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Abstract: The purpose of this paper is to make available for occidental lecturers a kind of synthesis of the information we accumulated over more than twenty years about horse breeding in Central Asia. It is also a trans-disciplinary approach mostly based on French bibliography and personal experiences. We will give a new perspective on the early time history of horse breeding to introduce the current breeding of horses in herds in Central Asia. We will continue with the description of the diet of the nomads and the central place taken by mare's milk in their culture. This induced rituals but also some medical aspects. These latter can now be partly explained with current modern studies. We will finally discuss on the prospects of horse milk products in the new globalised world.

Key words: Central Asia, horse breeding, meat production, milk production, history, ethnology.

1. Introduction

My work as a geneticist applied to horse production, combined with considerable cultural curiosity for anything connected to equines, has enabled me to consider subjects linked to the history of the techniques, ethnology and sociology of countries as distant from France as those in Central Asia. After an initial review of the bibliography [1], my first mission in January 1984 to the Equine Research Centre of the ex-USSR [2] allowed me to become familiar with what was happening with horse production on the other side of the "iron curtain". In 1990, I participated in the expedition "Guillaume de Rubrouck" to Outer Mongolia, which involved six weeks on horseback visiting breeders in that region. We were the first French people to visit the country after those of the *Croisière jaune*. See the books of Kappler [3] and Jan [4]. In 2000 and 2001, I was lucky enough to be asked to complete two missions to the Hohhot Agricultural University, which honoured me with the title of Associate Professor [5]. Not only that, but through its network of alumni, I was introduced into the horse farms of Inner Mongolia. And finally, in the autumn of 2007, I was able to complete a mission in Kyrgyzstan [6]. I thus feel qualified to put forward a technician's view of horse breeding in these regions, for many years totally unknown to Western equine experts, although it is now becoming increasingly well understood by young ethnologists, as shown by issue 40/2010 of EMSCAT journal and recent publication of the book by C. Ferret [7].

2. A Look at History

V. Eisenmann [8] recently summarised the state of our knowledge on the wild horses known to exist at the end of the last glaciations, about 10,000 years ago, from their fossilised remains. It was these animals which were the subject of different attempts at domestication, now situated at a relatively late stage, between 4000 and 3500 BC. The two types of wild horse described at the historical period were

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Prjewalski's horse (*Equus przewalskii*) in Asia and the Tarpan (*Equus ferus*) in Europe. Although quite similar at first sight, with their massive shape and short nose revealing their adaptation to cold conditions [9] and their short first phalanges, the Tarpan had shorter cannon bones and larger hooves than the Prjewalski, and its teeth also appeared to be less well-adapted to an abrasive diet. This suggests an Asiatic horse adapted to life on the steppes and a European horse adapted to forests. However, *Equus gallicus*, the Solutré horse (30000 BC) differed from these two others: the nose was greatly shortened, the cannons short, the first phalanges long and the hooves very broad. The same type of horse, *Equus latipes*, was present at Kostenski on the Don, but with even broader hooves. It is among these latter types that we should probably look for one of the origins of domestic horses, *Equus caballus*.

In Southern Europe, *Equus antunesi* has been known to be present for 100,000 years. Its limbs are svelte and its muzzle lengthened. According to the Luristan bronzes, it was also possible to identify horses in these mountains with very short limbs, living 4,000 years ago.

The first known horses (*Equus scotti*) were larger and heavier; their remains were found in Texas, dating from 0.7 million years ago. Those described in Europe, and particularly in Germany (*Equus mosbachensis*) go back half a million years. They probably migrated from North America via the Behring Straits, but it is not easy to determine that they were the origin of our modern working horses.

