Mare’s Milk: Composition, its Properties and Uses in Medicine

Musaev, A1 *, Sadykova, Sh2, Anambayeva, A1, Saizhanova, M1, Balkanay, G1, Kolbaev, M1

1. NJSC “Asfendiyarov Kazakh National Medical, University”, Almaty, Kazakhstan
2. Kazakh Medical University of Continuing Education, Almaty, Kazakhstan

Corresponding author: musaev.dr@mail.ru

Abstract

Mare's milk is a very valuable organic substance and has a very good potential to replace part of cow's milk. Consumption of cow's milk causes digestive disorders in some people. Immunoglobulin E (IgE)-mediated cow’s milk allergy (CMA) is one of the most common food allergies in infants and young children. Therefore, finding a protein substitute that has the same nutritional value is a priority. Mare's milk can be a good substitute for cow's milk, especially for people who suffer from CMA. The prerequisites for this review were the recent interest in mare's milk, associated with the fact that it is an ancient relic of the Turkic peoples and contains a large amount of nutrients with useful properties. This study aimed to systematize relevant information on the composition of mare’s milk and its application in medical practice. Literary searches were carried out on Googlescholar, PubMed, Cochrane, Elsevier, CyberLeninka. The keywords for the search were: mare's milk, saumal, composition, properties, use in medicine. Seventy-seven literature sources were selected for the review. Most of the sources are in English, except for one of the bottom 40 sources published in the last 10 years. Among the milk of many mammalian species, mare's milk is highly regarded for its similarity to breast milk in terms of chemical composition, which allows it to be used as a breast milk substitute. It is also used to feed people with various health conditions, in particular in patients at risk, or suffering from tuberculosis, hepatitis C, psoriasis and various types of immunodeficiency. The article describes the rich composition, antibacterial and antiviral properties of mare's milk. Based on the analysis of the literature, it was found that mare's milk is not only a food product and an excellent thirst quencher, but also has valuable nutrients necessary for the human body, in no way inferior to breast milk.
Keywords: Antibacterial property, Antiviral property, Composition, Mare’s milk

1. Introduction

Mare’s milk, in addition to being the most important nutritional resource for foals during the first months of life, is also one of the most important basic foodstuffs for the human populations in those areas of central Asia (Mongolia and southern states of the former Soviet Union, e.g.: Kazakhstan, Tajikistan, Kyrgyzstan), where lactic alcoholic beverages called kumis (1) and saumal are traditionally produced through fermentation (2). These products are used in Russia and Mongolia for the management of digestive and cardiovascular diseases. in Italy, equine milk is recommended as a substitute for bovine milk for children suffered from cow’s milk allergy (CMA) (3).

Genetic, physiological, nutritional factors and environmental conditions affect the composition of mammalian milk. Some researchers have compared the composition of mare's milk to human milk. The amount of protein in the mare's milk is more than breast milk and less than cow's milk. The concentration of casein in mare's milk is between human milk and cow's milk. Mare's milk is lower in fat than human and cow's milk, but the distribution of diglycerides and triglycerides are similar in mare's and female's milk. The proportion of unsaturated fatty acids in human and mare's milk is much higher than in cow's milk. Mare milk has some structural and functional properties that can be used in human nutrition (4).

Holmes, Spelman (5) experimented with mare milk compounds to determine water, protein, ascorbic acid, phosphorus, potassium, magnesium, and calcium. They showed that milk was produced in the early lactation period in late winter and early spring when mares fed mainly on alfalfa and cereals. The average amount of mare's milk was 89.7% water, 2.3% protein, and 89 mg ascorbic acid. Mare's milk per liter contains 63 mg of phosphorus, 64 mg of potassium, 9.0 mg of magnesium, and 102 mg of calcium. Holmes et al. reported that, per 100 grams of mare's milk, this amount is higher than the milk of cows, goats, ewes, buffaloes, camels, or humans. Mare milk has less protein than cow, goat, ewe, buffalo, or camel milk, but more than human milk. More ascorbic acid in mare's milk than in cow's, goat's or human milk; Phosphorus less than cow's or goat's milk but more than human milk; Only about one-third of the potassium in cow's or goat's milk; And it has less magnesium and calcium than cow's or goat's milk, but about four times as much as human milk. The ratio of calcium and phosphorus in mare's milk is much higher than cow's or goat's milk, but probably lower than breast milk (5). Csapó-Kiss, Stefler (6) performed experiments on 29 lactating mares and reported that total protein, whey
protein, casein, and NPN content were 16.41, 13.46, 2.95, and 0.052 for colostrum immediately after calving, respectively.

