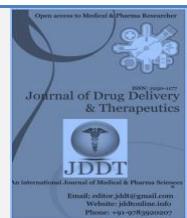




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Review Article

Nutritional and Therapeutic Values of Cow Milk: A Comprehensive Review

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Abstract

Milk is the most necessary food for humans because it provides almost all nutrients such as the most nutritious protein, calcium, essential fatty acids, water-soluble vitamins, and other bioactive compounds responsible for maintaining health and other physiological functions. Milk has also been used effectively in the Unani system of medicine for centuries to improve complexion and to treat other ailments (especially dermatological disorders). For skin brightening, Unani physicians mentioned the use of the paste made up of powdered *tukhm e kharpazah* (seeds of musk melon), *aarad e nakhud* (powdered chickpea) each 2 parts, *arad e baqla* (powdered broad beans), *aarad e jau* (powdered barley) each 1 part, *adas muqashshar* (powdered lentil), *nishasta* (corn flour), *kateera* (tragacanth gum) each half part, *tukhm e turb* (radish seeds) 1/4th part, *za'fran* (saffron) a little and milk at night on the face and advice to wash the face with the decoction of *banafsha* (sweet violet) and *post kharpaza* (musk melon fruit epicarp) in the morning. Milk has several therapeutic actions too e.g. *Musammin e Badan* (adipogenous), *Muhallil* (anti-inflammatory), *Mugharri* (glutinous- *Mugharri* drug is a cold and dry substance with a small amount of viscous moisture that coats the surface and constricts pores. It moisturizes the skin and makes it appear lighter), *Mohsin e laun* (fairness activity), *Ghassal* (irrigator), *Tiryaq* (antidote), and *Maqawwi* (general tonic), etc. There are some scientific reports on the anti-hyperpigmentation effect of cow milk in which a paste of cow milk and powdered roasted red lentils was tested to enhance the complexion. They found significantly effective result on the Fitzpatrick scale, enhanced complexion, and reduced tanning as well as dullness. The main objective of this article is to present cow milk's nutritional and therapeutic activity.

Keywords: Cow milk, Unani medicine, Nutrition, Skin Tanning, Skin Brightening.

Introduction

Milk is considered to be the most complete food of nature because it provides almost all nutrients to the human body.¹ Milk is also widely used in the pharmaceutical and cosmetic industries as a raw material because of its important biological activities.² Milk can be obtained in every season, but the milk obtained in spring is more dilute than that obtained in summer. Similarly, all animals produce diluted milk that grazes on cultivated and marshy lands owing to aqueous plants during the spring season. Milk obtained in the middle of the summer season is considered good, but it may increase heaviness after consumption. It is well known that milk varies according to the species, age, size, physique, and color of the animal. Milk from white animals is easily digestible.³ Ancient Egyptians applied plant essences, mud, milk, and kohl to protect, heal, and prolong the youthfulness of their skin.⁴ For skin brightening, Unani physicians mentioned the use of a paste made up of powdered *tukhm e kharpazah* (*Cucumis melo*), *aarad e nakhud* (*Cicer arietinum L*) each 2 parts, *arad e baqla* (*Vicia faba*), *aarad e jau* (*Hordeum vulgare*) each 1 part, *adas muqashshar* (*Lens culinaris*), *nishasta* (corn flour), *kateera* (Tragacanth gum) each half part, *tukhm e turb* (*Raphanus sativus*) 1/4th part, *za'fran* (*Crocus sativus*) a little and milk at night on the face and advice to wash the face with the decoction of *banafsha* (*Viola odorata*) and *post kharpaza* (*Cucumis melo*) in the morning.⁵ Unani Physicians used

lukewarm milk with some powder of turmeric and black pepper to treat fever and coryza.⁶ Churned cow milk is good to be used in bilious diarrhea. The addition of salt makes the milk and cheese water purgative. Boiled sour milk stops bilious and hemorrhagic diarrhea. Sour milk has been found to be useful in the treatment of tuberculous fever, especially when used after removing the cream to make it easily digestible. Milk is useful for the intake of fatal drugs. It is given as an antidote to people who have consumed henbane.³ Unani physicians advise eating chickpea soaked in milk with a meal to treat anaphrodisia (*zof e bah*).⁷ In the Unani System of Medicine, *Harira* (a curry that is white and prepared with milk) of black chickpeas is used to treat hoarseness of voice.⁶

