



Proposal for a Quality Mark for a more accurate differentiation of vegetable fermented foods

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Food produced by means of Fermentation; Fermented food containing undefined live microbial cultures; Fermented food containing specific live microbial cultures;

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Summary

- There is sufficient evidence to show that artisanal ferments with undefined microbial contents that are sold unpasteurised may confer significant health benefits
- These undefined microbial contents may even be probiotic, however it would be impossible to guarantee microbes being in sufficient “Colony Forming Units” (CFU) at the time of consumption
- Therefore, unpasteurised fermented foods cannot meet the scientifically accepted criteria for “Probiotic Food” due to the artisanal process involved in production
- The fermentation process confers medicinal benefits to foods beyond the microbial content at the time of consumption

We propose a three tier Quality Mark to differentiate subtypes of vegetable ferments:

Tier 1: Foods produced by means of fermentation: supermarket variety, shelf stable by means of heat or chemical treatment - no live microbial content

Tier 2: Fermented foods containing live cultures - ferments made by spontaneous fermentation with undefined but live microbial content; the artisanal variety

Tier 3: Fermented foods with specific microbial strains - ferments by specific starter taxonomically defined to strain level with known genome sequence; to the best of our knowledge these products are currently limited to some dairy products

Tier 1 Badge	Tier 2 Badge
	

For comparison only we've included the Probiotic Food tier, which sits outside of our proposed framework and is regulated by industry.

		Wild ferment or starter culture based?	Treatment to reduce microbial activity?	Cold or ambient storage?	Does it contain live cultures at time of consumption?	Are the cultures in sufficient quantity to provide health benefits?
Tier 1	Food produced by means of Fermentation	EITHER	YES	AMBIENT	NO	NO
Tier 2	Fermented food containing undefined live microbial cultures;	WILD FERMENT / UNDEFINED STARTER	NO	COLD	YES, undefined	UNDETERMINED
Tier 3	Fermented food containing specific live microbial cultures;	STARTER CULTURE	NO	COLD	YES, specific	UNDETERMINED
n/a	Probiotic food	STARTER CULTURE	NO / TARGETED	COLD	YES, specific	YES

1. Introductory statement

A growing consumer awareness about Health and Wellness, an increase in the consumption of Functional Food and Beverages and increasing awareness about Food Preservatives has triggered renewed global interest in fermented foods, at an unprecedented level.

The purpose of this paper is to help bring clarity to the fermented foods market. With the industry focused on dairy ferments (yogurt) and in recent years also on non-alcoholic

fermented beverages (kombucha), our own focus is on vegetable ferments such as sauerkraut and kimchi.

The scientific basis for this whitepaper is the consensus reached by a team of 13 interdisciplinary scientists on a global definition of fermented foods. Their work was published in Nature in January 2021¹ and defines fermented foods as:

“foods made through desired microbial growth and enzymatic conversions of food components”.

Most importantly, the authors take care to note the difference between probiotics and the live microbes associated with fermented foods, which makes for a great source of misinformation in various books, online and especially on the marketing materials associated with fermented foods, including but not limited to product labels.

Our mission is to:

- (1) provide practical guidelines to consumers by popularising the scientific consensus on fermented foods
- (2) support small and medium-sized producers of fermented foods to make scientifically accurate claims about their products
- (3) provide a framework that can support the development of a clear nomenclature for vegetable fermented foods
- (4) keep spontaneous, wild, fermentation as a legal, open and free technology

2. The many benefits of the fermentation process

Let's start by examining the benefits that the fermentation process adds to vegetables. The first level of discussion is to look at these irrespective of the microbial content at the time of consumption. More specifically, this can refer to any foods produced through the process of fermentation.

¹ Marco, M.L., Sanders, M.E., Gänzle, M. et al. The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on fermented foods. Nat Rev Gastroenterol Hepatol 18, 196–208 (2021). <https://doi.org/10.1038/s41575-020-00390-5>

Some of the many positive, documented effects of foods produced through the fermentation process² are as follows:

- Fermented foods have an increased amount and bioavailability of nutrients and enhance nutrient density³
- The fermentation process reduces the cooking time of food
- The fermentation process is responsible for the production of new enzymes that assist with digestion.
- Fermentation reduces serum cholesterol by inhibiting cholesterol synthesis in the liver and endogenous cholesterol absorption in the intestine⁴
- Fermentation is robust, stable, and safe for the product, thereby preempting diseases/infections such as diarrhoea and salmonellosis⁵
- Fermentation promotes the formation of antioxidants, bioactive, anti-hypertensive, anti-diabetic, and FODMAP-reducing components⁶
- Beyond health, the fermentation process enhances the organoleptic properties (smell, taste, texture) of foods.