Indeed, the coexistence of man with horses does not probably date back to more than 100,000 years, when the onset of the last Ice Age favoured the development of steppe-like vegetation where horses became abundant and their hunting developed. Some hunting communities became subservient to their herds or reindeer or horses in Western Europe, or to bison and aurochs in Eastern Europe. With the advent of *Homo sapiens sapiens*, this dependence on a particular food source could not have been sustained over thousands of years without the development of a particular culture and considerable knowledge. We can still see evidence of this culture today in remarkable ancient wall paintings (30-10000 B.C.) I see no reason why it was not also been expressed in hunting techniques. In particular, I feel that the wealth of late paleolithic images representing horses with halters, underlying the hypothesis put forward by Edouard Piette which advanced the date of domestication beyond 10,000 years ago, should be reconsidered from this angle. Indeed, if we think that these attached horses were decoys to control their wild counterparts, then all the findings can be reconciled. Horses were not really domesticated before 4000 BC, as the first chariot burials in the Urals dated from the end of the 2nd and the beginning of 3rd millennium B.C. and the Botai site in Northern Kazakhstan (now considered as the first) only dates from between 3500 and 4000 BC. However, the proximity of hunters to their prey via the intermediary of decoys would have enabled man to observe that they could easily be mastered. Indeed, its natural behaviour meant that it could be domesticated, which is only the case for a few species. But what was the reason for this domestication? It is generally agreed that the main aim was to obtain a source of food, meat certainly, but also milk, as suggested by the excavations at the Botai site [10]. On reflection, a mare would serve as a much better decoy than a young male living naturally outside the herd, or a stallion that would maintain the cohesion of the herd. Fertilised by a wild stallion, the mare could then produce a foal. Her milking would therefore have preceded her consumption and, if this had been successful, might have delayed the latter. In this domestication process, the production of milk would therefore have taken precedence over that of meat. But it is pleasant to allow one's imagination free rein if one is not constrained by the little data available on this distant era.

Later on, it appears that horses were first of all harnessed in a pair to a chariot, following the model used for cattle [11]. At least, that is what is suggested by archaeological remains. However, it is difficult to

imagine [12] that knowing how to harness them, man did not try to mount the animals, which seems to have been well established during the 1st millennium B.C. However, from various historical and linguistic cross-references, we do know that it was Indo-European populations which developed these techniques, from the steppes of Kazakhstan to the Iranian plateau, whence they spread to the Middle East, Europe and then Asia. These nomad peoples, long supposed to be illiterate, have left few traces, but we know that they were at the origin of the tree saddle, perhaps of the made of leather, or wooden stirrups [13] and of the short, so-called Turkish composite bow, particularly suited to use by horsemen. Some, such as Lebedinski [14], think that one of these horse-mounted peoples, the Sarmates and then the Alains, subsequently invented one-to-one combat with a lance and were thus the origin of the European military aristocracy that grew up at the end of the Roman Empire and during the Middle Ages. It was therefore these populations of nomadic livestock breeders from the steppes who instructed other, civilised, Assyrian, Greek, Egyptian and Gallo-Roman populations, and in the East a series of peoples that, for simplicity, can be qualified as Chinese, in the use of horses. According to Keegan [15], their familiarity with the slaughter of animals also meant that they invented true warfare which no longer took the form of the intimidating rituals that had prevailed hitherto. We who believe ourselves as the descendents of Greeks, Romans or–more modestly–Gauls, usually forget that we owe these nomad peoples a great deal. Indeed, the barbarian invasions contributed much to revivifying this heritage.

3. The Raising of Horses in Herds in Central Asia

The principle underlying this type of animal husbandry is to exploit natural forage resources, scarce during some seasons and always widely dispersed, by means of wholly open air management. The breeds in these regions are well adapted to these grassland conditions; they can graze at great distance from water points and, during the winter, develop considerable resistance against the cold through their behaviour, coats and anatomy. In arid regions, mixed herds of fat-tailed sheep and Kashmiri goats are associated with the horses. When the grazing conditions improve, this basic combination makes more room for cattle. However, yaks and small Mongolian cows, whose droppings serve as fuel, are very unlike the animals that are familiar to us. In the Gobi region, where tufts of plants grow at least one metre apart, Bactrian camels are raised. It is in the culture of the nomads to rely on the body reserves of their animals, and they are loath to store goods for the winter, which they consider is the domain of sedentary farmers. They understand, and have always maintained, commercial relationships with the latter. But their methods differ; they prefer to maintain non-grazed zones for over-wintering, often found in mountain valleys that offer shelter against the winter winds. And indeed, given the size of their herds, it would be necessary for them to switch to an agropastoral system if they wanted to constitute winter reserves, but the ecological equilibrium of the steppes does not in most cases tolerate tilling. Under these harsh climates, this will inevitably lead to the disappearance of soil, which ends up in a sand storm over Beijing. It is not for nothing that particular attention is paid by Mongolians to causing the least damage to the soil (Boots with uprightly incurved toes, no stakes used to support the yurt, etc.). Under the influence of Chinese or Western advisors, the Mongols are now starting to introduce some hay cutting. This is not to feed their livestock during the winter, but to use in the event of problems to help ewes get through a difficult period so that breeding can start again the next year. Nomadic farming is indeed subject to constant crises that the Mongols refer to as "zhud". They make a distinction between three types:

The "too many hooves zhud" which refers to over-grazing can lead to epidemics of disease.

The "white" zhud that occurs after a period of

thawing: the snow thaws and then turns into ice, thus preventing access to the land on foot.

The "black" zhud refers to drought that causes the disappearance of water sources.

The historical response of nomads to these difficulties is not that adopted by sedentary farmers, which is to confront them; rather, they disperse in a broad network of alliances of many types. If necessary, the nomad farmer will sacrifice some of his livestock, or in other words his fortune. He will take his absolute necessities with him, and move elsewhere. He mocks the advice of sedentary farmers, whom he qualifies as "green" zhud, considering that the remedies they suggest are often worse than the problems he is facing.

What is difficult for our mentality as sedentary farmers to grasp is that under this system, the path always seems to lead towards a catastrophe. At best, if all goes well, it is the "too many hooves zhud" that occurs. Under these conditions, domestic populations are subject to selection pressures that are very similar to those experienced by wild populations. This produces breeds that are very well adapted to their grassland conditions, and can either graze at great distance from a water source or, during winter, attain food sources that often lie 50 to 70 cm below a level of powdery snow in the coldest regions. In these horses, the hairs on the fetlock are like a brush. In addition, the aptitude of these animals to rapid fattening allows them to bear all periods of restriction satisfactorily. These consist not only in extreme summer heat and the drying of grasslands, but also extremely cold winters, with snowstorms and ice that only horses, of all the domestic animals, are able to break down if it is not too thick. These animals can therefore be used to graze very short on the soil (we have seen that the dentition of horses is well adapted to this, and they are also able to dig down for roots). They can also be raised in thickets, marshy zones, sparse forests and clearings. These inhospitable areas can thus be exploited by horses with a considerable aptitude for movement and which graze for about 14 hours in a 24-hour day, or as much time as cattle spend both grazing and ruminating [16, 17]. So horses are not only remarkable foragers, they also sort what they consume. For this reason, equine products (meat or milk) are considered to be of better quality than those from cool-muzzled animals: cattle, goats or camels. Only sheep, a warm-muzzled animal and thus close to man and consecrated like the horse in the ancient rituals of shamanism, escapes this discrimination.

Many years ago, Soviet animal production scientists considered that a kilogram of horse meat produced under these conditions cost half as much as beef and one-quarter less than sheep. The natural adaptation of horses to grassy steppes or forested environments is of course the reason for this, and the principal reason why horses have become the main domestic animals of the populations in these regions living in symbiosis with them. Since time immemorial, these peoples have used horses as a source of food and benefited from their great capacity for travelling; they can raise other species (sheep and cattle) but because of their nomadism, they are able to exploit vast areas with a low density of plant production. Furthermore, the horse gave these peoples an undeniable military superiority; in open country it enabled a reversal of the unfavourable demographic relationships that existed with hand-to-hand combat. Over time, the nomad confederations were able to threaten and even overwhelm powerful sedentary states. This dynamic of the steppes, oscillating between increasingly conquering federations and their dispersal, needs to be set against the ecological equilibrium of herds oscillating between development and "zhud". Indeed, some populations were dependent on their herds which, like wild animals, were subject to the selection pressures of the environments they colonised. One example of this is the taiga, the natural environment of reindeer, and some of the mountainous terrains which produce particular breeds. But in fact, total domestication was only achieved in the agricultural environments of the oases of Turkmenistan. Some

horses were raised there on the products of farming, as a function of their end uses. This is the origin of what we now call the Warm-blooded breeds. In my opinion, the Akhal-Teke constitutes a sort of outlier of this phenomenon, which subsequently continued with Arab and English thoroughbreds. In the West, we are an extension of this approach insofar as our breeders are not subject to the constraints of natural selection because of agricultural production. We cannot therefore understand that the Mongols tried and rejected all efforts towards crossings with improved breeds, which would nonetheless have generated immediate and spectacular gains in productivity. In fact, these immediate gains were then cancelled out by the lack of adaptation of the animals to their production conditions, which could pollute their herds for several generations until the natural equilibrium was completely restored.

