

# Plastic Purity and Sacred Dairy: Microbes, Vitality and Standardisation in Mongolian Dairying

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## Abstract

By investigating the growing use of plastics within Mongolian dairying, this paper explores emerging microbial/social assemblages as they relate to local and imported ideas of purity and hygiene. Although many Mongolian herders prefer to use dairy equipment made from materials such as wood and hide, these items are increasingly being replaced by plastic ones. As new infrastructure connects northern herders to more extensive markets, it presents challenges for herders and for the microbial communities with whom they co-exist, placing herders under increasing pressures to compete with large-scale dairy enterprises that brand, package and distribute standardised dairy products. Looking at the changing material culture of Mongolian dairying and its relationships with microbial communities, this paper examines two emergent notions of purity: the first in which sterility is generated and contained and the second in which living dairy is harnessed and grown.

*Keywords:* Socialism; capitalism; packaging; hygiene; ritual; pasteurisation; fermentation; material culture

## Introduction

In 2015 the asphalt road that had recently been completed to link Ulaanbaatar, Mongolia's capital, to the northern province of Khövsgöl facilitated a surge in domestic tourism. According to Saskia's friend Turuu, the inauguration of the road was followed by a summer of fatal car accidents, an inundation of rubbish and the emptying of shops, ATMs and petrol stations from the unprepared Khövsgöl province (*aimag*). Along with this boom in tourism, the road has presented opportunities for northern herders to connect to new markets for their

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This article can be accessed at <https://doi.org/10.22439/cjas.v40i1.6556>.

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dairy at roadsides, in town centres and in Ulaanbaatar, where around 50 per cent of Mongolia's population lives. In Mongolia new roads enable connections for tourism, mining and the transportation of goods, as well as creating novel forms of separation (see Reichhardt 2021a; Jackson 2015; Pedersen and Bunkenborg 2012).

The development of new infrastructure has influenced local dairying practices, in part by enabling their connection to wider distribution networks (Reichhardt 2021a). When Björn travelled the road between 2016 and 2020 *gers* (nomadic felt dwellings) selling *airag* (fermented mare's milk) could be found stationed next to the road every couple of kilometres. Attempting to connect northern herders to new market potentials, the Danish-based Khövsgöl Dairy Project has helped to establish dairy collectives for commercial dairy production and distribution. In mid-June 2017 Björn, along with female herders from the delightfully named Blessed by Yak Cooperative (Sarlagiin Saikhan Khishig Khorshoo), was invited to a guest house by a team of NGO workers to attend a three-day-workshop that aimed to educate dairy cooperatives about commercialising local dairy production.

In one of the workshop's seminars the NGO workers advocated the use of disposable gloves, sterile dairy equipment and certain kinds of plastics as ways of improving food hygiene. One NGO educator gave a presentation explaining how milk is likely to spoil under 'unclean' milking conditions. They explained that traditional equipment such as wooden vessels, human hands, 'dirty' udders, 'dirty' milking environment and dust could cause bacterial contamination in dairy products. These ideas of hygiene contradict local understandings of purity, wherein milk from grazing livestock is considered by definition to be pure and is metonymically associated with the generation of life. Milk in Mongolia is used to purify the body and is frequently incorporated into rituals for purification. The workshop presented ideas of hygiene that saw milk as a potential carrier for biological contamination. In this view contamination needs to be purified through sterilisation and the dairy then needs to be contained before consumption is deemed safe (Rest 2021).

The consumption of ruminant milk and dairy products in the Khövsgöl province dates back at least 5,000 years (Wilkin et al. 2020). On the dry steppe lands of Inner Asia, milk provides a valuable nutritional resource. Throughout this long history the co-evolution of dairy microbes and the human gut microbiome accordant with cross-generational sharing of microbes as a form of heritage has had a significant impact on milk becoming a main part of the Mongolian diet and culture

(Reichhardt 2021b). Given that most Mongolians are lactose-intolerant, dairy microbes seem to play a major role in turning indigestible sugars into nutritional foods. However, as this article argues, over the last 100 years Mongolian dairying practices have undergone significant changes linked to the industrialisation of food production. Today milk is still deeply embedded in Mongolian pastoral society and a broad range of diverse dairy products is produced on the pastoral household level (Ruhmann 2019). Yet, the circumstances in which these foods are produced have changed following the introduction of new technologies, sterile equipment and a standardised approach to food security and human health. As this article will explore, the use of plastics play a significant role in these processes.

For the northern herders with whom Björn has studied, plastics, both the kinds recommended and those explicitly discouraged in the workshop above, are increasingly present in herding households. Ladles, milking buckets and large barrels for fermenting mare's milk are now frequently made out of plastic and can be found for sale in *sum* (district) and *aimag* centres. Plastic tools are popular as they are cheap, lightweight and widely available. For some herders the use of plastic materials is encouraged, like they were in the workshop above, as a means to disconnect from domestic microbial communities that are seen by contemporary industrial food processes to be a source of potential contamination. Although many Mongolian herders prefer to use dairy equipment made from traditional materials such as aspen wood, sheep's stomach or cow's hide, these materials are being increasingly replaced by plastic items. As capitalist markets provide cheap alternatives to traditional dairying equipment and open up new potentials for selling dairy, local herders must compete with large-scale Mongolian dairy enterprises that package and brand milk and use imported starter cultures. These changes present challenges for maintaining the heritage microbes which have co-existed with northern herding communities for centuries. These diverse microbial communities are supported by the use of leather bags, bare hands and wooden vessels, together with which they build, shape and maintain unique domestic microbial ecosystems (Dunn et al. 2021).

