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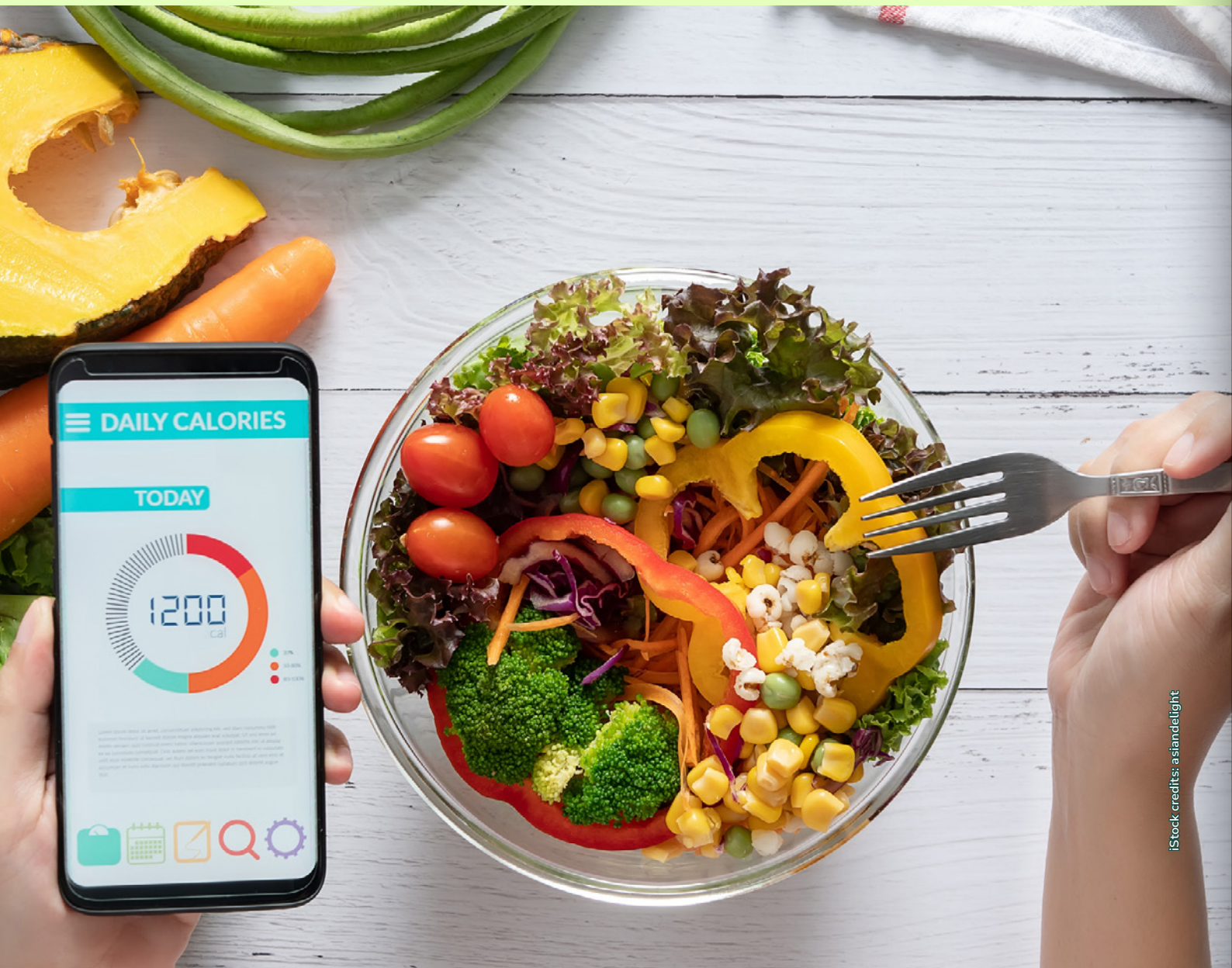
The 2024 Future of Nutrition Summit:

Giving a taster of
tomorrow's technologies



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Back by popular demand: The Vitafoods Europe Future of Nutrition Summit

The Future of Nutrition Summit is returning to Vitafoods Europe for 2024!

Following an incredible first year, the Summit is back at the Geneva Marriott Hotel on 13 May.

Join us for this one-day, in-person event, which takes place the day before the Vitafoods Europe exhibition opens, offering a snapshot of what the health and nutrition industry could look like in five or more years' time.

Independent futurist thinkers will share insights into how the nutraceutical landscape is evolving, with top-notch content and ample opportunities for peer-to-peer networking. Visionary experts from a diverse range of disciplines and industries will be represented, including food science, innovation, sustainability, retail, nutrition, and public health, as well as startups, scale-ups, and investors.

