

Research Article

Goat Milk: Bespoke for Multi-Therapeutic Effects

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Abstract

Goats are small ruminants that were among first domesticated farm animals which are into herding from about 10,000 years ago. Goats are widely distributed in the world, 95% of them are in the less developed countries. Their distribution is mainly associated with harsh environments (arid, semiarid, tropical, subtropical). Dairy breeds have their origin and are numerous in the developed countries, though they constitute only 5% of the world goat population. Goat population of India is 124.6 million with an overall growth rate of 3.05%. Goat production system of the country is highly diverse and has been broadly divided into six zones on the basis of agro-climatic conditions. Indian breeds such as Beetal, Jamunapari, Sirohi and Jakhrana have capacity to yield 4-5 kg milk/day, 400-600 litre milk in single lactation of 150-200 days and body weight of 30-40 kg at 12 months of age indicated tremendous potential of Indian breeds. India is the world's largest producer of goat milk, with an annual production of over 5 million metric tons. Goat milk has a significant role in livelihood improvement and become the most promising industrial products in future. It has so many medicinal values. It serves as complete nourished food, it can substitute a meal. It has fat globules naturally homogenized. It has Se containing antioxidant property. It is helpful in digestion as it gets digested in 20 minutes. It contains conjugated linoleic acid which has anti-carcinogenic properties. It is beneficial for people with who are lactose intolerant as it has very less amount of lactose. It is less allergic than cow milk. It has Ca and K in very high amounts so is very beneficial for bones. It is highly suggested for patients suffering from tuberculosis and dengue.

KEYWORDS: Goat Milk, Therapeutic Milk, therapeutic food, anti-carcinogenic, anti-cancer

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INTRODUCTION

There are about 500 different kinds of goats in the globe, but only about 600-700 of them are dairy goats, of which just six are typically raised for their milk. They live in a variety of climates, from high-altitude slopes to deserts. More than 95 percent of the goat population lives in underdeveloped countries. Global patterns of the evolution of the goat population and its products between 1969 and 2010 show a consistent and rapid increase in either cattle or lamb, particularly in developing nations. Milk goats include Anglo-

nubian, British alpine, Toggenburg, and Saanen. Toggenburg is the most productive breed that can produce a large amount of milk; it is not uncommon to find a 2 gallon (7.57 liter) milk everyday. Large pastoral plains in Asia and Africa are home to the majority of goat populations. Many regions of Asia, Africa, the Mediterranean region, and the Middle East primarily use goat milk for human nutrition. These areas are similar in that they all have expanding economies and a growing population that needs to be fed. Animal protein is therefore crucial in these areas [1].

Goat Milk: Bespoke for Multi-Therapeutic Effects

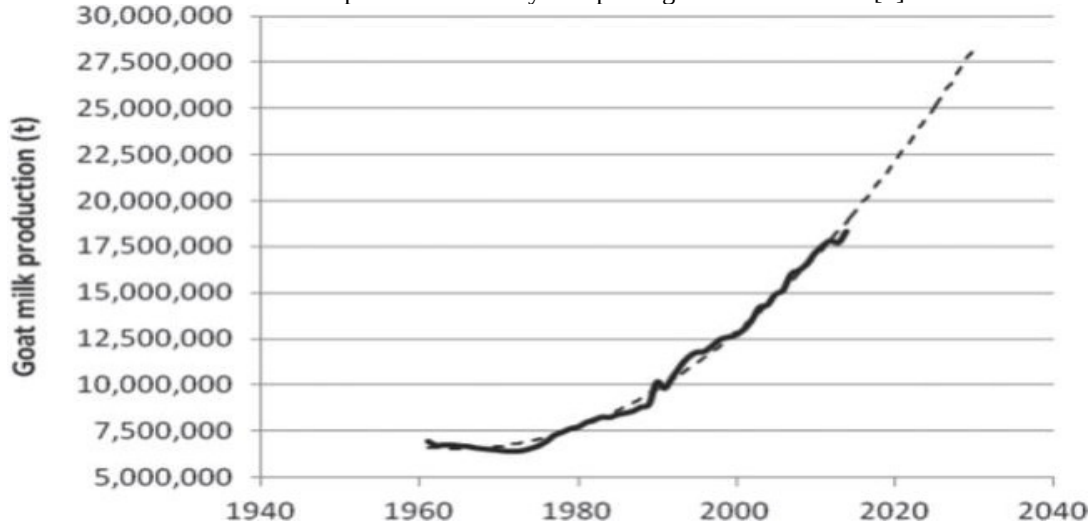
Goats are primarily grown in Ethiopia for three purposes: roughly 3.36% of adult goats are kept for meat, roughly 46.3% are kept for milk, and the remaining goats are raised for all three of the aforementioned purposes in addition to other goals. As per the CSA report from 2008 to 2010, Ethiopia is home to 21.96 million goats[2].