Little is known about the amino acid composition of colostrum and mare's milk. The amino acid composition of mare's milk proteins, except Arginine and Threonine, is relatively similar to that of ruminants (7). But other researchers reported that the amino acid composition of mare's milk was very different from that of other farm animals due to its higher Cysteine and Glycine content. Mare's milk is high in Serine and Glutamic acid but low in Methionine (8). Due to the importance of alternatives to cow's milk, the purpose of this study is to review the scientific literature available over the past ten years regarding mare's milk as a valuable food source and to investigate the potential of this organic matter.

2. Materials and Methods

Literary searches were carried out on the sites Google scholar, PubMed, Cochrane, Elsevier, Cyber Leninka. The keywords for the search were: mare's milk, saumal, composition, properties, use in medicine. Inclusion criteria were: availability of information on the composition, properties and use of mare's milk in medicine. The results did not include articles written in languages other than English and Russian. Based on the results of our search, 152 articles were found. Based on specific criteria related to the subject of this study 70 articles were selected.

3. Results & Discussion

Organoleptically, mare’s milk is not similar to cow’s milk (4, 9). It is clear, whitish, and sweeter than cow’s milk, which makes it similar to human milk (10). Mare’s milk differs greatly from milk of human or cow in terms of the major components content (Table 1). Each component of mare's milk is considered and described in detail in the current study, as well as its comparison with breast milk and cow milk.

Table 1. Composition of mare’s, bovine, and human milk

<table>
<thead>
<tr>
<th>Component</th>
<th>Fat (%)</th>
<th>Protein (%)</th>
<th>Lactose (%)</th>
<th>Ash (%)</th>
<th>Energy (kcal/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mare’s milk</td>
<td>1.21</td>
<td>2.14</td>
<td>6.37</td>
<td>0.42</td>
<td>480</td>
</tr>
<tr>
<td>Cow milk</td>
<td>3.61</td>
<td>3.25</td>
<td>3.25</td>
<td>0.76</td>
<td>674</td>
</tr>
</tbody>
</table>
3.1. Fat

The fat content of mare’s milk is significantly lower in comparison with human and cow’s milk (4, 11) (Figure 1). Mare’s milk consists mainly of medium chain fatty acids, human milk has high concentration of long chain fatty acids whereas cow’s milk is richer in short chain fatty acids (9). The ratio of unsaturated-to-saturated fatty acids in mare’s milk (1:3) is close to that in human milk (1:2), whereas it deviates from the values typical of cow’s milk (2:1). Mare’s milk is a good source of linoleic acid (n-6 acid) and α-linolenic acid (n-3 acid) (12), which are not synthesized by the human body and which are essential to the growth and development of the nervous system (13).

Figure 1. Comparison of fat and its components between different types of milk

Mare’s milk contains fewer triglycerides, but it is more rich for free fatty acids (FFA) and phospholipids for 9 and 5 times respectively, which is necessary for cellular membranes (14). This way, it may save cell wall from oxidative phosphorylation.

3.2. Proteins

According to recent researches (4, 15), mare’s milk is similar to human milk in terms of protein composition, 8.30% and 7.60% respectively (16). Compared to other fractions (Figure 2), the percentage of whey protein in mare’s milk is more than 20% higher than in cow’s milk, amounting to approximately 40%, but lower than in human milk (more than 50%) (4, 15).
Cow’s milk has the highest amount of caseins. For that reason it is called casein type milk, whereas mare and human milk are called albumin type milk (4, 17). Due to the fact that cow milk contains big amount of caseins (coarse proteins), which induces allergy, infants develop allergy for it more often (18). On the other hand, mare’s milk contains more albumins (finely dispersed), therefore it doesn’t develop allergy (9). The large amount of whey protein and exogenous amino acids in mare’s milk make it a more beneficial source of nutrients for people than cow’s milk (19).