Discussions will focus on the future of health, product development, and retail, with expert-led sessions on the advancements set to disrupt the industry in the years to come.

In this e-magazine, the Vitafoods Insights team brings you a selection of interviews with speakers who will be appearing at the Future of Nutrition Summit, as well as articles that give a flavour of where the nutraceutical industry is heading.

[Click here to book your spot](#)



[Download the Future of Nutrition Summit agenda here](#)



Holland & Barrett on its ‘customer-first, science-first’ R&D strategy

By Anthony Fletcher



Alex Glover
Nutrition Development Lead
Holland & Barrett International

Holland & Barrett takes a coordinated approach to new product development, embracing new technologies and new ways of reaching consumers, from AI to TikTok, says Alex Glover, nutrition development lead for R&D at the retailer, who will be speaking at the Vitafoods Europe Future of Nutrition Summit.

Holland & Barrett International is a leading health and wellness retailer and the largest in Europe, supplying its customers with a wide range of vitamins, minerals, health supplements, specialist foods, and natural beauty products. Alex Glover, nutrition development lead for R&D at Holland & Barrett, will be at **Vitafoods Europe Future of Nutrition Summit**, to share his insights into this fast-moving sector.

“Our approach is very much customer first, and science first,” he says. “If there is a customer trend, then we want to react in a way that is evidence-based, and for our solutions to be informed by science. This is important for building trust. There is growing scepticism and hesitancy among consumers when it comes to health and wellness, and I think this is good.”

Holland & Barrett has an entire team dedicated to trends and insights. New product development involves numerous teams working together, in order to take consumer insights and cutting-edge science from the concept board to the shelf. “We are constantly asking ourselves what problem we are trying to solve,” says Glover. “Another important question is: how can we make it easy for consumers to implement this product in their life?”

Tech in the health and wellness sector

The Summit will touch upon the implementation of technology in the health and wellness sector. “AI [artificial intelligence] is certainly an interesting possibility,” says Glover. “I’m not a part of the tech team, but I am aware that there are lots of ongoing initiatives into how we can leverage this technology in order to better translate science papers. It can be very easy to get drowned in science papers when you are trying to find answers.”

Glover notes that Holland & Barrett has started conducting in-store blood testing. This is an example of how the implementation of technology can open up new avenues and services for consumers, and shows how businesses can move away from just being product-led businesses.

“A key question is always whether these technologies can add value or benefit,” says Glover. “It is also important to note how they resonate with the customer, and what the benefit is for them.”

Engaging with consumers

Glover notes that consumers want to be informed, and have access to far more information than ever before. A key challenge of course is that not all these sources of information are trustworthy. This underlines the importance of building trust, and being able to reach your target customer in a crowded field.

“There is so much information out there,” says Glover. “We often see people receiving advice from so-called experts outside their sphere of expertise.”

The challenge for businesses like Holland & Barrett, says Glover, is not only to champion evidence-based nutrition and science, but to create content that resonates with consumers. “You need to reach people through media that they understand,” he says.

“This might be social media platforms such as Instagram and TikTok. Evidence-based science can still be funny and engaging, and some scientists are starting to do this, by tweeting their research, and not just publishing it in academic papers that consumers are not going to read. This is the biggest gap – the creation of bite-size content that is easily consumable and talks to consumers in a language they understand.”



A roadmap towards making precision nutrition a reality

By Anthony Fletcher



Vimal Karani
Professor of
Nutrigenetics and
Nutrigenomics
University of
Reading, UK

While precision nutrition offers huge potential in the delivery of tailored dietary recommendations, a number of challenges must first be overcome to accelerate the shift from personalised to precision nutrition, says Professor Vimal Karani.

Karani, professor of nutrigenetics and nutrigenomics at the University of Reading in the UK, has devoted his career to advancing personalised nutrition. He is also deputy director for the Institute for Food, Nutrition and Health, and has carried out a great deal of research into how healthy lifestyles can overcome the genetic risk of cardiometabolic diseases such as obesity, diabetes, and cardiovascular disease.

“My focus has been global, taking into consideration not only European countries but also lower- and middle-income countries,” Karani explained. “There is plenty of data for Western populations, and personalised nutrition companies in the UK and Europe are trying to provide solutions for most of the people.

“There is a lack of such evidence, however, in developing countries. This continues to be a key barrier to providing personalised nutrition for all.”

A global perspective on nutrition

With that in mind, Karani launched a large-scale collaborative study about a decade ago, with the focus very much on lower- and middle-income countries. Over the course of ten years, around 50 publications have been published, with reference to different regions and countries. Karani believes that more in-depth studies and data are still needed, in order to get to the next level of personalised nutrition.