About 10,000 years ago, goats—small ruminants—were among the first domesticated agricultural animals used for herding [3]. Although they are considered a "poor man's cow," goats are a significant source of dairy and meat products for rural

populations [4]. Goat milk makes up roughly 3.4% of the total milk production annually, compared to 1.4% for sheep, 0.2% for camels, 85% for cows, and 11% for buffalo [5]. Only Asia provides around 80% of the world's supply of goat milk [4], with India, China, Bangladesh, Iran, Pakistan, and Turkey being the principal producers. [6] 40.7% of the world's goat milk is produced by 36.7% of dairy goats raised worldwide, with India accounting for 60.6% of production (129 L/doe), Bangladesh (16.9%, 37 L/doe), and Pakistan (13.3 %, 100 L/doe).[7]

Total ² [million head (%)]		Dairy [million head (%)]		Milk [Mt (%)]		Yield ³ [L/head]		
Continent	Sheep	Goats	Sheep	Goats	Sheep	Goats	Sheep	Goats
Asia	512 (43.6)	556 (55.4)	135 (54.0)	106 (52.1)	4.73 (45.6)	8.04 (52.7)	35.1	76.2
Africa	352 (30.0)	388 (38.7)	79 (31.7)	80 (39.6)	2.54 (24.5)	3.93 (25.7)	32.2	48.9
Europe	131 (11.2)	17 (1.7)	33 (13.3)	9 (4.3)	3.01 (29.0)	2.54 (16.6)	90.8	290.1
America	84 (7.1)	38 (3.8)	3 (1.1)	8 (4.0)	0.09 (0.9)	0.75 (4.9)	33.0	93.4
Oceania	95 (8.1)	4 (0.4)	<0.1 (0)	<0.1 (0)	<0.01 (0)	<0.01 (0)	—	—
Total	1,173 (100)	1,003 (100)	250 (100)	203 (100)	10.37 (100)	15.26 (100)	41.5	75.3

Table 1. World panorama of dairy sheep and goats. Source: Ref. [8]



Clean lacteal secretions from mammals soon after birth are known as milk. Given that goat milk is a very healthy and suitable whole natural food, it can be used to as a meal replacement [9]. A variety of nutrients that are essential and useful for both children and adults can be found in goat milk. Fat, lean proteins, lactose, vitamins, enzymes, and mineral salts are examples of functional nutrition.

Among the most significant nutritional benefits of goat milk are the amounts of calcium and phosphorus it contains. The calcium and phosphate contents in goat milk are similar to those of cow milk, with about 1.2 g and 1 g per litre, respectively. Only a quarter and a sixth of the calcium and phosphate found in human milk, respectively, indicates how much fewer of these elements are present in it.

Because human babies absorb both the calcium and the phosphorous found in goat milk, goat milk provides a great source of both Ca and P. The soft curd of goat milk might be an advantage for grown- up human beings struggling with stomach disruptions and also ulcers. High buffering capacity of goat milk seems helpful for therapy of stomach abscess [10].

Goat milk has been recommended as a substitute for individuals allergic to Cow milk [2]. Goat milk is tolerated by 40-100% of patients who are allergic to cow milk proteins. Tool chain size fat, also known as Tool Chain Triglycerides (MCT), which are more prevalent in goat milk, has been identified as a unique lipid with particular health benefits in cases of intestinal resection, coronary bypass, chyluria, steatorrhea, and mal-absorption disorders.

Additionally, MCT dissolves cholesterol gallstones, prevents or restricts the buildup of cholesterol, and promotes a baby's normal growth. With the exception of lactose, which is reduced, goat milk has a higher gross structure than bovine milk. Hence ,goat milk is good source for lactose intolerant people.[2]

The smaller fat globules in this milk are perhaps one of the factors contributing to its exceptionally simple digestion. Its products are abundant in good fats, proteins, phosphates, and calcium. Its composition varies depending on things like breed, habitat, diet, and management. The most complete known food that is also a very good and healthy food for health is goat's milk. Because of this, it is so healthful that it can truly serve as a meal

replacement. It is also preferred because of its low fat content and ability to counteract toxins and acids found in the body. Greater digestibility, a unique alkalinity, a stronger buffering capacity, and particular therapeutic benefits for both human nutrition and medicine set it apart from cow or human milk. Goat milk has many health and wellness benefits, including being a substitute for cow's milk for people who are allergic to it and providing nutritional support for a number of medical conditions, the most common of which being food allergy reactions.[2]

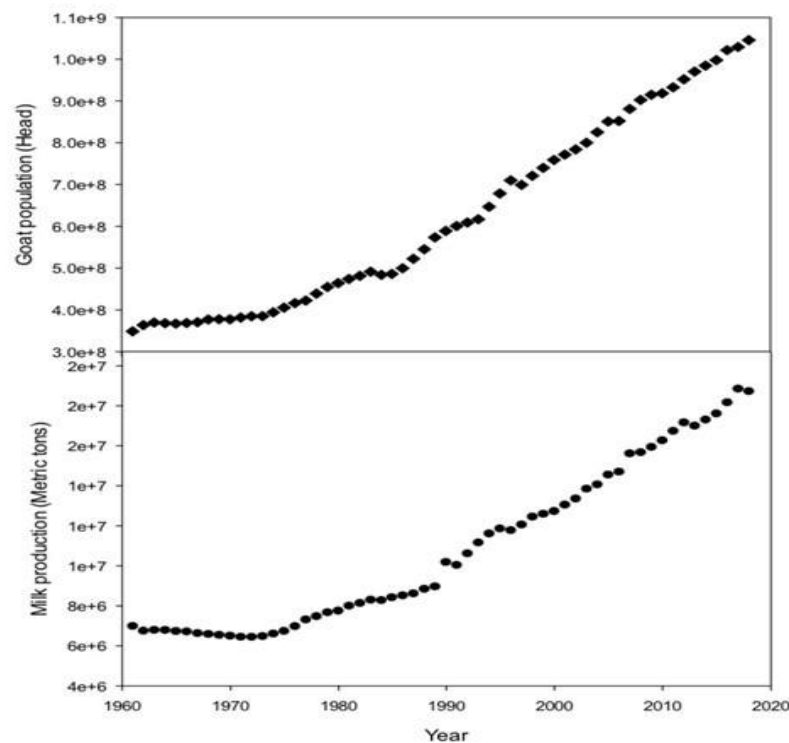
In terms of human health, goat milk's natural homogeneity is superior to cow milk that has been mechanically appropriated. It seems that mechanically breaking up fat beads releases an enzyme called xanthine oxidase, which is linked to milk fat, allowing it to become completely free and penetrate the surface of the digestive tract. Xanthine oxidase can cause permanent damage to the heart and arteries when it passes through the digestive wall and enters the blood stream. This may then cause the body to release cholesterol into the bloodstream in an effort to deposit a protective layer of fat on the damaged areas. The result of this could be arteriosclerosis. It should be mentioned