The increased presence of plastics in herding households reflects two interwoven trends associated with Mongolia's change from a planned socialist economy to a market economy in the early 1990s: the need for affordable domestic tools and the pressures for sterilisation and containment that come from attempts to access, or respond to, capitalist markets. This article will examine the two emergent and sometimes

incommensurable conceptions of purity accompanying changes in the material culture of dairying: the first in which sterility is regulated and symbionts contained, eradicated or replaced, and the second in which the living/life-affirming aspects of milk are harnessed and grown in partnership with non-human beings. Through examining these ideas of purity, we will look at the effects that the changing material culture of dairying have had on the characteristics of Mongolian dairy and the microbial lives which have been affected and affect Mongolian dairy cultures.

The ethnographic materials that support this paper come from Björn and Saskia's fieldwork in rural and urban Mongolia. Björn was mostly based in rural regions, engaging in herding and dairying practices and conducting interviews with pastoral herders in Khövsgöl, Bulgan and Dundgovi provinces during the summer months of 2017, 2018 and 2019 and spring 2020. Throughout his fieldwork he also collected samples of dairy products. Saskia carried out her fieldwork in Mongolia from 2009-2010 and again in 2013, 2015 and 2016. During these trips she worked mainly in the urban centre of Ulaanbaatar, visiting Buddhist temples and educational centres as well as participating in a wide variety of religious activities.

## **Hygiene as Purity: Regulated and Contained**

The history of the adoption and interpretation of modern forms of hygiene and purity in Mongolia dates back to the early years of the socialist Mongolian People's Republic (1921-1990). Before socialist hygiene campaigns began, the idea of purification was primarily religious and had moral connotations. Purification rituals were undertaken by shamans and Buddhist lamas who utilised fire and milk (Atwood 1996; King 2019). Following the adoption of Buddhism in the Mongolian Cultural Region, Mongolian medicine was often carried out by Buddhist lamas (Duoer 2019). As Daigengna Duoer (2019) writes of Mongolian medical practices before the collapse of the Qing Empire (from which Mongolia declared independence in 1911), the treatment of illness was thought to come from balancing the elements of wind, bile and phlegm. In addition to balancing these bodily elements through orally consumed medicines, lama doctors would incorporate astrological readings, recite mantras and carry out ritual activities (Duoer 2019). In socialist re-imaginings the ritual usage of fire and milk and the spiritual purification that they provided were replaced by Pasteurian understandings of hygiene and sanitation through water. In the socialist government's perspective,

water, and the cleanliness that it could provide, became a key medium through which an allegedly 'backward' culture could transform into a 'civilised' society.

During the socialist period Mongolian dairying was transformed by the introduction of new kinds of veterinary care and the industrialisation of milk production. Owen Lattimore (1962: 190) describes these changes in his observations of Mongolian *negdels* (socialist collectives) in the 1960s: 'In the old days, the Mongols kept milk in containers of wood or leather; now they use aluminium. They have also zealously adopted the idea that everything connected with milk must be clean and sanitary. For milking, making cheese or working in a butter-central, a white gown must be worn'.

Accompanying these changes to herding, dairy production and new kinds of medical interventions, ideas of purity and purification changed significantly. Through socialist education campaigns purity (*ariun chanar*) came to be associated with modern hygiene and cleanliness, often expressed in the term *ariun tsever*, meaning pure and clean (Stolpe 2008: 66). These new ideas of hygiene were presented in opposition to religious practices. As the renowned poet D. Natsagdorj (1906-1937) wrote in his treatise Infectious Disease:

Devils, demons, dragons, spirits,  
Gold and silver, exorcisms,  
Fees and offerings, pious worship,  
Do not do anything to help.

Drum and cymbal, bell and skull-drum.  
Useless, however much they're struck.

Sin, misfortune, evil spirits,  
Useless, though you watch and pray.

Living germs of catching illness,  
Tiniest of living creatures,  
Invisible to human eye,  
Will not be moved by silly noises.

Blessed with elixir, germs in saliva,  
Just the same with shared tobacco.  
Methodic scientific medicine  
Destroys them easily, without fuss.

