

# Forgotten Stories of Yogurt: Cultivating Multispecies Wisdom

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## Abstract

Thanks to recent human microbiome research, we are gradually gaining a better understanding of the vital role that microbial diversity plays in health and well-being. However, as industrial food production standardizes fermented foods—making mono-culture “probiotics”—we risk losing both microbial diversity and the cultural heritage of how to sustain it. This article takes yogurt as a case study to explore the ongoing disappearance of microbial biodiversity and its relationship to food practices. As an ancient fermentation product, yogurt has a rich biocultural heritage that is reflected in its diverse preparation methods—including, as this article describes, using ants and spring rain. I employed autoethnography as a form of qualitative inquiry to trace the stories of yogurt passed down through generations in my community from the Rhodope Mountains. Here multispecies and sensory approaches allowed me to delve into the intimate cultural and personal aspects of yogurt making. The stories I gathered from Bulgaria and Turkey reveal the richness of interspecies and sensorial connections involved in yogurt production. I argue that these practices cultivate diverse multispecies relationships and provide valuable insights into the broader loss of biocultural diversity. This article is thus an invitation to reflect on the ways in which the contemporary biodiversity crisis is related to the loss of local cultural knowledge, skills, and wisdom that have long nurtured diverse and generative multispecies relationships.

## Keywords

microbial diversity, traditional yogurt-making practices, multispecies stories, ethnobiology of fermentation, biocultural diversity

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## Introduction

Aunt Gülşen added a few pieces of wood to the stove and rushed to boil the fresh milk that the neighbor had brought. ‘Let’s cook and ferment it before cooling,’ she explained, ‘so it can rest overnight to be ready before we get up in the morning.’ This was a routine practice for her, something that has been happening since she can remember. While keeping an eye on the milk heating in the pot, Aunt Gülşen continued her preparations<sup>1</sup>...

In the last three decades, yogurt, with its various health promises, has become a popular “probiotic”<sup>2</sup> product widely available in many grocery stores all around the world. However, most commercial yogurt today only contains two strains of bacteria—*Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophiles*—mainly supplied by one company.<sup>3</sup> Food scientist Harold McGee (2004, p. 45) warns of the “biological narrowing” of fermented products that can alter their “flavor, consistency, and health value.” The industrialization of food poses not only a threat to its microbial diversity but also to the biocultural diversity of food production and the unique flavors that come with it.

This is especially worrying as recent microbiome research (Peterson et al. 2009; Huttenhower et al. 2012; Cho and Martin 2012) continues to raise concerns about our shrinking microbial diversity and its effects on human health (Blaser and Falkow 2009) and relation to current pandemics (Finlay et al. 2021). Collectively, these studies point to the microbial extinctions happening inside us and their relation to “western lifestyles” (Mosca, Leclerc, and Hugot 2016) and food habits (Singh et al. 2017). As Dominguez-Bello et al. (2018, p. 34) argue in their science article “Preserving Microbial Diversity,” it is crucial to preserve human microbial diversity in order “to maintain health and prevent many metabolic, immune, and cognitive diseases.” These warnings have caught public attention along with a widespread interest in probiotics and prebiotics<sup>4</sup> thanks in part to a revival in the popularity of fermentation practices (Leiper 2017; Lorimer 2016).

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This article explores the relationship between the loss of microbial biodiversity and food habits from a multispecies perspective. Unlike some current microbiome studies, here I approach the microbial diversity of fermented food not as mere numbers and specific individual species, but rather as multispecies relations coevolved and cultivated via traditional practices. Utilizing multispecies studies (Van Dooren, Kirksey, and Münster 2016) as a guide, this article delves into the lively relationships between different species and the ways in which they cocreate and shape each other. From a multispecies perspective, fermentation is a process where microbes, animals, and plants meet and thrive, where biodiversity becomes more than a gathering of species: it is a web of relations and interactions that holds its own stories. The ethnobiological insights from traditional yogurt-making practices reveal the multispecies stories at play, providing a lens through which we can rethink the wider loss of biocultural diversity.

While this article focuses on yoghurt, we are also losing many other traditional products, crafts, and multispecies relations that have been cultivated through generations. Environmental philosopher Ricardo Rozzi (2013, p. 9) recognizes this “biocultural homogenization,” which he describes as the main, “but little perceived, global driver of losses of biological and cultural diversity that frequently entail social and environmental injustices.” Just as monoculture agriculture homogenizes farming practices, the same process of simplification and standardization is also happening on a micro level, with the monoculturing of microorganisms in industrial food production.

Traditional fermented products hold rich microbial diversity and local microbial environments are inseparable from the foodstuffs produced within them (Katz 2016). In other words, in the face of industrial homogenization, traditional fermentation methods still reflect the diverse flavors of the “microbial terroir” (Gilbert, van der Lelie, and Zarraonaindia 2014; Kergourlay et al. 2015) each location holds. In a recent study, a group of Bulgarian microbiologists analyzed the microbial content of homemade yogurts in Bulgaria (Velikova et al. 2018). They were able to identify 76 isolated strains belonging to a single group of lactic acid bacteria (LAB), including some that are part of the “endemic yogurt microflora” (Velikova et al. 2018, p. 1206). Of the areas they studied, they found that the yogurts containing the highest biodiversity of LAB are those from the Rhodope Mountains. This is the region in which I have collected the traditional yogurt practices described in this article. Velikova et al. (2018, p. 1216) conclude their paper by noting that “the specific natural and climatic conditions in Bulgaria” historically “have contributed to the spontaneous evolution of yogurt starter cultures with unique features.”