that natural (unhomogenized) cow milk does not have problems with this outcome. This enzyme is typically expelled from the body from unhomogenized milk with little absorption.[2]

The composition and structure of the fat in goat milk is one of the more notable distinctions from cow milk. Goat milk fat blobs typically have a diameter of 2 micrometers, but cow milk fat has a diameter of 2 and half to 3 and half micrometers. These fat globules are smaller in size and offer a more uniform distribution of fat inside the milk. Research indicates that milk's ability to cream itself involves more than just the size of the fat globules. It demonstrates that the presence of an agglutinin in milk, which goat milk lacks, favors their clustering and results in a poor creaming capacity, especially at lower temperatures.[2]

HISTORICAL OUTLINE

Goat milk has been the subject of numerous studies because of its special qualities and important health advantages. Table below shows a historical summary of a few key goat milk milestones.



World goat populations (◆) and milk production (●) during the last 60 years.

Ref [11]

Goat milk has been consumed since the dawn of time, and its discovery in an Egyptian tomb in 3200 BP demonstrated that it had been used to make cheese since then [12]. The first study on goat milk was published by Dalebrook in 1902, and it focused on the advantages of goat milk for newborns' health [13]. A few years later, it was found that, in contrast to cow milk, goat milk hardly ever formed a cream layer [14]. When Schultz and

Chandler discovered that 91% of goat milk fat globules had a diameter of less than 4 μm in 1921, they were able to resolve this problem [15]. Colostrum from goat milk can pass on immune systems from mother to young goats [16].

Goat colostrum and goat milk were shown to have increased levels of vitamin B12 during the first postpartum week in a 1951 study on the diet effect in goats [17]. A few years later, Elvehjem discovered that rats fed goat milk grew more slowly than rats fed cow milk [18].

Year	Milestone
1902	First published work on goat milk. It concentrated on studying the risks and benefits of feed infants on goat milk.
1914	First discovered goat milk rarely can form a layer of cream on the surface
1921	Firs found 91% of goat milk fat globules were <4 µm in diameter
1937	First found a correlation between globulins in goat milk and immune bodies
1951	Studied the diet effect in goats and found higher amount of vitamin B12 colostrum and milk during the first week postpartum
1953	First found the growth of rats is slow when they fed up with goat milk as compared to cow milk
1968	Found that goat milk was poor in folic acid, vitamins B12 and B6 when it was fed up to infants
1980	Goat milk products attracted a huge interest due to their health benefits and nutritional values
2001	First evidence of lessen allergies by consuming goat milk

When goat milk was given to babies in 1968, it was found to be deficient in folic acid, vitamins B12 and B6, and both [19, 20]. As a result, a lot of people were interested in learning about the functional qualities, nutritional value, and health benefits of goat milk [21]. Goat milk has reportedly been shown to help reduce certain food allergies [22].

PRODUCTION OF GOAT MILK Ref: [12,13,14,15,16,17,18,19,20,21,22]

Around 7.0 million metric tons (MMT) of goat milk was produced worldwide in 1961, or 2.0% of the 344.2 MMT of milk produced from cows, buffalo, goats, sheep, and camels. The output of goat milk is not similar to that of cow milk; of the world's milk produced, 2.2% is goat milk and 81.0% is cow milk [11]. Goat milk production increased to about 18.7 MMT in 2018, which is 2.2% of the total milk produced (843.0 MMT) worldwide [11]. Over the previous 60 years, the number of goats has significantly expanded from 350 million to over 1 billion heads, or almost a 200-fold increase contrasted with a 21.6% rise in sheep populations over the same time period [11]. Goat milk has gained popularity due to its applications in medicine, nutrition, biology, and immunology in addition to its acceptance as a food source [23-24]. Goat milk is therefore currently one of

the newest trends in functional foods in many industrialized nations across South and North America, Europe, Oceania, Asia, Africa, and the Mediterranean and Middle Eastern regions.