(Translated by Bawden 2003: 1236)

Here Natsagdorj (who studied in Germany during the 1920s) identifies microbes (*bichil biyeten*) as dangerous living entities that pose a larger threat to human life than spiritual contamination and spirits. This perspective, along with its explicit anti-religious tendencies, was developed by the Politburo throughout the socialist period. By the 1950s the socialist government focused its efforts on cultural campaigns that aimed to educate rural areas about hygiene (Kaplonski and Sneath 2010: 854). Through these hygiene campaigns they introduced ideas of progress that reflected socialist ideas of modernity, ones which did not involve religious specialists (see Abrahms-Kavunenko 2019a). By the 1960s these programs had linked the notion of culture (*soyol*) and of being cultivated (*soyoltoi*) to secular education and hygiene (Stolpe 2008: 65f.). This emphasis on hygiene changed the material culture of rural Mongolian homes. *Gers* and houses were equipped with sinks, soap and tooth brushes so that socialist citizens could achieve and maintain cleanliness in the new era (Tserenkhand 2015).

The ideas that informed socialist approaches to hygiene and medicine followed from scientific developments in Europe. Before the widescale acceptance of the agentive nature of microbes in the mid to late 1800s, fermentation was often thought by Europeans to spontaneously arise from matter. As Bruno Latour (2019: 131) explains of the European intellectual community of the period, ‘fermentation could and had been explained, without the intervention of any living thing whatsoever, in a purely chemical way by the degradation of inert substances’. Although fermentation had been actively manipulated for countless centuries in dairying societies across the world, it was through the experiments carried out by Pasteur’s laboratories that European theorists were convinced that microbes were responsible for this transformation. The awareness that tiny living beings were key to the fermentation process and that some subset of these miniscule creatures were associated with disease, radically transformed understandings of fermentation, illness and hygiene. These breakthroughs enabled vaccination programs and innovative regimes of hygiene, along with new forms of industrialised food production and transportation. The reproduction and continuity of countless microbial communities on the planet was forever transformed.

Microbes were first noticed by Antonie van Leeuwenhoek (1632-1723), a Dutch experimenter who, after developing powerful lenses, was able to confirm the existence of tiny creatures moving around in water, creatures that he named (translated into English) animalcules.

Van Leeuwenhoek was opposed to the idea of spontaneous generation (that living things could arise from inanimate matter) and sought to understand the tiny organisms that he saw through his lenses (Lane 2015: 4). Though van Leeuwenhoek's discoveries were largely ignored in the following century (Lane 2015), Pasteur was able, along with his colleagues, antagonists and contemporaries, to provide evidence to support the agency of microbial life. In Pasteur's laboratory they experimentally separated substances from contaminants through the heating and use of swan-neck glass bottles. By containing sterilised materials in certain vessels and exposing others to the external air, they were able to demonstrate that souring only occurred when microbes were present. Through the separation and sterilisation of substances, they generated and replicated the proof that microbial forces, rather than spontaneous arisings, were key to causing both fermentation and some diseases.

Latour (1988) argues that the discoveries of Pasteur's laboratory enabled new rationalist orderings of human social relations that denied the interruptions of microbial contaminants. Suddenly microbes, agents previously unknown, were identified by European experimenters, regulators and administrators as powerful agents, more or less synonymous with contagion in spite of their nuanced activities, that needed to be destroyed and controlled (Latour 1988: 38-40). These developments laid the groundwork for the industrialisation of food production, including dairy products, without the contamination of microbes, some of which are harmful to human health. As Heather Paxson (2008: 22) notes, rather than working with the different terroir microbes present within different regions, milk was able to be sterilised and, if need be, reseeded with industrially generated starter-cultures.

In late July 2018, in order to collect dairy samples in the pasturelands surrounding Khatgal village in the Khövsgöl *aimag*, Björn visited Nyamka at her summer camp on the southeastern shores of Khövsgöl Lake. Björn had spent the past weeks visiting herder households to collect samples of a wide variety of dairy products for microbial, nutritional and genetic analyses. These included fresh and boiled milk, clotted cream (*öröm*), yoghurt (*tarag*) and dried sour curds (*aaruul*). Finding products made from cow's, rather than yak's, milk had proven to be a difficult task. Nyamka is a middle-aged female herder who was one of a few herders with cows (*ükher*) in the region. Though relatively difficult to rear in this region due to the cold climate, cows, as Nyamka explained, provided more milk than yaks. When asked about the



**Figure 1. A plastic ladle is used for stirring milk whilst heating it on the central stove.**

*Source:* Photo by Björn Reichhardt, July 2019.

presence of bacteria or microbes inside the milk, Nyamka took a colander from her kitchen shelf and stated that all of the bacteria were removed from the fresh milk when she filtered the milk through the colander before boiling it. According to Nyamka, bacteria and microbes were harmful and had no place in her dairy products. As she explained to Björn, while resuming stirring the heating milk with a plastic ladle, her cows' milk and the dairy products she produced were healthy and pure.