Furthermore, I believe that the yogurt-making traditions of that region deserve closer attention. I see biocultural practices as integral to the fermentation processes that nurture the products’ microbial diversity. Barthel, Crumley, and Svedin (2013, p. 1) use the term “biocultural refugia” to define diversity hotspots that “carry knowledge and experiences about the practical

management of how to produce food while stewarding biodiversity and ecosystem services.” According to them, traditional food practices are “closely linked to the maintenance of entire landscapes, habitats” and are essential for the “survival of locally evolved species” (Barthel, Crumley, and Svedin 2013, p. 4). As yogurt microbes and recipes are standardized for the industrial production of yogurt, my concern is that we are losing the biocultural heritages of how to sustain diverse multispecies relations.

My initial interest in fermentation comes from my personal history, which fundamentally shaped my perspective on food. I grew up in a small village in the Rhodope Mountains in Bulgaria, where traditional dairy practices such as making yogurt and cheese at home were common. I still remember how surprised I was the first time I encountered store-bought yogurt in my childhood. Why buy yogurt, I thought, when it is so easy to make? This article is about yogurt-making practices passed from generation to generation as part of my own community.

While tracing local traditional yogurt practices, I conducted multi-sited ethnographic fieldwork over two years with several visits to two different sites in Bulgaria and Turkey (Figure 1). These sites are the places where I spent the earlier part of my life and where my relatives still live. My family is part of the Turkish ethnic group in Bulgaria<sup>5</sup> and some members migrated to Turkey after the fall of the socialist system in 1989. My fieldwork locations include two remote rural sites: Şirinköy, a village on the Turkish island of Gökçeada and Nova Mahala, a village in the Rhodope Mountains of Bulgaria.

During this fieldwork, autoethnography (Buzard 2003), as a form of qualitative research, enabled me to incorporate my own experiences and connections. As an insider from the community, I could easily attune myself to people’s lives and participate in their daily practices. The use of autoethnography was particularly helpful in providing intimate insights into the cultural and personal aspects of yogurt-making.

In this exploration, I adopted sensory (Pink 2009, 2010, 2011) and multispecies (Kirksey and Helmreich 2010; Ogden, Hall, and Tanita 2013) ethnographic approaches to explore how people perceive and engage with multispecies encounters in food practices. The more I engaged with the dairy practices, the more I felt that fermentation is a fertile ground to deepen our multispecies understanding of food. Fermentation—as a mundane experience to which my participants can easily relate—provided me with an entry point to gather multispecies stories. Being native and familiar with the multisensoriality (Pink 2011) of yogurt-making helped me to orient myself in this journey.<sup>6</sup>

As an initial inquiry into the multispecies stories (Van Dooren and Rose 2016) of yogurt and the timely insights they can offer, this article is structured in four parts. The first part sets the scene by introducing yoghurt’s historical and cultural importance, as well as its ethnobiological aspects. The second part is dedicated to three forgotten stories of yogurt, where each has a different cultural practice of milk



**Figure 1.** Maps and fieldwork photos. The first row of images shows geographical locations of my fieldwork sites: Nova Mahala, a village in the Rhodope Mountains of Bulgaria, Şirinköy, a rural settlement on Gökçeada, the biggest Turkish island in the Aegean Sea (Google Earth and Google Maps). The photos in the second and third rows are from Nova Mahala and Şirinköy respectively, depicting foodscapes and various stages of the traditional yogurt-making process (photos by author).

fermentation. Here I perceive the stories of yogurt as carrying place-specific insights that can awaken our multispecies wisdom in a time of crisis. The third part further explores the sensorial and intuitive realm of yogurt making. Through the sensorial impressions of making homemade yogurt, it reveals how interspecies encounters are shaped by and shape our perceptions. The last part is an invitation to think deeply about multispecies relationships—those crafted and maintained by traditional fermentation practices and those upon which we depend.

## The Historical and Cultural Significance of Yogurt

We know that fermentation is an ancient practice that goes back long before the beginning of agriculture (Mintz 2011; Scott and Sullivan 2008). Throughout history, every culture has developed diverse fermentation methods to preserve its staple foods, which were essential for survival (Dunn and Sanchez 2021). Before canning and refrigeration, fermentation was the most widespread way of preserving food, along with salting,

sun-drying, smoking, and freezing in some regions (Tamang and Kailasapathy 2010). Despite this broad categorization, these methods are used together in most traditional food preservations.

