Fermented Living: Challenges in Adopting a Fermented Dietary Regime and the Role of Food Memories in Acquiring New Tastes

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Abstract
Our predisposition to adopt new dietary norms is both personal and intimately connected with our current life situation and our life-story, not least childhood experiences of food. The article describes the challenges, including health concerns, encountered by participants while adopting a fermented diet, in the context of an eight-week dietary intervention study, organized by the researchers. It also describes how memories and experience helped them overcome those challenges and adapt to the new diet. Based on qualitative interviews with seventeen participants in the study, selected at random; the article describes the frustration of not meeting expectations but equally the joy when things work out and we are able to overcome the challenges.

Keywords: diet; fermented foods; health; food memories; food taste

Finding a solid footing when faced with dietary choices in everyday life can be a daunting task. We face a variety of challenges when trying to make informed choices about the food we eat. These include availability, pricing and selection, but also our own personal inhibitions, tastes and health concerns. This article is based on interviews with participants in a food intervention study (see e.g. Welch et al., 2011). During the intervention, the participants were required to increase significantly the amount of fermented food consumed. In what follows, we will discuss the challenges that people encountered, and the strategies they deployed, which they discussed with our researchers in semi-structured interviews (cfr. Hopf 2004; Roulston 2018). They indicated that the everyday dietary choices that they made were informed by various factors, including their current life situation and personal history, as well as what we may broadly refer to as culture. Participants were randomly selected for this food intervention study, using a mixed methodology, dietary intervention research on

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the effects of fermented food consumption, combining analysis of biological samples, quantitative surveys, participants' food journals and qualitative interviews, involving 97 participants, aged between 50 and 70 years, divided into four groups. Over 90% of the participants volunteered after seeing an advertisement on social media identified themselves as women.

Group 1	Group 2	Group 3	Group 4
Food intervention group	**Supplement group**	**Control group**	**Experienced control group**
3 sets of biosamples Interviews	3 sets of biosamples No interviews	3 sets of biosamples No interviews	1 set of biosamples Interviews and participant observation
Compliance survey	Compliance survey	Compliance survey	
Food diary	Food diary	Food diary	Food diary

Figure 1. The four research groups.

As outlined in previous research by Stiemsma et al. (2020), Crowder et al. (2023), Wilburn et al. (2017) and van Hylckama Vlieg et al. (2011), specific studies and scientific reviews suggest that consumption of fermented foods, including living cultures, may affect human health in statistically significant ways, as it increases the diversity of the gut microbiota and seems to decrease inflammation markers (Wastyk et al. 2021).

Research designs using a mixed methods approach, combining laboratory work with quantitative surveys and qualitative methods (semi-structured interviews and participant observations), have been successfully deployed to engage with in real life (as opposed to laboratory) research contexts, as demonstrated in e.g. Nyirenda et al. (2020) on community engagement in biomedical research. In our case, the aim of this intervention was to investigate the effects of 1) increased consumption of fermented food, and 2) the daily intake of a new probiotic supplement with fermented bovine colostrum (the first milk produced by cows after giving birth), over a period of 8 weeks, measuring changes in the composition of the intestinal and skin microbiome, metabolic related markers, inflammatory factors and metabolomic patterns. The purpose of this research project is to study the effects of a probiotic diet on the gut flora in a real-life context. Quantitative surveys were included to measure participants' compliance with the premise of the intervention.

This article is based on the analysis of a set of 17 qualitative interviews with participants in "group 1" (above) that form part of the data collected during this study. Our main questions are: What were the challenges and health concerns that participants in the dietary intervention encountered when aiming for an increase in their consumption of fermented food? What strategies did they adopt to overcome those challenges? How did experience and childhood memories help participants adapt to the new dietary regime?

The Dietary Intervention Study

This article is based on 17 semi-structured interviews conducted in the winter of 2022/23 with some of the participants in the fermented foods group ("group 1" in the figure above) of the dietary intervention study, investigating the effects of fermented food and supplements on health and wellbeing.[1] All of the participants were 50 to 70-year-old Icelanders who had shown interest in an advertisement we published on Facebook, on the study website, and shared on several mailing lists. Volunteers were asked to submit their contact details on the study website hosted by the University of Iceland. A letter describing the study informed volunteers whether they met the eligibility criteria, and after a short telephone interview, the participants, if selected, signed an informed consent document. Before the intervention period began, the participants were asked to fill in surveys and several biological samples were collected to establish a statistical baseline to compare with samples collected at regular intervals during the study period of 8 weeks. Each participant was then randomly (using SPSS randomization software) assigned to one of three groups: the fermented food group, a food supplement group, and a control group. A fourth group consisted of hand-picked participants with many years of experience working with fermented foods. These participants constituted a second control group. The research was conducted according to Good Clinical Practices (GCP; see the European Medicines Agency, n.d.) with each participant assigned a number to ensure their anonymity and privacy.