Nyamka's approach to microbes does not embody the kinds of post-Pasteurian perspectives that Paxson (Paxson and Helmreich 2014) describes in her research among raw milk producers in the United States. For the post-Pasteurians raw milk is 'a traditional food processed for safety by the action of good microbes – bacteria, yeast and molds – that can outcompete bad bugs for nutrients in milk' (Paxson and Helmreich 2014: 172). Instead, as Björn and his colleagues have found in their research, Mongolian herders tend to recognise bacteria and microbes as a threat, while simultaneously positively engaging with collective microbial communities on a daily basis. However, the relationships that Mongolian herders have with the living potentials contained within Mongolian dairy are under pressure from the

large-scale production of dairy and the standardisation of pastoral dairying practices that come from imported Pasteurian approaches to hygiene. These Pasteurian approaches are carried through the materials that are used for the sterile production and packaging of dairy products for sale in capitalist markets.

### **Packaging: Containing Purity**

Along with, and pre-dating, emerging theories and methods of pasteurisation, novel forms of food packaging have enabled the industrialisation of food systems. Innovations in packaging initially followed the needs of warfare as troops needed to have consistent food supplies to assist their campaigns. The invention of canned foods in the early nineteenth century was a response to Napoleon Bonaparte's challenge to French inventors to design ways for transporting food for his armies so that they wouldn't spoil (Risch 2009: 8089). By the end of the nineteenth century, in spite of these earlier innovations, as Gay Hawkins (2013: 69) notes, tinned foods were still largely seen as luxury items. Food packaging, such as hessian sacks, primarily serviced larger scale transportation to shops, from which most urban Europeans bought bulk foods to be stored in their own reusable containers. Milk was delivered door to door by a milkman providing households with milk decanted from a large milk can (Hawkins 2013: 69).

Over the course of the twentieth century, food packaging has been increasingly designed to keep food separate from contaminants, such as dust and bacteria, until it reaches the consumer's household, rather than for its transportation to grocery stores. Prior to the 1950s much of this householder-oriented packaging, when it occurred, was enabled through the use of glass, tins, paper and cardboard. As grocery stores in some countries began to move away from counter to self-service, new forms of packaging were invented to reflect changing consumer expectations, themselves being actively manipulated by advertising from food companies. In 1951 tetra packaging, cardboard packaging with a foil and plastic coating, was developed in Sweden to maintain the freshness and hygiene of grocery bought foodstuffs (Risch 2009: 8091). Other uses of plastics for food packaging in high-income countries rose exponentially from the 1950s onwards. Whilst the first applications of plastics, such as Bakelite, focused on the material's durability (Meikle 1995: 5), the plastics industry began to shift its focus from durability to disposability in the 1950s. This shift, as cultural

historian Jeffrey Meikle (1995: 190) argues, followed from the invention of new kinds of plastics such as polystyrene and the squeeze bottle made from polyethylene (PET) invented in 1947. Although new plastics such as blow-moulded polyethylene was initially more expensive than other materials such as glass, Meikle (1995: 190) notes how the industry switched its messaging in 1956 as the economic costs decreased. That year Lloyd Stouffer, the editor of *Modern Packaging Magazine* exclaimed that ‘the future of plastics is in the trash can’ (quoted in Hawkins 2018: 98) laying the gauntlet for the design of novel single-use plastics, departing from designers’ previous emphasis on their durability and re-usability.

As Hawkins (2013: 74) has pointed out, the design shift to single-use plastic packaging ‘generates a complex socio-material and economic paradox. Packages for single-use items have to perform as both tough *and* expendable’. Packaging, such as polyethylene (PET) bottles, must withstand the pressures of circulation and yet be a material that enables fleeting consumption to be then tossed aside (Hawkins 2013: 75). As she writes elsewhere:

Containing isn’t a static function; it is an action in itself, a dynamic capacity to hold and *re*-source. This socio-material and technical effect enacts a distinct form of *presentism* or ontology of the present. Commodities are immediately present and available on the shelf before you; they appear to have no history or origin, their source *is* the package and they are endlessly replaceable and reproducible (Hawkins 2018: 99).

Food branding has enabled and been enabled by the shift to self-service supermarkets and grocery stores. Individual packaging, which is designed to communicate directly with the consumer, has radically changed the nature of people’s relationships to food. Brands act to hide or romanticise the origins and the processes that have generated their products. As Hawkins (2018) argues consumers are encouraged to forget the history of the product and communicate with the presentism implied in branding. The complex worlds through which the food was grown or reared, the labour involved in production, packaging and transportation, along with the origins of the packaging itself (amongst other elements) is obscured.

Plastics carry with them, as Meikle (1997: 281) writes, a ‘hygienic aura’. Used as food packaging they have enabled foodstuffs to be separated from contaminants until immediately before their consumption. By providing industrially regulated containment, plastics have enabled the emergence of new kinds of foods to be distributed in places

they were absent, such as cheap to purchase noodles and individually wrapped sweets (see Chao 2019; McDougall 2021). The standard narrative of providing hygienic transportation and convenience has not gone unchallenged (see Pathak 2020a; 2020b). Rather than being neutral substances, plastics have been shown to leach chemical residues into the food which they carry (Bergman et al. 2013). Emerging research on endocrine disruptors suggests that many of the plasticisers and monomers, such as bisphenol A (BPA), that enable plastics to take on unique qualities may have serious consequences for human health, including being linked to cancer, obesity, diabetes, hormonal disruption, neurological disorders and reproductive problems (Bergman et al. 2013).

