



Chemistry, Nutritional Properties and Application of Mare's Milk: A Review

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ABSTRACT

Mare's milk has long been considered to have special nutritive and therapeutic properties in Mongolia and southern states of the former Soviet Union. It is now gaining popularity in some parts in Europe also. Mares' milk is characterized by their unique nutritional profile. Therefore, interest has increased in the use of mare's milk for human nutrition in the past several years, especially in France and Germany. As compared to many other mammal species, mare's milk is highly appreciated for similarity to human milk in terms of chemical composition allowing its use as a substitute for mother's milk in infant feeding. Mare's milk also has been used for the treatment of certain human pathologies such as hepatitis, chronic ulcer and tuberculosis. This review dwells on the chemical composition, nutritional value and various health-promoting properties of mare's milk.

Key words: Bioactive peptides, Koumiss, Mare's milk, Milk composition.

The horse species, *Equus caballus* (Order: Perissodactyla, Family: Equidae, Genus: Equus), denotes an example of animal diversity around the world, mainly established for transportations, communications, warfare and sport due to its combination of strength and stamina (US Department of Agriculture, 1980). It is thought that thirty million people throughout the globe drink mare's milk additional or less frequently. Mare milk consumption could be an appallingly ancient observe, that was mentioned by Homer within the Iliad (Doreau and Martin-Rosset, 2011). Mare milk is principally produced and consumed in central Asia, Mongolia and the former Soviet Union, regions in which traditionally horses have been widely bred and mare milk is an important nutrient resource (Park *et al.* 2006). Recent interest in mare's milk is related to the very fact that it contains a large number of valuable nutrients with health-promoting properties (Doreau and Martin-Rosset, 2011). In Italy, mare milk has been considered as a potential substitute for cow milk as formula for allergic teenagers (Businco *et al.* 2000; Curadi *et al.* 2001). The normal use of mare milk for human consumption, first by nomadic peoples, then for therapeutic uses in the area of production, is now completed by different expensive products in some economically developed countries. Besides horses, asses were additionally milked for a few years (Doreau and Martin-Rosset, 2011).

Milk is a fluid secreted by feminine mammals for the nutrition of its offspring. The most milk constituents of mammals are water, fat, protein, carbohydrate, mineral and vitamins. Mare's milk ("saumal") is a physiological, delicate and simply assimilated biologically active product (Fotschki *et al.*, 2016). The composition of the mare's milk is similar to human milk and it must be capable of performing many biological functions due to the presence of high concentrations of lactoferrin, lysozyme, ω -3 and ω -6 fatty acids (Unjacke-Lowe *et al.*, 2010).

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Mare's milk contains about 40 biological components necessary for the human body such as amino acids, fats, enzymes (lysozyme, amylase), microelements (calcium, sodium, potassium, phosphorus, iron, magnesium, copper, iodine, sulphur, cobalt, zinc, bromine) and vitamins (A, C, B1, B2, B6, B12, E, carotenoid, folic acid) in optimally balanced proportions. The mare's milk is characterized by sufficient quantity of lactose-72.80 g/l, fat content-6.40 g/l and proteins-15.52 g/l, particularly caseins-13.4 g/l (Fotschki *et al.*, 2016).

The therapeutic significance of mare's milk was legendary throughout the territory of Russia and Western Asia. Mongolian medication used mare's milk for the treatment of chronic infectious disease, liver disease and ulcer disease (Salimei and Park, 2017). Mare's milk conjointly has anti-acid properties because of the high content of phospholipids and vitamin A. The utilization of mare's milk for the treatment of patients with tuberculosis (T.B.) has been practiced for a long time within the territory of Russia and Mongolia. Doreau and Martin-Rosset (2011) also reported that anemia, nephritis, diarrhea, gastritis and other digestive disease been dealt with using Mare's milk (Fotschki *et al.*, 2016). The composition of the mare's milk is similar to human milk and it must be capable of performing many biological functions due to the presence of high

concentrations of lactoferrin, lysozyme, ω -3 and ω -6 fatty acids (Uniacke-Lowe *et al.*, 2010).

Recently, interest in mare's milk production has increased due to fact that it contains a wide variety of valuable nutrients as well as health-promoting properties. The aim of this review is to compare the composition of mare's milk to cow and human's milk, to discuss on bioactive peptides that could be of interest in terms of human nutrition as well as manufacture of milk products from mare's milk and its application which could also be of commercial interest to the dairy and food industry.