The primary objective of the research was to investigate the impact of consuming fermented foods or food supplements on health indicators, measured as the composition of the intestinal microbiota (feces/skin), nutritional and immune status as well as metabolomic factors (metabolites found in blood samples), physical ailments of the digestive tract and general physical and mental wellness (based on survey data) over an 8-week period. The survey included general background and lifestyle factors such as age, height, weight, physical activity, sleep habits, education, and occupation.

The food supplement was a capsule of fermented freeze-dried bovine colostrum with added probiotic microbes taken twice a day over a period of eight weeks. No interviews were conducted with these participants or the control group. The participants in the food intervention group were asked to increase their intake of fermented food from two portions or less per day, to six portions or more, over an eight-week period. This could be done through eating fermented vegetables, fermented milk products (instead of any unfermented milk), sourdough bread (instead of their usual bread/cracker intake) and/or kombucha which was suggested as a replacement for some of their daily coffee or tea. They were free to combine these at will or even skip one or two types. They received recipes, as well as instructional videos on how to make fermented vegetables, fermented dairy, sourdough bread, and kombucha at home, and they were offered enrollment in a live fermentation cooking class. Participants were also told they could buy ready-made fermented foods from the supermarket and were provided with a shopping list of suggestions. Finally, they were offered consultation with a dietitian at any point during the intervention period.

The researchers could monitor the consumption of fermented food through compliance questionnaires sent to the participants each week, as well as through a three-day food diary at the beginning of the intervention period, at four weeks and eight weeks—always using the same three days (either Thursday, Friday and Saturday; or Sunday, Monday and Tuesday). In addition, we collected information on overall food intake using a short Food Frequency Questionnaire (FFQ) based on a standard Icelandic database of 1200 commonly available food types (ÍSGEM).

The information that the participants were given on fermented foods was in the form of general written information, recipes, and instructional videos on the making of fermented food at home; all published in a closed Facebook group created for the study. The participants also used this group to exchange experience with fermentation and advice with one another, and to ask questions of the researchers. The participants were, moreover, encouraged to send emails to the researchers to book a personalized interview with a nutritionist to discuss their diet during the study, and how to incorporate more fermented food into their daily food consumption.

During the registration process, participants were asked to indicate whether they would be available for an interview toward the end of the intervention period, and almost all of them were. When the period was almost finished, we contacted over half of the participants in the food intervention group and conducted 30-to-60-minute interviews with 17 participants selected at random, focusing on their experience participating in the study, how they felt about their change in diet, and the challenges they met during the study. The following analyses are based on these interviews as transcribed by the researchers. Direct quotes have been translated from the original Icelandic by the authors of this article.

Challenges and Strategies

Most of the participants interviewed were open to sharing details about their participation in the study. The challenges they met with were mainly related to the number of portions, time, taste, food availability, lack of experience with making fermented food, and the reactions of others to their new diet. However, in many cases, participants found effective and innovative solutions to these challenges. Just over half of the interviewees made part of the fermented foods they consumed at home during the study period, while almost half of them purchased everything and did not experiment with making fermented foods at home.

Each participant was asked to consume six portions of fermented foods per day. However, the interviews indicated that they really managed to consume between four and five portions per day. They found the six-portion mark harder to hit than they (or we) realized before the study began.

Many participants were enthusiastic about the study but were hesitant about making their own fermented food to begin with. Most of them started by focusing on one thing, such as baking with sourdough, for example. Often this meant going back in time to something they had tried many years or decades earlier, and most said they were happy to have found their way back to an old habit. Others were happy to try

out something new and exciting.

The difficulties the participants found in making fermented foods were quite varied. Many of them described sourdough baking as complicated and difficult, while others had a good relationship with the sourdough ("It's the easiest thing in the world, to make sourdough bread"). For some, kombucha was something unknown and complicated to prepare, and the same was reported regarding fermented vegetables. Others found the home-fermentation process easy for both vegetables and milk.