“This will be a key message of my presentation at the Future of Nutrition Summit,” he said. “People differ in their genetics, nutritional requirements, and responses to nutrients, and some of this boils down to ethnicity. We need more data on people from Asia, Africa, and South America.”

This more holistic research approach, Karani believes, will help to accelerate the shift from personalised to precision nutrition.

“Precision nutrition is about going to the next level of detail,” he said. “It is about taking a holistic, comprehensive approach. Dietary recommendations are based on all data available – genetic, microbiome, health status, dietary patterns, ethnicity, taste perception, socioeconomic status – and even early life.”

Challenges to achieving precision nutrition

Karani notes that advances have been made. Scientists and researchers now have access to large sets of genomic data, in-depth data on gut health and the gut microbiome, and are using new “multi-omic” approaches. What is needed now, he says, is more data.

“We have identified nearly 800 genetic variants related to obesity, but these still only explain up to 5% of total variations,” he said. “That means we still need to discover more than 90% of genetic variants, and personalised nutrition in this respect is still based largely on assumptions.”

Another challenge is that everyone’s gut microbiome is in constant flux, with metabolites and microorganisms changing all the time. This again makes it difficult to make assumptions about what someone’s ideal diet should be.

Machine learning and cohort-based studies

In his presentation, Karani intends to highlight the potential of machine learning approaches in overcoming these challenges. Researchers are already working on integrating big datasets into machine learning models, and developing algorithms to design personalised diets.

“For this, we need large cohort-based studies, with screening right from birth,” he said. “A key message I would like to send to researchers is that they please start gathering this information, because this is going to be very useful!”

Exciting new areas of research include metabolomics, and also metabonomics. This is about looking at low-weight metabolites, which we know play a key role in maintaining glucose levels. Karani will also highlight at the Vitafoods Europe Future of Nutrition Summit the importance of looking at multiple genetic variations, and developing a genetic risk score for specific cohorts.

“What I try to do in my research is identify what percentage of the population has a high genetic risk, and how this can be addressed,” he said. “For this, all data needs to be taken into consideration.”

Karani’s presentation at Vitafoods Europe, entitled “Precision Nutrition: Hype or hope for the prevention of cardiometabolic disease?”, will examine in depth this exciting area of cutting-edge research, and bring to light many of the practical implications and opportunities for both industry and consumers.



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The seven pillars of ethical AI in personalised nutrition

By Kirstin Knight

Personalised nutrition AI has the potential to change the world for the better – but at the speed at which technology is moving, we need to act now to ensure these tools are ethical and trustworthy.



**“WE
NEED TO
REALLY
RAISE THE
BAR”**

That’s the idea behind a white paper published by B2B personalised nutrition platform [Qina](#) outlining the principles of an ethical AI framework.

The EU reached an agreement on the [AI Act](#), the world’s first comprehensive law regulating AI, in December 2023. However, conversations on ethics tend to focus on privacy and security. Nutrition is often seen as low risk, despite its wide reach and capacity to influence behaviour and, ultimately, health outcomes.

Building AI solutions on empathy is key, according to Qina CEO Mariette Abrahams, who said she hoped for the white paper, entitled “The ethics of AI at the intersection of nutrition and behaviour change”, to act as an “audit tool”.

“We have a lot of companies starting to employ AI solutions now, but it’s more about the implementation and about that level of personalisation, rather than thinking actually, what are we trying to do in terms of behaviour, and who are we impacting, and who are we benefiting in the end?” she said.

And, while cultural changes such as these can take years to embed, she warned that at the speed that tech is moving, time is of the essence.

“I think it’s important that at this stage, we need to really raise the bar... [We] can’t look back in even two years’ time and have all these solutions drawing on the same datasets, coming up with the same recommendations, and excluding swathes of people,” she told Vitafoods Insights.

Embedding ethics into personalised nutrition AI

The white paper lays out **7** pillars that form the basis of its ethical AI framework. These are “not standalone principles but are integrated within a multi-layered structure”, which considers four “cardinal directions”: health, nutrition, society, and technology.

Data

Data is a crucial consideration for all sorts of reasons, not least in terms of where and from whom it is sourced, as many personalised nutrition tools draw on research carried out in specific populations.

“It needs to be transparent [regarding] who was included in that research,” said Abrahams. “You can’t recommend a Mediterranean diet and apply it to the Chinese population, for example.”

Meanwhile, companies that make products designed to drive behavioural change need to ensure transparency if they are to build solutions that are truly inclusive, she said.

AI system

The white paper says human agency and oversight are “paramount” to ensure personalised nutrition AI systems “are not only built under supervision for expert review, but also remain under expert guidance once deployed for continuous evaluation purposes”.

