

Overview on Importance of the Donkey Milk and Its Nutritive Value

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Donkeys belong to the Equidae family, which also includes horses and zebras. Various breeds of domesticated donkeys live all over the world, and like many other mammals, female donkeys, known as jennies, have been raised for thousands of years for their milk (Elisabetta Salimei et al., 2012). Donkey milk has a long history of medicinal and cosmetic uses. Hippocrates reportedly used it as a treatment for arthritis, coughs, and wounds. Cleopatra is said to have maintained her soft, smooth skin with donkey milk baths (Osman Swar M. 2011). It has antimicrobial properties and is used as a folk medicine treatment for infections, including whooping cough, as well as viruses in parts of Africa and India (Osman Swar M. 2011). Compared with milk from other dairy animals like cows, goats, sheep, buffalo, and camels, donkey milk most closely resembles human breast milk. In fact, it was first used in the 19th century to feed orphaned infants (Maria Aspri et al., 2016). Donkey milk has a growing interest due to its composition similar to human milk, with good tolerability and palatability. Many pediatricians suggested donkey milk in the infant's diet as a valid alternative in terms of nutritional adequacy for subjects affected by allergy to cow milk proteins. It is rich in lactose and whey proteins, contributing to the intestinal absorption of calcium, essential for bone mineralization. Additionally, due to the low-fat

content and favorable lipid composition, donkey milk and derived products are also valuable foods for elderly consumers. The presence of endogenous bioactive compounds increases some other alleged health benefits, as the antibacterial activity, the stimulation of immune system, the prevention of inflammatory diseases, and antiaging properties. The attractive characteristics of donkey milk, also defined as a nutraceutical product, seems to meet the growing consumer's demand for natural and health-promoting foods.

Milk composition

Milks from nontraditional animal species (i.e., donkey, camel, and buffalo) are recently gaining momentum mainly due to the fact that they are considered suitable to supplement the needs of special population groups (i.e., infants, the elderly). Research on donkey milk has dramatically increased over the past few years. Donkey milk is gaining a growing interest for human nutrition because of some other alleged health benefit. It shows antibacterial activity toward a wide range of Gram-positive and Gram-negative bacteria, stimulates immune system in convalescence, regulates gastrointestinal flora, and prevents inflammatory and autoimmune diseases.

Most of the protein in dairy milk comes from casein and whey. Casein is the protein most people with an allergy to cow's milk react to. Donkey milk

is similar to human breast milk in that it's low in casein and higher in whey. The whey protein in donkey milk is notable for its antimicrobial properties. It contains compounds that can prevent the growth of viruses and bacteria *in vitro*. In lab studies, it prevents the spread of bacteria, including *Listeria monocytogenes*, *Escherichia coli*, and *Staphylococcus aureus*. (Diana Brumini et al., 2016). Donkey milk may be a suitable dairy substitute for people with a cow's milk protein allergy, although it still contains casein and lactose. In addition, it might offer other benefits, including supporting a healthier immune system and reducing blood pressure.

Table.1 Nutritive value of comparison between Donkey milk, cow's milk and human breast milk

	Donkey milk	Whole, vitamin-D-fortified cow's milk	Human breast milk
Calories	49	61	70
Protein	2 grams	3 grams	1 gram
Carbs	6 grams	5 grams	7 grams
Fat	2 grams	3 grams	4 grams
Cholesterol	3% of the DV	3% of the DV	5% of the DV
Vitamin D	23% of the DV	9% of the DV	1% of the DV
Calcium	7% of the DV	11% of the DV	3% of the DV
Riboflavin	2% of the DV	13% of the DV	2% of the DV

* Daily Value (DV) (Mina Martini et al., 2017; Li L et al., 2017)

Clinical Importance

Experimental data on animal models observed that donkey milk affects glucose metabolism in a manner more similar to human milk than cow milk and that might have beneficial effects by changing energy homeostasis in favour of fatty acid oxidation, thereby reducing fat storage. As a

result of its clinical tolerance, palatability, and nutritional suitability, donkey milk is particularly beneficial for kids with cow's milk protein allergies (CMPA). Donkey milk consumption exerts anti-inflammatory properties by normalizing antimicrobial peptides levels in Paneth's cells, so the authors speculate about its possible use as dietetic intervention in patients with Crohn's disease. The lactoferrin content in donkey milk is intermediate between the value reported in cow's milk and the highest value reported in human milk. Lactoferrin inhibits the growth of iron-dependent bacteria present in the gastrointestinal tract. Lactoferrin also protects against viral diseases, including those caused by coronavirus. Moreover, recent data suggest that donkey colostrum and mature milk inhibit the growth and metastasis of mouse 4T1 tumors by inducing apoptosis. Thus, anticancer properties could be hypothesized for the future as well (Enrico Bertino et al., 2022)

Other uses of donkey milk

Donkey milk is more than a food item. It's just as well known for its use as an ingredient in cosmetics. In fact, you'll probably have much better luck finding donkey milk skin moisturizers and soaps than donkey milk beverages. The proteins in donkey milk have the ability to attract and hold water, which makes it an excellent moisturizer. Some of the proteins in donkey milk also function as antioxidants. They help protect cells from oxidative damage, including that caused by sun exposure, thus providing anti-aging benefits. Cosmetic products that may have donkey milk as a major ingredient include skin creams, face masks, soaps, and shampoos (Cosentino, C et al., 2015).

Limitations of Donkey milk

The biggest downside of donkey milk is its price and availability. Because both the number and size of donkey dairy farms are limited, it's expensive to produce and sell. Europe has some larger manufacturers who sell the milk in powdered form, but it can be expensive to ship overseas. The prices of donkey milk, along with its low casein content, also make it very expensive and difficult to use for cheese making. Another potential downside is that most small farms only sell raw donkey milk, and drinking unpasteurized milk carries a risk of foodborne illness. Although donkey milk has antimicrobial properties, and tests usually find it to be free of harmful pathogens, there's always a risk that raw milk contains bacteria or other harmful toxins. That can be dangerous if fed to infants, older adults, or anyone with a compromised immune system. If you want to try donkey milk in liquid or powder form, look for one that has been pasteurized. Alternatively, heat the raw milk to at least 161°F (72°C) for 15 seconds before drinking it to kill any pathogens. (Conte F et al ., 2019) Finally, if you have lactose intolerance and experience symptoms like gas, bloating, and diarrhea after drinking milk, donkey milk will likely cause these same symptoms due to its lactose content. Thus, people with lactose intolerance should avoid or limit donkey milk.

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