Fresh milk, as an easily perishable food, especially requires preservation for its storage. Yogurt<sup>7</sup> was probably the earliest form of milk preservation. Archeologists associate the first dairy practices with the domestication of animals that began about 10,000 years ago in the ancient Middle East, covering some parts of modern Turkey (Peters et al. 1999). Evidence from this region suggests that early pastoral communities first domesticated goats and sheep, then cattle (Vigne and Helmer 2007). Afterward, they spread these domesticated animals to Europe along with the associated dairy practices.

According to Gibbons and Rinker (2015), the domestication of microbes likely occurred parallel to the domestication of plants and animals via fermentation practices. One of the oldest traces of fermented milk products—dating back to 5900–5800 BCE—was found in Çatalhöyük, Turkey, where protein residues in pottery are associated with yogurt-making (Rosenstock, Ebert, and Scheibner 2021, p. 267). Due to genetic lactose intolerance, Rosenstock, Ebert, and Scheibner

(2021, p. 257) note that “it is likely that prehistoric adults consumed not fresh milk but variants of lactose-reduced fermented milks and cheeses.”

Throughout the ages, herders around the world have used yogurt as an initial step to produce various dairy products, including different cheeses flavors that vary widely across regions. Cultured butter also requires the conversion of milk into yogurt, whereas buttermilk (*ayran* in Turkish) and *lassi* (a yogurt-based drink) are some of the byproducts of this process. The transformation of milk into yogurt needs a starter culture—which is called *maya* in Turkish. The word *maya* originates from Persian, and denotes “essence, substance” (*öz*, *hammadde* in Turkish),<sup>8</sup> and is also used in a figurative sense as “the essence of a human being.” One can easily blame a person’s *maya* if dissatisfied with their behavior. I use “culture,” “starter,” and “maya” interchangeably in this text to depict the multiplicity and contingency of its agency.

Ethnobiologists have already contributed to mounting literature around human–microbial relationships. Gary Paul Nabhan (2010, p. 183) was among the first to recognize the critical role of ethnobiologists in contextualizing “how human cultural and technological change may be affecting our ‘food cultures’—those in our fermenting vats, sourdough starters, vinegar mothers and our very own guts.” Inquiries into fermentation have been a fruitful avenue for collecting ethnobiological insights from traditional practices (Flachs and Orkin 2021; Quave and Pieroni 2014; Söukand et al. 2015; Yamin-Pasternak et al. 2014). Flachs and Orkin (2019), in their topical review on “Fermentation and the Ethnobiology of Microbial Entanglement,” argue that microbes deserve further ethnobiological attention, “not only as threats but also as complex and beneficial actors in our lives” (Flachs and Orkin 2019, p. 35). It is essential, they write, “to understand how socioecological practices including growing, preparing, and consuming fermented foods sustain microbial communities, heritage foodways, and human well-being” (Flachs and Orkin 2019, p. 35). Fermentation bridges the invisible world of microbes and the tangible world of food and culture.

Considering dynamic interactions between communities, food, and their ecosystems, Pieroni, Pawera, and Shah (2016, p. 54), in their paper “Gastronomic Ethnobiology,” point out that an “ethnobiological approach” to food should focus on “place-related history, culture, and philosophy, as well as [on] the spiritual aspect.” From an insider perspective, I would add that such an ethnobiological approach should be attentive to multispecies stories (Van Dooren and Rose 2016), which, through my research, extends to yogurt fermentation practices. The stories of yogurt I am going to share illuminate “the multitudes of lively agents that bring one another into being through entangled relations” (Van Dooren, Kirksey, and Münster 2016, p. 3).

In that sense, fermentation changes the microbial content of food, which in turn reflects the “microbial terroir” (Gilbert, van der Lelie, and Zarraonaindia 2014; Paxson 2010). It does more than preservation; it enriches flavors and makes food more

digestible and often less toxic (Katz 2012). Looking at fermentation practices, it becomes salient how traditional food practices and biodiversity are intimately linked. Invisible biodiverse elements become part of fermented products—captured by their taste and carried by the multispecies stories of how to produce them.

Crucially, yogurt is not only a staple food in many pastoral communities, but it is also a powerful medicinal agent with a range of therapeutic applications: internally, it is used to treat gastroenterological problems and poisonings; topically, it is recommended for providing relief from sunburn, used as a balm (in the form of fresh butter made from yogurt, either on its own or mixed with other ingredients) to soothe irritated skin and eczema, and even sometimes used to combat vaginal infections.

These multiple uses are a testament to yoghurt’s biocultural coevolution, which is further manifested in the diverse methods used to produce it. But what made yogurt so special? Microbiologist José I. Garabal (2007, p. 1) argues that the “fermentation process whereby milk is transformed has not changed to any great extent since humans discovered the process as a means of preserving food.” But this is not strictly true. As the following part of this article illuminates, diverse processes have evolved even within the relatively geographically close regions I focused on. Even though yogurt making is pretty simple, I was excited to hear about such diverse ways of making it. Each method harbors unique and localized recipes that are closely associated with the biocultural heritage. By acknowledging their deep histories, what follows invites you to explore some forgotten stories of yogurt, in which ants, plants, and rain emerge as protagonists.