Methodology

The data were collected from 5 ancient Unani books, NFUM, as well as other published research papers indexed on PubMed, science direct, Scopus, google scholar, and research gate.

Results and Discussions

In Unani Medicine, *Mizaj* (میزاج /Temperament) is a quality that is produced by action and reaction of opposite qualities of elements which are broken up in small particles in order to facilitate their mixing. When these components interact among themselves, a condition is produced, which is found in equal proportion in all the particles of the compound. This

new formation is known as Mizaj or temperament. Milk has hot 1^o and wet 2^o temperaments.⁸

Milk has several therapeutic actions e.g. milk is *Musammin e Badan* (مسمن بدن)/Adipogenous i.e. An agent which increases the formation of fatty tissue in the body), *Muhallil* (محلل /anti-inflammatory- An agent which resolves thick and viscous humours due to its resolvent properties), *Mugharri* (غموري/glutinous-*Mugharri* drug is a cold and dry substance with a small amount of viscid moisture that coats the surface and constricts pores. It moisturizes the skin and makes it appear lighter), *Mohsin e laun* (fairness activity- these are the drugs increase the fairness of the skin), *Ghassal* (حلل/irrigator- A liquid agent which cleanses the treated part due to its detergent property, *Tiryaq* (تربيق/antidote- It refers to any substance or drug that neutralizes a poison or counteracts its effects.), and *Muqawwi* (مقوى/general tonic- Non-toxic natural substance that has the ability to improve and maintain the health of the human body when used regularly over a long period of time. They tone up the internal organs and improve the body functions.)⁸ Table 1.

Table 1: Unani description of Milk

<i>Mizaj</i> (Temperament)	Hot in the first degree and wet in the second degree. ⁹
<i>Murakkabat</i> (Compound formulation)	<i>Majoon e Gheekwar</i> , <i>Jawarish e Amla Ambari</i> , <i>Halwa e Musammin</i> , <i>Halwa e Badam</i> , <i>Halwa e Bed Anjeer</i> , <i>Halwa e Suparipak</i> ¹⁰
<i>Afa'al</i> (actions)	<i>Musammin e Badan</i> [Adipogenous], <i>Muhallil</i> (anti-inflammatory), <i>Mugharri</i> (glutinous), <i>Mohsin e laun</i> (fairness activity), <i>Ghassal</i> (irrigator), <i>Tiryaq</i> (antidote), and <i>Muqawwi</i> (general tonic) ³

When milk is taken with honey, it strengthens and fattens the body. Owing to its ablent activity, milk cleanses thick humors from internal ulcers and washes them. The milk produces good chyme. It is agglutinant and gives extra nourishment to the brain. The milk is easy to digest because its source is the blood. The body utilizes the milk before any change sets in.

