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Review Article

FROM TRADITION TO SCIENCE: UNRAVELING THE THERAPEUTIC SECRETS OF CAMEL MILK

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One of the animals listed in the Quran as a wonder of God is the camel. It is customary to allow camels to consume specific herbs in order to use the milk for therapeutic purposes. Camel milk has superior nutritional value and is said to be therapeutic for a variety of human diseases. Many human ailments can be treated with camel milk. It has been demonstrated to be an effective treatment for food allergies, diabetes type 1, and stomach and intestinal issues. Additionally, camel milk has been used to lower blood cholesterol levels, prevent psoriasis, treat bodily inflammation, help patients with tuberculosis, boost the human immune system, slow the formation of cancer cells, and treat autism. In India, camel milk is used medicinally to treat conditions such as dropsy, jaundice, spleen issues, tuberculosis, asthma, anemia, and piles. The "chal" and other lung conditions have been successful in treating tuberculosis. In this paper, we had made a review on importance of camel milk as a health care and alternative treatment of various diseases and we had discussed about its composition and content found in camel milk.

KEYWORDS: - Camel Milk, Heath, Treatment, Composition, Importance, Disease.

INTRODUCTION

The camel is one of the animals listed in the Quran as a God-given miracle. Since ages, "raikas" and "rabaris" have served as a source of milk in various sections of camel rearing civilizations. [1] Only the camel lives and continues to provide milk in places of the world when ongoing drought decimates the populations of cattle, sheep, and goats. The fact that camels produce more milk during drought than any other household animal acclimated to desert areas is crucial for pastoralists since camel milk may make up as much as 50% of their daily food intake. [2,3,4] Currently, it is thought that there are 35 million camels in the globe, of which 1 million are Bactrian (two-humped) camels and the rest are dromedary (one-humped) camels. [5]

Today, camel milk is more in demand in Africa, where it is sold and consumed in large cities and towns where camels are not common. [6] Additionally, due to the possible health benefits of camel milk, interest in it is rising among particular consumer groups in North America and Europe. [5,7,8,9,10] Since twenty years ago, numerous studies have documented the use of camel milk in the treatment of human disease. Camel milk has been used medicinally for ages by nomadic tribes. In Kazakhstan, stomach and intestinal ailments can be treated with camel milk and fermented milk products (Shubat). [11] The presence of antimicrobial compounds in camel milk, such as lysozymes, hydrogen

peroxide, lactoferrin, lactoperoxidase, and immunoglobulin's, has been related to this action. [12]

Compositions And Content Found In Camel Milk

Literature researches have revealed significant variations in the make-up of camel milk. Mean values were obtained from a meta-analysis of published research on the gross composition of camel milk (one-humped and Bactrian) are (in g/100 mL) of 3.82 ± 1.08 for fat content, 3.35 ± 0.62 for total protein, 4.46 ± 1.03 for lactose, 12.47 ± 1.53 for total solids, and 0.79 ± 0.09 for ash. The same study reported a mean value (in g/100 mL) of 4.14 ± 0.80 for fat content, 3.33 ± 0.52 for total protein, 12.69 ± 1.11 for total solids, 4.18 ± 0.72 for lactose and 0.76 ± 0.09 for ash for milk of East African one-humped camels. [13]

Water: Camel milk's water content can range from 84% to 90% [16,17]. Numerous studies have found that camel milk can vary in water content, which they ascribe to variations in animal nutrition, water availability, and water consumption. [8]

Protein: Camel milk has a total protein content ranging from 2.15% to 4.90%, with an average of 3.1%, and the proteins are separated into two primary fractions: casein and whey protein. [18] As previously stated, variance in camel milk content is primarily due to variations in seasonal conditions and camel breeds. [8]

Making fermented dairy products like cheese and yoghurt from camel milk is challenging because camel milk does not readily coagulate. The difficulty of manufacturing products from camel milk is ascribed to the unusual structural and functional characteristics of the milk proteins, particularly the low levels of kappa casein that lead to casein network breakdown during cutting and loss of dry matter of cheese to whey. [19]

Table 1: The average gross composition of camel milk. [14,15]

Composition (gram/100gram milk)	Camel Milk Content (Range)
Water	89.0 (88.7-89.4)
Total Protein	3.1(2.4-4.2)
Total Fats	3.2 (2.0-6.0)
Lactose	4.3 (3.5-4.9)
Ash	0.8 (0.69-0.9)
Total Solid	11.0 (10.6-11.3)

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Table 2: Protein Fraction (g/litre) and amino acid concentration (g/100g) of protein of Camel Milk.