## Forgotten Stories of Yogurt

In my search for diverse yogurt-making practices in Bulgaria and Turkey, I noticed that some of them were already at risk of being lost as they were hardly practiced anymore. My intention in this part is to record and thereby preserve the multispecies stories of three methods of yogurt fermentation before they are completely lost.

The first method involves mixing mashed nettle (*Urtica dioica*) roots with milk. Here, the soil microbes and root components likely play an important role in fermentation. Although there are references to practices using nettle leaves to make traditional cheeses (Fiol et al. 2016), my informants told me they only used the roots for yogurt making. This method, which is no longer practiced today, was used by villagers who spent long periods with their herds in the highlands during the summer when access to yogurt cultures was limited.

The second practice is burying a can of milk inside an ant colony overnight. Three of my interlocutors in Bulgaria talked about this old practice, one of whom had direct experience of it, albeit more than 50 years ago. Some records from ancient nomadic people in Anatolia (modern-day Turkey) suggested that they collected ant eggs (or possibly ant cocoons) to

ferment milk (Yurdakök 2013). Ali Rıza Yalman (2000), one of the pioneers of oral and local history studies in Turkey, notes this use of ants as “another type of yogurt starter” in his 1938 book *Cenupta Türkmen Oymakları* (Turkmen Tribes in the South). Yalman (2000, p. 521) writes that “If the nomads want to make yogurt and cannot find enough starter culture to make yogurt, they crush the tiny eggs of the ants sheltering under the stones in their palms. When you put this into the milk that was decided to be made into yogurt, that milk becomes yogurt.”<sup>9</sup> While researching this ancient method, I was surprised to hear that ants are used in some milk fermentation practices in India, too.<sup>10</sup> These geographically-separate uses of ants in yogurt fermentation led me to speculate that they could demonstrate a collective biocultural memory that has survived from the spread of ancient dairy practices, or they could be the result of convergent cultural evolution shaped by similar landscapes. Either way, it is clear that yogurt-making has rich multispecies stories full of wonder.

Biological aspects of the ants in fermentation may contribute to yogurt making. Colonies of ants evolved traits to maintain the health of the society that potentially extend to yogurt fermentation, expanding the intrigue of the multispecies interaction. In a discussion with biologists,<sup>11</sup> we developed three hypotheses on the transformative potential of ants in yogurt making. The central tenants of these hypotheses were developed by Rob Dunn, an expert in ant ecology and fermentation microbiology. The hypotheses relate to the acid the ants spread in the nest ecosystem and the microbes they partner with.

The first hypothesis is that the acid produced by the ants contributes to the texture and sour taste characteristic of yogurt. Many ants spray acid as a form of defense, to keep their dense societies and nests healthy. Interestingly, this acid is used to control microorganisms that may be harmful to the ants (Pull et al. 2018; Tranter and Hughes 2015). Thus, the effects of this acid may extend to the yogurt ferment and prevent fungi and bacteria from growing that could spoil the milk, add an acidic flavor, and promote coagulation. This chemical process would require the use of the acids in precise proportions, meaning that more ants might be needed to make more yogurt.

The second hypothesis is that the microorganisms originating in the ant colonies act as a starter culture. The ants harbor microbes in their mouths and bodies that likely aid the digestion of their sugar-rich diet of aphid honeydew (Ivens and Kronauer 2022; Zheng et al. 2022). These microbes are closely related to many of those found in our ferments. In this case, even a small amount of these microorganisms could continue to grow in the milk, potentially transforming a relatively large volume of it. This explanation could account for the use of ant eggs to ferment the milk.

The third hypothesis posits that the synergistic effect of ant acid and microorganisms creates conditions favorable environment for the growth of fermentative bacteria. Interestingly, the ants also consume the acid, which favors these bacteria over other nondesirable microbes (Tragust et al. 2020). Furthermore, the conditions of the ant colony may support the fermentation practice of burying the milk in the colony.

Before the invention of glass jars, people likely used clay or wooden containers to store their milk, and these porous materials would have allowed the infusion of acids and microbes into the milk. Additionally, the stable and suitable temperature provided by the nest might favor yogurt fermentation (Kadochová and Frouz 2013).

We still do not know for sure what was happening in these practices, and it is possible that some of these fermentation pathways are occurring simultaneously. The sad thing is that these practices may soon disappear along with their secrets before we reveal them.<sup>12</sup>

The final yogurt-making practice I will share needs the spirit of spring to refresh the starter culture. It relies on the help of the spring rains, collected annually during the first days of May. It is the time of *Hidirellez* (known as *ederlezi* in the Balkans), an ancient folkloric festival that celebrates the beginning of spring. According to my interlocutors in Bulgaria, who learned this method from their grandmothers, the existing yogurt culture should be mixed with the collected water of the first spring rains to refresh it. Some even use this water directly as a starter to make yogurt, while others store the collected springtime rainwater to enliven the old yogurt culture throughout the year. Notably, recent studies show that rainwater has its own microbiome, which changes seasonally (Cáliz et al. 2018). With this practice, it seems that yogurt-makers are harvesting seasonal airborne microbes to create a new yogurt culture.