That is why milk proves to be useful in persons having hot and dry temperaments when their stomachs are free from yellow bile. A person must take a rest for some time after consuming milk so that it is not spoiled or turned acrid. Further, it is also suggested that one should not go to sleep after taking milk. Intake of milk should not be followed by consumption of any other food till it is in the process of digestion. Milk is more suitable for aged persons than hot-tempered young men. Milk is useful for old people due to its moisturizing property. It removes dry scabies. In most cases, milk causes relaxation of the bowels and expulsion of morbid matters from the intestines. Thereafter it provides nourishment and spreads throughout the body. Unboiled milk causes constipation and flatulence. Milk has two different effects: (a) it relaxes the bowels due to its fluidity and (b) produces constipation due to its cheesiness. Moreover, it agglutinates the harmful humors and prevents them from coming in contact with the body to produce adverse effects. Its local application clears off the ugly marks from the skin. Oral intake improves the color of the body. When taken with sugar the milk improves the complexion in women. Milk fattens the body due to its moisturizing potency and capability to expel the bad humors. It rectifies the (corrupt) food. Cheese water removes freckles and ugly marks both when painted and taken orally. Mostly oral use of the milk cures those people who suffer from acute swellings, furuncles, facial erysipelas, scabies, and prurigo. Milk is suitable to be used in internal ulcers as it washes, cleanses, and agglutinates them. Cheese water is used with chebulic myrobalan in cases of scabies. Milk is a remedy for amnesia attributed to dryness, sorrow, and melancholia. Milk is considered to be a good drug for pulmonary ulcers. Gargling and mouth washing with milk are useful in diphtheria, angina, uvulitis, and tonsillitis. Cheese water is useful in jaundice. All kinds of milk are useful to treat the hardness of the spleen. Cheese water purges out burnt bile. When used with aftimun, it also purges out burnt black bile. When boiled milk is concentrated by removal of water, causes constipation and stops bloody stools. Churned cow milk is good to be used in bilious diarrhea. The addition of salt makes the milk and cheese water purgative. Boiled sour milk stops bilious and hemorrhagic diarrhea. Sour milk has mostly been found to be useful in tuberculous fever, especially when used after removing the cream to make it easily digestible. Milk is useful against the intake of fatal drugs. It is given as an antidote to persons who have consumed henbane. Table 2.

Table 2: *Istemalat* (Therapeutic Uses) of Milk

	Ailments	Approach
Nervous system	Provides nourishment to the brain	Oral use of milk produces good chyme, agglutinates and nourishes the brain
Respiratory System	Pulmonary ulcers Tuberculous fever	Use orally Oral use of sour milk without cream
Abluent activity	Internal ulcers	Oral use of milk washes, cleanses, and agglutinates thick humors
Skin diseases	I. Facial spots, freckles II. Improves complexion III. Acute swellings, furuncles, facial erysipelas, and prurigo IV. Scabies	I. Oral and local application of cheese water clears off facial spots and freckles II. Oral intake of milk with sugar improves complexion III. Oral use of the milk IV. Oral use of cheese water with chebulic myrobalan
Throat	Diphtheria, uvulitis, and tonsillitis	Gargling and mouth washing with milk
Gastrointestinal system	Expel morbid matters Jaundice	Oral use of milk causes relaxation of the bowels Oral use of cheese water is helpful
Antidote	Consumed henbane	Oral use of milk is helpful against the intake of fatal drugs. ³

In Unani Medicine, *Murakkabat* (مركب/Compound formulation) is a mixed medicine with two or more ingredients. There are several dosage forms in Unani system such as *Majoon* (معجون) is a compound medicine composed of powders, or other ingredients, incorporated with some conserves, honey, or syrup; a confection. *Jawarish* (جوارش) is a gastrointestinal dosage form made from different ingredients for different purposes such as stomach tonic, digestive,

carminative, laxative, astringent, visceral analgesic, antihaemorrhoid, antiemetic, emetic, antireflux and anticolic. *Halwa* (حلوا) is a thick paste made from flour, butter, oil, saffron, rosewater, milk, cocoa powder, and sweetened with sugar. Milk has several compound formulations like *Majoon e Gheekwar*, *Jawarish e Amla Ambari*, *Halwa e Musammin*, *Halwa e Badam*, *Halwa e Bed Anjeer*, and *Halwa e Suparipak*. Table 3.

