



PERSONALIZED NUTRITION

Let's talk about personalized nutrition

The old adage of “you are what you eat” is having something of a renaissance as personalized nutrition (PN) gains a foothold in the food industry. We’ve never been able to collect this much data on our eating habits before – nor tailor our nutrition accordingly. We can now take our differences in metabolism, genetics and biochemistry into account and use

this data to live a healthier life¹.

While the premise of PN is promising, much needs to be done to better understand how the human body works in relation to nutrition³, how much personal biodata consumers are willing to share, and whether people are truly ready to accept PN as a healthcare practice.

Hello, reader!

You're holding a fact sheet produced by Food Tech Platform, an allied ICT Finland network orchestrated by the University of Turku. This leaflet gives you an easily approachable overview of personalized nutrition. It covers the topic from four different points of view:

Keep reading to find out

- what speeds up and hinders consumer acceptance of PN
- how digitalization affects the personalized nutrition market
- what kind of scientific advances are being made
- how the characteristics of personalized nutrition influence legislation and policy

See last page
for a quick
summary!



CONSUMER
BEHAVIOR



BUSINESS



SCIENCE &
RESEARCH



LEGISLATION



CONSUMER BEHAVIOR

Skepticism over health? Consumers are hesitant about PN

Your browsing history knows what movie you should watch next, which artist you should listen to, and even which restaurant you should order food from. Wherever data exists, so does the possibility for personalized recommendations and services. We've been tracking our calories and writing food journals for decades, customizing our diets to fit our changing needs. But what if we went a bit deeper?

Many studies show the importance of personalized nutrition in healthcare. So far, nutritional guidelines have not slowed down the rise of chronic diseases. Meanwhile, conflicting nutrition information has caused consumers to doubt their nutritional choices⁴. A tailored approach would benefit several patient groups, such as people with kidney failure, whose diets are already very strict. If individuals' reactions to nutrition were better understood, dietary changes could be made without affecting lines of treatment⁵.

A paradigm shift towards personalized nutrition would certainly have its benefits, but it's still waiting for widespread consumer acceptance. While consumers are mainly positive about the concept of personalized nutrition, they're concerned about privacy, especially in terms of nutrigenomics test results and the high cost of these tests. These concerns could be alleviated through more knowledge of the relationship between genes and nutrition along with more com-

prehensible personalized nutritional advice compared to general recommendations, among other things⁶.

In addition to a lack of acceptance, consumer ambivalence may play a part in dampening the development of personalized nutrition. Studies show that a person's eating context (that is, the environment and situation in which they eat) can increase their ambivalence towards PN advice and even act as a barrier to use said advice⁷.

Despite these hindrances, there are several popular applications and services that have introduced consumers to different iterations of personalized nutrition. Here are a few examples:

- **Habit** (2018) is a company based in San Francisco that generates personalized information on how the body responds to nutrients. It looks at more than 60 indicators, such as sensitivity, blood sugar and cholesterol biomarkers.
- **Blue Apron** (2018) is a food delivery service that offers a wide range of chef-designed meals to cook at home. Customers receive fresh ingredients and recipes delivered to their doorstep.
- **Day Two** (2018) offers smart, research-based and personalized nutrition based on the customer's individual body metrics and gut microbiome. Consumers need to provide a stool sample for analysis and complete a questionnaire.

WHAT IS PERSONALIZED NUTRITION?²

PN leverages human individuality to drive nutrition strategies that help us fight disease and be healthy. There are four areas of application in the field: science and data, professional education and training, guidance and therapeutics, and semi-tailored products based on individual needs.



BUSINESS

Digitalization is driving the personalization of food

The covid pandemic has accelerated the digitalization of overall consumer business, which will continue to drive the personalization of various services. The food industry is no exception. According to a 2020 survey, the pandemic has accelerated global businesses' digitalization plans by at least 1-3 years. For example, PepsiCo has recently launched two direct-to-consumer platforms containing an array of different products.

This brings the products even closer to the consumer and reduces covid-related supply chain challenges⁸.

Grand View Research estimates that the global personalized nutrition market was at 25 billion dollars in 2017 and is expected to grow more than 9 percent per year until 2025⁹. At the moment, the personalized nutrition market relies heavily on technology. So far, the most widespread area of

business for personalized nutrition is nutritional coaching.