As pasteurisation and the standardisation of milk production has become instrumental in the distribution and sale of dairy products, transitions in the material culture surrounding dairying have reflected broader transitions in the places they are embedded. As a child growing up in northern England in the 1980s and Australia in the 1990s, Saskia remembers having glass milk bottles delivered to the door and exchanged for cleaned empty bottles in the morning. When she arrived in Australia in 1991, milk was delivered by open-doored milk vans, with charismatic teenage delivery boys hanging daringly from out the sides, skilfully sprinting up to the door to make deliveries before the heat of the day turned the milk sour. By the mid to late 1990s, these delivery boys began to disappear and milk in Australia (along with milk alternatives, first arriving in the form of soymilk) came to be found more and more often encased in tetra-packaging and one or two litre plastic cartons. In Australia, while cardboard packaging is still common, plastics, which were already in use to contain yoghurts and supermarket cheese, came to take over the role of displaying the pure whiteness of milk previously glimpsed through condensed droplets, glistening on glass bottles and daily transported to one's porch.

When Saskia was first in Ulaanbaatar in 2009, most people purchased their milk in individual packages from the local store. Yet occasionally near her apartment building, there was a man who could be seen lading out fresh milk to urban dwellers. At this time the separation between the inner city and the countryside was less clearly defined than it was a decade later. In part this was because herders could still bring their animals into the city to graze along the river beds, particularly in the Dund river bed, a practice which was banned sometime after the spring of 2010. It was not uncommon before the expulsion of herds

from the city limits to see apartment dwellers wrestling a live sheep up the stairs or to see a couple blowtorching a freshly slaughtered animal out on the street.

In Mongolia's urban centres dairy, like other forms of consumables, is now frequently bought in clear plastic bottles, plastic containers, coated cardboard and tetra-packaging. In the centre of the small town of Khatgal, in the Khövsgöl *aimag*, the shelves of local shops and markets offer small amounts of fresh dairy products provided by local pastoralists, and these must compete with industrially produced foods with brightly branded packaging including milk, candy and cans of beer. In Ulaanbaatar's supermarkets plastic containers, cardboard milk cartons with plastic lids or tetra-packed milk frequently link themselves to purity and nomadic lifestyles through their branding as 'pure' (*tsever*), 'beautiful' (*goyo*) and 'good' (*sain*). The colours used in packaging tend to be white and blue as white links milk to purity (exemplified by the colour of milk itself) and blue is linked to the clarity of a clear blue sky (*tenger*), the qualities of which are exalted in rituals and Buddhist practices (see Abrahms-Kavunenko 2019a). Like large-scale dairy produced in other nations, milk is pasteurised before it is packaged to ensure that microbial contaminants are not present.

In Mongolia consumption of single-use plastics has drastically increased over the last decades. In 2019 The Asia Foundation (2019) reported that the amount of garbage produced in Ulaanbaatar had increased by seven times in the previous decade. The capital is a high waste producing city with each urbanite creating over one kilogram of waste per person per day, without including recyclables (Byamba and Ishikawa 2017: 6). In 2015, when Saskia was spending time in Ulaanbaatar, friends told her that they had noticed increasing amounts of rubbish littering the rivers, and that much of it was plastic. For Saskia's friend Turuu, increasing single-use packets were reflective of, and instantiated, growing wealth inequality in the city. As he told Saskia small shops in Ulaanbaatar's *ger* neighbourhoods<sup>1</sup> often divide larger packages into smaller, cheap to purchase plastic-wrapped bags so that people with very little cash can buy food. This he said was a sign of increasing separation between the rich and the poor in the city. As Turuu explained:

People there [in the *ger* districts] buy sunflower oil by the gram. They don't sell it anymore in a full bottle... you get ten grams of oil. And sheep intestines are in grams, in little packets... So people are living there buying a gram of sunflower oil and people living here [in the centre of

the city]... before there was more connection between them. I was in one apartment, and there was always three or four very poor families, but we shared things. When you killed a sheep you gave the intestines to this family for free, it's like the community helping each other... Now in these apartments you don't see a poor guy. And in these kind of *ger* districts you don't see a rich man living there. So it's kind of literally separated.

Here the separation of food into smaller packages is considered a demonstration of the increasing divisions between the wealthy and the poor. The purchase of smaller and more expensive (per unit measure) portions of food meets short-term needs for those who live hand to mouth. Small shops in the *ger* neighbourhoods are themselves generally making very small amounts of money which they derive from dividing larger packets into ever smaller containers. Here separation and containment have co-arisen with growing wealth inequalities.