Figure 2. Average percentage of whey protein fractions in milk of mare, human and cow (% of total whey protein)

<table>
<thead>
<tr>
<th>Whey proteins (g/kg)</th>
<th>β-Lactoglobulin (%)</th>
<th>α-Lactoalbumin (%)</th>
<th>Immunoglobulins (%)</th>
<th>Serum albumin (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mare’s Milk</td>
<td>8/3</td>
<td>5/7</td>
<td>42/37</td>
<td>4/45</td>
</tr>
<tr>
<td>Bovine Milk</td>
<td>5/1</td>
<td>20/1</td>
<td>19/77</td>
<td>11/73</td>
</tr>
<tr>
<td>Human Milk</td>
<td>7/6</td>
<td>0</td>
<td>18/25</td>
<td>7/56</td>
</tr>
</tbody>
</table>

3.3. Amino acids

Amino acids are important constituents of food. They supply the required building blocks for protein biosynthesis (20). About 300 amino acids are found in cells and tissues of living organisms, but only 20 of them serve as links (monomers) from which the peptides and proteins of all organisms are built (21). Based on their nutritional/physiological roles, amino acids can be differentiated as: 1. Essential amino acids (valine, leucine, isoleucine, phenylalanine, tryptophan, methionine, threonine, histidine (essential for infants), lysine and arginine (“semi-essential”); 2. Nonessential amino acids (glycine, alanine, proline, serine, cysteine, tyrosine, asparagine, glutamine, aspartic acid and glutamic acid) (22).

Due to a high percentage of whey proteins and exogenous amino acids, mare’s milk is a better source of nutrients for humans than cow’s milk (6, 23) (Table 2).
The quantity of Asparagine, Threonine, Serotonin, Proline, Leucine and Lysine is almost 6 times higher in comparison with cow milk. On the other hand, Glutamine level is 3 times greater. But, however, human milk indexes are 10 times more in all points, which proves its’ significance, for infant’s muscular and skeletal system development.

Table 2. Composition of essential and non-essential amino acids content (g/100g milk) in milk of mare, human and cow

<table>
<thead>
<tr>
<th>Amino acid</th>
<th>Mare’s milk</th>
<th>Cow milk</th>
<th>Human milk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Essential amino acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>His</td>
<td>0.492</td>
<td>0.10</td>
<td>2.50</td>
</tr>
<tr>
<td>Ile</td>
<td>0.492</td>
<td>0.14</td>
<td>6.09</td>
</tr>
<tr>
<td>Leu</td>
<td>1.444</td>
<td>0.29</td>
<td>10.02</td>
</tr>
<tr>
<td>Lys</td>
<td>1.444</td>
<td>0.27</td>
<td>6.33</td>
</tr>
<tr>
<td>Met</td>
<td>0.213</td>
<td>0.06</td>
<td>2.94</td>
</tr>
<tr>
<td>Phe</td>
<td>0.738</td>
<td>0.16</td>
<td>4.48</td>
</tr>
<tr>
<td>Thr</td>
<td>1.132</td>
<td>0.15</td>
<td>4.22</td>
</tr>
<tr>
<td>Trp</td>
<td>0.229</td>
<td>0.05</td>
<td>-</td>
</tr>
<tr>
<td>Val</td>
<td>0.853</td>
<td>0.16</td>
<td>5.17</td>
</tr>
<tr>
<td></td>
<td>Non-essential amino acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asp</td>
<td>1.543</td>
<td>0.26</td>
<td>9.85</td>
</tr>
<tr>
<td>Ser</td>
<td>1.444</td>
<td>0.16</td>
<td>3.6</td>
</tr>
<tr>
<td>Glu</td>
<td>2.281</td>
<td>0.77</td>
<td>-</td>
</tr>
<tr>
<td>Pro</td>
<td>1.346</td>
<td>0.32</td>
<td>-</td>
</tr>
<tr>
<td>Gly</td>
<td>0.558</td>
<td>0.06</td>
<td>-</td>
</tr>
<tr>
<td>Ala</td>
<td>0.673</td>
<td>0.10</td>
<td>5.03</td>
</tr>
<tr>
<td>Cys</td>
<td>0.164</td>
<td>0.02</td>
<td>0.99</td>
</tr>
<tr>
<td>Ile</td>
<td>0.492</td>
<td>0.14</td>
<td>6.09</td>
</tr>
<tr>
<td>Tyr</td>
<td>0.771</td>
<td>0.15</td>
<td>4.19</td>
</tr>
<tr>
<td>Arg</td>
<td>0.706</td>
<td>0.11</td>
<td>3.91</td>
</tr>
</tbody>
</table>
3.4. Carbohydrates and lactose

Carbohydrates occur also in the form of oligosaccharides which build the surface of external layer of lipid globules. They form a branched structure, similar to that of human milk, absent in cow’s milk. Such a structure is likely to slow down the transport of fat through the gastrointestinal system and allows for a longer activity of bile salts and lipase (24).