A similar yogurt-making practice is one in which people in Anatolia collect the morning dew of plants during the first days of spring to use as a starter culture. This yogurt is called *Hidirellez yoğurdu* (yogurt of *Hidirellez*) or *mayasız yoğurt* (yogurt without starter) (Önal 2008, p. 1187).<sup>13</sup> The latter name indicates that this yogurt is made without using a small amount of previously fermented products. According to Mehmet Naci Önal, who recorded the rituals of *Hidirellez* in the villages of southwestern Turkey, people believe that “on the day of *Hidirellez*, something happens in the air so that yogurt and dough without a starter can ferment” (1187). In fact, people assert that “*mayasız* yogurt only happens during *Hidirellez*, not any other time!” (1187).

Önal (2008) provides further details on the rituals involved in preparing *Hidirellez* yogurt. During *Hidirellez*, in the villages of southwestern Turkey, women wake up before sunrise and go to the meadows (1187). They collect dew from flowers in a small bowl, which will be used to ferment the milk. Often, three small stones or flowers are placed in the bowl with prayers as the dew water is added to the milk that morning. On the microbial side of this story, it is worth noting that these plants might contain aphid honeydew (Douglas 2009), a sugar-rich liquid secreted by tiny insects that attracts and harbors diverse microbes. Interestingly, in some of these villages, Önal also notes that people collect water from ant colonies before sunrise on *Hidirellez* to ferment bread (Önal 2008, p. 1201). This yogurt and bread made with dew water are praised for their unique taste and are believed to have healing properties. These yogurt-making traditions of



*Hidirellez* highlight the intertwined past of bread and yogurt-making as ancient fermentation practices.

Solmaz Karabaşa, another folklorist, studied the traditions and rituals of *Hidirellez* among villagers in northwest Turkey. She describes that on the night of *Hidirellez*, women collect the dew from chamomile flowers to ferment milk (Karabaşa 2017, p. 60).<sup>14</sup> The local name of these chamomile flowers is “yogurt flowers,” revealing an intimate link between linguistic and biocultural diversity. They also use this yogurt water as a starter for preparing sourdough bread. Thereafter, the starter cultures that originated from these precursors are used throughout the year. In all these cases, fermentation is a lively relationship whose spirit must be refreshed from time to time. Ursula Le Guin (1971, p. 158) nicely captures this seasonal kiss of life when she writes, “Love doesn’t just sit there, like a stone, it has to be made, like bread; remade all the time, made new.”

These multispecies stories of yogurt reveal the intimate connections between humans and other species, including microbes. Collectively they broaden our view of biodiversity to encompass cultural traditions and practices that impact and reflect our interactions with other species. The following section extends this discussion into the realm of the senses and examines yogurt-making as a multisensory experience that is both shaped by and shapes multispecies interactions in a reciprocal manner. Fermentation, in this context, can be seen as nothing but the alchemy of mutual transformation.

## Making Home-Made Yogurt

In the flurry of preparations, while washing the jars for yogurt, the milk almost boiled over. She swiftly took it away from the stove and left it outside on the terrace to cool. ‘Be careful with the cats; don’t let them spill the milk!’ she warned. As the work continued, old yogurt was taken out of the refrigerator and allowed to warm up for use as a starter. She smelled it, her face souring, as if mirroring its smell. ‘Hmm, we need to thin it; otherwise, the new yogurt will be sour.’ She mixed some water

with the old yogurt. ‘Let’s have it rest a while, then we can use the water rising to the top as maya...’

Despite the ever-increasing availability of store-bought yogurt, many people in the region of the Rhodope Mountains of Bulgaria in which I grew up continue to make their yogurt at home using traditional methods. All they need is a small spoon of yogurt, *maya*, for seeding. The *maya* is obtained from a yogurt substance kept from a previous yogurt or borrowed from a neighbor. *Maya* is the live starter culture that harbors a wide array of bacteria, yeasts, and viruses. This microbial community and its interactions are crucial for the metamorphosis of milk into yogurt and other dairy products. And such transformation is closely related to the sensory attributes (tactile, taste, smell) of cultured dairy foods.

The flavor of traditional yoghurt can vary significantly based on the source of its milk and starter culture, as well as the method and duration of its fermentation. Industrially produced yogurts that are sweet and creamy, often with added fruit or flavorings, are a market adaptation to cater to consumers who may be unfamiliar with the strong flavors of yogurt. Some of my participants jokingly referred to these types of mass-produced products as “fake” yogurts. In order to distinguish “fake” ones, one needs to sense the multispecies interactions that produce them.

A small amount of starter culture added to a liter or two of milk is sufficient to make homemade yogurt. Despite this simplicity, my participants told me that achieving the “best” result requires the use of *meleke*, a concept in Turkish that refers to a capacity of sensation acquired through experience and strengthened by repetition (Figure 2).