### **Living Milk and Purification: Harnessed and Grown**

The offering of milk or dairy is not an unusual sight in the countryside or the city as a means to purify obstacles, spiritual pollution and bad karma. It is common for rural mothers to offer the first cup of milk tea as an oblation standing beneath the vast skies outside of their *ger*, a practice that is carried out from balconies and windows in Ulaanbaatar. In Mongolia dairy in all its forms is sacred and makes good offerings when people travel to their homelands (*nutag*), visit Buddhist temples and go to pilgrimage sites. Upon visiting the now destroyed Mandushir Khiid (Manjusri Temple), to the south of Ulaanbaatar, one can see milk and dairy products smeared on the mouths of Buddhist paintings of *burkhan* (Buddhas/bodhisattvas) that are depicted on the walls of the south facing meditation caves. Making oblations of milk is an important part of most pilgrimages. It is common to offer milk oblations whilst encircling sacred sites in the countryside. At Eej Khad (mother rock) people offer milk whilst circumambulating the sacred rock before requesting to her to grant one's wishes. On long journeys people often stop to offer milk at the sacred rock cairns (*ovoo*s) that are found on mountain passes, sometimes leaving them in tetra-packaging (see Abrahms-Kavunenko 2022).

Milk is often poured onto the back of horses at the start of a race or upon vehicles (including trains) before a journey is undertaken. Used in this way it is believed to purify obstacles. When dairy *khöröngö*, starter cultures in form of, for example, yoghurt (*tarag*), is passed on cross-generationally from mother to daughter, milk becomes a reminder of the bond between mother and child who are connected through

breastmilk (Reichhardt 2021b, Thrift 2014). Milk and dairy products are synonymous with purity, an idea which, as Eric Thrift (2014: 498) writes, 'encompasses goodness'. The colour white, as associated with dairy, is often used to describe that which is pure and essentially good. Having thoughts unclouded by harmful motivations is known as *tsagaan setgel* (white mind/thought) (Thrift 2014: 498). On some days in the Buddhist calendar meat is abstained from and only white foods (*tsagaan khool*) are eaten. Some ritual specialists and lay practitioners (Buddhist, shaman and other) abstain from meat when they are preparing for rituals as this is sometimes thought to offer spiritual purification (Abrahms-Kavunenko 2019a). Saskia was told by many urbanites that herders only ate white foods in the summer months, as a way of clearing out the digestive system and cleansing oneself spiritually. In recent years as vegetarian and vegan diets linked to new religious movements have become more popular in the capital, these movements, initially at least, tended to use the term *tsagaan khool* 'white foods' to refer to vegetarianism, before it came to be replaced by the now common Cyrillic transliteration of the term vegan (Abrahms-Kavunenko 2019a). These associations tend to strengthen existing notions of dairy as purity, even though maintaining a vegetarian diet all year is uncommon.

In Mongolia, along with the broader encompassing notion of *energi* (energy), two energetic systems are thought to circle within and outside of the body (see Abrahms-Kavunenko 2020; Humphrey and Ujeed 2012). One of these is *khishig* which circles around the body externally and can be harnessed to enable growth. Among the Buryat herder households, with whom Rebecca Empson (2007: 114-115) lived in northern Mongolia, the energy of *khishig* as she writes:

Refers to the concept of a life-force or animating essence that can be understood through actions that involve attending to a part or portion that fuels a whole. Because it is mobile, the exact place or property of this animating essence is difficult to locate. The uncertain residence or property of fortune means that people take daily precautions so as not to lose it or let it slip away unnoticed to outsiders).

In order to maintain the good fortune and energies of *khishig*, the herding family, with whom Empson lived, would ensure that they kept a small portion of dairy for the home when they were selling milk or cream. In this way a piece of what is being sold is separated and retained, ensuring that the family's *khishig* does not depart with that which has been sold (Empson 2012: 122). *Khishig* is also associated with

the idea of the act of gathering or calling and growth (Abrahms-Kavunenko 2019b; 2020). Dairy, through its connections to the maternal bond and to *khishig*, is linked with generation and multiplication of good fortune.<sup>2</sup>

Likewise metonymically related to growth, the starter culture *khöröngö*, used for fermenting dairy, literally means capital, wealth and heritage (Reichhardt 2021b). Yoghurt-based starter cultures are shared across generations following matrilineal kinship relations. These microbial communities are seasonally stored, dried or frozen during winter and reactivated in the spring to inoculate the new dairying cycle. Herders rely on back-slopping techniques to produce fresh yoghurt: a portion of the daily batch is taken away and reserved for inducing fermentation in the batch the following day. Horse herders are known to travel great distances to acquire specific starter cultures for producing particularly flavoursome fermented horse milk (*airag*). Starter cultures are important elements of establishing and sustaining social and economic relationships between pastoral households (Reichhardt 2021b). If a household's *tarag* (yoghurt) fermentation fails, lactic ferments, such as goat yoghurt, are often purchased from other households in exchange for other dairy products, candy or money (Reichhardt et al. 2021). The character of the starter culture is measured by the qualities of the dairy it produces, and this can influence the relationships between households. As it was explained to Björn, a good and stable lactic ferment has the ability to sustain neighbourly relationships, while a starter culture that does not work well might, to some extent, disrupt cordial relations.