A few participants discovered that kombucha can be an excellent alternative to drinking coffee. Others found it was not to their liking, and many participants mentioned that they found it far too sour. A few participants had had accidents with the carbon dioxide building pressure inside the bottle that they neglected to release and had splattered kombucha all over their kitchen. Some stopped trying to make it at home after that experience. People also worried about the amount of sugar used for making kombucha ("It bothered me a bit, all that sugar that's put in it."). Even though they realized that it breaks down with the help of the bacteria and fungi, they still felt there might be something unhealthy about the volume used to facilitate the initial fermentation process.

Although most found the instructional videos prepared by our specialists on how to make various fermented foods inspiring, many of the participants nonetheless expressed unfamiliarity and insecurity regarding the fermentation processes. They asked questions on the Facebook group, such as "When are the vegetables ready?" or "Is it ok that there is a white thing on top of the kombucha?" or "Can you make

Figure 2. A screenshot from one of the instructional videos we made. Film (2022) by Hrafn Helgi Helgason. Presented by Dagný Kristinsdóttir.

fermented food from non-organic vegetables?" The participants seemed more at ease with making sourdough bread and fermented milk products than with kombucha or sauerkraut. This is consistent with current Icelandic food habits as revealed by a national survey conducted in 2019–2021 (Icelandic Directorate of Health, n.d.).

One of the challenges that people experienced was that they lacked a local community of fermentation practitioners. Some participants said that they would have made the food themselves if there were more people actively making it around them at the time of the study. Those who were used to making food from scratch found it easier to dig into the different recipes and test different things, even using non-Icelandic cookbooks and websites, trying out different types of vegetables, spices, and even fermented fruits. Those who had other interested peers around them also found it easier to prepare the food, as they could exchange experiences, share recipes from different countries, and laugh at their mistakes together. They also generally found that their own homemade fermented foods tended to taste better than the ones bought in the supermarket. Many of these participants mentioned how much cheaper it was to make the food themselves and had the added benefit of being able to choose from many different vegetables. However, more than one participant mentioned the need for a lot of space in the kitchen and even the need for an extra freezer to store materials related to the home-fermentation process. It was clearly easier for those who worked from home to both remember to eat fermented foods and to have time to prepare the food. As one of the participants described making kombucha:

> But it seems to me that I'm getting it, and I think it's also just if you let it wait a little longer it just gets stronger and the germs just work longer, so I think it's like you say you just need to put a little love and attention and stick with what you are doing. Then I like it. I also just like doing things like this myself.

However, in most cases, participants bought their fermented foods at grocery stores. Some tried to make fermented foods at home to begin with, but then stopped as they found it too time-consuming to prepare and monitor. When purchasing fermented foods, most participants were interested in tasting all the supermarket had to offer before selecting one or two regular products. In general, the participants requested a greater variety of fermented foods in Icelandic stores. For example, some participants mentioned that it was much easier to find sugary probiotic food items, such as the more common sweetened yogurt, than pure probiotic milk, which often can only be bought by the liter.

Not all types of fermented food were found in all grocery stores and even within the stores it was hard to find, as their staff did not know where to look. Participants living outside the capital area found it especially challenging to buy fresh sourdough bread, for example. A few mentioned that the best sourdough bread in Iceland could only be found in one bakery in Reykjavík. Several participants travelled abroad during the intervention period, and some of them reported that they found it hard to find the right products in the stores there. People would for example call our researchers to ask how to say "fermented" in Spanish.

The price of fermented food often came up in the interviews with those partici-

pants who purchased all their fermented foods. Bottles of quality kombucha at the supermarket can be quite expensive, especially when consumed every day or even twice a day. Even locally produced fermented vegetables are comparatively expensive when bought from the store.

The sour taste was a big challenge mentioned in many of the interviews. Sometimes, the participants found the yogurt or skyr from niche producers too sour for their taste buds and told us that they preferred the commercial ones which, however, contain far less lively cultures to extend their shelf life. Others embraced these niche products. Strategies to remove the sour taste of fermented vegetables involved mixing them with something fatty such as butter on bread, cream cheese, mayonnaise, or peanut butter, mixed with kimchi, cortido or sauerkraut, for example. Some participants added fresh vegetables or fruit to the fermented ones, and one participant in particular mentioned frying the fermented vegetables on a pan with sugar ("I fried onion, red onion, on a pan and added sugar, like healthy sugar, and added the fermented red cabbage. It was a big hit"). The participants tasted various products until they found ones that best suited their palates. In the end though, many people said that although they found the sour taste off-putting at first, they became more comfortable with time and even came to appreciate it.