Human milk contains a little bit more lactose (6.71%) than mare’s milk (6.37%). This is the main source of carbohydrates (23). Lactose can be supplied to an organism only as a constituent of milk. As a part of milk, lactose can influence the process of seeding the gastrointestinal tract with microorganisms responsible for its breakdown (25, 26). This could result in a symbiosis in which favorable microflora are established that compete with and exclude many potential pathogens (24).

Galactose contained in lactose takes part in the process of fast brain development and myelination in young organisms, which require significant amounts of galactosylceramides and galactolipids (24). That’s why milk galactose play a unique role in providing the requirements of the rapidly developing infant brain (27).

3.5. Vitamins

According to recent reviews (19, 22), mare’s milk has been proven to contain vitamins A, D3, E, K2, C, B1, B2, B3, B6, B12. The content of these vitamins in mare’s and cow’s milk does not differ significantly (19) (Table 3). But mare’s milk is much richer in vitamin C as compared to cow’s milk, and this vitamin has a high nutritional value due to its resistance to oxidation and anti-inflammatory properties. Mare’s milk contains a similar level of vitamin A as compared to cow’s milk but some authors [16] pointed out that it is less than in human milk. Results of recent studies showed that vitamin D was found in greater amount in mare’s milk as compared to human milk (19). According to Glade (28), supplementation with vitamin D significantly decreased the risk of premature death and death from cancer as well as supporting general health. Mare’s milk is characterized by an average concentration of vitamins from the B group, while human milk contains less and cow’s milk more as compared to mare’s milk (Table 3). The level of cobalamin was shown to be higher and vitamins B2 and B9 to be lower in mare’s milk compared to human and cow’s milk (22, 24). On the other hand, the level of Vitamin K is almost 9 times more compared with human milk, which means that it has a positive effect on blood coagulation system.
### Table 3. Composition of fat soluble vitamins and watersoluble vitamins content in milk of mare, human, and cow

<table>
<thead>
<tr>
<th>Vitamins</th>
<th>Mare’s milk</th>
<th>Human milk</th>
<th>Cow milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A (mg/l)</td>
<td>0.403</td>
<td>0.455</td>
<td>0.435-0.799</td>
</tr>
<tr>
<td>Vitamin B1 (μg/l)</td>
<td>20-40</td>
<td>14-17</td>
<td>28-90</td>
</tr>
<tr>
<td>Vitamin B2 (μg/l)</td>
<td>10-37</td>
<td>20-60</td>
<td>115-202</td>
</tr>
<tr>
<td>Vitamin B3 (μg/l)</td>
<td>70-140</td>
<td>147-178</td>
<td>50-120</td>
</tr>
<tr>
<td>Vitamin B5 (μg/l)</td>
<td>277-300</td>
<td>184-270</td>
<td>260-490</td>
</tr>
<tr>
<td>Vitamin B6 (μg/l)</td>
<td>30</td>
<td>11-14</td>
<td>30-70</td>
</tr>
<tr>
<td>Vitamin B9 (μg/l)</td>
<td>0.13</td>
<td>5.2-16</td>
<td>1-18</td>
</tr>
<tr>
<td>Vitamin B12 (μg/l)</td>
<td>0.3</td>
<td>0.03-0.05</td>
<td>0.11</td>
</tr>
<tr>
<td>Vitamin C (μg/l)</td>
<td>1280-8100</td>
<td>3500-10000</td>
<td>300-2300</td>
</tr>
<tr>
<td>Vitamin D3 (μg/l)</td>
<td>4.93</td>
<td>0.03-0.12</td>
<td>2.31-15.39</td>
</tr>
<tr>
<td>Vitamin E (mg/l)</td>
<td>1.13</td>
<td>5.09</td>
<td>1.05-1.95</td>
</tr>
<tr>
<td>Vitamin K2 (μg/l)</td>
<td>17.93</td>
<td>1.8</td>
<td>4.81-17</td>
</tr>
</tbody>
</table>

### 3.6. Minerals

Milk is generally a good source of calcium and phosphorus which are necessary for the process of bone growth and development, and also magnesium, which is needed for mineralization of bones (15).