Chemical compositions of mare milk

It is acknowledged that gross composition of milk varies significantly between species, as duct gland secretion is physiologically and structurally related to the biological process necessities of the new-born of every specific species (Malacarne *et al.*, 2002). Table 1 shows the comparison of the gross composition of mare, human and cow milks, wherever some vital variations exist between the 3 species. The lactose content of mare milk is comparable to it of human milk, that is above that of cow milk. However, mare's and human milk have considerably lower levels of proteins and minerals as compared to cow milk (Table 1).

The casein to whey protein ratio in mare colostrum is 0.2:1 immediately postpartum and this changes to 1.1:1 within one week. The mare milk is relatively rich in lactose and reduces with advancing lactation. The lipid content of mare's milk decreases with advancing lactation, whereas that of bovine milk shows a definite minimum after 3 months of lactation and increases thereafter. The energy content of mare milk is significantly less than both human and cow milk (Jenness and Sloan, 1970; Solaroli *et al.* 1993).

Mare's milk is low in fat as compared to other mammals, values lower than 5 g/kg have been reported (Doreau and Martin-Rosset, 2011). Mare's milk is poor in ash ranging from 0.3 to 0.5 per cent. It is partially associated with low protein content, which involves low content in calcium and phosphorus (Davies *et al.*, 1983).

Lipids

Mare milk has very low levels of fat as compared to those of human and cow milks. Fat content in colostrum immediately after foaling averaged 2.9%, while that of transition and normal milks averaged 2.1% and 1.2%, respectively (Csapo

Table 1: Gross composition of mare's milk vis-à-vis human and cow milk.

Constituents	Mare	Human	Cow
Fat (%)	0.5-2.0	3.5-4.0	3.5-3.9
Crude protein (%)	1.5-2.8	0.9-1.7	3.1-3.8
Lactose (%)	5.8-7.0	6.3-7.0	4.4-4.9
Ash (%)	0.3-0.5	0.2-0.3	0.7-0.8
Energy (Kcal/kg)	390-550	650-700	650-712

Source: Jenness and Sloan, (1970); Solaroli *et al.* (1993); Malacarne *et al.* (2002).

et al., 1995). There have been no clear differences in fat content between colostrum and normal mare milk. Milk lipids are dispersed as emulsified globules and fat globule size of mare milk is about 2-3 μ m (Kharitonova, 1970). Milk fat globule membrane (MFGM) in human milk is coated with an array of glycoprotein filaments, almost like mare milk, whose suggested role is binding lipases to reinforce fat digestion (Jensen *et al.*, 1992).

Triglycerides

Cow and human milk fats are almost totally made from triacylglycerols (TAGs), while mare milk contains just 80% TAGs and therefore the remainder of milk fat is especially composed of free fatty acids and phospholipids (Parodi, 1982). A high percentage of identified TAGs are composed of saturated and unsaturated fatty acids in both human (84.9%) and mare (76.7%) milk. In human milk, 50% of total TAGs is represented by five classes (lauric-palmitic-oleic, myristic-palmitic-oleic, palmitic-palmitic-oleic, palmitic-oleic-oleic and palmitic- linoleic-linoleic) while no TAGs prevalence is reported for mare milk (Haddad *et al.* 2012).

Fatty acids

Mare milk lipids is characterized by a higher percentage of unsaturated fatty acids (about 53% total fatty acids), which is similar to human milk (59.5%) but is greater than those of cow milk with 37% (Salimei and Fantuz, 2013). The ratio of total unsaturated to saturated fatty acids in mare's milk ranges from 1.03 to 1.33 while it's reported to average 0.5 in cow milk (Marconi and Panfili, 1998).

Compared to cow milk, mare milk fat has an especially lower level of octadecanoic acid (13.2 g/100 g of fatty acid) but is higher in linoleic acid (1.13 g/100 g of fatty acid) and ω -6 fatty acid (0.6 g/100 g of carboxylic acid) (Devle *et al.* 2012). However, the miniscule amounts of odd-chain fatty acids also as trans-fatty acids in mare milk are indices of microbial activity within the upper alimentary canal of the horse (Hoffman *et al.* 1998).

Mare milk fat contained only 0.62 times the maximum amount of tetra decanoic acid, 0.53 times hexadecenoic acid and 0.2 times octadecanoic acid as compared to cow milk fat. The mare milk fat has higher unsaturated or short-chain fatty acids, which is more desirable as a dietary constituent than cow milk fat (Csapo *et al.* 1995). As compared to human milk, mare milk features a lower proportion of saturated fatty acids with a low and high number of carbon atoms (Malacarne *et al.* 2002).