This review of production methods so distant from our own is nonetheless valuable, particularly in a period when the terms "environment" and "sustainable development" form part of the obligatory vocabulary of any discussion on the subject.

4. The Diet of the Centre Asiatic Nomads

4.1 White Food and Grey Food

For the administrative authorities, it is first of all the meat produced by a farm that counts; milk production is only seen as a supplementary benefit, and little account is taken of animals harnessed for work or ridden. The situation differs completely for the Turkic-Mongolian people. No account is taken of work accomplished ridden, as this is an everyday occurrence. It is nonetheless celebrated during festivals: *naadam* in Mongolia, equine games and *badgé* in Kirghizistan and Kazakhstan. But, above all, it is mare's milk that is valued by these cultures.

In summer, when their animals are lactating, the Mongols eat white food, i.e. dairy products. In winter their diet is made up of grey foods, i.e. boiled meat that they prefer to be very fatty. The most important white product is airag (in Mongolian), which is also called kumiss in Turkish languages. Airag is yoghurt made from fermented mare's milk. Because equine caseins are very short, they do not solidify as they coagulate but remain liquid. Its titre is between 2% and 3% of alcohol, obtained by the alcoholic fermentation of lactose. It is considered as both a food and a drink, and sometimes as a medicine. For the Mongols, winter is defined by an absence of airag, and summer by its abundance. There is however one exception, as they keep a small amount of airag frozen for the New Year festival. The collection of milk starts one month after foaling, so that the foal is assured of a sufficient supply to initiate its growth. Mares and foals are caught in the morning and attached to a rope staked in the ground so that without separating the mother and her foal, the latter is still prevented from suckling. Milking can then commence, at a rate of four or five times a day. One ethnographical point is that milking is performed from the left of the mare, while cows are milked from the right. The left is the male side, and both horses and airag were historically the exclusive domain of men. Today, it is mainly the women who milk, but the men continue to participate. In the evening, the mare and her foal are released together so that they can graze. Indeed, efforts are made to ensure that they are not separated for more than 18 hours each day. If it is necessary to milk so many times a day, this is mainly because the milk produced by the mare is of an alveolar type, and the cisterns of the mammary gland hold very small quantities. In addition, there are marked variations in the ease of milking between mares. Some mares may need their own foals to be present for milk production to be triggered, while for others any foal will suffice, and others again can be milked alone. It is thus possible to collect about 2 litres of milk per day and per mare, or 300 to 400 litres per lactation, without recourse to supplementation. As a comparison, milking Cold-blooded mares receiving supplements in their diet can produce up to 3,000 litres per lactation, and milking can be mechanised, but this is not the point we

are trying to make here. The milk collected in buckets–traditionally made of wood–is immediately transferred to a large container made of two cow skins sewn together using horsehair and camelhair threads, with the hide on the inside. A large wooden paddle or frother is placed in the container. The new milk is thus mixed with the ferment in the same way as in a yoghurt-maker. Each person entering the yurt is invited to stir the mixture vigorously, and is honoured to do so. This skin container is situated in the yurt of the head of the family on the left when entering, i.e. on the masculine side. The airag is consumed constantly, with fresh milk replacing what has been drunk. It has a flavour situated between lemon juice and watery fresh milk. The Mongols can recognise numerous vintages from the quality of the ferments that give them their acidity, from that of the milk as a function of season and pastures, and the degree of advancement of the fermentation (weak-moderate-strong). However, this beverage cannot be stored for more than four days, after which the remains are distilled with a similar preparation of fermented cow's or yak's milk, the tarag, to produce arkhi, a milk alcohol with a titre of about 16°. To store airag or kumiss, the Russians have suggested adding sugar to prolong the alcoholic fermentation. This produces a sparkling drink that is more similar to milk and can be kept in small, encapsulated bottles. The Mongols think that the result bears no relation to airag and are totally uninterested in this idea.