Research analysis showed that mare’s milk contains relatively few minerals compared to cow’s milk (Table 4) (29). However, its calcium-to-phosphorus ratio (1.6–1.8:1) is more favorable to the proper growth of the skeleton of young organisms than cow’s milk (approximately 1.4:1) and is closer to that in human milk (approximately 1.9:1) (15).

The investigation showed that cow’s milk contains about 50% more non-ionizedCa²⁺ but mare’s milk contains about 2 times more ionized Ca²⁺ than in human milk (22). Ca²⁺ to P⁺ ratio of human and mare’s milk are reported to be more favorable for intake of Ca²⁺ compared to the ratio in cow’s milk, because it is ionized, which means it is not connected with proteins and easily digested.

The highest amount of sodium and potassium is found in cow’s milk (30). While the number of males and inferior breast several times. Sodium in the form of cations plays an important role
as a constituent of blood and extracellular fluid, potassium as a cation takes part in maintaining
the integrity of intracellular fluid (31).
However, microelements concentration is low in all milks discussed (22).

Table 4. Composition of minerals content (mg/100 ml milk) in milk of mare, human and cow

<table>
<thead>
<tr>
<th>Mineral component</th>
<th>Mare’s milk</th>
<th>Human milk</th>
<th>Cowmilk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca$^{2+}$</td>
<td>50–135</td>
<td>28–34</td>
<td>112–123</td>
</tr>
<tr>
<td>P$^{+}$</td>
<td>20–121</td>
<td>14–43</td>
<td>59–119</td>
</tr>
<tr>
<td>K$^{+}$</td>
<td>25–87</td>
<td>53–62</td>
<td>106–163</td>
</tr>
<tr>
<td>Na$^{+}$</td>
<td>8–85</td>
<td>10–18</td>
<td>58</td>
</tr>
</tbody>
</table>

3.7. Antimicrobial activity
Analysis of the literature showed that mare's milk has a broad antimicrobial and antiviral effect
(28, 29). Antimicrobial activity of mare’s milk is maintained by lysozyme and lactoferrin
present in it (32).
Also called N-acetylmuramidase or muramidase, lysozyme is a hydrolyse-type enzyme that
catalyses the breakdown of peptidoglycan polymers of bacterial cell wall at the 1-4 bond
between N-acetylmuramic (NAM) acid and N-acetylglucosamine (NAG) residues, thereby
lysing sensitive bacteria (33). Lysozyme was first discovered by Flemming (1922) in the nasal
mucus and subsequently purified from various plant, animal, microbial (bacteria, virus and
fungi) materials (28, 29).
Antibacterial activity of lysozyme is essentially directed towards gram-positive bacteria, as
their target cell-wall component (peptidoglycan) is freely accessible to the enzyme, contrary to
that of gram-negative bacteria, which is shielded by the lipopolysaccharidic (LPS) layer of the
outer membrane (33). In addition to bacteria, lysozyme has also been reported to inhibit viruses
(HIV) and eukaryotic micro-organisms including parasites (Entamoeba histolytica trophozoites)
and fungi (Candida albicans) despite the absence of typical peptidoglycan in their envelopes
(33).
The bactericidal properties of lysozyme are primarily ascribed to its N– acetyl-
muramoylhydrolase enzymic activity, resulting in peptidoglycan hydrolysis and cell
lysis. Lysozyme catalyzes the hydrolysis of the $\beta$-(1,4)-glycodic linkage between N-
acetylglucosamine and muramic acid of the peptidoglycan in the bacterial cell wall (30),
interacts with the lipopolysaccharide (LPS) layer in the outer membrane and subsequently distorts the normal packing between phosphate groups of phospholipids and LPS by its polycationic properties. The distortion results in the perturbation of the outer membrane structure and the stimulation of the susceptibility to lysozyme of the peptidoglycan layer (9). According to recent researches (17), the quantity of lysozymes in mare’s milk is the highest among human, cow, goat and camel milk (Figure 3).

Figure 3. Reported concentration (mg/l) of lysozyme in the milk of different mammals

Another component of mare’s milk which gives it great antimicrobial activity is a lactoferrin (Figure 4). It is an iron-binding glycoprotein of the transferrin family which was found in most biological fluids and is a major component of the mammalian innate immune system. The antibacterial activity of LF has been widely documented both in vitro and in vivo for Gram-positive (Bacillus stearothermophilus, Bacillus subtilis, Clostridium sp., Haemophilus influenza) and Gram-negative bacteria (Listeria monocytogenes, Micrococcus sp., Staphylococcus aureus, Streptococcus mutans) and in some acid-alcohol-resistant bacteria (Mycobacterium tuberculosis) (34).