Consumer interest in personalized nutrition can be seen in the rise in popularity of dietary and nutritional apps. Positive feedback loops, reminders and other nudging techniques already rely on understanding consumer behavior, but advances in technology, data and analytics will enable even more personalized services across different channels and buying stages¹⁰.

As digitalization diversifies consumer choice, companies will have to rethink their approaches to business and consumer engagement. According to McKinsey's 2019 report, there are two main operations that help businesses thrive as the demand for personalization grows. Firstly, businesses need to invest in identifying behavioral data and customer propensity from consumer data and analytics. Secondly, they have to be able to protect customer privacy. Transparency about data use, limiting the processing of personal data only to what's necessary,

and granting customers the right to have their data deleted are crucial actions¹¹.

The secure use and processing of data is certainly one of the main challenges in personalized nutrition. While the positive feedback loop mentioned earlier in this chapter is central to the personalized service model, it relies on the consumer's willingness to continue sharing their data. The ongoing sharing brings up questions about privacy and data ownership that the industry needs to resolve¹².

Another challenge is the higher cost of personalized products. Consumers have to believe in the products and their power to make a positive difference in order for the cost to feel justified. Companies must design their operations and systems with this goal in mind¹³. These data and privacy issues may be part of the reason why very few companies offer truly personalized nutrition based on specific health biomarkers and genetic information.



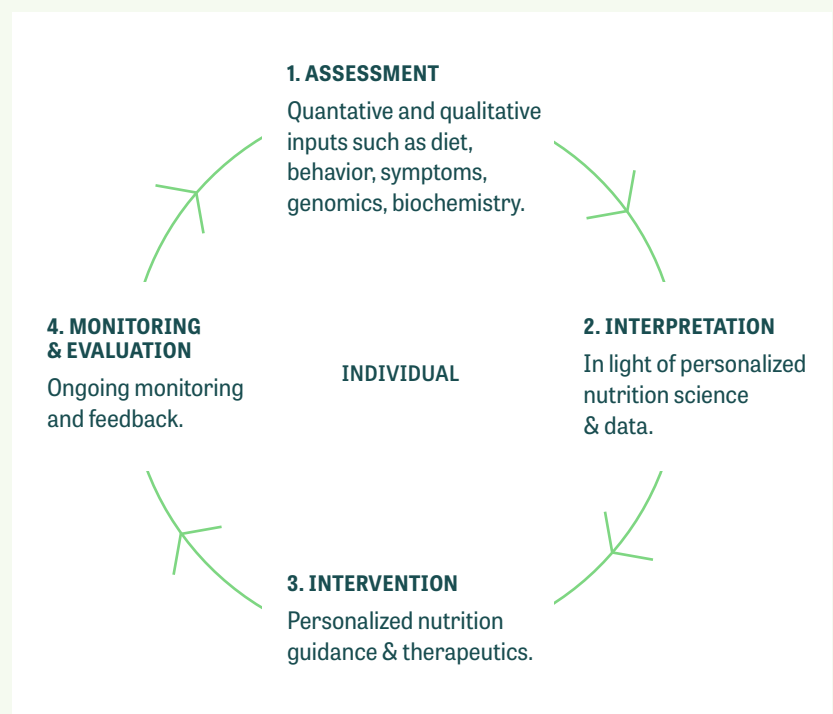
SCIENCE & RESEARCH

3D printing takes tailored food to the next level

Researchers argue that the current disease-centered medical approach is ill-suited to chronic conditions that have multiple causes and impact several biological systems, and which are a major cause of death and disability worldwide. Patients should be treated comprehensively and their personal circumstances should be taken into account¹⁴.

Personalized nutrition's main strength is that it can influence how diet shapes a person's response to nutrients and how, for example, their genetic makeup impacts nutrient metabolism, thus optimizing health. Despite its proven health benefits and growing popularity among consumers, personalized nutrition is still unexplored in our Western healthcare culture¹⁵.

Yet there are several promising advances in personalized nutrition research and development. Let's take a look at some of the science and technologies that could make personalized nutrition a more mainstream component of our health toolkits.