Furthermore, we believe that fermentation is in and of itself is a virtuous process in the context of the problems associated with current global food production:

- It is local - makes use of local products and local microbes
- It is an un-patentable food technology available to everyone, for free
- It can prevent food waste
- Where organic farming is not possible, it can break down pesticides from the raw materials⁷

3. The war on microbes and its consequences

*The processes required for fermented foods were present on earth when man appeared on the scene... When we study these foods, we are in fact studying the most intimate relationships between man, microbe and foods.*⁸

- Prof. Keith H. Steinkraus, Cornell University, 1993

² Sharma R, Garg P, Kumar P, Bhatia SK, Kulshrestha S. Microbial Fermentation and Its Role in Quality Improvement of Fermented Foods. *Fermentation*. 2020; 6(4):106. <https://doi.org/10.3390/fermentation6040106>

³ Huan Xiang, Dongxiao Sun-Waterhouse, Geoffrey I.N. Waterhouse, Chun Cui, Zheng Ruan, Fermentation-enabled wellness foods: A fresh perspective, *Food Science and Human Wellness*, Volume 8, Issue 3, 2019, Pages 203-243, ISSN 2213-4530, <https://doi.org/10.1016/j.fshw.2019.08.003>.

⁴ Jesch, E.D.; Carr, T.P. Food ingredients that inhibit cholesterol absorption. *Prev. Nutr. Food Sci.* 2017, 22, 67, <https://doi.org/10.3746/pnf.2017.22.2.67>

⁵ Minh, N.G. Investigation of pickled water spinach (*Ipomoea aquatica*) fermentation by *Lactobacillus* sp. *Int. J. Multidiscip. Res. Dev.* 2014, 1, 71–80.

⁶ Melini F, Melini V, Luziatelli F, Ficca AG, Ruzzi M. Health-Promoting Components in Fermented Foods: An Up-to-Date Systematic Review. *Nutrients*. 2019 May 27;11(5):1189. doi: 10.3390/nu11051189. PMID: 31137859; PMCID: PMC6567126.

⁷ Regueiro J, López-Fernández O, Rial-Otero R, Cancho-Grande B, Simal-Gándara J. A review on the fermentation of foods and the residues of pesticides-biotransformation of pesticides and effects on fermentation and food quality. *Crit Rev Food Sci Nutr.* 2015;55(6):839-63. doi: 10.1080/10408398.2012.677872. PMID: 24915365.

⁸ Steinkraus KH: Comparison of fermented foods of the East and West. In *Fish Fermentation Technology*. Edited by Lee CH, Steinkraus KH, Reilly PJ. Tokyo: United Nations University Press; 1993:1–12.

Despite being considered one of the oldest methods of food preservation (after drying), fermented foods have sadly made their way outside of popular consciousness particularly in the West. In the 1860s, French scientist Louis Pasteur made the discovery that microbes were responsible for souring alcohol and this can be prevented by heating the beverages.

Today, with the consolidation of global food supply chains where 70% of what we eat and drink is controlled by the top 10 global companies⁹, it is of no surprise that pasteurisation is ubiquitous, an essential technology in food distribution. The food we eat today is rendered microbially dead for many good reasons, but it comes with two unfortunate features:

- 1) Homogeneity - every batch made to look, taste & smell identically (McDonaldization¹⁰)
- 2) Maximisation of ambient shelf life - hence the ubiquity of ultra-processed foods in the modern diet

This problem is only exacerbated by overprescription of antibiotics^{11,12} and over-reliance on antibacterial cosmetics and household cleaners¹³.

Humans as hosts have co-evolved with microorganisms over millions of years, and each body habitat has a unique set of microorganisms shaping its microbiota¹⁴. There are about as many bacterial cells in our body as there are human cells¹⁵, with over 90% of them living in our gut. The gut controls and deals with every aspect of our health. We must therefore recognise the importance of our microbiome, that we rely on bacteria, yeasts and moulds for wellbeing and health.

4. The case for a more accurate differentiation of vegetable fermented foods

With so many forces converging against our fellow microbes it is not a surprise that misinformation is ubiquitous. This has notable effects on the fermented foods market in general but especially on the fermented vegetable camp in particular.

The main culprit here is the lack of any clear differentiation of different types of foods containing live microbes at the time of consumption.