Some participants did not eat bread, and others did not like kombucha. Consuming six portions per day was more challenging for those who did not have the full selection of food to choose from. It is also interesting that one of the reported challenges to fermented food consumption was their own opinion of people who are more dedicated fans of fermented food:

> Maybe I'm missing the extreme trait, excess. I don't have this excess. I imagine many people who go for this kind of thing go to extremes, try everything, and find it exciting and fun and everything. But I'm not there.

Participants were advised to change their current bread consumption and opt for sourdough bread only. Those who ate sourdough bread were happy with it, but it was clear that those who made the bread themselves had a closer relationship with their food and were glad to discuss different techniques for how to make different meals with sourdough, including waffles, Danish rye bread, pizza, and even muesli.

Whether substituting some of their regular food with fermented alternatives, or adding it to regular meals, all the participants tried with earnest to increase fermented foods in their regular diet, using fermented vegetables as a side dish with meat and fish or as a bread topping, and drinking kombucha instead of coffee or tea. Those exchanging some of the coffee for kombucha, as we recommended, reported feeling better as they had decreased their coffee consumption. Indeed, some of the participants were quite happy with the new foods and eating habits they had tried during the intervention:

> Yes, I often have kefir in the morning and naturally I use sauerkraut on everything now. At first, I thought it was bad and not very good, and I started there with the cab-

> bage that had caraway seeds in it. I thought it was really just disgusting to eat. Then I started to develop... or in other words… yes, just looking more and found something like this with a bit of a tropical feel and something from Korea and something, like… that had some strong spices added, and I just think it's really good... to eat this with everything. And I've just become hooked on kombucha. I think it's awesome and here… yes. So that's the main thing I eat. And naturally bread. If I have bread, it's sourdough bread.

Many participants also mentioned that it was harder to follow the dietary recommendations of the study during weekends, as weekday life is more consistent, with fixed posts throughout the day. Regular schedules made it easier to remember the fermented food portions.

One participant stopped eating fermented foods after the jar exploded or the vegetables threw themselves out of the jar due to gas build up when opened. However, another participant found this to be a very exciting experience and hoped for it to happen again:

> After that I always thought it should be like that, always got a little sad when it didn't happen. [laughs] Because it was something like that, it's so nice to eat something like that, that's just, yes, it just works like that, beautiful life. [...] Unbelievable, bubble bubble making quite a stir.

Despite stories like this one, few participants mentioned thinking about live bacteria in the food. However, some had more positive shifts about the presence of bacteria in their food:

> I don't think I'm impressed with fermented foods here at all, especially after this, especially not with vegetables, but on the other hand, I think my attitude must have changed in a positive way because you still realize that this must somehow be good. For the body. It's just that it's in the nature of things, I think, compared to these studies that you've only read about compared to what's behind the kefir and the like. Then I think my thinking is more positive than before. So, I imagine that as more is revealed about these things, the discussion will be more positive in society.

When asked about the reactions of family members, most participants reported that they were mainly positive, with partners or children starting in some instances to make and eat the same fermented food and finding it good. However, for some, enthusiasm seemed to dwindle towards the end of the intervention period, as by then they had mostly given up trying to follow the same diet as the study participants were following. Some of the participants experienced this dip in enthusiasm as well. At the start, participants were upbeat, but when they realized how much energy and organization was required in the food preparation process in additions to incorporating four to six portions of these foods into their diet per day, their enthusiasm deflated.

Some family members were sensitive to the smell of the fermented vegetables, and a few participants mentioned that they tried to camouflage the fermented food

by mixing it with other food for those family members who were more skeptical. In some cases, other members of the family did not participate at all, while conversely in some cases younger children were deeply involved and loved the fermented food and kombucha.

Friends and coworkers of those in the study tended to view the study positively. They were ready to taste some of the novel fermented foods, although not always ready to eat a whole portion except for the bread. Some found new allies at work:

> There is a Polish woman who works with me, and she was just so happy when I brought sauerkraut to eat. She just said that she never really sees Icelanders eating this and that it is eaten a lot in Poland. Not least with fish and such.

Other challenges were, for example, related to a bottle in the freezer at work that fell on its side and smelled, prompting comments from colleagues at work. It was a challenge to remember to take the sauerkraut to work and eat it. They pointed out that it would be easier if it was in the canteen (lunchroom) to begin with as a normal part of the meals provided by the workplace.