Protien Content	Camel Milk Content
Total Caseins	22.1-26.0
Total Whey Proteins	5.9-8.1
Caseins/Whey proteins ratio	73.2:76.2
α-S1-Casein	4.9-5.7
α-S2-Casein	2.1-2.5
α-casein	0.8-0.9
β-casein	14.4-16.9
β-Lactalbulin	Absent
α-LActalbulmin	0.8-3.5
Aspartic acid	6.9
Alanine	2.1
Cysteine	1.9
Glycine	2.1
Glutamic acid	18.1
Isoleucine	4.9
Leucine	6.1
Lysine	4.0
Limiting amino acid	Lysine
Methionine	2.0
Phenylalanine	4.0
Histidine	2.1
Threonine	4.1
Serine	4.3
Proline	12.0
Valine	4.1
Tyrosine	3.1
Arginine	2.0
Tryptophan	Not Defined

Table 3: Fatty acid profile {% of total fatty acids) and cholesterol content of camel milk.

Fatty Acids	Composition
Saturated Fatty Acid (%)	47.0-69.9
Monounsaturated Fatty Acid (%)	28.1-31.1
Polyunsaturated Fatty Acid (%)	1.8-11.1
Cholesterol (mg/mL milk)	31.3-37.3

Fats: - Camel milk has a fat content that ranges from 2.9% to 5.4%. [2]

Properties present in camel milk are creaming property, fats globule size, butter obtained by high churning temperature 20-25 °C and camel milk butter has a melting range between 41 and 42 °C, which is on average 8 °C higher than the similar value for cow milk butter.

Due to genetic variations within the species, it was shown that the fatty acid composition of camel milk fat varied. [20] According to a report, the breed of camel had a big impact on the amount of omega-3 fatty acids in the fat found in camel milk. [21]

Lactose: - Camel milk contains between 4.8 and 5.8% lactose. It seems that camel milk's lactose concentration stays substantially stable throughout lactation. Studies on the effects of drought on camel milk's composition have shown that the lactose content was only 2.8% at birth but quickly increased to 3.8% after that. [2,22] A further increase of up to 5% in lactose was seen as long as drinking water was accessible. [2,22]

Total Solid: - The fat, lactose, proteins, and ash that make up milk's dry matter. Season and lactation stage both have a big impact on how much milk is produced every day. Average total solids in camel milk are 15.06%, of which protein makes up 4.9%, milk fat 5.60%, lactose 5.85%, and mineral elements 0.99%. [23]

Table 4: Content of mineral in camel milk.

Minerals Present in Camel Milk	Camel Milk Content
Calcium	114-116
Copper	140.0
Phosphorus	87.4
Potassium	144-156
Manganese	80.0
Magnesium	10.5-12.5
Sodium	59.0
Zinc	530-590
Iron	230-290
Iodine	Not Defined
Selenium	Not Defined

Minerals: - A one-humped camel's total mineral content, which is typically referred to as total ash, ranges from 0.60% to 0.90% with an average of 0.79 ± 0.07%. [13]

Vitamins: - The vitamin content of camel milk is shown in Table 5. Water-soluble and fat-soluble vitamins such vitamin B complex, vitamin C, vitamin D, vitamin A, and vitamin E are added to camel milk. [24]

Contents of other vitamins, such as vitamin B12, pantothenic acid, and vitamin A, are considerably lower.

Camel Milk Therapy

97.5 and 85% of respondents in Babilie and Kebribeyah, respectively, acknowledge the therapeutic benefits of camel milk. This result is that camel breeders in every country where camels are raised are convinced that camel milk has unique medicinal properties, particularly for dropsy, jaundice, and conditions affecting the lungs and spleen. Asthmatics (7.5%), stomach discomfort (2.5%), HIV (7.5%), hamot (kar) (12.5%), tuberculosis (12.5%), fever (2.5%), urinary difficulties (5%) and hepatitis (2.5%) were among the conditions for which respondents from Babilie said camel milk was useful as a remedy. Respondents in Kebribeyah reported the benefits of camel milk for treating jaundice (18.33%), the common cold (1.67%), dearbeh (vomiting), and diabetes (1.67%). For Babilie and Kebribeyah, respectively, respondents in both woredas mentioned the medicinal efficacy of camel milk for constipation

Table 5: Content of Vitamins in camel milk.