Abrahams emphasised the importance of transparency not only in terms of how nutrition recommendations are decided upon, but when and how consumer behaviour is being influenced.

“We should also be alerting people on, ‘Hey, we are now kind of nudging you’... helping people to raise their self-awareness and also their levels of self-efficacy,” she added.

Human-centric

Affordability and access are “foundational pillars for AI solutions in personalised nutrition, and a determinant to adoption”, the white paper states.

Abrahams added: “Social determinants are one of the biggest influencers of health outcomes. And if we look at where you live, your education level, your digital literacy level, your income level, how much you spend on your health, percentage of your income, access to fresh food and vegetables – those are data points that are not being taken into account in personalised nutrition solutions, in most cases.”

If the endpoint of personalised nutrition is to improve health outcomes and healthspan, “we are missing the biggest chunk of data of information that can drive the personalisation”, she warned.

People and planet

While companies broadly acknowledge the importance of sustainability, Abrahams said it tends to be treated as “an area on its own. It’s not built into the current AI system”.

Personalised nutrition could act as “the bridge between sustainability and health”, according to the white paper; however, professionals need guidance on how to incorporate sustainable diet principles, for example, in different cultures and regions.

“At the moment they are separate worlds, but they should be integrated,” said Abrahams.

Regulation

Personalised nutrition “is unique”, said Abrahams, “because we sit at the intersection of so many other things, like functional food and medical software”.

It means there are multiple grey areas to navigate and sometimes brands fail to realise that they “are dipping their toes in regulated territory”, she said.

“If you want people to increase more vegetables, then that’s good, that’s great – but if you’re going to tell people to have specific supplements or functional foods to manage their hypertension... now you’re on medical territory,” she explained.

Abrahams called for enhanced awareness but also for the regulators themselves to step up.

“At the moment, it’s a grey zone,” she said.

Organisational commitment

Many AI ethics frameworks focus on the AI system itself, with “not enough focus” on the inherent biases that every person working on that system brings with them.

The white paper suggests that organisations ensure diversity among their teams, as well as offer bias detection and reduction training to all staff who work on AI systems.

Abrahams also drew attention to discrepancies in the language used by different teams, arguing for them to agree on a “common language” around solutions that may be impacting communities at a societal level.

Education and training

The white paper highlights a “readiness gap” among both consumers and professionals regarding the adoption of AI technologies, which it blames on a lack of understanding of the benefits that AI can offer as well as a perceived threat to job roles.

Abrahams said the “massive shift” taking place in terms of job roles would have an inevitable impact on education.

“It’s changing the way we need to think about not only how we train people, but also what we train them in,” she said.

“There [are] so many areas we need to think about that if we don’t watch out, then AI can easily just pick up any kind of bad science... That’s what we need to be very, very mindful of.”

“IT’S CHANGING THE WAY WE NEED TO THINK ABOUT NOT ONLY HOW WE TRAIN PEOPLE, BUT ALSO WHAT WE TRAIN THEM IN”

Upcycling anti-inflammatory nano-nutrients from whey

By Niamh Michail

Israeli startup Exosomm has developed a chemical-free process to extract exosomes – the nano-nutrients found in mammalian milk that have anti-inflammatory properties – from whey. This is a game-changing technology for a truly novel, upcycled health ingredient, it says.



“IT IS WELL KNOWN THAT BREASTFED BABIES ARE PROTECTED FROM A LONG LIST OF DISEASES”

Exosomes are membrane-bound nanoparticles naturally present in human and animal milks that contain microRNA (miRNA), or short chains of RNA that are associated with beneficial immune-related activity and anti-inflammatory properties.

“It is well known that breastfed babies are protected from a long list of diseases,” said Netta Granot, CEO and co-founder of the Israeli startup. “Research shows that many health benefits of mother’s milk are due to high concentration of natural nano-nutrients, called exosomes. Milk exosomes protect and contain short chains of RNA – microRNAs – which are proved to have health benefits, like anti-inflammatory activity.

“Obviously, mother’s milk isn’t commercially accessible or scalable. But our research team found that the same beneficial components exist also in raw cow’s milk, as we are all mammals. This realisation led us to develop our game-changing technology.”

According to laboratory analyses conducted by Exosomm, bovine milk exosomes and those found in human breast milk have a 90% similarity. The startup therefore worked to develop a proprietary chemical-free process to isolate these nano-nutrients from whey, a by-product of cheese manufacturing.

“We are creating a new ingredient. We are one of the first teams in the world to reveal this: to identify the exosome composition and understand the microRNA mechanism and connect it with a medical indication and benefit use,” said Granot.

While several companies have now started to develop products based on microRNA, Granot said Exosomm has a head start thanks to years of research led by Professor Shimon Reif and a team at the Israeli Hadassah University Medical Center in Jerusalem, and its numerous patents.