4.2 Rituals

I. Bianquis [18, 19] recently reported on the different rituals involved linked to this product, and I agree with her principal findings.

On the steppe in summer, the farmers visit each other and airag gradually becomes their main food, supplying energy, proteins and vitamins. The average consumption of men can reach 10 litres a day. Some are proud to announce "25" litres a day, a sign of virility as a defiance of alcohol, and a manifestation of being a true Mongol.

Children are initiated in consuming airag at the very early age of around 8-9 months, so that later they will become true Mongols.

When airag is associated with hospitality rites or gifts to divinities, it is considered as arkhi, i.e. as an alcohol. In this case, each person drinks from the same cup, supplied by the host, on a white or blue stole (haddack). The gift is consecrated by flicking some of the precious liquid from the middle finger towards the four cardinal points, sometimes only to the ground and the sky, but other times both ways successively. The host then empties his cup. He fills it again and the guest is asked to respond by following the same ritual. The cup is then handed to the next guest, and so on. Everyone drinks from the same cup, that of the host, making this a veritable communion ritual. This differs from the consumption of airag as a food, where each person drinks from his own, traditionally wooden, cup, which forms part of the essential utensils carried at all times by a Mongol, together with a knife, chopsticks and tobacco pouch. Airag can also be sprinkled on "Ovoo", piles of stones covered with fabric that are found throughout the steppe as offerings to the powers of nature that are venerated in Shamanism. Airag is also used to bless people during Buddhist rites. A special wooden spoon, rectangular in shape and sculpted to hold the liquid, is then used. Thus, on the occasion of departing for a voyage, the stirrups are blessed with a few drops of airag, and the rump of the horse is sprinkled with it to wish the rider luck.

4.3 Medicine

Because mare's milk is similar to human milk in terms of its composition, and because it is the principal source of vitamins in the high-protein diet of nomads and has always been free of tuberculosis, it benefits in Central Asia from a considerable reputation as a probiotic to treat numerous diseases of the digestive tract, liver and lungs. Its ability to lighten the skin when applied as a cosmetic or consumed via the digestive

tract is considered by Chinese medicine as a symptom of good health and is taken as proof of its beneficial action. It should also be noted that historically, an ukase of the Russian Tsar banned all Cossacks from milking mares. This authoritarian measure was designed to ensure a better diet for foals, but in fact resulted in severe vitamin deficiencies in the soldiers and had to be abrogated a few months later. But mention is still made of it, and the health image of mare's milk is enhanced as a result. For this reason, from the Southern Urals in Bashkortostan, visited by the great Tolstoy himself, to Xilin Gol in Inner Mongolia, very active health cure tourism has developed. For example, this is the case in the town of Xilin Gol in Inner Mongolia, where hotels offer an abundant consumption of airag. Further away, in the East Ujim Qin district, I was able to visit a more medicalised dispensary for a mare's milk cure. The association of airag with the traditional Mongolian plant-based pharmacopoeia is apparently achieving success in the treatment of diabetes, allergies and skin diseases. In particular, diabetic ulcers can be treated by applications of mare's milk. 40% of the success of this treatment is attributed to mare's milk, and 60% to the pharmacopoeia. I am not qualified to pronounce upon these claims. In the dispensary I visited, about thirty mares were milked by hand four times a day to supply less than two litres of milk per mare. The milk collected here was put to ferment in stoneware salting vessels, half-buried in the floor of a yurt refrigerated by watering the floor. The ferments used had recently been renewed by supplies from Outer Mongolia. The airag was moved from the first vessel to a second, where it was filtered as a function of its degree of fermentation. From the second vessel, it was then distributed at regular times to those following the cure who, after consuming it, ensured that they protected themselves from the sun by placing one side of their *del* (robe) on their heads, apparently to prevent any allergic sensitization.

4.4 Current Modern Studies

Table 1 taken from Fox and Uniacke [20], Martuzzi [21], and Salimei et al. [22], shows the comparative compositions of milks from different mammal species.