Polyunsaturated fatty acids (PUFAs)

Mare's milk contains high amount of PUFAs like linoleic acid (C18:2) and particularly α -linolenic acid (C18:3) as compared to other species (Malacarne *et al.* 2002; Park *et al.* 2006).

The PUFA content of mare's milk was 19.0 per cent. The linoleic to ω -6 fatty acid ratio was 0.8 for mare's milk which is higher than that cow - 0.42, sheep - 0.4 and goat milk - 0.25 (Devle *et al.*, 2012).

Conjugated linoleic acids

Mare milk has negligible levels of CLA (mean value 0.09% of total fatty acids). CLA content of human milk has been reported to be 0.2 to 1.1%, while that of cow milk ranges from 0.2 to 2.4% (Jensen *et al.* 1992).

Phospholipids

Mare milk contains high levels of phospholipids in comparison to human and cow milk (Pastukhova and Gerbeda, 1982). Phospholipids of mare milk are relatively high in phosphatidyl ethanolamine (31% mare vs. 20% human) and phosphatidyl serine (16% mare vs. 8% human) and fewer rich in phosphatidyl choline (19% mare vs. 28% human) and phosphatidyl inositol (trace in mare vs. 5% in human milk). Therefore, the proportion of sphingomyelin mare's milk (34%) is similar to human milk (39%) (Jensen *et al.* 1990; Malacarne *et al.* 2002).

Sterols

A greater proportion of the unsaponifiable fraction is reported in mare milk fat (4.5%) than in cow (1.5%) and human (1.3%) milk lipids (Pastukhova and Gerbeda, 1982). This fraction is especially composed of sterols and cholesterol accounting for about 0.3–0.4% of the lipid content in human, bovine and equine milk (Jensen *et al.* 1990; Pagliarini *et al.* 1993).

Protein

Mare's milk contains less total protein as compared to cow milk but higher than human milk which is depicted in Table 2 (Park *et al.*, 2006). The non-casein nitrogen is higher in mare milk with regard to both whey protein and non-protein nitrogen fractions (Marconi and Panfili, 1998). Cow milk features a higher casein content as compared to mare and human milks (Solaroli *et al.* 1993; Malacarne *et al.* 2002).

Proteins of mare milk are composed of 40-60% caseins, which are in line with human milk (40% caseins). The free aminoalkanoic acid fraction of mare milk is particularly rich in serine and glutaminic acid (Doreau and Martin-Rosset, 2002). The whey protein fraction represents approximately 40% in mare milk, somewhat lower than in human milk (50%) and fewer than in cow milk (Malacarne *et al.* 2002). Mare milk proteins are more readily digested by human gastrointestinal enzymes than cow, goat, camel and human milk proteins (Inglingstad *et al.* 2010).

Casein

Cow and mare milk casein micelles have a sponge structure,

Table 2: Protein fractions of mare's milk in comparison to human and cow milks.

Constituents	Mare	Human	Cow
Crude protein, g/kg	21.4	14.2	32.5
True whey protein, g/kg	7.8	7.6	5.7
Casein, g/kg	10.2	3.7	25.1
NPN × 6.38, g/kg	2.4	2.9	1.7

Source: Park *et al.* (2006).

while human milk features a reticular, fairly regular and loose structure thanks to numerous canals and caverns (Jasinska and Jaworska, 1991). The size of casein micelles in mare's milk (255-311.5 nm) is higher in comparison with human milk (64-146 nm) (Inglingstad *et al.* 2010; Uniacke-Lowe *et al.* 2010).

Caseins of mare milk are mainly composed of β -casein (78.5%) while the α s-casein and κ -casein accounted for about 20.0% and 1.8%, respectively (Salimei and Fantuz, 2013). On the opposite hand, Doreau and Martin-Rosset (2011) reported that mare milk caseins contain β -casein and α -casein, which represent 50% and fewer than 10% of total caseins, respectively, while it contains α s1- and α s2-caseins as 40% of total caseins and a miniscule quantity of κ -casein. Mare milk caseins contain lower levels of proline and glutaminic acid and higher levels of aspartic acid than bovine milk counterparts (Park *et al.* 2006; Doreau and Martin-Rosset, 2011). Cow milk has significantly higher α s1-casein content (41% of total caseins) than mare and human milk. Mare's and human milk behaves similar to goat milk which form a finer, softer curd, suitable for infant nutrition and provides better digestibility compared to cow milk (Solaroli *et al.* 1993).