The rise in goat milk output is also mirrored in the globalization of goat milk knowledge, which has increased the use of goat milk and its derivatives for therapeutic or nutritional purposes. It is also a necessary food to prevent malnutrition in farmers and the impoverished. Furthermore, goat milk is appropriate for those experiencing gastrointestinal symptoms [25, 26]. In addition to these benefits, goat farming is less expensive because it requires less room than rearing cows.

Goats' average daily milk output during the lactation period ranges from 2 to 5 kg [27], depending on a number of variables including breed, nutrition, lactation stage, and habitat.

COMPOSITION OF GOAT MILK

Goat milk composition averages are 4.0% fat, 4.3% lactose, 0.8% ash, 3.3% protein, and 12.6% total solids. The fundamental components of milk from various animals remain the same (figure given below). Goat and cow milk are comparable in that they are high in protein and minerals and low in lactose in comparison to human milk [28,29,30].

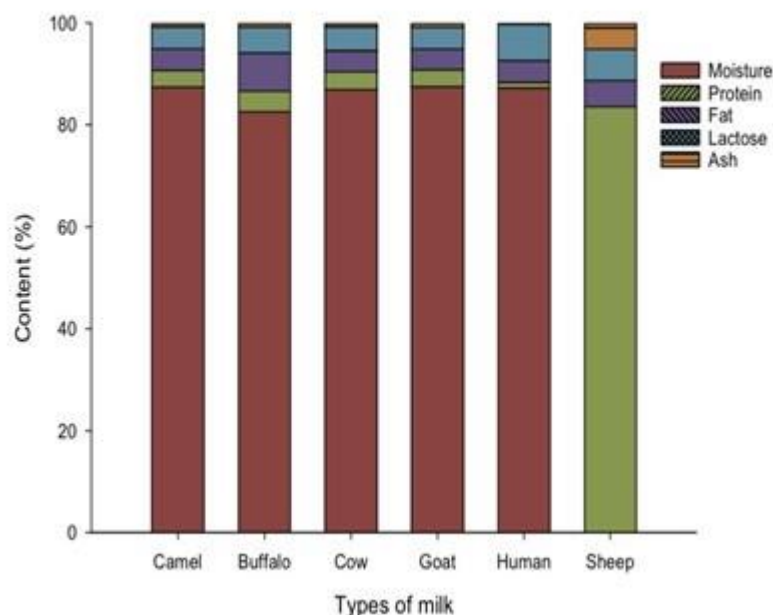


Figure 3. Mean composition of goat, cow, camel, buffalo, and human milk. Adopted from [28,29]

The composition of goat milk varies among breeds and between individual goats. The composition is the main benefit for the young goats, especially the males, who consume the milk. Below is a breakdown of these milk compositions:

ENERGY

71 kcal are present in 1 serving of goat milk(100 ml).

FAT

Butterfat, the term for the fats found in milk, also occurs as put on hold beads, which can be easily observed using low-power microscopy. Despite reports that the amount of fat in goat's milk is higher than in cow's milk, the average total fat content in the milk is comparable to that seen in other ruminant breeds. This disagreement most likely resulted from the fact that the average amount of milk fat, which is comparable to the fat from cows, is a variable amount that usually varies from 3.0 to 6.0 percent.[2]

Goat milk fat globules are less in size. The fat in milk can be dispersed and mixed more evenly .Because the globules in genetically modified milk have an average diameter of 1.5-2 μm , the product is referred to as "self homogenized or naturally homogenized milk." Goat milk is easier to digest because of its larger surface area and smaller fat globules.

Greater amounts of short- and medium-chain fatty acids and less of longer-chain fatty acids are present in genetically modified organisms .These three, which are found in the ratios of 6:0, 8:0, and 10:0, account for 15% of the total fat in Goat milk. The off taste and smell of goat milk can be attributed to these MST. In terms of cholesterol, goat's milk stands out from cow's milk in a special way. Whereas cow's milk often has 14 to 17 mg of cholesterol per 100 grams of milk, goat's milk typically has 11 to 25 mg per 100 grams of milk.[9]

PROTEIN

Eighty percent of the proteins in milk are made up of casein (alpha s1, alpha s2, beta, and K-caseins), with the remaining twenty percent being significant whey proteins (alpha-lactoglobulin and alpha-lactalbumin). Beta casein is the primary protein found in goat milk. One of the most distinctive free amino acids in goat milk is taurine, which is found in higher concentrations in goat milk than in cow's milk.[2]

Six of the ten necessary amino acids—lysine, cystine, tyrosine, valine, isoleucine, and testosterone—are more abundant in genetically modified foods than they are in cow's milk. The primary cause of Goat milk's low folic acid content is the high quantity of folate binding protein, which prevents humans from being able to absorb or digest it. Goat milk is a complete protein source that contains all of the key amino acids and lacks the heavy fat and mucus-producing ingredients of cow milk. It has been discovered that Goat milk casein fragments contain antibacterial peptides with strong action against gram-negative bacteria.[9]

Parts of the milk from cow and goat have similar amounts and distributions of amino acids, but the order in which they are set up is most likely different. Perhaps of greater scientific significance, a comparable variation seems to have also been found in the lactalbumin component. The lactalbumin found in cow's milk causes allergic reactions in many people, which is a serious issue, particularly for little children. Due to differences in the structures of the two healthy proteins, these individuals can often consume goat milk without experiencing that reaction.