Vitamins Present in Camel Milk	Camel Milk Content
Vitamin A (µ g/100 g)	26.7
Vitamin D (µ g/100 g)	0.3
Thiamine (B1) (mg/100 g)	0.05
Folic acid (B9) (µ g/100 g)	87
Cobalamin (B12) (µ g/100 g)	85
Vitamin C (mg/100 g)	33
Riboflavin (B2) (mg/100 g)	0.17
Niacin (B3) (mg/100 g)	0.77
Pantothenic acid (B5) (mg/100 g)	0.37
Pyridoxine (B6) (mg/100 g)	0.55
Biotin (B7) (µ g/100 g)	Not Defined

(7.5, 41.67%), as well as yewefbeshita (15, 6.67%). This finding is consistent with medical benefits of camel milk for anemia, rickets, asthma, and liver cirrhosis as well as for constipation and rickets. [25]

Importance Of Camel Milk And Its Targeted Treatment

Tezera (1998) observed the benefits of camel milk in the treatment of malaria, gastro-intestinal diseases, jaundice, pneumonia, and other illnesses. Research by Indian experts supports the therapeutic value of camel milk in the treatment of several ailments, such as tuberculosis. [26] Lactoperoxidase Gram-positive strains are resistant to camel milk's bacteriostatic effects, whereas Gram-negative cultures are susceptible to its bactericide effects. According to researchers, camel milk contains antibodies that may be useful in the fight against hepatitis C, HIV/AIDS, cancer, and Alzheimer's disease. [12,27,28,29,30,31] Many people are still working on determining whether camel milk can also be used as a preventative measure for diabetes and heart disease. [32,33,34,35] Additionally, probiotic lactic acid bacteria that are crucial for human health were identified from camel milk. The next sections detail each of these putative camel milk health benefits.

Camel Milk against various disease/disorder

1. Camel Milk against Gastrointestinal disorder

High levels of anti-inflammatory proteins found in camel milk are beneficial for gastrointestinal and intestinal illnesses. Better carbohydrate metabolism is provided by the composition's abundance of mono- and polyunsaturated fatty acids as well as its high vitamin content. [36,37] Moreover, it was found that fermented camel milk has an enzyme (Angiotensin I-converting enzyme, ACE) [38], this makes it easier to digest milk proteins. [39] Recent studies on the use of camel milk for the maintenance of digestive health revealed that camel milk has anti-diarrheal characteristics, and all kids who consume it and experience 20 bouts of diarrhea per day are cured and resume having regular bowel movements. Due to camel milk's abundance of anti-rotavirus antibodies, it can also be used to treat young infants who suffer diarrhea brought on by rotavirus contamination of their food. [18]

2. Camel Milk against Diabetes

Camel Milk is used to treat sugar diseases. Hyperglycemia, a condition caused by the metabolic illness diabetes mellitus, is elevated blood sugar. The hormone insulin insufficiency leads to type I diabetes. The pancreatic beta cells, which make insulin, are eliminated. The basic type of this illness is insulin-deficient diabetes, which typically develops during infancy or adolescence. [28] The use of camel milk significantly lowers blood glucose levels and the need for insulin. It also prevents diabetic consequences including high cholesterol, liver, and renal disease, reduced oxidative stress, and slower wound healing. It

seems that more in-depth research is required to demonstrate camel milk's efficacy in the management of diabetes. Other trials of patients with lactose intolerance have shown that camel milk consumption produced positive benefits, and that 23 out of 25 patients accepted it quite well. [35]

3. Camel Milk against Food Allergy

Camel milk has been used to treat kids with food allergies. [12,30,40] It's common knowledge that some foods, such milk and dairy products, can trigger allergies. Effects of camel milk consumption on eight kids with severe food sensitivities. For two weeks, camel milk was the only food given to the kids in place of all other foods. The children's symptoms would have decreased within 24 hours after the start of the medication, and they would have completely eliminated within 4 days. Treatment brought about a quick improvement in the children's health in each of the eight cases, which was then followed by their capacity to digest various foods. Immunoglobulins in camel milk are thought to be crucial in easing allergy reactions in youngsters. [30] The data that have been provided indicate that more scientific study is required to conclusively demonstrate camel milk's ability to treat allergies.