Whey protein

The whey proteins of mare milk after the colostral stage contain 2-19% barbiturate albumin, 25-50% α -lactalbumin, 28-60% β -lactoglobulin and 4-21% immunoglobulins (Doreau and Martin-Rosset, 2002). Both mare and bovine milks contain significant amounts of β -lactoglobulin, while human milk is lacking in such whey protein (Businco *et al.* 2000). As per Doreau and Martin-Rosset (2002), mare milk is rich in lysozyme and lactoferrin, lactoferrin content is especially high (0.2-2 g/kg milk), which is 10 times higher than in cow milk and slightly less than in human milk.

The antimicrobial property of mare milk could also be due to the higher levels of lysozyme and immunoglobulins in the milk. Cow milk is deficient in these antimicrobial factors, where immunoglobulins act serve as the primary defense against microbes, although they're rich in colostrum's (Solaroli *et al.* 1993).

Vitamins

Vitamin contents of mare colostrum is 2.6, 1.7, 1.4 and 1.5 times higher vitamin A, D3, C and K3, respectively as compared to normal mare milk from 8-45 days of lactation. Vitamin C content was also higher in colostrum than in normal milk and mare milk had higher vitamin C than cow milk (Csapo *et al.* 1995).

The vitamin fortified mare powdered milk sample has an exceptionally high level of α , γ and δ tocopherols. They were added so as to enhance shelf-life as well as nutritional quality of finished product (Madhavi *et al.* 1996). Moreover, the powdered mare milk samples had a higher cis/trans retinol ratio than in raw mare milk, due to isomerization of trans retinol during thermal treatment (Panfili *et al.* 1994).

Minerals

The mare's milk contains higher amount of Ca (830 mg/L), P (610 mg/L), K (530 mg/L) and Mg (60 mg/L) as compared to human and cow milk. The ratio of Ca to P was 1.72 in mare's milk, higher as compared to cow milk (Ishii *et al.* 2014).

Manufacture of mare's milk products

Due to its integrative similarities to human milk and claims on its therapeutic properties, mare's milk has recently entered within the markets of western European countries (Doreau and Martin-Rosset, 2011). Among the various mare's milk products, koumiss is fermented milk widely consumed in Russia and western and central Asia for its nutritive and therapeutic properties. Industrial mare milk cheese might not exist because of its weak clotting properties (Uniacke-Lowe *et al.* 2010). Powdered mare milk is commercially made and marketed in certain developed countries. Recently in Europe, raw mare milk was pasteurized and freeze-dried at farm level, which is commercially available.

Koumiss

Koumiss is particularly most popular fermented milk made from mare's milk for its therapeutic uses. It contains 0.6-3.0% alcohol, averaging 2.00%. After mare's milk fermentation, koumiss contains ethyl alcohol, because of an association of microorganism and yeast in milk. Sweet koumiss contains 0.6-0.8% acidity as carboxylic acid and 0.7-1.0% ethanol. Sour koumiss contains 1-1.2% acidity and 1.8-2.3% ethyl alcohol with hydrogen ion concentration values 4.2-4.7 (Doreau and Martin-Rosset, 2002).

The production technology of koumiss is analogous to kefir, except that mare milk is employed for koumiss. Proper adjustment of fermentation is believed to be the key issue for manufacturing high-quality koumiss (Zhang and Zhang, 2012). Koumiss is employed for the management of organic processes and various disorders in Russia and Mongolia (Lozovich, 1995). The health-promoting properties of koumiss in case of hepatitis, chronic ulcer and tuberculosis are associated with its long chain PUFAs content (Solaroli *et al.* 1993).

Powdered mare milk

Dried mare milk is directly consumed or rehydrated in water before consumption. The vitamin-fortified powdered mare milk was additionally made and marketed (Resmini *et al.* 1990). The powdered mare milk product maintained some peculiar characteristics of raw mare milk like high whey proteins and unsaturated carboxylic acid (C18:2; C18:3) contents and low casein content. Compared to cow milk counter parts, powdered mare milk had considerably higher levels of arginine, half cystine and aspartic acid (Marconi and Panfili, 1998).