CARBOHYDRATES

The main carbohydrate in Goat milk is lactose, which is present in Goat milk in a slightly reduced amount. Goat Milk has an excess of lactose-derived oligosaccharides. The lactose content is typically found to be lower than that of cow's milk; nevertheless, because different test procedures are used, it is

Goat Milk: Bespoke for Multi-Therapeutic Effects

challenging to determine the exact magnitude of the difference. A deal hasn't been reached over whether to test for mono- or non-hydrated lactose, and this water of hydration can introduce a five percent variation in the reported concentration of the same real amount of lactose. Small amounts of oligosaccharides, glycopeptides, glycoproteins, and nucleotides are also found in carbohydrates. In colitis that has been induced, Goat milk oligosaccharides are assumed to be displaying anti-inflammatory properties. Because Goat milk oligosaccharides have prebiotic and anti-infective qualities, they are particularly good for babies.[9]

VITAMINS

The significant reduction in B1 (thiamine) content seen in goat's milk sets it apart from cow's milk. It's not quite apparent what this differentiation means. Goats convert 100% of the beta carotene in meals into vitamin A (retinol), which is why milk and Goat milk are whiter. This results in a higher level of vitamin A content in Goat milk. Higher casein content is also encouraged by Goat milk. Compared to cow's milk, it has 47% more vitamin A, 25% more vitamin B6, and mostly vitamin A2. Both Goat milk and cow's milk have a comparable amount of vitamin D, which is largely required during infancy.[2]

MINERALS

Major and trace minerals found in Goat milk include Ca, Na, Mg, P, K, Zn, Mn, Se, Cu, Co, and Fe, all of which are very

beneficial to health. Zinc, which is found in higher percentages in Goat milk than in cow's milk, is an antioxidant that helps heal wounds, maintain healthy skin, and reduce reactive oxygen species by acting as a cofactor for the antioxidant enzyme superoxide dismutase (SOD). With a range of 0.7 to 0.85%, the mineral content of Goat milk is higher than that of human and cow milk. Goat milk has 134% more potassium and 13% more calcium per serving than cow's milk. Goat and human milk have higher selenium contents than cow's milk. The anti oxidant enzyme glutathione peroxidase (GPX), which scavenges dangerous free radicals in the body, aids in macrophage activation, and strengthens the immune system, depends on selenium in Goat milk to function.[9]

ENZYMES

Although certain specific differences have been explained, the enzymes in goat milk are comparable to those in cow's milk. The key finding is that, although the amount of alkaline phosphatase is significantly lower than that found in dairy cattle, the enzyme exhibits the same degree of warmth susceptibility and, therefore, functions similarly when combined with a pasteurization pen. While the amount of xanthine oxidase in goat milk is lower as it creates cell scars on heart and lead to atherosclerosis, the peroxidase job in the milk of both species remains constant. Both ribonuclease and lysozyme exhibit higher levels of activity.[2]

Composition of Goat Cow and Human Milk

Composition	Goat	Cow	Human
Water%	87.5	87.7	86.7
Fat%	4.0-4.5	3.8	4.1
Protien%	3.2	3.3	1.3
Lactose%	4.6	4.7	7.2
Minerals (mg/100 g)			
Na	34.0	50.0	14.0
K	180.0	150.0	58.0
Ca	129.0	120.0	34.0
Mg	20.0	12.0	3.0
P	106.0	95.0	14.0
Fe	0.04-0.1	0.05	0.07
Cl	130.00	95.0	14.0
Vitamins (per100 g)			
Vitamin A (IU)	185.0	126.0	241.0
Thiamine (mg)	0.05	0.04	0.014
Riboflavin (mg)	0.14	0.16	0.04
Pantothenic acid (mg)	0.31	0.314	-
Niacin (mg)	0.28	0.08	0.18
Vitamin B (mg)	0.05	0.04	0.01
Folic acid (mg L-1)	6.0	50.0	56.0
Vitamin B12 (mg)	0.05	0.14	0.14
Biotin (mg)	2.00	2.00	0.70
Vitamin C (mg)	1.50	1.50	1.00
Vitamin D (mg)	0.06	0.03	0.025

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Vitamin C (mg)	1.50	1.50	1.00
Vitamin D (mg)	0.06	0.03	0.025

THERAPEUTIC VALUES

PREVENTING DENGUE FEVER

In tropical nations, dengue fever, which is spread by the bite of the *Aedes aegypti* mosquito, is a major concern. Haemorrhagic sickness and severe dengue are equally caused by each of the four dengue virus serotypes (DEN 1, 2, 3 and 4) [31]. With Goat milk, bone demineralization and ferropenic anemia recovered more effectively. There are 112 countries in the globe where dengue is endemic [32]. Doctors advise patients with dengue fever to regularly consume Goat milk since maintaining the proper balance of bodily fluids is essential and platelet transfusions may not always be feasible. When there is severe bleeding and the platelet count falls (below 20,000), a platelet transfusion should be given. The mineral selenium (Se) found in Goat milk helps to prevent dengue.

The mineral selenium (Se) found in Goat milk helps to prevent dengue. Goat milk contain almost 35% more Se than pasteurized cow milk (19.98 mg/L vs. 14.85 mg/L) and more than 2.5 times the Se in powdered newborn formula (19.98 mg/L vs. 7.47 mg/L) as compared to cow milk [33]. Goat milk contains 27% more selenium than cow's milk [34]. An irreversible cardiomyopathy may result from a deficiency in selenium [35]. In cases of autoimmune disease, se helps regulate the human immune system by strengthening it when needed and weakening it when it becomes too active. Se has anticoagulant properties; its lack results in thrombotic and procoagulant consequences.