4. Camel Milk used as reduce high cholesterol in blood

Heart disease is thought to be greatly increased by having high blood cholesterol levels. It has been proven that giving rats fermented camel milk lowers their cholesterol levels.[41] Although the exact mechanism underlying camel milk's hypocholesterolemic effects is still unknown, several theories have been put out, including the notion that camel milk's bioactive peptides interact with cholesterol levels to lower them.[42]

5. Camel Milk for treatment of psoriasis

In a study on the use of camel milk cream, it was discovered that patients with psoriasis experienced excellent benefits while using the preparation CAMeLK-Psoralait with 40% raw camel milk. Twenty patients, 10 men and 10 women, ages 6 to 72, with mild to moderate psoriasis, received camel milk cream twice daily for four weeks. They described a nice, cool, reduce itching and other discomfort. [43]

6. Camel Milk against Hepatitis C and B:-

The hepatitis C virus (HCV) is contagious everywhere, and there is currently no cure. Egyptian people frequently use traditional treatments for their illnesses, such as camel milk records, which contain the protein lactoferrin. Additionally, camel IgG demonstrated the ability to detect Hepatitis C virus peptides with a considerable titer in comparison to human IgG, which was unable to do so, indicating that camel IgG may possibly have a role in HCV infection in addition to the lactoferrin in camel milk.[44]

7. Camel Milk to strengthen the immune system

Numerous researches have examined the

ability of camel milk to bolster the immune system. It is well recognized that the immunoglobulin's found in camel milk serum belong to an entire class that fundamentally differs from all other known antibodies. According to additional research, camel milk contains immunoglobulin's (Ig) that are unique to camels. The immunoglobulins are identical to human immunoglobulins in structure, although they are just one-tenth as large. [45]

8. Camel Milk against cancer

The application of camel milk and camel urine (a drinking remedy) resulted in a decrease in the proliferation of cancer cells, according to numerous scientific researches. [29] A study investigated that camel milk (but not bovine milk), significantly inhibited HepG2 (human hepatoma) and MCF7 (human breast) cells proliferation and the induction of death receptors in both cell lines and oxidative stress mediated mechanisms. The scientists believe that camel milk inhibited HepG2 and MCF7 cells survival and proliferation through the activation of both the extrinsic and intrinsic apoptotic pathways. [46] Additionally, camel milk lactoferrin's potential for preventing DNA damage, colon cancer cell line HCT-116 proliferation in vitro, as well as its antioxidant activity, was assessed for the first time. [31]

9. Camel Milk against autism

Opioid peptides are considered to promote the emergence of autism. [47] In general, autism is an autoimmune disease, which surprisingly reaches the intestine not the brain. [48] The reactions in the intestines begin with diarrhea and effect on appetite. It has been demonstrated that the camel milk has a therapeutic effect in the Autism disease.It has been proven that camel milk has a therapeutic impact on the autism disorder. On general, autism is an autoimmune disease that, surprisingly, affects the intestines rather than the brain. The reactions in the intestines start with diarrhea and affect appetite. [49] Showed the following situations where camel milk was used to treat autism: When a 4-year-old girl who had autism disease drank camel milk for 40 days, her autistic symptoms vanished.

10. Camel Milk for tuberculosis patients

According to a scientific study from India, camel milk drinking by patients with multidrug-resistant tuberculosis significantly reduces the severity of their symptoms. As a result, the patient received 1 liter of camel milk daily in the test group as a nutritional supplement. No longer did I have a cough, sputum, or chest pain. As a result, the group had an increase in appetite and a growth in body weight, with complementary camel milk. [50]

11. Camel Milk as a skin disease treatment and cosmetic

Researchers have been concerned about the influence of camel milk consumption and its impact on the skin. Vitamin C in milk has anti-oxidant properties that protect skin tissue. Since vitamin C promotes the formation of

blood vessels and cells, which in turn gives the skin strength and firmness, it is also important for the production of collagen protein. Additionally, vitamin C shields the skin from free radicals, which are responsible for various skin issues like wrinkles and dryness. [48][51]

Future Goals

The California-based company, Desert Farms, is attempting to make camel's milk the newest trend in dairy with its ironic motto, "make every day a hump day," and packaging that highlights the product's health advantages. Despite the fact that camels are thought to be the source of the Middle East Respiratory Syndrome (MERS) coronavirus, a young Saudi man has started a business selling camel milk in the United States.[25]

CONCLUSION

As we conclude that Camel Milk is very important for health care system, as it provide various healths related benefits and used as an alternatives of various disease or disorder. As we seen above camel milk is a magic drug therapy for various diseases. We got the scientific evidence that the camel milk possesses anti-ulcerogenic effect, anti-hyperglycemic effect, anti-cancerous effect, anti-bacterial, anti-viral effect. We also concluded that the using of camel milk also cure disease like piles, asthma, anemia, spleen ailments, dropsy and tuberculosis. Hence, this knowledge came from indigenous traditional people who founded these magical remedies of treatments.

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