Dairy *khöröngö* form microbial assemblages that generate value and induce growth. *Khöröngö* proliferates for years and generations, constituting biosocial forms of heritage. The lives of dairy microbes are deeply enmeshed with their human co-habitants and foster more-than-human relationships between humans, animals and their shared ecologies. However, with the ongoing stigmatisation of microbes and the adoption of modern hygiene and sterility practices, these relationships are increasingly under threat. The large-scale production of dairy products such as cheese and yoghurts in most industrialised contexts relies upon reseeded milk products with microbes from standardised cultures that create fermentation processes in reliable ways only after the milk has been heated (pasteurised) to remove unwanted contaminants (Paxson 2008: 22).<sup>3</sup> This is also true for both pastoral dairying and the dairy industry in Mongolia. On the household level, fresh milk

is heated up to approximately 60-70°C for 40-60 minutes, a process through which most pathogenic and other microbes are killed (Rest 2021). During a conference in 2019, organised by Björn and his colleagues in Ulaanbaatar, a representative of one of Mongolia's largest dairies described how the company relies on imported starter cultures from Chr. Hansen, an internationally renowned biotechnology company based in Denmark. Assuming that Chr. Hansen provided high quality lactic ferments, the representative explained that the quality of local starter cultures remains unknown as it has not been studied for industrial purposes.<sup>4</sup>

Local dairy microbes actively contribute to sustaining microbial diversity in dairy foods and, consequently, the human gut microbiome, which is key for human health. Studies have shown that decreasing microbial diversity in the human gut microbiome – often related to the transition from a rural, artisanal to an urban, industrialised diet and lifestyle – leads to higher risks for illness and disease for adult humans (Blaser 2014; Sonnenburg and Sonnenburg 2019; Warinner et al. 2015). These studies suggest that a decrease in microbial diversity might bring unfavourable long-term health effects. Facilitated by recent changes in Mongolian infrastructure, and paired with the fact that artisanal, homemade dairy products have to increasingly compete with industrial foods – which now fill the shelves of rural and urban Mongolian stores – a decreasing diversity of dairy products may lead to a severe alteration of herders' long-term health and further the predicament of nutritional health in Mongolia (Bromage et al. 2020).

In 2018 Björn visited a household of horse herders who produced and sold *airag* in the Khövsgöl province. The family ran a small bistro at the roadside of the main road leading to Khatgal, from which they sold deep-fried dumplings and fermented mare's milk from large, blue plastic barrels (*khökh sav*). While Khishigee, the oldest daughter of the household, was being interviewed, her sisters filled hand-rolled dough with fresh minced meat and then skilfully folded it into delicious *khuushuur* (deep fried dumplings). A group of travellers thirsty for *airag* arrived and ordered several litres. So that the customers would not have to wait for too long, one of the girls jumped up, abandoning her task of cutting meat for the dumplings and rushed towards the blue barrel. Before she could reach it, Khishigee was quick to intervene and yelled to her sister to 'wash your hands!' As she resumed the interview, Khishigee explained that one should never mix meat and milk since the latter is a substance of purity which can be polluted through

its contact with meat. As she continued, she pointed out that fermenting mare's milk was a delicate procedure. She explained that it is important to frequently and carefully stir the mixture of *airag* and fresh mare's milk, especially when using plastic barrels. If the *airag* is not stirred properly, it will become too strong (*khatuu*) and bitter, with too strong an alcoholic taste. Plastic barrels, she told Björn, should not be directly exposed to sunlight. Doing so would release the undesired taste of plastics into the *airag*. Her family therefore stores most of their *airag* inside an *extra ger* without a central stove. This storage provides for a cool, shadowy environment where the *airag* can ferment properly and develop its special taste. This careful treatment of *airag* fermentation indicates specific forms of microbial care (Rest 2021). Several herder women have described to Björn that dairying can be compared to child-care (Reichhardt et al. 2021).

Although the herders that Björn communicated with did not perceive microbes as individual agents that transform their milk into



**Figure 2. Milk containers in Khövsgöl Province. Herders use various materials for storing and processing milk.**

Source: Photo by Björn Reichhardt, July 2019.

dairy products, they strongly recognised their collective vibrancy and considered them to be alive. Local herders frequently described to Björn that they preferred their *airag* fizzy, and particularly enjoyed the sound of the ferment making a hissing sound, which indicates that it is alive (*amid airag*). If the flavour of the *airag* creates a tingling sensation on the tongue, it is said to animate those who drink it (Reichhardt 2021b). Milk and dairy products are essential elements of co-constitutive processes of growth. This growth can be of various natures, including biological, social and economic growth, as well as individual and collective growth.

In spite of the microbial care with which herders look after their dairy, the imported plastic barrels that Khishigee used presents particular kinds of hazards in contemporary Mongolian dairying. The use of this particular kind of plastic to store dairy was overtly discouraged in the three-day workshop attended by Björn at the beginning of this article. The type of plastic that the large cheap blue barrels are made



**Figure 3. Fermenting mare's milk in Dundgovi Province. Large blue plastic barrels have widely replaced handmade leather bags.**

Source: Photo by Björn Reichhardt, September 2019.

from are not designed for food storage, particularly not liquids which contain fats. A poster, written in Mongolian, handed out during the workshop pictured a large blue plastic barrel and read 'Are you sure that the vessels into which you fill your water, *airag*, yoghurt and milk, and the ladle you use for stirring are not harmful and toxic?' (translated by Björn). The poster pointed to the hazards that non-standardised dairy equipment could pose. The subtitle read: 'By using equipment that adheres to standards, you can prevent suffering from illness and ensure food security.' Although this small workshop emphasised the disadvantages of using cheap and widely used plastics, they remain attractive alternatives both to the previously widely used materials such as wood and hide, and the more expensive, less available and superficially similar items recommended by the workshop.