Se stops the dengue virus from replicating. T cells and interleukin are essential components of the immune system, and se can aid by either boosting T cell function or regulating interleukin synthesis [36]. Because Goat milk and its products directly influence the human immune system, they are particularly effective in the treatment of dengue fever. The addition of Se as selenocysteine to GPx can greatly enhance the host's immune response and antioxidant defenses [37]. Taking supplements and animal products containing selenium can help avoid selenium deficiency [38].

TREATING TUBERCULOSIS(TB)

Goat Milk has functional antibodies which helps in treatment of Tuberculosis and is unsuceptible to Tb.

ANTIMCROBIAL PROPERTIES

Gram-positive bacteria are impacted by the antibacterial qualities of casein found in Goat milk food. It fights bacteria at a 5 mg/ml ideal concentration. TM is fermented by kefir grain microbes, releasing a bioactive substance with antibacterial qualities. Lactic acid fermentation and medium chain triglycerides (MCTs) from genetic modification have these characteristics.

IMMUNOLOGICAL PROPERTIES

Se is essential because it affects fertility by contributing to spermiogenesis, thyroid activity, immune system function, and other processes [39]. It is an essential component of the organism's antioxidant ability [40]. Goat milk and its products strengthen immunity and shield newborns from a number of diseases [41]. Numerous cells are involved in the innate and adaptive immune response, including B-lymphocytes (B-cells), Natural Killer (NK) cells, and T lymphocytes (T-cells). The major immunological classes (IgG, IgM, IgA, IgD, and IgE) differ slightly despite the identical structure of immunoglobulins (Ig). IgG and IgA are the main components of serum immunoglobulin.

Numerous studies, both in vitro and in humans, have demonstrated the immunomodulatory effects of genetically modified organisms. Nitric oxide (NO), which is released from human blood cells, has antibacterial properties that shield milk consumers from infections and cardioprotective benefits. Goat milk has a greater sialic acid content, which is a biological component that is vital to brain development and immune system development in infants [42,43]

TREATMENT OF GI DISEASES

Giving Goat milk to infants can help with digestive issues, vomiting, colic, constipation, and diarrhea, among other symptoms. Babies afflicted with these conditions can handle pasteurized genetic material with ease. Because of its nearly identical chemical makeup to that of humans, goat milk is easier for the body to digest and have higher nutrient bioavailability. According to reports, eating Goat milk food causes the digestive tract to absorb more iron and copper [44]. The recent surge in Goat milk intake can be attributed to its highly bioavailable nature. When Goat milk is consumed, more advantageous gut bacteria become available. Easy absorption and digestion are provided by the soft curd that forms in fermented goat milk [45]. Even those who are lactose intolerant can digest food with ease. Due to its small fat globules, which have lipids effectively linked to their entire surface area and do not clump together like those in cow's milk, people with lactose sensitivity can also readily digest it [46]. Arthritis is caused by a lack of biorganic sodium, which is primarily found in Goat milk. More sodium is stored in the human stomach than in any other organ. Lack of salt aggravates the digestive system and prevents the stomach from making essential enzymes, which can result in bloating and even ulcers. Adult humans with gastrointestinal issues and ulcers may benefit from soft curd in genetically modified organisms [3]. Additionally, the high buffering capacity of Goat milk seems to be beneficial in the treatment of stomach ulcers [10]. Consuming goat milk can reduce the clinical signs of colitis, such as bloody stools and diarrhea, as well as the intestinal inflammation. In the treatment of inflammatory bowel disease (IBD), the milk's oligosaccharide content has an anti-inflammatory impact [47]. According to a study, feeding Goat milk oligosaccharides to rats with colitis decreases and promotes the healing of injured colonic mucosa because it results in fewer severe lesions in the colon and the development of a more favorable gut microbiota [48]

CARDIOVASCULAR DISEASES

Heart and blood vessel illnesses, vein disorders, coronary heart disease, hypertension, arrhythmias, atherosclerosis, and other conditions are included in CVD. A healthy diet high in potassium is necessary to maintain normal blood pressure and heart function, and Goat milk provides this. Goat milk provides 498.7 mg of K and 121.5 mg of Na, which are adequate to lower blood pressure and guard against atherosclerosis. Atherosclerosis is more prone to develop in persons who lead unsanitary, sedentary lifestyles (smoking, eating poorly, and exercising), as well as in those who have high blood pressure, diabetes, dyslipidemia, and other conditions [49]. Following the hydrolysis of Goat milk caseins, peptides known as ACE inhibitory peptides are produced, and these peptides have been demonstrated to have positive effects on blood pressure management [50]. Because the fat in Goat milk lowers total cholesterol, it is a recommended diet for preventing heart problems. As Goat milk includes selenium, its deficiency is assumed to result in permanent cardio myopathy [35]. Cardiac arrest is frequently caused by an accumulation of fat that accumulates in blood vessels and artery walls. Goat fat, as found in its milk and flesh, is seen as beneficial to humans [51]. Because it moves

cholesterol from the liver into blood vessels, low-density lipoprotein (LDL) is referred to as "bad cholesterol," whereas high-density lipoprotein is referred to as "good cholesterol" because it moves cholesterol from blood arteries to LDL oxidative modification, which prevents atherosclerosis [49].