Some found the experiment inspiring and said they would continue to use and even make kefir, kombucha, and sourdough bread. Others stated that at the outset they had not been impressed by fermented food, and really disliked vegetables, but with time they had begun to enjoy them more. Some participants mentioned the empowerment they felt in baking bread for others, either at home or at work. Bringing fermented foods to the table became popular. In the end, some participants were determined to continue their own fermentation journeys. As one of the participants who gave herself time to make the food said:

> No, actually, I think it's just like I said at the beginning with regard to being able to participate in this, that it just opens up all kinds of opportunities. And this makes you think about this, that here it's not that complicated, if you just give yourself the time, you can do a lot of this yourself. And and and here I like listening to this interview with [sauerkraut expert], that's right, I saw it somewhere when she, or did I read it in the book, that she just found out about this and started bothering herself with this, fermented vegetables here, just keep an open mind about it and do it yourself and see where it takes you. That's how I feel that getting to take part in this study really opened my eyes to this diet and this world. So I only see an opportunity in this.

While many of the challenges the participants faced during the intervention study were specific to this context, the interviews provided many insights into the issues people confront when changing their diet. The interviews show a marked difference between those who had the opportunity and capacity to make food from scratch and those who relied on finding the fermented foods they liked in the supermarket, with the former group reporting a more positive experience of the intervention study overall. Challenges also included adapting to unfamiliar tastes and renegotiating what foods were liked or disliked. It was obvious that the sour taste that is characteristic of

many traditional fermented foods was not very palatable for many of the participants, although some of them got used to it over time.

Health Concerns

Many of the challenges participants faced during the intervention period were intimately connected with their own perception of how healthy they believed certain food practices, products, or ingredients were. As noted in e.g. Hey (2020) and Maroney (2020), the current interest in gut flora and effects of microbial life within our bodies on our health, risks reinforcing healthism (Crawford 1980, cited in Dryden 2023, 132), a managerial approach to human well-being where the individual is seen as both in control and ultimately responsible for their health through dietary and lifestyle choices. Recent developments include wearable technology and smartphone apps that give people the impression that they can manage nutrient and calorie intake in their diet. These perceptions were also mentioned in the interviews.

Among the health concerns cited by participants were factors related to the acidity and/or salinity of available fermented foods. One participant expressed worries regarding the effect of sour food on tooth enamel, and a recommendation not to brush the teeth straight after eating or drinking fermented food was put out on the Facebook site of the research. Some of the participants worried about the salt content of the food, both in the bread but also very clearly in the fermented vegetables. A 5% salt solution must be added to cut vegetables for preservation, because it supports the growth of beneficial bacteria while deterring potential pathogenic activity. Participants with high blood pressure, who had been advised to avoid salt, were particularly concerned about this. High blood pressure was not an exclusion criterion for the study. In two cases, participants reported that a common health monitoring app that they were using was warning them about the sodium content of commercially available sauerkraut. At the end of the intervention study, the blood pressure of one participant had increased so severely that he had to increase his medicinal dosage for the treatment of his hypertension.

In the interviews some participants expressed worries that eating bread would cause weight gain and that they were eating more bread than before. Others did not consume any bread during the study, as they did not regularly eat it, often citing challenges relating to their own body weight. This was especially evident among people who had experienced health problems, such as knee injuries or were pre-diabetes.

Overall, most participants mentioned that they were happy to participate in the project and try something new. A few, however, were disappointed that they did not feel better after a few weeks of trying this diet, as they hoped. Some even said that they got more heartburn and digestive problems, mainly increased gas, while others felt it had no effect.

On the other hand, many reported that they felt better than they did before the start of the study, saying that the fermented food was beneficial, and that they experienced better digestion, less distention, and less gas than before. This was even reported by those with a sensitive stomach:

> I felt a difference after about a week. About five days - a week, then I noticed a difference in... in this way, yes. Just feel better about it. I wasn't as bloated as I was saying earlier and stuff. Yes. That's the main thing.

Some participants also mentioned that they felt more satiated after eating fermented food, such as fermented vegetables. Some also noted that fermented foods affected their desire for other types of food such as cola drinks:

> Yes, but I am a Coke fan, or was a Coke fan. It's my greatest weakness in life. It's just Coca Cola. I just avoid imitations. I don't want this diet junk; I just want sugar in it. But now I don't want it, it's so remarkable. I have, you know… I drink at least 330 ml [about 11.16 oz] a day of this kombucha, sometimes more; and I don't reach for the Coke. I just realized it the other day. Because I, yes... because it's been such a joy for me, you see. I don't drink... or you know, I drink beer and red wine and stuff like that, you know, but I don't drink much, and I've never smoked and stuff like that. But... but here Coke has been my main thing and now somehow, I don't need it anymore. I just realized this now while we are talking. I just haven't had a Coke.