⁹ Spector T D, Gardner C D. Challenges and opportunities for better nutrition science—an essay by Tim Spector and Christopher Gardner *BMJ* 2020; 369 :m2470 doi:10.1136/bmj.m2470

¹⁰ Anthony R. Grace , Janet E. Palmer (2015). The Homogeneity of Society: The Role of Franchising in the Health and Food Sectors. *Sociology and Anthropology*, 3(12), 661 - 664. DOI: 10.13189/sa.2015.031205.

¹¹ Ramachandran P, Rachuri NK, Martha S, Shakthivel R, Gundala A, Battu TS. Implications of Overprescription of Antibiotics: A Cross-Sectional Study. *J Pharm Bioallied Sci.* 2019;11(Suppl 2):S434-S437. doi:10.4103/JPBS.JPBS_62_19

¹² Llor C, Bjerrum L. Antimicrobial resistance: risk associated with antibiotic overuse and initiatives to reduce the problem. *Ther Adv Drug Saf.* 2014;5(6):229-241. doi:10.1177/2042098614554919

¹³ Aiello AE, Larson EL, Levy SB. Consumer antibacterial soaps: effective or just risky? *Clin Infect Dis.* 2007 Sep 1;45 Suppl 2:S137-47. doi: 10.1086/519255. PMID: 17683018.

¹⁴ Kostic AD, Howitt MR, Garrett WS. Exploring host-microbiota interactions in animal models and humans. *Genes Dev.* 2013 Apr 1;27(7):701-18. doi: 10.1101/gad.212522.112. PMID: 23592793; PMCID: PMC3639412.

¹⁵ Sender R, Fuchs S, Milo R. Revised Estimates for the Number of Human and Bacteria Cells in the Body. *PLoS Biol.* 2016;14(8):e1002533. Published 2016 Aug 19. doi:10.1371/journal.pbio.1002533

Historical forces like the push for shelf-stable (pasteurized) foods by supermarkets, negligent media hype and misleading marketing claims, have generated confusion for everyone in this market: consumers, producers and even regulators.

- Consumers are confused about how to choose fermented foods that are palatable (potential cultural biases), healthy (potential misinformation issues) or both;
- Artisan producers need to cut through the industry noise with clear labelling that is truthful but can also act as a relevant marketing vector;
- Regulators will need to develop a framework for a relevant industry standard for these foods sooner rather than later;

We believe that the way to sort out this confusion and enable a more thriving ferment market is to bring together scientific rigour, a clear classification system and transparent labelling. The solution we thus propose is the development of a quality mark that attests to a more accurate differentiation of vegetable fermented foods. This way we can address the confusion across all categories of stakeholders within this particular market:

- Providing a practical guideline for consumers to navigate the space and make more informed choices based on their particular needs
- Ensuring a standardized, recognizable label for small and medium-sized producers to make accurate claims about their products
- Supporting the development of a framework for regulators to establish a standard nomenclature for vegetable fermented foods

It is imperative that such a mark is developed relying on the latest scientific consensus on fermented foods and constantly updated to reflect the latest development. Ensuring rigour to establish credibility across the board will be key.

5. Fermented Foods, if not Probiotics then what?

The ISAPP paper referenced gives a clear definition of what is considered a probiotic:

Live microorganisms that, when administered in adequate amounts, confer a health benefit on the host.

- ISAPP, Nature, 2021

As it is understood, a probiotic must meet all the following criteria:

- Documented health benefit via a high-quality scientific study
- Microbes alive at the time of consumption
- Number of microbes at sufficient level as to provide benefit
- Microbes taxonomically defined to strain level

- Genome sequence of microbes available

As artisanal products made by spontaneous fermentation, foods like Kimchi and Sauerkraut cannot be labeled as probiotics. Even if they contain live microorganisms at the time of consumption, that may be probiotic, they can never meet the full criteria.

The ubiquity of contradictory information available online compels us to try and provide a framework that food artisans can use to properly label and market their products, without minimising their potential medicinal benefits.

Further information on how probiotic foods differ from fermented foods courtesy of ISAAP [here](#).

But some important questions remain:

- Are we missing out on potential health benefits by not consuming foods that are microbially alive, such as unpasteurised sauerkraut and kimchi?
- What about fermented foods that are made by natural, spontaneous fermentation, but are pasteurised when packaged - the vast majority of supermarket variety, found on ambient temperature shelves?
- Can fermentation artisans reliably create cultured ferments with specific strains of microbes that are associated with health benefits?

We hope this whitepaper will go a long way to answering these questions and providing clarity to consumers.

