatulence, abdominal pain and diarrhea [66].

Anecdotal evidence suggests that goat milk is easier to digest due to the sour curd formed in the stomach as a result of the much lower content of a peculiar type of casein, αs-1 casein. The implicaon is that the different casein composing of goat milk allows the digestive products (Including lactose) to pass through the large intense more quickly and helps prevent the symptoms of lactose intolerance [31].

Goat milk has a high content of conjugated linoleicacid (CLA) [67]. Anti-carcinogenic properties of CLA have been reported against mammary and colon cancer [68] in animal models, as well as *in vitro* models of human melanoma [69] colorectal and breast cancer [70]. The mechanism by which CLA inhibit tumor development is not fully understood, although perturbation of the eicosanoid-dependent cell signaling systems, anti oxidative effects and disturbance of the receptor mediated actions of estrogen have all been suggested by fermented goat milk [67].

Immunological Properties: Many types of cells are involved in the innate and adaptive immune response, with T- lymphocytes (T-cells), Natural Killer (NK) cells and B-lymphocytes (B-cells) as the main players. Although immunoglobulin's (Ig) are similar in structure, minor differences within the main immunological classes (IgG, IgM, IgA, IgD and IgE) are associated with a variety of biological properties and IgG and IgA account for the majority of serum immunoglobulin's. A number of factors influence our immune health and nutrition in particular is main determinant of the body's immune response. Goat milk play a key role in almost all biological reactions and exert antioxidant and anti-inflammatory effects in the body. This is important as inflammation is the body's primary response to infection and oxidation has been linked to the development of many diseases, including cancer. Furthermore, other factors such as the maintenance of a healthy intestinal microflora with the help of probiotics and prebiotics (Also contained in goat milk) are essential for protecting against the negative effects of pathogenic infection allergy [71].

Even if goat milk might not be a perfect alternative for people with cow milk allergy, very recent studies have showed immunomodulatory effects from goat milk both in in-vitro and human studies. Recently investigated the effects of goat milk on human blood cells in terms of nitric oxide (NO) and cytokine release. The results demonstrated that goat milk was able to activate NO release from blood cells as well as triggering of cytokine production (IL-10, TNF-α and IL-6). The NO release could have cardio-protective effects in the milk consumer and also expose antibacterial activity and thereby prevent infections.

CONCLUSSION

Goat milk products are considered to be the dairy products with greatest marketing potential. Fermented goat milk incorporating live probiotic cells represent a group of products with great prospects in the future with regard to their nutritive and therapeutic properties. The unique characteristics of goat milk have been fairly good surveyed regarding nutritional value and health effects. The superior digestibility of goat milk, the proper composition of fatty acids, protein and its content of bioactive compounds seem to give properties suitable for treating or preventing certain medical conditions. Goat milk have beneficial effects on malabsorption disorders and inflammatory bowel diseases. Fermented goat milk may reduce the risk of cardiovascular disease by antioxidative, anti-atherogenic and anti-thrombotic effects. In line with the above fact: there should be awareness creation for the community about the importance of goat milk for their nutrition and medicinal values, there should be improvements of goat breeds to increase milk production, further studies and research on goat milk should be conducted.

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