Some felt that there was a marked difference between eating unhealthy food and the fermented vegetables, and expressed a determination to continue incorporating them in their diet after the intervention period:

> Just somehow, just like when you eat unhealthy things if you get sugar, you feel it. You just get a little dull and foggy in your thinking. This is the exact opposite of that. You become clearer. So, this will definitely happen with the Christmas dinner, no matter what my husband says [laughs].

In general, many of the participants had already formed an opinion about the possible health benefits of a probiotic diet. Several talked about reading books that recommended fermented foods and "eating for your gut" (one mentioned for example Michael Mosley's *The Clever Gut Diet*). Citing research she had read, one participant specifically mentioned colon cancer and attention-deficit disorder (ADD) as examples of conditions that she believed might be caused or exacerbated by an unbalanced gut flora.

In several cases participants' ideas about the health benefits of a fermented diet were mediated or prompted by personal experience, such as having had to use medicine to aid digestion in the past. A personal experience of a diet change in the past correlated in some cases with a positive evaluation of fermented food in general, whereas a health condition such as high blood pressure or having symptoms of diabetes in the past caused participants to be more skeptical and wary of the new diet.

Childhood Memories and Previous Experiences

The links between memory, food, and the past experienced through the development of a taste for certain foods and aversion to others has been explored by scientists in

many disparate contexts, such as Italian or Caribbean diaspora communities (La Trecchia 2012; Sealey-Ruiz 2004), tourism (Sthapit 2019), consumer behavior (Vignolles et al. 2014), nursing (Hanssen et al. 2016) and even war (Katto 2020). What emerges from the literature is the prominent role of memory in creating a visceral or "gut reaction" to certain types of food (see e.g. Pétursson et al. 2022, 62–63; Bernstein et al. 2009, 137), as well as a culturally determined critical component whereby people engage with their own sense of belonging (and non-belonging—see Vanha-Similä et al. 2023), and identity (see Abarca et al. 2016) in what they classify as food and the positive or negative values they associate with those foods. Food memories were not a part of our loosely defined frame of questions for the interviews. Nevertheless, many of the participants in our study mentioned how some of the novel fermented foods they tried adopting as part of their regular diet during the study had brought back memories, both fond and foul, from their childhoods, or past experiences.

Several participants remembered tasting kombucha prior to the study. Some had tried brewing it themselves while others had tasted the kombucha that their parents made. Two participants remembered that they found it "disgusting" and one mentioned that the reason for this was that the idea of brewing a drink using a fungus was somehow repellent:

> So, I had just gotten this fungus somehow, when I was little. I found it disgusting. It was some Caucasian fungus. […] I remember that mom put some vanilla extract in it to make it better and I thought it was absolutely diiiisgusting and I hated the smell of vanilla for many years afterwards.

In this case, the participant did not like the kombucha available on the market, and avoided it, although it was among the fermented products that we recommended. It is quite possible that the aversion she felt for the "Caucasian fungus" as a child had translated into a dislike of kombucha as an adult, even though she never explicitly stated that they were the same thing.

Kombucha has been a health fad in Iceland under such "exotic" names as the "Manchurian fungus," "Caucasus fungus," or even "Cossack fungus," referring to the SCOBY (symbiotic culture of bacteria and yeast), which is not a fungus at all, but a biofilm, rich in microbes, that mostly consists of a cellulose polymer that forms on the surface of fermented tea. Judging from the interviews, it seems that kombucha has had at least two such periods in recent Icelandic history, before it became popularly known as kombucha; one in the early 1970s and another in the early 1990s. A few participants mentioned folk beliefs and ceremonies associated with brewing kombucha in the past, for example the "rule" that whenever the SCOBY became too big it should be split in two and one half given to a friend (this is how the practice spread), and if a new home could not be found it should be buried in the ground, like a dead pet.

One participant mentioned that she had tried making kombucha in the past and had felt more energy after drinking a cup every morning. Eventually she found it a bit awkward and ended the venture by throwing the "fungus" away because she believed it had gone bad. Another participant mentioned that as a child she had snuck a drink

Figure 3. Participants in one of our courses learning how to make sauerkraut. Photograph (2022) by Áki Guðni Karlsson.

from the kombucha that her mother was brewing, because she liked it so much:

> [S]he kept it exactly in a wardrobe [laughs a little], because it had the best conditions [...] and it finished quite fast, because without her knowing, I was always drinking it. So obviously there I was… I liked it obviously; and probably… I must have felt it had a good effect.