Bacteriostatic function of lactoferrin (LF) is maintained by it’s ability to withdraw the Fe³⁺ ion, limiting it’s usage by bacteria and inhibiting the growth. LF’s bactericidal function is due to it is direct interaction with bacterial cell wall. In 1988 it was opened that LF damages the external membrane of Gram-negative bacteria through an interaction with lipopolysaccharide (LPS). The positively charged N-terminus of LF prevents the interaction between LPS and the bacterial
cations (Ca\(^{2+}\) and Mg\(^{2+}\)), causing a release of LPS from the cell wall, an increase in the membrane’s permeability and ensuing damage to the bacteria. The interaction of LF and LPS also potentiates the action of natural antibacterials such as lysozyme, which was discussed earlier (35).

Figure 4. Reported concentration (mg/l) of lysozyme in the milk of different mammals

![Reported Concentration (mg/l) of Lysozyme in the Milk of Different Mammals](image)

Figure 4 shows average concentration of lysozyme in the milk of different mammals, which proves great antiviral activity of mare’s milk (24). Mare’s milk contains a highest amount of lysozyme (98.9 mg/l), as while as in human milk it is lower for 5 times (21.39 mg/l). Based on this quality, nowadays, mare’s milk is used in variety of fields. For example, treatment and prophylaxis of Tuberculosis and other bacterial infections, supplement for infants feeding.

3.8. Antiviral activity

Literature review showed that several constituents in mare’s milk may have a potentially antiviral effect. Not only proteins of the non-specific immune system (lysozyme, lactoperoxidase, LF), but also specific immunoglobulins (IgM, IgG and secretory IgA), lipid components, cytokines or prostaglandins help in the protection (36). Later studies have shown that at least part of the antiviral properties of mare’s milk can be attributed to a direct antiviral activity of LF. LF comprises antiviral activity against a wide range of human and animal...
viruses, both RNA-and DNA-viruses. This property will be discussed below on the example of HCV (37).

Hepatitis C virus (HCV) is a member of the flaviviridae family. HCV is an enveloped virus that contains a positive, single strand RNA genome. A unique feature of HCV is its ability to cause a persistent infection. Therefore, HCV is associated with the cause of chronic hepatitis, liver cirrhosis and hepatocellular carcinoma. Little was known about infection and maturation processes of HCV due to the lack of an in vitro culture system. Recently, however (24, 37), employed two different human derived cell lines for the replication of HCV. Using these culture systems, an antiviral effect of LF on HCV replication was observed (37).

LF can prevent adsorption to target cells by the fact that it binds to the envelope proteins of HCV E1 and E2. In addition, it was shown that LF interfered with binding of HCV E2 in vivo, since anti-human LF antibodies, in the presence of LF, were able to co-precipitate secreted and intracellular forms of E2, which were transiently expressed in HepG2 cells. In concordance with others. Time of addition assays indicated that LF probably interferes with adsorption of HCV to the target cells: it is most effective if administered before or simultaneous with the viral inoculum (37).

Recent researches have shown that LF also works against Rotavirus, Friend virus, Poliovirus, Respiratory Syncytial Virus, HIV, Herpes simplex virus types 1,2 and Cytomegalovirus (37). This property of Mare's milk makes it a valuable product in autumn and winter, in order to prevent and strengthen the immune system.

Saumal has long been a popular gourmet food with an exceptionally delicious flavor and subtle nuances found in no ordinary dairy product in Central Asia. On the basis of literature data analysis and review findings, it was found that mare’s milk is not only food product and thirst quenching but also provides valuable nutrients for human body. It is rich in proteins and carbohydrates, but it is low in fat, which makes it a dietary product. Due to the high percentage of whey proteins and exogenous amino acids, mare's milk is the best source of nutrients compared to cow's milk. And its high content of vitamin C confirms its importance and value in immunomodulation. A high concentration and optimal ratio of Ca2 + and P + in mare's milk was also detected. During the review, its antibacterial and antiviral effects, as well as effectiveness against Tuberculosis and Hepatitis C were given due to lysozyme and lactoferrin present in it. Despite the fact that many beneficial components, effects and uses in medicine have been identified, in the future there is the prospect of discovering other components of mare's milk and studying its effectiveness in various diseases.
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