A solution for sufferers of IBD

Exosomm has decided to initially capture the medical food market with a product targeted towards sufferers of inflammatory bowel diseases (IBDs), including Crohn's disease and ulcerative colitis.

"We decided to start first on the chronic colitis segment mainly due to their unmet needs," Granot told Vitafoods Insights. "This is like a very good starting point to get recognition of the therapeutic benefits of our ingredient. As a startup you need to know where your entry point to the market [is] because you are very limited with resources, and you cannot conquer all the world at once."

The number of people suffering from IBD, Crohn's, or colitis also provides a more than adequate consumer base for Exosomm: there were around 4.9 million sufferers globally in 2019, according to [a study published in the British Medical Journal](#), an increase of over 47% since 1990. Traditionally regarded as a Western disease, prevalence is also spreading to more recently industrialised countries in the Middle East, Asia, and Latin America. In the long term, the startup also plans to target the much larger infant formula category and it has also conducted studies showing benefits of exosomes for managing type 2 diabetes and pre-diabetes.

Health benefits: Four distinct mechanisms of action

Exosomm, which is currently raising funds for a seed round, [has published several pre-clinical studies that demonstrate](#) how its milk exosomes improved inflammatory pathologies via four distinct mechanisms.

Firstly, milk exosomes promote cell proliferation to repair inflamed gut tissues, critical to ulcer healing; secondly, they increase the levels of anti-inflammatory cytokines; thirdly, they reduce the expression of pro-inflammatory cytokines; and, finally, they improve the gut microbiome.

Exosomm's research on mice demonstrated that its exosomes reduce gut inflammation by 90%, results that are equivalent to the pre-clinical results of the drugs available today, it said.

It now plans to carry out clinical trials on humans suffering from Crohn's and colitis, and has submitted a formal application to the Helsinki Committee at the Hadassah-Jerusalem Hospital.

Exosomm has already secured generally recognised as safe (GRAS) status from the US regulatory agency and is beginning to compile the data required for a novel food dossier in the EU.

A novel ingredient from a global waste product

One benefit of Exosomm's production process is that it extracts exosomes from whey – both acid whey and sweet whey – without creating demand for additional milk production.

Whey is the liquid left over when milk has been curdled and the solids separated to make cheese. This huge side-stream of the dairy industry is generated worldwide at a rate of about 121 million tons per year.

"For one kilo of cheese, you need to have 10 litres of milk, so nine litres is whey cheese water," Granot said. "You need to do something with it. It's a huge amount. [...] This is an opportunity for everyone."

Upcycling whey is a win-win situation for cheesemakers because they can add value to a by-product that otherwise must be treated, she added.

Environmental regulations in many Western countries require whey to be disposed of properly. The acidity of acid whey – a by-product of making acid-coagulated dairy products such as ricotta, goat's cheese, and Greek yoghurt – can be harmful to the environment. Nutrient-rich sweet whey can be used as crop fertiliser or animal feed but too much can also pollute waterways.

Exosomm's ingredient comes in a shelf-stable, powdered format that can be added to food and drink products.

Strategic collaboration with Tnuva

The startup is already collaborating with Tnuva, Israel's biggest dairy company, to produce its ingredients in Tnuva's Ba'emek-Tech factory. Thanks to this collaboration, Exosomm has access to both a pilot facility and commercial-scale facility without having to invest in infrastructure itself – one of its biggest strategic advantages, Granot said.

However, it is looking for additional manufacturing partners to test various product applications, such as a ready-to-drink beverage, a milkshake-style powder, or food supplements, for example, and test its stability within these matrices.

"It's like the art of finding the right application," she said. "This is why we ... want to collaborate with partners [as] this is their expertise."

Precision fermentation: Challenges for the alternative protein industry, **part 1**

By Kirstin Knight

Precision fermentation could pave the way towards a new generation of sustainable proteins. But questions around formulation, consumer education, and marketability present challenges for industry.



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That was the opinion put forward by experts during a panel discussion at the Future of Nutrition Summit, held as part of Vitafoods Europe's sister event, Food Ingredients Europe 2023.

Led by Ruben Smouter, senior consultant at Bright Green Partners, the panel explored the opportunities and complexities associated with precision fermentation, looking specifically at its role in the production of alternative proteins.

Precision fermentation: A 'game-changer' for alternative proteins

Precision fermentation – a technology that uses microbes, microalgae, or yeast to produce molecules that are analogous to those found in animal products – was described by Smouter as “a real game-changer” for the alternative protein industry.

Stephan van Sint Fiet, CEO of Vivici, a Dutch precision fermentation dairy startup, agreed that it was a “great technology”, adding that he hoped it would be “one of the technologies that helps us get to sustainable protein”.