Beetroot and cucumber are types of pickled vegetables that are relatively commonly eaten in Iceland, cured with sugar and vinegar, and accompany both fish cakes and the traditional Sunday roast. There hasn't been a native sauerkraut tradition in Iceland, at least not until quite recently. Several participants mentioned previous experiences

with sauerkraut, however, and in all cases, it was associated with other countries. One woman mentioned that her father liked sauerkraut. She believed he had learned to appreciate it while studying to become a gymnastics teacher in Scandinavia. Another mentioned spending a summer in Austria in her youth and remembered that she liked the sauerkraut there. She added that she had tried several times to buy a packet of sauerkraut in Iceland and did not fancy the taste. One woman specifically stated that she saw her participation in this research as an opportunity to try to eat more sauerkraut, as her mother, who was German, had made it when she was little. As an adult, she tried to find a product that was like the one that her mother had made:

> She made sauerkraut when I was a child. There was a big barrel in the storeroom outside with a lid that would lift. We liked it so much that we snuck out to the storeroom to steal some sauerkraut. [...] you know, it was probably just good for me back then.

She also mentioned trying sauerkraut at a conference in Bratislava in Slovakia, but she didn't like the taste because it was different from the one that her mother made.

What emerged from the interviews is that both sauerkraut and kombucha are seen as rather exotic and unusual products in the Icelandic context, probably making them sensorily "suspect." The "funkiness" of kombucha and the "foreignness" of sauerkraut can be offset however, by memories, where participants have grown fond of these foods as children. However, often this came with the caveat that they had not continued to consume them as adults and had been unable to find products that replicated their childhood experience, even if they were convinced that these foods were healthy and had been "good for them." Participating in the food intervention group in our research was seen as an opportunity to rekindle a lost interest, and participants readily associated the fermented foods that we recommended with the foods that they remembered from their past, creating what Abarca et al. (2016, 7) terms a "visceral self-awareness" that speaks through our senses. A historically positive association seemed to imply a liking for both sauerkraut and kombucha, whereas a negative past association implied aversion, at least in one case.

Another type of fermented food that is also sensorily suspect, although intimately familiar to many Icelanders, are meat products stored in fermented whey. This was a traditional method of storing meat in Iceland, as a lack of firewood in a largely deforested country implied a general lack of salt. Whey was abundant, however, as a byproduct of making butter and skyr (a fermented dairy product, similar to yogurt). Once it was acidified, through the action of lactic acid bacteria, it would keep meats, sausages, and other animal products unspoiled for many months, while also altering their taste. With modern refrigeration, this food conservation method became a relic of the past. However, the taste of meat pickled in sour whey was familiar to most generations of Icelanders living in the 20th century, and many people still appreciate food cured this way, although it is much less common than several decades ago.

Traditionally cured meat was not one of the explicitly recommended fermented foods to our food intervention group. However, during the interviews, we prompted the participants to discuss their familiarity with this kind of food, if they didn't offer

that information spontaneously (many of them did). Several participants mentioned that they found the smell or texture disgusting, even if they were regularly presented with this food as children. Others stated that they enjoyed fermented meats because they grew up eating it, although one mentioned that as a teenager she found it embarrassing to know that her father kept a barrel of whey on the balcony ("I thought it was a bit uncool to have a barrel with sour and old-fashioned food."). She still liked the taste, however. One participant stated that as a child she considered sour whale blubber and ram's testicles special treats. Another participant associated this tradition with a lost skill in food preparation and connected with the ideas of "making food with love" that she remembered from both her grandmother and her mother-in-law, while she herself "wouldn't know how to make" this kind of food:

> Yes, you do that of course and also because grandma, my dad's mom, always did a lot of this, and she did a lot of this type of food and made the loin sausage [lundabaggi - traditional Icelandic sausage made using lamb loin] herself which was then placed in the fermented whey, and she made the head cheese [sviðasulta - from sheep heads] and was a big food lady, you know. So, yes, it really takes me back, you know.

One of the participants said that she had been brought up eating very old-fashioned foods, and never liked whey-cured meats, but she wondered whether she might appreciate it once again because of a belief that "our taste buds change with age." Another said that he believed that fermented foods had been a bigger part of his diet in the past and his participation was an opportunity to refresh his memory of its taste.