Although many herders reported to Björn that they would prefer using organic materials for milk fermentation, they simultaneously pointed out how the production skills for handcrafting equipment from wood or hides were becoming increasingly rare. Plastics such as polyethylene terephthalate (PET) bottles and the common large blue plastic containers of dubious provenance were frequently used and re-used for storing *airag* in, because these products were cheap and widely available for herders. The use of plastic equipment, being the most affordable and available at local markets, has become inevitable for many. By the summer of 2020, the Khövsgöl Dairy Project had successfully established a collectively run dairy facility for the women of the Blessed by Yak Cooperative in Khatgal. There, their animals' milk was processed in sterile production environments that adhered to Western hygiene standards with the goal of tapping into extended regional markets.

## Conclusion

As the generation of market possibilities, enabled by the new road, opens up potentials for dairying in the Khövsgöl *aimag*, it also presents challenges. On the one hand, the road enables the further incorporation of northern herders into national markets promoting economic integration of local dairy enterprises into far-reaching distribution networks. On the other, northern herders must increasingly compete with branded packaged foods and fulfil hygiene standards necessary for their own packaging and sale of dairy. Co-emergent with these dynamics, the use of plastics, at least in dairying, has increased largely due to the economic pressures that come from living in a country which has

embraced market capitalism (see Abrahms-Kavunenko 2019b). Plastic packaging (and some plastics used in production) instantiate imported ideas of purity and hygiene, wherein milk products must be contained after being pasteurised to prevent contamination. In order to sell dairy, northern herding communities must compete in markets that are saturated with packaged well-known dairy brands that incorporate imported standardised starter cultures. Ironically, the branding of these dairy products utilise the iconic imagery of rural herders to sell their products, specifically the use of imagery, colours and words associated with nomadic life.

Due to the relative remoteness of northern Mongolian herders and the very recent infrastructural development that have brought these communities closer into the fold of emerging capitalist economies, one can see how the sudden expansion of food packaging and its associated waste situates plastics as a seemingly inevitable outcome of the large-scale production and distribution of foodstuffs. This is a dynamic that requires further interrogation, even if the plastics involved meet international food safety standards. What is clear is that changing economies of dairy, which are materialised in an increasing reliance on plastic domestic tools and the competition with, or adoption of, new forms of packaging, are transforming northern dairying cultures.

And what of the heritage microbes and microbial communities living with herders in the north? Competing ideas of hygiene and purity present challenges for maintaining food safety whilst maintaining the diversity of Mongolian microbial communities which have co-existed with humans and herding animals in the region for centuries. These microbes have their own lives, yet their existence is reliant upon the herders who exchange, harness and assist in their growth. Dairy represents growth and purification in Mongolia, yet in order to meet international standards of industrial food production and distribution and to compete with the brightly coloured packages promising purity in local stores, the lives of diverse local microbes and the health properties that they promote are under threat.

## ACKNOWLEDGEMENTS

We would like to acknowledge and thank the people in Mongolia who have invited us into their homes, chatted to us at Buddhist temples and rituals, attended workshops with us and welcomed us as we

participated in dairying. This article would not have been possible without the support of the Center of Contemporary Buddhist Studies and colleagues at the Cross-Cultural and Regional Studies at the University of Copenhagen. Many thanks go to the participants of the Plastic Asia workshop, Trine Brox, Amy Holmes-Tagchundarpa, Kalzang Dorje Bhutia, Gauri Pathak, Deirdre McKay and Nadine Plachta. The writing and research for this article has been made possible by the funding received from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 890728 as well as by the European Research Council Starting Grant No. 804884 as part of the project 'Dairy Cultures: Gene-Culture-Microbiome Evolution and the Ancient Invention of Dairy Foods'. Thanks also to Shultz Abrahms-Kavunenko for his dialogical and editorial skills and Zoljargal Enkh-Amgalan for contributing to the ethnographic work of this paper.

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## NOTES

- 1 Districts made up of fenced areas with one or multiple felt dwellings (*gers*) with small concrete buildings.
- 2 See also Fijn (2011) on the maternal bond that forms between herding women and young animals.
- 3 In her research with small-scale raw dairy producers in the United States, Paxson (Paxson and Helmreich 2014: 167) notes that her interlocutors oppose the idea that microbes in foods are synonymous with contagion. In contrast to the forces of microbial standardisation, she writes that 'they seek to rescue indigenous cultures - microbial but also human - from industrial homogeneity' (Paxson 2008: 23).
- 4 See also Rest (2021).

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