6. A heuristic to determine medicinal properties of live cultured fermented foods

Last updated: April 2021

Question	Scientific evidence
Does the gut microbiome play an important role in human health?	Yes, there is strong scientific evidence in support of this claim. ¹⁶
Can diet influence the gut microbiome with implications for human health?	Yes, there is strong scientific evidence in support of this claim. ¹⁷

¹⁶ Mohajeri MH, Brummer RJM, Rastall RA, et al. The role of the microbiome for human health: from basic science to clinical applications. *Eur J Nutr.* 2018;57(Suppl 1):1-14. doi:10.1007/s00394-018-1703-4

¹⁷ Singh RK, Chang HW, Yan D, et al. Influence of diet on the gut microbiome and implications for human health. *J Transl Med.* 2017;15(1):73. Published 2017 Apr 8. doi:10.1186/s12967-017-1175-y

Is there overlap between microbial strains found in fermented foods and the ones in the human gut?	Yes, there is strong scientific evidence in support of this claim. ¹⁸
Can these beneficial microbes survive digestion and reach the gastro-intestinal tract?	There is some scientific evidence in support of this claim. ¹⁹
Are live, unpasteurised, fermented foods safe to eat?	Yes, there is strong scientific evidence ^{20,21} , backed by a historical safety track record of thousands of years; excluding rare health conditions such as histamine sensitivity ²²
Is there sufficient evidence to conclude that eating fermented vegetables with live cultures will improve specific health-related conditions?	No, there is only very limited evidence on the effectiveness of most fermented foods in gastrointestinal health ²³ . Furthermore, there are no quality RCTs (randomised controlled trials) on the consumption of live fermented foods and their impact on health.

7. Our proposal for a 3-tier Quality Mark for food artisans and producers

	Available certification via weferment.org at launch
	Unavailable certification at launch, under development
	Unavailable, regulated by industry outside of weferment.org

TIER	DESCRIPTION	HAS LIVE CULTURES?	MARK NAME
Tier 1	Food produced by means of fermentation, pasteurised, shelf stable, ambient storage	NO	Made by Fermentation™ weferment.org

¹⁸ Rezac S, Kok CR, Heermann M, Hutkins R. Fermented Foods as a Dietary Source of Live Organisms. *Front Microbiol.* 2018;9:1785. Published 2018 Aug 24. doi:10.3389/fmicb.2018.01785

¹⁹ Corcoran BM, Stanton C, Fitzgerald GF, Ross RP. Survival of probiotic lactobacilli in acidic environments is enhanced in the presence of metabolizable sugars. *Appl Environ Microbiol.* 2005;71(6):3060-3067. doi:10.1128/AEM.71.6.3060-3067.2005

²⁰ Tolulope Joshua Ashaolu. Safety and quality of bacterially fermented functional foods and beverages: a mini review, *Food Quality and Safety*, Volume 4, Issue 3, August 2020, Pages 123–127, <https://doi.org/10.1093/fqsafe/fyaa003>

²¹ Motarjemi Y, Nout MJ. Food fermentation: a safety and nutritional assessment. *Joint FAO/WHO Workshop on Assessment of Fermentation as a Household Technology for Improving Food Safety.* *Bull World Health Organ.* 1996;74(6):553-559.

²² Joneja, Janice M. Vickerstaff. *The Health Professional's Guide to Food Allergies and Intolerances.* Academy of Nutrition and Dietetics, 2013.

²³ Dimidi E, Cox SR, Rossi M, Whelan K. Fermented Foods: Definitions and Characteristics, Impact on the Gut Microbiota and Effects on Gastrointestinal Health and Disease. *Nutrients.* 2019;11(8):1806. Published 2019 Aug 5. doi:10.3390/nu11081806

Tier 2	Fermented Food, unpasteurised, cold storage	YES, Undefined microbial content	Live Cultures Inside™ weferment.org
Tier 3	Fermented Food that contains specific cultures, unpasteurised cold storage	YES, Species specific	L plantarum inside™ weferment.org
n/a	Probiotic Fermented Food	Regulated by industry	n/a

6.1 We Ferment Support Badge for Cafes, Pubs and Restaurants

Badge	Description
Live Ferments Here™ weferment.org	Live ferments are available for purchase in this establishment (Tier 2 certified products).
We Ferment Here™ weferment.org	This establishment does its own fermenting and makes them available for purchase .

All producers that get certified, including establishments that choose to display our badge will feature on the weferment.org directory and benefit from our various Fermentation Advocacy activities.

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