Table 3: Important formulations of cow milk and their therapeutic uses

<i>Murakkabat</i>	Therapeutic uses
<i>Majoon e Gheekwar</i> ,	Nerve tonic and anti inflammatory
<i>Jawarish e Amla Ambari</i> ,	Gastric and liver tonic
<i>Halwa e Musammin</i>	Adipogenic and general tonic
<i>Halwa e Badam</i>	Brain tonic
<i>Halwa e Bed Anjeer</i>	Deobstruent
<i>Halwa e Suparipak</i>	Increases the viscosity of semen, retentive of semen, and aphrodisiac. ¹⁰

Milk contains numerous essential nutrients, the content of oleic acid, conjugated linoleic acid, omega-3 fatty acids, short- and medium-chain fatty acids, vitamins, minerals, and bioactive compounds have beneficial effects on human health. It contains immunoglobulin, hormones, growth factors, cytokines, nucleotides, peptides, polyamines, and other

bioactive peptides. The lipids in milk are emulsified in globules coated with membranes. The proteins are in colloidal dispersions as micelles. The casein micelles occur as colloidal complexes of protein and salts. Chemical constituents of milk with therapeutic actions are given below in the table no. 4.

Table 4: Nutritional composition of cow milk with their therapeutic actions

Nutrient	Composition in cow milk	Reference	Therapeutic actions
Protein	k-casein	2	Cow milk protein has antimicrobial, antihypertensive, ACE inhibitor, antidiabetic, hypolipidemic, anticancer, and immune boosting activities. ¹
	beta-casein		
	Beta-lactoglobulin		
	Alpha-lacto albumin		
	Lactoferrin		
Amino acids	Threonine	11	Threonine is very important for gut protein synthesis and its protection from pathogens. ¹²
	Cysteine		It has antiaging activity and improves skeletal muscle functions. ¹³
	Valine		It promotes muscle growth and tissue repair. ¹⁴
	Methionine		It is antioxidant. ²
	Isoleusine	1	It has antioxidant activity and maintains skeletal muscles. ¹
	Leucine		It is used topically to exhibit anti-inflammatory and wound healing activity. It also increases fibroblast cells and collagen fibers. ¹⁵
	Tyrosine	11	It inhibits melanogenesis. ¹⁶
	Lysine		It is important for protein synthesis, cell growth, and maintenance. ¹²
Fatty acids	Linoleic acid and alpha linolenic acid	13	These have anti-inflammatory activity. ¹⁷
Minerals	Ca	11	It regulates skin functions like keratinocyte differentiation, skin barrier formation, and permeability barrier homeostasis. ¹⁸
	K		It hydrates the skin and enhances elastic tissues. ¹⁹
	Mg		It enhances skin hydration, dermal permeability, and barrier repair. It has anti-inflammatory activity. ²⁰
	Na		Treat atopic dermatitis and dry skin. ²¹
	Zn		Oral use of zinc enhances wound healing, reduces inflammation, alopecia, rheumatoid arthritis, colitis, Crohn's disease, and psoriatic arthritis. Topical use of zinc also increases wound healing and reduces inflammation. ²²
	Cu	23	Copper, zinc, and selenium are antioxidants.
	Se		It is an antioxidant and maintains tissue integrity. ²⁴
	Mn		It is used to treat facial photodamage. ²⁵

Milk is a natural complete single food for all humans but it also serves as a good medium for the growth of microorganisms because of high nutrition and moisture content. Therefore, it is conserved in dairy forms. India has become the world's largest producer of dairy milk due to increase consumers' demand and agriculture capacities. Therefore, dairy milk is low of cost and more accessible in India.²⁶ Ancient Indians developed more stable products from milk that can be classified into nine major categories:

1. Concentrated products such as khoya, rabdi.
2. Coagulated products e.g. paneer
3. Fermented products i.e. dahi, misti dahi
4. Fat rich products like ghee, makkhan, malai
5. Frozen products such as kulfi, milk ice
6. Cereal based pudding e.g. kheer
7. Khoya based sweets i.e. gulab jamun, burfi, milk cake
8. Refreshing beverages like lassi, chhachh
9. Miscellaneous products such as raita, dahiwada.