He explained: “It’s a mature technology. It’s been around for many, many decades. A lot of things, including proteins and enzymes, are made by fermentation today. And really, the novelty here is not so much the fermentation part; it’s the fact that we’re now focusing on food proteins or on macronutrients.”

He compared the situation to the energy transition, where “as you move away from fossil fuels, you got a mix of solutions”, whether that was wind, solar, or water.

“I think precision fermentation will be in the mix,” he said. “It won’t be the only technology out there, but it will certainly be one of [them].”

Precision fermentation, formulation, and consumer education

Dr Anastasia Krivoruchko, co-founder and CEO of Melt&Marble, a B2B startup that uses precision fermentation to produce designer fats, agreed that it was an exciting technology with huge potential.

However, it does not come without its challenges, she warned.

“It is definitely challenging in terms of, first of all, getting to a process that is robust enough to be cheap, but then also scaling it up and also having access to production infrastructure,” she said. “It is something that takes time to get right.”

Meanwhile, Dr Heike Steiling, vice-president of R&D and head of Nestlé Product Technology Centers Dairy, pointed to the complexities associated with formulation, using beta-lactoglobulin as an example.

“Of course, there are still bottlenecks,” she said. “If you believe you have beta-lactoglobulin and you

can easily just use it to reformulate milk, it is not so straightforward, because we have thousands of proteins in milk. They all play a functional role; they also play a bioactive role.”

Specifically, the diversity of proteins produced via precision fermentation was not the same, she said, adding: “We are not yet there on replacing milk fats, for instance – there’s still a long way to go.”

It was crucial also to understand how to educate consumers on precision fermentation as a source of sustainable, good-quality protein, she said.

“It’s not an easy black-and-white answer but I think as part of R&D, it’s for us very important to pivot, to see what’s out there, to experiment – and that’s what we are committed to do because at the end, we need to have a portfolio [with good-tasting] products but which also plays a role in a sustainable future,” she added.

Precision fermentation industry’s main challenge lies in marketing, not technology

Van Sint Fiet, who has worked for corporates as well as startups, said the major challenge for precision fermentation companies was to ensure professionalisation throughout the value chain.

“It’s a really steep learning curve. It’s a long journey,” he said. “You start in the lab and you start producing microgram quantities or milligram quantities of your ingredient, then you have to go through scale-up, through regulatory, through manufacturing, and then you have to learn how to run a successful ingredients business or B2C business.”

He argued that the main challenge for these companies lay not with technology, but with marketing.

“It’s about telling the story to the consumer, creating great brands that people want to buy – so to understand, hey, we are actually making sustainably produced ethically sourced ingredients that can turn the products you love into a more sustainable product version of what you already like, or alternatives thereof... not just mimicry,” he said.

He added: “I think that’s really where we need to flip the switch and start not thinking like biotech companies, but we need [to think like] food companies.”

Precision fermentation: Challenges for the alternative protein industry, **part 2**

By Kirstin Knight

Precision fermentation is widely touted for its sustainability credentials – but how can formulators be sure that the model is truly circular?



That was one of the questions raised by experts during a panel discussion at the Future of Nutrition Summit, held as part of Vitafoods Europe's sister event, Food Ingredients Europe.

Panel moderator Ruben Smouter, senior consultant at Bright Green Partners, described precision fermentation – a technology that uses microbes, microalgae, or yeast to produce molecules analogous to those found in animal products – as “a real game-changer” for the alternative protein industry.

But questions remain around sustainability and price parity, others argued.

The question of sustainability and ensuring 'true circularity'

Dr Heike Steiling, vice-president of R&D and head of Nestlé Product Technology Centers Dairy, drew attention to the question of ensuring circularity.

"What is the true circularity of the model?" she asked. "Because we have the growth medium and you need to as well feed those cells with sugar or sugar compounds – how is then circularity of that growth medium? Because... if you have to cultivate maize or other crops in order to feed the cells, you are nothing better than a plant-based beverage."

She added: "We should not overlook the circularity, that we truly can say yes, this is a more sustainable version that not only the traditional dairy business but also a stepping stone vis-a-vis plant, which is today I think not so straightforward."

Dr Anastasia Krivoruchko, co-founder and CEO of Melt&Marble, a B2B startup that uses precision fermentation to produce designer fats, sounded a more positive note, pointing to the opportunities presented by upcycling.

"You can use all sorts of side-streams from the food industry or other types of industries to create those ingredients," she said, describing this as "the next generation" of veganism.

And she emphasised the importance of making a comparison with the means of production currently in use.

"We're producing fat and we're trying to replace coconut oil, which is right now grown in tropical regions where it is associated with a lot of deforestation and loss of biodiversity," she said.