Powdered mare milk had lower essential amino acid content as compared to raw and freeze-dried mare milk powder (Stoyanova *et al.* 1988). Marconi and Panfili (1998) reported that losses in essential amino acid in case vitamin-

fortified powdered mare milk because of storage conditions, especially when the moisture content exceeded 6% and higher storage temperature would favor the Maillard reaction.

Frozen and freeze-dried mare milk

In western European countries, mare's milk is consumed as frozen milk and capsules of lyophilized milk for people who seek such food or specialized organic foods (Fanta and Ebner, 1998; Doreau and Martin-Rosset, 2011). Pasteurized and lyophilized mare milk, prepacked in 100 g powder bags, is consumed upon rehydration with warm water at the original mass. Frozen mare milk is sold in packages of 250 ml (Naert *et al.* 2013) and is consumed upon thawing at 4°C and heating at 72°C/15 sec. Neither frozen nor freeze-dried milk are added with any kind of preservatives.

Bioactive peptides of mare milk

Mare's milk gaining popularity in some parts of Europe. When digested, these proteins release bioactive peptides possessing different properties (Shang and Fang, 2009). These include blood pressure regulators, antimicrobial and anti-inflammatory peptides (Uniacke-Lowe *et al.* 2010).

Differences within the composition of mare and cow milk proteins suggest that bioactive peptides from the two sources will not be same. Koumiss, has been reported to show ACE-inhibitory activity with IC_{50} of 52.5 ± 2.9 mg/mL (Chen *et al.* 2010). The ACE repressive activity of koumiss has been separated into 3 fractions by ultrafiltration consistent with the molecular size. The foremost active fraction had a molecular size of <3 kDa (IC_{50} 80.11 ± 2.13 mg/mL) and repressive potency quantitative relation (IER) of 225.7 ± 2.8 mg/mL. Twenty one peptides of variable Angiotensin-converting enzyme (ACE) inhibitory activities were separated from the <3-kDa fraction (Ricci *et al.* 2010). The aminoalkanoic acid sequence, IC_{50} and IER of the four most potent peptides separated were determined (Table 3). These peptides are found to be comparatively stable at numerous hydrogen ion concentration values and in the presence of ACE.

The sole mare milk protein-derived ACE amide found in koumiss was P1 (b-CN (f 217-241) (Chen *et al.* 2010). The origin of P3 and P4 was unknown, in all probability as

Table 3: Amino acid sequence and ACE-inhibitory activity of the potent peptides separated from Koumiss.

Peptide	Amino acid sequence	IC_{50} (mM)	Origin
P1	YQNPRLGPTGELDP	$14.5 \pm$	P-CN
	ATQPIVAVHNPVIV	0.21	(f 213-241)
P _K	PKDLREN	$9.82 \pm$	CPN1
		0.37	(f 144-150)
P _m	LLLALILL	$5.19 \pm$	Unknown
		0.18	
P _P	NHRNRMMDHVH	$13.42 \pm$	Unknown
		0.17	

Source: Chen *et al.* (2010).

degradation products of microorganism proteins, whereas P2 originated from cytochrome. The structure of P1 ACE amide as an outsized amide (27 aminoalkanoic acid residues) is fascinating because of its high ACE activity, whereas most ACE peptides of high ACE activities square measure shorter peptides *i.e.* 2-10 aminoalkanoic acid residues (Ricci *et al.* 2010).

Applications of mare milk and milk products

Low allergenic properties

Cow milk protein allergy (CMPA) is an increasing disorder in infancy in developed countries (1.9-4.9% of the youngster's population) when breast feeding is not possible. CMPA is additionally associated with hypersensitivity or allergy against other foods (50% of cases) and just in case of inhalants 50-80% (Host and Halken, 2014).

Curadi *et al.* (2001) reported that children with CMPA can tolerate mare milk because mare milk protein shows a weak cross-reactivity with cow milk protein. Mare milk can therefore be used as a dietary ingredient for youngsters with severe IgE-mediated cow milk allergy. The high lactose content makes mare milk more pleasant to consume than hypoallergenic milk formulas, but the described nutritional profile must be integrated within the infant diet (Salimei and Fantuz, 2013). Additionally, mare's milk has been reported to be safe more evacuated more rapidly from the stomach than cow milk (Lozovich, 1995).