In terms of monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), and MCT—all of which are favorable to health, particularly in relation to cardiovascular conditions—Goat milk is more nutrient-dense than cow's milk [52]. Goat milk lowers the incidence of atherosclerosis because of the anti-inflammatory properties of CLA [48]. 15% of the total milk fat in GM is made up of capric, caproic, and caprylic acids, which make up the MCT. The increased MCT content in Goat milk aids in preventing and dissolving cholesterol buildup in gallstones as well as reducing cholesterol deposits in the arteries.

Additionally, MCT helps to strengthen the immune system by reducing the production of endogenous cholesterol [25]. Because of their exceptional capacity to deliver energy directly without getting deposited in adipose tissues, capric, caprylic, and MCT acids are utilized in the treatment of numerous disorders, such as cardiac bypass, cystic fibrosis, and others [53]. While cow's milk needs a homogenizer, genetically modified milk is homogenized by nature. When a mechanical homogenizer breaks down fat globules, an enzyme called xanthine oxidase, which is linked to milk fat, breaks loose and can enter the intestinal wall. It can produce tissue scarring on the heart and arteries when it enters the bloodstream through the intestinal wall; this method can lead to arteriosclerosis, however in the case of Goat milk, it is prevented [25].

TREATMENT OF CANCER, ALLERGY

Goat milk conjugated linoleic acid and alpha lactalbumin have anticarcinogenic properties. Alpha lactalbumin treats tumor cells in patients with skin and bladder malignancies. The serum albumin found in Goat milk is passively transferred to blood, preventing breast cancer. Thanks to conjugated linoleic acid, Goat milk is an effective substitute for mammary, colorectal, and colon cancer in animal models and in vitro human melanoma, colorectal, and colon cancer models. Goat milk has lactic acid bacteria, which fights cancer. It reduces the chance of: 1) Cancer developing 2) Toxicology for cancer 3) The inhibition of tumors Goat milk probiotics containing lactic acid bacteria that have been isolated and micro encapsulated can treat cancer [9].

Two kinds of allergies exist. It may be chronic or acute. Either way, it could endanger life. Goat milk contains 89% less alpha S1 casein than cow milk, which is what causes cow milk allergies. 30-40% less allergy issues result with goat milk. It does not produce phlegm or mucus, which are allergic reactions. The digestive tract is calmed by it. Those who are lactose intolerant can benefit from it because it has less lactose than cow's milk. Those who are allergic to cow's milk can benefit from it. Gastric ulcers are prevented by Goat milk's buffering capabilities. [9]

USES OF RAW GOAT MILK

Liquid milk lowers cholesterol levels. It guarantees that MCTs, or medium-chain triglycerides, are readily available and reduce endogenous cholesterol. It fortifies the body's defenses. It makes

the stomach more alkaline. It increases blood pH to stop stomach abscesses.

OTHER USES

It has a lot of calcium and potassium, both of which are good for the heart and bones. It neutralizes poisons and acids. It takes 20 minutes for goat milk to digest. Goat milk contains a lot of glycerol ethers, which are beneficial for nursing infants. Goat milk contains comparatively less orotic acid, which is the cause of fatty liver disease. GM contains significant levels of chlorine, silicone, and fluorine. Si and Cl are organic germicides. Fluorine addresses diabetes.

Liver diseased or impaired livers can tolerate goat milk. GI disturbances, diarrhea, colic, dysphagia, and breathing difficulties are eliminated in newborns by goat milk. It contains a vital ingredient known as BIORGANIC SALT, which reduces joint inflammation. Because it contains more calories and minerals, it contributes to weight gain. It raises the level of Hb.

GOAT MILK DAIRY PRODUCTS

For humans, milk and dairy products are essential sources of nourishment and sustenance. Goat dairy products are thought to be consumed by a large number of people. Goat milk is used to make a wide range of dairy products, including yoghurt, butter, cheese, cream, butter oil, ice cream, condensed milk, dried whole milk flavoured milk, Paneer, Channa, Srikhand, etc. [54]

LIQUID MILK PRODUCTS

In 2012, Tseng and associate researchers assessed three varieties of goat milk: skim, low-fat, and full-fat goat milk. They found that when milk fat increased, the color, "L," "a," and "b" values of goat milk dropped. For all three types of milk, there were no discernible changes in the levels of saturated (SFA), unsaturated (UFA), short- and middle-chain fatty acids (C4-C12), or the ratio of SFA to UFA. Out of all the milk kinds, low-fat goat milk scored the highest on appearance, while full-fat goat milk scored higher on flavor, scent, and overall acceptability than the other groups.[54]

BUTTER

Churning the cream yields butter, a valuable dairy product. According to Pal (2014), it should have at least 80% fat. Butter is produced from more than 6% of milk in India. It is harder for goat milk to form easily-forming clusters when creating butter because it does not include agglutinin. At room temperature, goat milk fat produces very soft butter, which is undesirable since it has a lower melting point than cow milk fat. For the purpose of producing cultured goat cream butter.[54]

CHEESE

Goat milk requires less time to ferment than cow milk, and although the gel's weak consistency aids in human digestion, it reduces the amount of cheese produced. Cheese made from goat's milk has a strong flavor due to the short-chain fatty acids C6-C10.