"In our case, even [if], say, we're using traditional sugar sources that come from somewhere in Iowa – growing your sugars in Iowa is still probably more sustainable than cutting down all of these rainforests in Malaysia or Indonesia."

Price parity and partnerships 'crucial' for precision fermentation to be truly sustainable

Stephan van Sint Fiet, CEO of Vivici, a Dutch precision fermentation dairy startup that was borne out of a collaboration between DSM and Fonterra, said partnerships were key.

He added: "I really see a good partnership between the precision fermentation companies who enabled the ingredient and the actual brand owners who know how to tell the story."

Steiling agreed, saying: "It would be stupid to think we can solve all the problems ourselves... Nobody has a crystal ball but currently it's very clear – partnership is where we are going forward. We work with a lot of different partners to figure out and also to get the knowledge."

Asked about the costs associated with the technology, van Sint Fiet said: "Depending on who you talk to, price parity is already here or right around the corner. I don't believe the here part to be honest..."

"I think that there are credible technologies that are out there that if they were implemented systematically in our industry, price parity would be within reach in three to four years."

He added: "Once we hit that social cost level, plus the flexibility and the ability to tailor properties, I think that will really make these proteins very, very exciting ingredients of the future."

Steiling agreed that it was a way off but highlighted the opportunities that would be available once precision fermentation-produced ingredients reach price parity.

She added: "Just imagine, in areas and countries where there is no dairy farming possible, where the climate is too hot – you can still run a reactor and you have good protein, which [is] then also sustainable and affordable... Then I think we have cracked the whole story. But this is not something which is around the corner."



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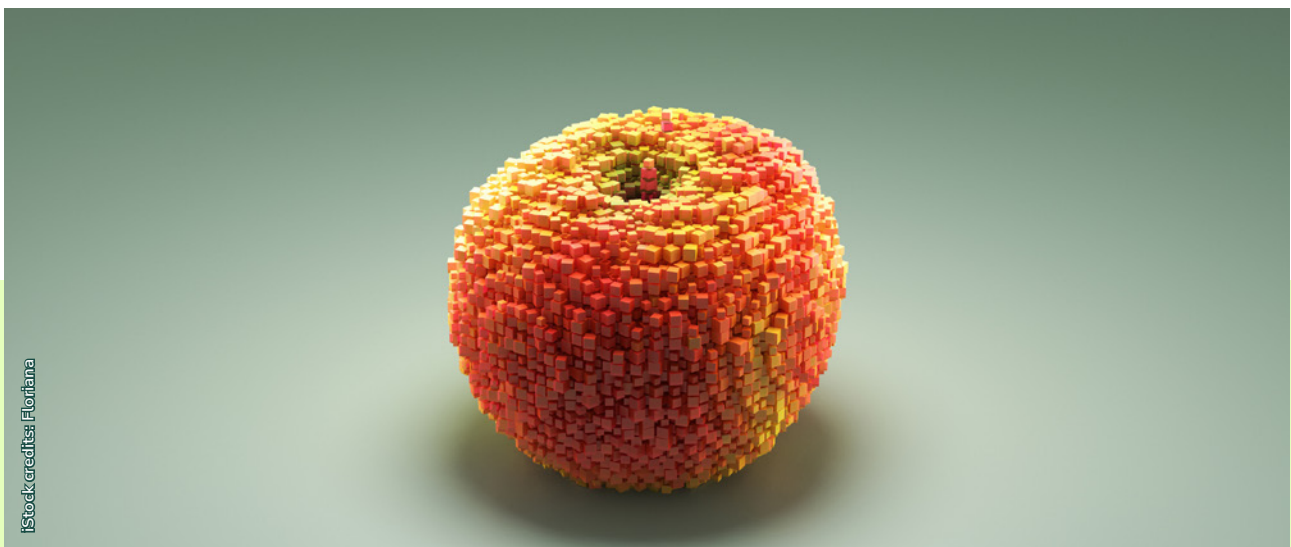
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Fast-tracking ‘transformative’ ingredient discovery: How AI is changing new product development

By Niamh Michail

While artificial intelligence (AI) has become something of an overused buzzword in the nutraceutical world, true AI has the power to allow R&D scientists to discover genuinely transformative ingredients that would take millions of years to develop with traditional methods. “There is no other way forward in this space,” says Nora Khaldi, CEO of Nuritas.



iStock credits: Floriana

In recent years, investors have seen growing numbers of companies interested in using AI and generative AI to discover new food ingredients when previously, they would have entered the pharmaceutical space, said Gil Horsky, founding partner at venture capital fund Flora Ventures.