It can first of all be noted that equine milks, like human milk, are amongst the lightest and most aqueous. They also contain the highest lactose concentrations, and are less fatty (2%) (from which, 80% triglycerides, 5% phospholipids and 9% fatty acids, including a high proportion of medium-length and polyunsaturated fatty acids). This high proportion of fatty acids essential to human nutrition, combined with a low proportion of linoleic acid (0.1%) (Which is much lower than in the cow or ewe) means that mare's milk has a highly dietetic lipid fraction. And that is not all: the lipids are present in globules of 2 to 3 mm in diameter, stabilised by a membrane that is acquired in mammary secreting cells. Long mucine filaments (0.5 to 1 mm long) extend from the surface of these globules. They facilitate the

Table 1 - Comparative compositions of milks from domestic species compared to those of equids and human (%).

Species	Water	Proteins		Fats	Lactose	Minerals
		Caseins	Whey			
Ewe	81.6	4.5	1.1	7.5	4.4	0.9
Goat	86.8	2.8	0.5	4.5	4.4	1.0
Sow	79.9	2.9	2.9	8.5	4.8	1.0
Cow	87.3	3.9	2.6	3.6	4.8	0.8
Mare	89.6	1.3	1.2	1.4	6.7	0.5
She-ass	89.2	0.9	0.8	1.8	5.9	0.4
Zebra	88.7	0.9	0.8	2.2	7.0	0.4
Human	87.7	0.7	0.7	3.6	6.7	0.3

adhesion of these fat globules to the intestinal epithelium, thus preventing the adhesion of bacteria and protecting the tissues to which they are bound from infections and tumours.

As for the protein fraction, a distinction must be made between whey and caseins which, by coagulating, enable the production of cheeses. In both humans and equines, the ratio of these two types is 1/1. The principal whey proteins are alpha- and beta-lactoglobulin. Lysozyme, which has antiseptic properties, is also found in large quantities, as well as immune globulins. The latter proteins may explain some of the milk's therapeutic properties because they intervene in tissue repair. The principal caseins are beta casein and, to a lesser extent, alpha-casein; however, a particular feature is that kappa-casein is almost absent. This explains the hypoallergenic properties of equine milk. It also means that equine milk curdles but does not form a gel under the action of the ferment; it remains liquid. It is impossible to make cheese with either mare's milk or she-ass milk.

5. Perspectives

The way in which this long tradition is likely to evolve raises another problem. Ex-USSR countries have already been confronted by the need to modernise this sector; to meet domestic demands and to supplement the production of meat so that the vast areas of land that are under-used for agricultural purposes can be exploited. In the first case, as the populations of Central Asia gradually moved towards large urban areas, they started to demand koumiss. It was thus decided to intensify and rationalise its production in regions closer to this new market demand. So during the 1980s, the regions of Moscow, Riazan, Tambov, Kirov, Minsk and Voroschilovgrad also started to produce kumiss in a more rational manner by equipping specialised farms that housed herds of about a hundred or more mares. In an intensive setting, milking mares receiving supplementation can, as we have seen, produce about 3,000 litres during six months of lactation. Milking is mechanised with adapted milking machines, milking parlours are organised to take account of the need not to wean foals so that the mares will properly produce their milk. Both mares and foals receive appropriately supplemented diets. Occasional experiments, performed without much enthusiasm, have also been carried out in Europe [23]. In addition, the manufacture of kumiss has been standardised so that the final product is more similar to "mare's milk champagne" than to traditional kumiss. The milking procedures must of course comply with strict hygiene standards. The milk thus collected is filtered through four layers of gauze. It is left in containers that are plunged into a tank of running water, the temperature of which does not exceed 9 to 10°C. Milks from different milkings are not mixed. The ferment is cultured separately and only replenished with fresh milk. Milk collected during the day until 18:00 is thus stored until the next day at 11:00, when the manufacture of kumiss starts. The ferment is mixed with the milk until it reaches an acidity of 50-60 Terner degrees at a temperature of 26-28°C, which ensures the normal fermentation process. Immediately after the coagulation of caseins (which is relative given their nature), the mixture for the manufacture of kumiss is stirred using electric mixers at a rate of 430-480 rpm. This mixture is then left to mature for 1.5 to 2 hours, until an acidity of 65-70° Terner is reached. Fresh milk is then added until an acidity of 50-60° Terner is attained again. After that, it is mixed again for 20 minutes to achieve an acidity of 70° Terner. At that point, the milk is mixed for a further hour and then chilled to 17°C, before being placed in bottles that are sealed hermetically with capsules and placed in a cold room at 4°C for further maturation and chilling. After 24 hours, the kumiss is ready for sale. It can be kept chilled for 25 days. After a few days at ambient temperature, the koumiss bubbles like champagne.