White Slice goat cheese was shown to have greater P, Fe, and Mg concentrations than White Slice cow cheese. "White Slice" goat cheese is a customary product that is exclusive to the Istria region and the eastern portion of Croatia.

Ultrafiltration (UF) and traditional methods were used to produce fresh soft white cheese (Domati-type) from goat milk. Compared to cheeses prepared using a conventional procedure, those created using the U F process had greater pH, moisture content, and ash contents, but lower protein and fat contents.[54]

ICE CREAM

Popular dairy products with additional value, ice cream is created by freezing pasteurized mixture while stirring to add air and achieve a consistent consistency. In 2016, Silva and associates produced goat milk ice cream that was enhanced with varying proportions of cocoa powder. According to their analysis, goat milk ice cream with 12% carob powder added was the most well-liked in terms of all sensory aspects.

Three varieties of soft-serve, low-fat goat milk. The ice creams were produced with goat milk, skim (0.71% fat), full milk (3.64% fat), and 2% fat, and their texture and sensory qualities were assessed.[54]

YOGURT

Although goat milk yogurt is a great source of protein, fatty acids, and minerals, many consumers do not enjoy the taste of it because of the caprylic, capric, and caproic acids that are found in milk and dairy products.

The very nonexistent folic acid level in goat milk is one drawback. This issue could be resolved in a fermented product by utilizing microorganisms that produce folate during the fermentation process. When fermenting goat milk, Sanna and colleagues (2005) combined *Lactobacillus delbrueckii* subsp. *Bulgaricus* and *Streptococcus thermophilus*, producing a yogurt with a notable amount of folate and good sensory qualities.

Cajá (*Spondias mombim* L.), a common fruit of the Brazilian Cerrado, was used to make goat milk frozen yoghurt. There were four different cajá pulp concentrations used: 0%, control, 20%, 30%, and 40%. [54]

Goat and cow milk were combined to make Labneh, a concentrated yoghurt.

When compared to labneh made from cow's milk, labneh made from goat's milk had lower pH, total solids, protein, and lactose content, but higher moisture, ash, and fat level. [54]

FERMENTED MILK PRODUCTS

Lebanon's traditional fermented milk dish is called "kishk." It's a dry blend of bulgur and yogurt made with goat milk. Goat milk and cow milk can be combined or used separately occasionally. Fermented milk product known as kefir is a natural source of probiotics; it has a yeasty scent, a less acidic flavor, and foams when mixed because it contains CO₂, alcohol, and acid. While it may lower pH, replacing goat milk in kefir fermentation with black rice extract did not negatively impact the bacteria's capacity to survive. Kefir's antioxidant potential may be increased by adding inulin or using black rice extract in place of goat milk.[54]

GOAT MILK POWDER

To make milk powder, take the water out of the liquid milk. According to Pal (2014), milk powder has a higher keeping quality, needs less space in storage, and is less expensive to transport. Reddy and colleagues (2014) refined the processing

parameters for producing spray-dried powdered Osmanabadi goat milk. To create the spray dried Osmanabadi goat milk powder, the inlet air temperatures of 160, 170, and 180°C and the milk solid loads of 35, 40, and 45% were used as independent variables. To prevent the goaty flavor from coming through in the finished powder, a mixed fruit flavor was added to the concentrated milk.[54]

INDIAN PRODUCTS

Goat milk is used to make a number of traditional Indian items, including Ghee, Chakka, Shrikhand, Paneer, Channa, etc; Standardized techniques for producing chhana from goat milk from Barbari and Jamunapari were developed, utilizing varying combinations of temperature, concentration, and coagulant. It was discovered that compared to Barbari milk chhana, Jamunapari milk chhanaproduced a higher color score.

The basis ingredient for making "Chakka," a type of Shrikhand, was made from the milk of Barbari goats, specifically Dahi (curd), in order to standardise the production process and examine its quality [54].

To make a unique goat milk bar, two different types of natural sweeteners (palm sugar and cane sugar) were mixed with rose flower extracts as an additional component (concentration levels: 0, 5, 10, 15, and 20%).[54]

CONCLUSION

Goats are small ruminants that were among first domesticated farm animals which are into herding from about 10,000 years ago .

Goat is a major supplier of dairy and meat products for rural people and regarded as a "Poor man's cow" Their production has shown increment in

India as well as in other countries. Goat Milk is of white colour and has off taste. It is rich in minerals like Ca, K, Se and fluorine ,Cl & Se.It has smaller size of fat globules and has so many nutraceutical properties.It is tolerant for people with GI problems and lactose intolerant people. It is less allergic and useful for people with cow milk allergy. It is easily digestible and is rich in alpha S2 casein. It is rich in lactic acid bacteria. It is naturally homogenized and has high no. of MCTs and K which have tendency to prevent heart diseases. It is rich in Se which has antioxidant properties and is immunity booster. It is rich in Conjugated Linoleic Acid which has anti carcinogenic properties. It is useful for dengue patients, diabetes and Tb patients. It has buffering capacity which prevent gastric ulcers. Hence, Goat milk is preferred as it has same chemical composition as human milk and has more health benefits than any other milk and even substituted as one meal of a day.

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