(Traditional Dairy Products on agrimoon.com)

India is the world's biggest dairy industry of milk production in 2022-23 by producing 230.58 million tonnes of milk. India ranks first in the world in total milk production. India's export of dairy products was 67,572.99 MT to the world during the year 2022-23, net worth 2,269.85 Crores.^{27, 28} Therefore, 74.1% of Indians (1.043 billions) were unable to afford a nutritive diet in 2021, according to the report of five UN agencies on food security and nutrition.²⁹

There are also some scientific reports on the anti-hyperpigmentation effect of cow milk, in a study, Mishal S. et al., 2018 tested the efficacy of roasted lentil powder and milk *Lepa* [powder of roasted red lentils mixed with milk] in enhancing the complexion. They enrolled 40 females having tanned their faces. They asked candidates to apply *Lepa* once in the morning with a thickness of one-fourth of Angul for one month. They found that a red lentil face pack was significantly effective on the Fitzpatrick scale, enhanced complexion, and reduced tanning and dullness. ($P<0.001$) They reported that a red lentil face pack was effective for both dry and oily skin.³⁰

In another study cow milk was used to make a face pack for skin aging, in which it is found that cow milk can reduce skin pigmentation, wrinkles, roughness, and dullness through its different constituents. ($P < 0.001$)³¹ The principal effect of chronic sun exposure on human epidermal melanocytes is not premature aging but activation and/or proliferation of the exposed melanocytes. UV radiation mediates the synthesis and release of alpha-melanocyte-stimulating hormone (α -MSH) which expressed the melanocortin 1 receptor (MC1R) on the surface of melanocytes. The activation of the MC1R activates the expression of the MITF gene, leading to the increased expression of its target genes including tyrosinase and TRP-1 and TRP2. MC1R is expected to sustain the activation of melanogenesis. Likely, combination therapy that targets MITF, tyrosinase, and the other regulatory pathways are more likely to produce a measurable and prolonged effect on skin pigmentation.³² Amino acid, found in milk¹¹ viz tyrosine,¹⁶ inhibit tyrosinase activity and prevents hyperpigmentation while threonine, lysine,³³ cysteine³⁴ and leucine¹⁵ (milk¹) has stimulatory effects on fibroblast proliferation and collagen fibers. Increased fibroblast proliferation and collagen fibres reduce wrinkles.

Lipids and fatty acids, found in milk¹³ viz linolenic acid^{35, 36} improve skin hydration and skin barrier function, provide

moisture to the skin and have anti-aging and brightening effects on the skin.

Minerals present in milk¹¹ viz Magnesium,^{20, 37} Potassium,¹⁹ Sodium²¹, and Manganese increases skin hydration, elastic tissues, dermal permeability, and barrier repair as well as facilitate epidermal proliferation and differentiation, thus reducing inflammation. Thus, milk can reduce hyperpigmentation, wrinkles, roughness, and dullness in the skin via multiple mechanisms, including increasing collagen synthesis from the skin fibroblasts and improving skin hydration by barrier repair.

Thus, Cow milk is a naturally complete food, provides several essential nutrients and effects positively on human health especially skin health. It is a readily available, easily accessible and more affordable.

Conclusion

In this review article, the authors explored cow milk in the Unani literature as well as in scientific reports. Based on the above description, it can be suggested that milk is a complete food that provides almost all the nutrients essential for the human health especially skin health such as proteins, fats, vitamins, and minerals. Milk has also been used effectively in the Unani system of medicine for centuries to improve complexion and to treat other ailments (especially dermatological disorders). This review article covers the traditional knowledge and therapeutic and pharmacological applications of cow milk. Further studies should be conducted on the nutritional and medicinal values of cow milk.

Conflict of interest

There is no conflict of interest.

Contribution of Authors

All authors contributed to the writing as well as critically reviewed and approved the final manuscript.

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