It thus appears that the development of a productive mare's milk sector is possible, even in regions where it is not traditional. It can be based not only on demands

from the medical sector (humanised milk, food for patients who have undergone digestive tract surgery, koumiss cures, cosmetology) but also on a demand from the general public which is certainly specific to certain cultures but has been seen to be able to win new markets. The major problem is therefore one of marketing, because the technical problems have been resolved, even if further improvements are still possible. In particular, meeting traditional market demands supposes the persistence of a certain extensification and local consumption via short market channels. At present, only a frozen product can circumvent this dilemma. Can other solutions, such as freeze-drying, be envisaged without changing the nature of the product? What would be our opinion of a frozen or freeze-dried wine? The problem is precisely the same. On the other hand, although airag can still be consumed in the steppes, it is more difficult to obtain supplies in towns, although this is possible through family or commercial channels. It is the globalisation and introduction into towns of products such as fruit juices or coca cola that are competing with airag, particularly among young people who aspire to a more modern lifestyle. Perhaps this will open the way to novel products based on mare's milk, but who can say?

6. Conclusion

For thousands of years, the consumption of mare's milk has played a central role in the identity and conviviality rites of the Mongols. Without exaggerating, it is possible to make a parallel with wine in France. This concept can certainly be extended to all the famous Turkic and Mongolian horse cultures, or about 30 million people.

How will this tradition evolve? That is very difficult to predict.

Technically, Russian animal production scientists had already shown that the intensification and standardisation of production were possible. Occasional experiments in Europe then confirmed these initial results. At that time the product was considered for its medical and/or cosmetological uses. It might now be possible to launch new products of interest to the general public, such as "mare's milk champagne" or fresh cheeses made using mixed milks. However, this can only be envisaged with the marketing support of major industrial groups. Indeed, it would be necessary to introduce an entirely novel product, which is a problematic proposition. However, the close similarity between mare's milk (or she-ass milk) and human milk is a strong marketing argument. The very low levels–or absence–of kappa caseins from these milks renders them hypoallergenic, so that their use can be recommended for infants with cow's milk intolerance. No other milk from a domestic animal benefits from this characteristic, but it also constitutes a drawback; because all its caseins are short, mare's milk cannot be used to make cheese unless it is mixed with milks from other species. Nevertheless, mare's milk (and she-ass milk) also displays other health benefits, the demonstration of which is now growing. This good "healthy" image could enable the launch of novel products. And we should add that, for an equivalent weight, a mare only produces a third of the methane generated by a cow [24]. This is a major advantage in terms of the greenhouse effect. The product could therefore develop its ecological image alongside its health benefits. However, it is still necessary to master the problems of lactose intolerance: indeed, these milks contain more than others, and although infants might digest them all without problems, the same does not apply in some adults, in whom the necessary enzyme is no longer expressed.

What will change for the 30 million people already consuming this milk? For those who remain breeders, it is likely that there will be no effect. Their lifestyle is balanced with the resources of their environment, and the system to which their culture belongs has remained stable for many centuries. On the other hand, those who migrate to towns to search for education or a more comfortable life are confronted by globalisation. While remaining attached to their culture and the products that can be supplied to them by family or commercial

networks, they are starting to become accustomed to the products of the modern world. This situation can be seen as a battle where global products will gradually supplant those of local origin. However, in my opinion, new products arising from a local culture are likely to be able to hold their ground. Indeed, as proposed by Clausewitz [25], ultimately, and regardless of the defeats suffered, the final advantage always remains with the defender.

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