The above figure illustrates a personalized nutrition care model from an individual's point of view. (16)

1. Personal prediction models and scenarios.

Studies have shown that certain food items affect different people in different ways. A banana can make one person's blood sugar shoot up radically, while someone else remains unaffected. According to research conducted in the University of Eastern Finland, different reactions to food can be modeled and predicted with the help of nutritional data and blood tests. These kinds of prediction models could help in the treatment and dietary restrictions of both types of diabetics and people suffering from kidney malfunctions¹⁷.

2. The "omics" sciences. "Omics" refers to studies in biological sciences that end with -omics, such as genomics or metabolomics. For example, nutritional genomics and microbiomics analyse, identify and charac-

terize molecules in the structure or function of a cell, tissue or organism. Nutritional genomics, for instance, explores the interaction between genes, nutritional components and health outcomes. These omics studies allow a more comprehensive understanding of a person's health needs¹⁸.

3. 3D food printing. 3D printing technology enables the sustainable production of personalized food in different structures and shapes, ranging from triangles to snowflakes. In 3D printing, consumer data, such as nutritional needs, likes and dislikes, drives the production of food. The taste, flavor, color and even the appearance of food can be modified to make it more appealing depending on a person's dietary needs and preferences¹⁹.



LEGISLATION

Legislation and policy could help accept and adopt PN

Despite multiple campaigns and recommendations by governments around the world on healthy and unhealthy nutrition, some of our most harmful eating habits haven't really changed over time. Metabolic diseases and obesity are still on the rise²⁰. The idea of a universal healthy diet that applies to the global population should be tossed out, and more accurate nutritional information should be incorporated as part of public health policies²¹.

In this final section of the fact sheet, we'll go through three important challenges from the point of view of legislation and policy. The first one has to do with the **acceptance of personalized nutrition**. According to researchers, the lack of a shared and accepted definition of personalized nutrition creates barriers for the field's credibility. For instance, the changing regulatory landscape and the identification of biomarkers pose challenges for the field to continue gaining acceptance. The personalized approach does hold promise for public health, but further research on the utilization and standardization of personalized nutrition systems is needed, among other things²².

The second challenge relates to **data**

privacy and security. These issues surface especially in nutrigenomics (the study of how food affects a person's genes and how a person's genes affect the way the body responds to food)²³. Nutrigenomics requires the collection of biological samples as well as the management of genetic information. No research or services can be legally carried out without consent, and in this context the scope of consent is broad: it encompasses, for example, the testing of children and the secondary use of genetic information by interested third parties, such as employers²⁴.

Finally, the third challenge is the **commercialization of health**. When it comes to personalized nutrition, consumers seem to trust health professionals, such as dietitians, more than commercial actors. In order to maintain consumers' trust, businesses need to rely on nutrition and dietetics professionals when developing personalized nutrition products and services. These service providers also need to consult experts on how to address legal and ethical issues concerning personalized nutrition. Ideally, commercial personalized nutrition in the future will be the end result of active dialogue between companies and health experts²⁵.