Some of the participants mentioned being brought up with "old-fashioned" foods: fish for lunch and meat for dinner, with skyr and buttermilk for dessert. Despite its iconic status as a staple fermented dairy product, skyr was rarely mentioned in the context of food memories. It is, of course, neither exotic nor old-fashioned, and perhaps too ordinary to deserve a special mention. Skyr, kefir, yogurt, and other fermented dairy products were included on the list of suggestions provided to the food intervention group participants. A participant noted she had decided to participate because she had felt that as a child this kind of food benefitted her health, and another discussed how his past habit of eating a lot of skyr had prepared him for the food he was eating in the intervention study. One woman specified that she saw her participation in the study as an opportunity to connect with the memory of her recently deceased mother who had been a regular sourdough baker.

The food memories expressed by our participants in the interviews involved many kinds of engagement with their experience of fermented foods. Several accounts constitute what Pétursson et al. (2022, 29) call "reflexive nostalgia," juxtaposing past and present experiences. In some cases, what we have are strategies of associating unknown foods with familiar foods that have similar sensory characteristics. This is used, for example, in food chaining (see e.g., Coulthard et al. 2022), a method for treating reluctance to try new foods in adults and children. The participants' positive or negative assessment of past food experiences was also informed by traditions (being brought up with this food) and personal life-stories (memories of a lost parent).

There was also a strong thread involving health concerns, based on the assumption that what we instinctively liked as children must somehow be good for our health. As noted above, health concerns and ideas about the health benefits of fermented foods were prominent in the interviews and were a motivating factor in volunteering for the research. Memories of past experiences with fermented foods had in some cases shaped people's perception of both what kinds of food they liked and what kinds they believed were "good for them." Food memories directly affected the food choices participants made throughout the study.

Conclusion

From the seventeen interviews conducted with participants in the fermented food intervention group of the study, participants encountered more challenges than they had originally thought they would when they signed up for the study. We specifically asked about this during the interviews, so people were encouraged to think about hurdles and issues when partaking in the research. These ranged from practical constraints resulting from lack of time, kitchen space or money, to people having issues with sour taste, or health concerns related to overconsumption of carbohydrates, sodium, caffeine, or alcohol. The six-portion mark set in the research design proved to be very challenging, especially for those who discovered that they did not like one or two of the fermented foods we recommended and were unable to find substitutes, and for people who were not in a set routine for the whole eight-week period. In fact, what emerged from the interviews was that most of the participants seemed able to consume four to five portions daily.

One lesson learned from the study is how important it is to be available and proactive while interacting with the study participants. Many of the concerns raised in the interviews about fermented food containing too much salt or bread giving a lot of energy and carbohydrates, were not raised on the Facebook page or when in direct contact with the researchers during the intervention period. In our view, the change was irrelevant, as participants were asked to substitute their habitual bread consumption with sourdough bread. The recommended daily portion of fermented vegetables would not have added more than 0.7 grams of salt to the daily diet. Yet it would have been better to address these concerns at the outset, for example through a pilot focus group, before starting the study.

An interview with a nutritionist was optional, but those who discussed their diet with a dietitian were more secure in their actions. It might have increased compliance and reduced confusion to push this option more.

It is also clear from the interviews that participants signed up for the study not only out of interest in fermented food and intestinal microflora, which was the main reason the researchers would have guessed. They also stated they wished to change their diet in some way. Some described positive changes when changing their diet in the past. Others mentioned participating because they had experienced ongoing digestive problems, and one participant even stated that he jumped on all opportunities to do something fun. Most participants also wanted to receive personal results from

the questionnaires and biosamples. Interest in fermented food was not, as such, the main driving force for volunteering to participate.

Using a mixed-method research design, we were able to gain rich insight into the challenges and strategies deployed by the participants from the interviews, which, combined with the data from the compliance surveys, demonstrate not only that most people found it difficult to comply with the six daily portions of fermented foods, but also provides important directions as to why participants found this consumption level difficult, and what they did to overcome those difficulties. While this article is based on a preliminary analysis of the interviews, we plan to further explore the potential for a combined analysis of the qualitative data with analysis of the biological samples collected during the intervention study.

This study demonstrates how the change from a diet low in fermented foods to a diet high in fermented food entails a rage of challenges, which have more to do with personal, physical, and practical constraints than with the regulatory and safety challenges that are often the focus of such studies (see e.g., Paxson 2021; Sanders 2018). It also highlights some of the viable strategies that people use to overcome such constraints, adopting novel food items as part of their daily diet, and referring to food memories when reaffirming their choices to themselves and others. The current study will increase our scientific understanding of challenges and strategies for adopting a fermented diet and might, with time, influence dietary recommendations and practices for improved well-being.

Notes

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