To offer a mundane example: in yogurt making, milk should be warm enough to provide a suitable basis for *maya* to flourish. Interestingly, none of my participants has ever used any special equipment to measure the temperature of the milk. Instead, they observed, touched, and felt it as an act of attention. When asked for more specific guidance on the ideal temperature, they described it as “warm enough to bite your little finger



**Figure 2.** The process of yogurt-making at home. From left to right: preparing the starter culture by adding maya to milk; allowing the mixture to ferment overnight in jars; the final product, yogurt ready for consumption, which can also be used as a starter culture for future batches (photos by the author).

gently.” Even noticing the right temperature can be a challenge for a novice, who would need a lot of practice to gain such sensibility or *meleke*.

Simply observing and touching are not sufficient to comprehend this ever-changing fermentation process, in which food is never in a fixed state. One needs to consistently sense and respond to changing multispecies possibilities in this transformation. *Meleke* here becomes the faculty of allocating the appropriate senses to attend to multispecies relations. It is the sensory multispecies wisdom that Anna Tsing (2015, p. 17) calls the “arts of noticing.” For me, this is more than an individual act of sensing; this is a faculty that needs to be gained through multispecies encounters. As A.Y. Tamime (2003, p. S2) emphasizes in her historical review, the origins of “fermented milks” likely lie in “the Middle East and the Balkans, and the evolution of fermented milks through the ages could be attributed to the culinary [and sensory] skills of the inhabitants living in these regions.”

Sensory skills are equally crucial in the act of consuming food too. How and what do I taste when I savor yogurt? Here, the senses of taste and smell become particularly essential as they drive “a primal sense of ‘acceptable’ or ‘unacceptable’ for what we eat” (Breslin 2013, p. 409). Being familiar with the taste and smell of microbial interactions is crucial. I believe senses operate within a reciprocal multispecies context; while sensing is essential in these practices, our engagement with multispecies assemblages also shapes and enhances our senses.

Consider the flavors of various traditionally fermented foods: it can be difficult to appreciate them if you are not familiar with their intense flavors. For instance, homemade yogurt has a distinctive sour taste, making it difficult for someone unfamiliar with it to distinguish it from spoiled yogurt. Hence, someone who cannot discern the difference may discard food others consider a beloved treat. As Sidney Mintz (2011, p. 56) observes, “which is fermented and which is rotten” depends on “whether a person has been raised to eat one or the other.” According to him, this difference illuminates “the power of culture and social learning to shape perception.”

From a multispecies perspective, one might also attribute this “power of culture” to the interspecies encounters that shape and enhance our perceptions. Hence our engagement with fermentation, I argue, teaches us how to sense and appreciate intense flavors. The more fermented foods we experience, the better we distinguish their tastes and the more we prefer complex flavors (Smith 2007). In a world where “fast” foods increasingly homogenize tastes, Sally Fallon Morell vividly describes these diverse acquired tastes in her foreword to *Wild Fermentation* (Katz 2016, p. IX):

The taste for fermented foods is usually an acquired taste. Few of us can imagine eating fermented tofu crawling with worms, which is relished in parts of Japan; or bubbly sorghum beer, smelling like the contents of your stomach, which is downed by the gallons in parts of Africa. But then, few Africans or Asians can enjoy

the odiferous chunks of rotten milk (called cheese) that are so pleasing to Western palates. To those who have grown with fermented foods, they offer the most sublime of eating experiences—and there are many that will appeal to Western tastes even without a long period of accustomization.

That said, psychological studies suggest that “pleasant odor” is commonly associated with happy experiences and good memories, and is “perhaps the most intrinsically hedonic sensory experience” (Ehrlichman and Halpern 1988, p. 778). The sense of smell, Boyn Gibbons (1986, p. 337) writes, “reaches more directly into memory and emotions than other senses.” Consequently, if one cultivates sensory familiarity with the strong flavor of fermented foodstuffs, consumption of them becomes a convivial gathering full of emotions and memories. Fermentation, in this spirit, is a communal experience in which diverse assemblages of humans and nonhumans stimulate and foster emotions. Considering the role microbes play in producing flavors leaves us with questions of who affects whom and in what way.

As I delved deeper into the sensory aspects of yogurt making, I was struck by the way in which the process evoked memories from my participants. This led me to realize that stories are not just individual, but also collective and multispecies, extending across generations and connecting the present with the past. I came to understand that multispecies wisdom involves not only the interactions between different species in the present but also correspondences and stories that span across time. This highlights the importance of the role that multispecies stories may play in preserving and strengthening our relationships with other species. In an era of extinction and loss, it is crucial that we remember and draw upon the wisdom of past generations, and the knowledge and skills that they have cultivated and passed down. With this in mind, the following and final section invites you to consider how we might cultivate and nurture such wisdom.

## Cultivating Multispecies Wisdom

In the meantime, the milk pot was brought back inside and checked. ‘OK, it is almost ready; it will also cool further in the jars anyway.’ She poured the milk into individual jars, carefully checking its heat with her little finger. It needed more time to cool down before being cultured...