REFERENCES

- 1, 2 Bush, C. L., Blumberg, J. B., El-Soehy, A., Minich, D. M., Ordovás, J. M., Reed, D. G. & Yunez Behm, V. A. (2020). Toward the Definition of Personalized Nutrition: A Proposal by The American Nutrition Association, *Journal of the American College of Nutrition*, 39:1, 5–15
- 3 Kohlmeier, M., De Caterina, R., Ferguson, L. R., Görman, U., Allayee H., Prasad C., Kang J. X., Nicoletti C. F., Martinez J. A. (2016). Guide and Position of the International Society of Nutrigenetics/Nutrigenomics on Personalized Nutrition: Part 2 – Ethics, Challenges and Endeavors of Precision Nutrition. *Nutrigenet Nutrigenomics* 2016, 9:28–46.
- 4 Rizo, J. (2020). Consumers demand personalization, and individually tailored supplement plans fit the bill
- 5 Turkia, J. (2017). [Analytiikka personoidun ruokavalion perustana](#)
- 6 Szakály, Z., Fehér, A. & Kiss, M. Consumer Acceptance of Personalized Nutrition. *Trends in Personalized Nutrition* (2019). Pp. 225–260.
- 7 Reinders, M. J., Bouwman, E. P., van der Puttelaar, J. & Verain, M. C. D. (2020). Consumer acceptance of personalised nutrition: The role of ambivalent feelings and eating context.
- 8 Top Five Digital Consumer Trends in 2021. Euromonitor International.
- 9 Grand View Research. (2020). [Personalized Retail Nutrition And Wellness Market Size, Share & Trends Analysis Report By Recommendation \(Fixed, Repeat, Continuous\), By Region \(North America, Europe, APAC, MEA, LATAM\), And Segment Forecasts, 2020–2027](#).
- 10, 11 McKinsey. (2019). [The future of personalization—and how to get ready for it | McKinsey](#).
- 12, 13 Oakland Innovation Ltd. (2020). [Personalized nutrition: How technology is unlocking a complex, disruptive market](#)
- 14, 15, 16 Bush, C. L., Blumberg, J. B., El-Soehy, A., Minich, D. M., Ordovás, J. M., Reed, D. G. & Yunez Behm, V. A. (2020). Toward the Definition of Personalized Nutrition: A Proposal by The American Nutrition Association, *Journal of the American College of Nutrition*, 39:1, 5–15
- 17 Seppälä, L. (2017). [Reagoimme ruokiin yllättävän yksilöllisesti. Turun Sanomat.](#)
- 18 Vailati-Riboni, M., Palombo, V. & Loor, J. J. (2017). [What are omics sciences?](#)
- 19, 20 Derossi, A., Hosain, A., Caporizzi, R. & Severini, C. (2020). Manufacturing personalized food for people uniqueness. An overview from traditional to emerging technologies, *Critical Reviews in Food Science and Nutrition*, 60:7, 1141–1159
- 21 Giazitzi, K., Karathanos, V. T. & Boskou, G. (2020) Personalized Nutrition Recommendations in Food Services. In: Quality Assurance in the Era of Individualized Medicine
- 22 Adams, S. H., Anthony, J. C., Carvajal, R. Chae, L. Khoo, C. S. H., Latulippe, M. E., Matusheski, N. V., McClung, H. L., Rozga, M. & Schmid, C. H. (2020). Perspective: Guiding Principles for the Implementation of Personalized Nutrition Approaches That Benefit Health and Function. *Advances in Nutrition*, Volume 11, Issue 1, pp. 25–34.
- 23 National Cancer Institute. [Definition of nutrigenomics.](#)
- 24 Castle, D. (2007). The ethics of personalized nutrition. *Agro FOOD industry hi-tech*, vol. 18, pp. 68–70.
- 25 Stewart-Knox, B., Gibney, E.R. Abrahams, M., Rankin, A., Bryant, E., Oliveira, B. M.P.M. & Póinhos, R. Personalized Nutrition: Making It Happen. Editor(s): Charis M. Galanakis, *Trends in Personalized Nutrition*, Academic Press, 2019, Pages 261–276.

PERSONALIZED NUTRITION

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We hope this leaflet has given you some food for thought. Take your time to digest it! But if you're feeling too full, take these bites with you.

CONSUMER BEHAVIOR



A paradigm shift towards personalized nutrition would have its benefits, but still awaits widespread consumer acceptance. Consumers are concerned about privacy and high costs.

BUSINESS



At the moment, the personalized nutrition market relies heavily on technology. So far, the most widespread area of business for personalized nutrition is nutritional coaching.

SCIENCE & RESEARCH



Despite its proven health benefits and growing popularity, personalized nutrition is still unexplored in our Western healthcare culture. However, the current scientific advances look promising.

LEGISLATION



More accurate nutritional information should be part of public health policies. Ideally, commercial personalized nutrition would be the end result of active dialogue between companies and health experts.

Let's start a dialogue!
Contact the Food Tech Platform Programme Leader Laura Forsman (laura.forsman@utu.fi) and start something exciting.

Food Tech Platform Finland is a food focused research-business network in Finland that brings together companies, startups, science and education communities, and the public sector. Its ambitious aim is to develop a sustainable Food System 2.0. For this purpose, it facilitates the breeding of science-based food innovations and novel business propositions. Food Tech Platform Finland is an Allied ICT Finland powered growth network and is orchestrated by the University of Turku.