Therapeutic values

In Mongolian medicine, it is reported that mare milk is more efficient than cow milk for treating chronic hepatitis and peptic ulceration (Doreau and Martin-Rosset, 2011). A study conducted by a team of researchers from the University of Jena (Germany) demonstrated that mare milk improves the health of individuals with atopic eczema. Systematic use of mare's milk reduces the severity and extent of eczema (Foekel *et al.* 2009). The utilization of mare's milk to treat the patients suffering from tuberculosis has been practiced for an extended time in Mongolia. The mare's milk is also used to prevent various diseases and symptoms including anemia, nephritis, diarrhea, gastritis and other digestive diseases, while Koumiss, especially for post-operative care (Doreau and Martin-Rosset, 2011). Mare milk also benefits patients with Crohn's disease and colitis (Markiewicz-Kęszycka, 2012).

Koumiss is believed to possess better therapeutic effects than raw mare milk because the fermented product has some added ingredients during manufacture and a few microbial metabolic by-products like peptides, bactericidal substances, synthesized vitamins and therefore the presence of fatty acids of the n-3 series, which could stimulate the system and promote antibacterial activities (Doreau and Martin-Rosset, 2011; Ishii *et al.* 2014).

Mare milk also has positive effects on patients with cardiovascular diseases, bronchial and lung diseases, cirrhosis, stomach ulcers, osteoporosis (by increasing calcium absorption) and anemia. Mare milk accelerates

wound healing and features a bactericidal effect. In diabetic patients, it improves the glycemic index (Chiofalo *et al.* 2006). In people who suffer from migraine, it alleviates attacks and extends the interval between such bouts. Due to its high content of lysozyme, it is utilized in the treatment of tumours and in convalescence following chemotherapy and radiotherapy (Küçükçetin *et al.* 2003).

Influence on the immune system

A high percentage of nutrients, including vitamins and amino acids, contribute to immunomodulation, increasing the apoptogenic properties of the body. Valiev (2001) demonstrated the effect of the essential fatty acids of mare's milk on immunocompetent cells and non-specific resistance after 6 weeks from the start of inclusion within the ration of mare's milk.

Secretory IgA is the main immunoglobulin of mare's milk. The homology of human secretory IgA and mare's milk has been previously demonstrated by cross-reactions using human anti-IgA antiserum (Pahud and Mach, 1972). In clinical test conducted by Foekel *et al.* (2009) on 23 patients demonstrated that the daily intake of mare's milk (250 ml for 16 weeks) had a positive significant effect on the index of severity of atopic eczema, which decreased from 30.1 to 25.3 after 12 weeks of consumption ($P < 0.05$) (the Severity Scoring of Atopic Dermatitis -SCORAD) and fecal bifidobacteria increased from 4.6% to 11.9% ($P < 0.05$).

Antiproliferative impact

Saumal and koumiss (fermented drinks) have a full of life therapeutic impact on a range of diseases like infectious disease and anemia. Regular consumption of such fermented drinks reduces the danger of developing cancer (Guri *et al.* 2016).

Guri *et al.* (2016) studied mare's milk for antimicrobial impact and antiproliferative properties. During this study, raw mare's milk modulated the expression of the factor hla associated *ssrB2 Salmonella typhimurium* (qPCR) and has an antiproliferative impact on Caco-2 cells. The mare's milk, that has been heat treated, failed to show such positive impact.

Cosmetic industry

Mare's milk has been used and praised for thousands of years as a great health and cosmetic ingredient which has useful impact on the skin. For this reason, numerous varieties of balsams, creams, shower gels and shampoos created with this milk (Temuujin *et al.* 2006). Cosmetics developed from horse milk is suitable for all skin problems, even irritated skin due to rich in omega 3 and 6 fatty acids, vitamins and minerals to regenerate the skin and reduce wrinkles. Also mare's milk is rich in phospholipids, ceramides and proteins, it promotes long lasting skin hydration. Till date, over 65% peoples were unaware of this use of cosmetics with the use of mare milk (Romaniuk *et al.* 2019).

CONCLUSION

Mare's milk is considered to have numerous qualities, mainly

related to human health because of its composition being close to that of human milk. The lactose, protein and ash contents are almost similar in both mare's and human milk. The pattern of the whey protein of mare's milk make it more favorable for human nourishment. Mare's and human milk form a finer and softer curds that can be easily digested. In addition to koumiss, powder, frozen and freeze-dried products, mare's milk can also be utilized for other dairy products. Mare's milk and the products based on it provide valuable nutrients for the human body. Such products can also be used as supportive therapies in disease treatment and recovery due to their health-promoting substances and limited allergenic properties.

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