Despite the debate about whether yogurt is Turkish, Bulgarian, or Greek, yogurt is a product of the region’s biocultural diversity, with its deep history dating back to long before the emergence of modern nations. In this article, I traced some multispecies stories of yogurt in Turkey and Bulgaria, part of the region where some of the first dairy practices evolved and from which spread to Europe. Until recently, yogurt was made in every home in this region, consumed as a side, as a main dish with bread, and drank mixed with water (*ayran*).

During my research, I observed that fewer and fewer households are still making their own yogurt. Although plain yogurt is still an integral part of the table accompanying many dishes, it is increasingly replaced by “fake” ones bought from the shops.

From the microbes that ferment the milk to the animals that provide it, the process of yogurt-making relies on the collaboration and cocreation of a diverse community of beings. The stories of yogurt production that I have shared depict how traditional fermented products cultivate a rich diversity of multispecies interactions. This multiplicity becomes more apparent when we consider viruses’ crucial role in fermentation (Fernández et al. 2017). In this regard, microbiologist José Garabal (2007, p. 2) highlights the importance of preserving microorganisms for the survival of traditional or autochthonous products:

Although protection of the world’s biodiversity is currently a topic of particular concern, little attention has been given to the preservation of microorganisms and how this is related to the survival of traditional or autochthonous products ... there is increasing risk of loss of diversity in raw-milk microbiota and [as a result] the quality of traditional fermented products is seriously threatened.

What does it mean to lose “diversity in raw-milk microbiota”? What are the consequences? In other words, what is left? Further echoes of this biocultural homogenization are recorded by microbiome research (Cho and Martin 2012; Dominguez-Bello et al. 2018). These studies point out that “in industrial societies, we already have lost more than half of our microbial diversity” (Blaser 2018, p. 1173). Microbiologists are now deeply worried about the disappearing human microbial diversity that “opens up niches for opportunistic invaders, which often do not have the same coevolved constraints” (Dominguez-Bello et al. 2018, p. 33). The “missing microbes” (Blaser 2014) are thus considered to be a potential cause of various so-called “modern epidemics” (Velasquez-Manoff 2012)—such as autoimmune and inflammatory diseases, and obesity (Blaser and Falkow 2009). Interestingly, microbiologists commonly use the terms “co-evolution, co-adaptation and codependency” (Blaser and Falkow 2009, p. 887) to describe the features of our relationships with our indigenous microbiota. Considering increasing autoimmune diseases in this light (Gilbert, Sapp, and Tauber 2012), reminds us that we are all rooted in our relations with other species and even the echoes of lost ones still linger within us.

As we grapple with the implications of disappearing microbial diversity, the stories shared in this article offer a fertile context for considering how to revitalize our multispecies relations through foodways. In both practical and normative terms, the question of how to revitalize our multispecies relations is a helpful provocation in many ways. It urges us to reflect on entangled relations of food and consider the implications of

biocultural diversity loss. Importantly, I believe it can spur the recognition of the ways in which traditional practices nourish multispecies relationships.

Traditional food practices hold diverse modes of human–animal–microbe–environment relations (Paxson 2008; Rest 2021), which not only enhance microbial diversity but also stimulate our imaginations. The stories of yogurt here exhibit how people cultivate mundane relations with ants, plants, and rain to preserve a staple food. And their ways of knowing are sensorial as much as embodied.

Crucially, these practices call for an ecological approach (Ingold 2000) that puts practitioners in the context of active engagement with beings around them.<sup>15</sup> From a multispecies perspective, traditional fermentation is a praxis of “the arts of attentiveness” (Van Dooren, Kirksey, and Münster 2016, p. 17), which is not about knowing mechanisms or naming the species, but rather is about “being affected and ... being able to affect” (Despret 2004, p. 114). Among traditional practitioners, I witnessed *meleke*, the wisdom of sensing and responding to multispecies entanglements. Although we are acquiring more and more scientific knowledge around fermentation, we seem to be less and less capable of having *meleke* to attend to the multispecies stories surrounding it. Tim Ingold (2016, p. 100) urges us to think critically about this by asking:

Does knowledge actually lead to wisdom? Does it open our eyes and ears to the truth of what is there? Or does it rather hold us captive within a compendium of our own making, like a hall of mirrors that blinds us to its beyond? Might we see more, experience more, and understand more, by knowing less? And might it be because we know too much that we seem so incapable of attending to what is going on around us and of responding with care, judgment and sensitivity?

What constitutes *maya* is something beyond specific microorganisms or a chemical component, but rather emerges from relationships within a broader web of life. To culture it, one needs to attend to the cycles of rain, plants, and ants—each an “intimate relationship between human life and living nature” (Tagore, cited in Shiva 1988, p. 54) that gives rise to multispecies stories. These multispecies stories, deeply rooted in practices passed down through the generations (Anderson 2011, p. 9), demand both the sensory and cognitive dimensions of our experience.

Although we cannot directly taste these lost multispecies relations, we may regain a sensorial and intuitive realm of multispecies wisdom by recovering their stories. In other words, these stories serve as surviving legends that remind us that knowing and living are inextricably linked and “paying attention can and should be the basis for crafting better possibilities for shared life” (Van Dooren, Kirksey, and Münster 2016, p. 17). Without the ability to care for one another, how can we hope to survive?

For me, working on this piece has been journey of tracing lost multispecies relations in order to begin to recast the way



we think about food, and indeed about ourselves. Hence, we are nothing other than beings made and unmade by the relations we cultivate with other species. To delve deeper into the cultivation of multispecies relationships, we must embrace “multispecies wonder” (Ogden, Hall, and Tanita 2013, p. 5) and share it as a spark that can create change, like *maya*. This wonder can be further passed on and carried with multispecies stories of fermentation. Like the traditional masters of fermentation, we just need to prepare the ground and add a little curiosity-starter, and ultimately those relations will find their own ways to flourish.

Eventually, saying ‘Bismillah,’ she mixed a spoonful of the watery top of the old sour yogurt in each jar. The jars, with lids closed, were lined up one by one and wrapped in a blanket where they would rest overnight. The milk, covered with care, fell asleep...

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### Notes

1. I included vignettes from my field notes in various parts of the article to illustrate the practical aspects of yogurt-making.
2. World Health Organization (WHO 2001) defines probiotics as “live microorganisms which, when administered in adequate amounts, confer a health benefit on the host.” Food and Agriculture Organization and World Health Organization Expert Consultation. *Report; Evaluation of health and nutritional properties of powder milk and live lactic acid bacteria* (accessed April 4, 2022) Available from: <https://www.fao.org/3/a0512e/a0512e.pdf>

3. This information was obtained from Elise Tancoigne’s presentation at the “Microbes and Microbiology” online conference (15–16 June 2021) and a subsequent personal conversation. One of the largest and most well-known companies providing starter cultures for the dairy industry is Chr. Hansen, Danisco (now part of DuPont Nutrition & Biosciences).
4. Prebiotics play a vital role in promoting the growth and activity of beneficial bacterial species in the gut microbiome. Unlike probiotics, prebiotics do not contain live microorganisms and are nondigestible food components that are fermented by the microbial community in the digestive system.
5. According to demographic data, the Turkish ethnic group in Bulgaria represents approximately 9% of the total population. National Statistical Institute of the Republic of Bulgaria, “2011 Population Census – main results,” [https://www.nsi.bg/census2011/PDOCS2/Census2011final\\_en.pdf](https://www.nsi.bg/census2011/PDOCS2/Census2011final_en.pdf) (accessed April 4, 2020). The origins of this community can be traced back to the late 14th century, when Bulgaria was part of the Ottoman Empire and nomadic people from Anatolia began to settle in the Balkans.
6. Here it is important to emphasize that there are no singular or static fermentation practices; they are dynamic and adaptive, exhibiting constant change across generations and places. Like all traditional practices and folk knowledge systems, they are situated and relational. More importantly, they are not free from societal power dynamics; that is, further work could provide a feminist analysis of gender roles within such practices, though this is beyond the scope of this article.
7. Yogurt comes from the Turkish verb *yoğurmak*, meaning “to leaven” and “to make dense” (*kabartmak*, *yoğunlaştırmak*). It is also used for the process of kneading dough for making bread (*ekmek yoğurmak*) (more details at <https://www.nisanyansozluk.com/?k=yo%C4%9Fur-&lnk=1>). The first written records of the word *yogurt* date to before 1000 CE in Uighur texts and *yogurt* appears in the first Turkish dictionary dating to 1073 CE (Kaşgarî, *Divan-i Lügati’t-Türk*); <https://www.nisanyansozluk.com/?k=yo%C4%9Fur>. It entered the English language much later, in the early 17th century; [https://www.etymonline.com/word/yogurt#etymonline\\_v\\_4976](https://www.etymonline.com/word/yogurt#etymonline_v_4976). However, the first written records of yogurt in English do not necessarily indicate its first appearance, since yogurt-like products such as *Skyr* were already known in Europe long before.
8. <https://www.etimolojiturkce.com/kelime/maya> (in Turkish), accessed August 13, 2021.
9. Original in Turkish, translation my own.
10. From comments by Salla Sairola on my presentation at a panel at the SIEF 2021 conference (online).
11. I previously presented an earlier version of this article at a meeting organized by the Dunn Lab. In 2022, we had follow-up meetings with entomologists, microbiologists, and food scientists to discuss ant yogurt further. During these online meetings, I had the chance to talk about how ant ecology may interface with yogurt fermentation.
12. I am collaborating with biologist Rob Dunn and his team at Copenhagen University to explore the microbial diversity of “ant yogurt.” By providing ethnographic insights, I am contributing to this interdisciplinary research effort to uncover the microbial secrets of yoghurt-making with ants and bring attention to this ancient tradition.
13. Original in Turkish, translation my own.
14. Original in Turkish, translation my own.

15. In *The Perception of the Environment*, (2002, p. 19), Tim Ingold explains that an ecological approach “is one that would take, as its point of departure, the whole-organism-in-its-environment. In other words, ‘organism plus environment’ should denote not a compound of two things, but one indivisible totality... and an ecology of life—in my terms—is one that would deal with the dynamics of such systems ... if, that is, we are prepared to treat form as emergent within the life-process.”

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