So, is the food and nutraceutical industry about to experience a wave of companies developing new ingredients using AI?

According to Ehsan Moaseri, CEO and founder at Nulixir, a US startup developing nanocarriers for functional ingredients, many people are using the term AI very loosely without really understanding what it is. Others incorrectly label a process as AI when, in fact, it is based on neural network machines.

“If it is actual AI, it’s definitely a fascinating platform to have,” Moaseri said. “It simply enables you to gain significantly more knowledge about any topic, [such as] fortification and bioavailability in a significantly shorter amount of time.

“But applying the principles and assumptions behind these AI models [is] sometimes very challenging. No matter how strong your hardware is, your output data is only as good as the input data you provided.

“One of the key challenges [...] we see with AI models is that in many of those cases, you start creating very major claims from your output data. Well, you haven’t really screened that input data to make sure you can actually back those claims that you are now creating...”

Verifying the robustness of claims that are being made is an area that requires greater regulation, Moaseri said, adding: “I see that as a major challenge compared to what we have in pharma.”

Understanding molecules and associating them with a health benefit

One of the first companies to use AI in ingredient development for food agriculture applications was Irish company Nuritas. Its CEO and founder, Khaldi, was clear about the role this technology has to play in ingredient R&D.

“There is no other way forward in this space – creating new ingredients, whether it’s in pharma or whether it’s in food – without today the use of AI,” she said.

According to Khaldi, AI has the most potential within food product development when applied at a molecular – rather than diet – level.

“Understanding the molecules within a source material and associating those molecules to a health benefit – that’s what AI can do. And that’s the exact same problem pharma is solving,” she said.

“How do we associate a molecule – no matter what that molecule is, whether it’s in a natural product or whether it’s synthesised by human – [...] with a human and what can it do for the human? Is it beneficial? Is it not? Is it neutral?”

AI can speed up NPD – but years of data collection are still necessary

Khaldi noted, however, that while AI can help solve these fundamental questions, it does require years of experiments to get there. Nuritas, for instance, spent seven years experimentally testing short protein peptides and different cell types from human body tissues and studying the data from a molecular perspective.

“We built in the lab digestive systems where we followed the molecule through the digestive system and we did thousands, millions of those experiments to just build a predictor in the bioavailability space,” she said. “Forget efficacy – efficacy is a whole different world.

“Then, when the AI works, it starts from: what do we actually need? We need an ingredient that’s going to be [generally recognised as safe] GRAS, natural, but also efficacious, and also orally available, and also heat stable. All those are factors [related to] the molecule itself and can only be done through AI.”

Companies must be prepared to invest the time and resources required to collect and develop robust data.

“[You cannot] pluck it out of the internet,” she added. “You have to go into the lab and produce it, and it’s costly and it takes time. But once you get there, you can create ingredients that are transformative.”

Can AI-powered products be affordable?

Carole Bingley from RSSL voiced concerns over the affordability of AI-powered food and drink ingredients. Creating ingredients that have undergone extensive, pharmaceutical-level testing could create cost barriers, pricing the healthiest products out of reach of the people who may stand to benefit from them the most, she said.

According to Khaldi, however, by speeding up the bioactive or ingredient discovery phase, AI can ultimately reduce the cost of R&D and product development. Nuritas recently calculated that it would have taken 30 million years to identify and develop one of its ingredients, PeptiStrong, with the traditional methods of discovery used today.

When developing health ingredients, food manufacturers must factor in not only efficacy of the molecule but also taste and texture, which can complicate the process and make product development very expensive. AI can take these parameters into account from the very beginning.

That’s not to say, however, that AI helps product developers create the perfect product from the very start. Khaldi noted that Nuritas’ first iteration of this ingredient was too expensive and the second one was too bitter.

Biofortified beans tackle hidden hunger in Colombian coffee fields

By Tessa Wiles

Unlocking the potential of sustainable agriculture, three biofortified bean varieties have been released in Colombia, promising resilience to drought and the ability to combat hidden hunger.



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For the four million Colombians dependent on coffee cultivation and earning less than \$2 a day, hidden hunger – the presence of multiple micronutrient deficiencies – is a daily reality.

Three biofortified pulse/bean varieties – BIO103-SGA, BIO105-SGA, and BIO109-SGA – have been introduced in a collaborative effort between the National Coffee Research Centre (Cenicafé), the Alliance of Bioversity International, the International Center for Tropical Agriculture (CIAT), and Semillas Guerrero y Asociados.

Specifically designed for intercropping with coffee, these beans not only promise higher yields with their bushy growth habit but also hold the potential to address hidden hunger among coffee farmers.

Nutrient-rich beans for optimal brain health

Micronutrient deficiencies impact a significant portion of the global population. A 2022 study highlighted in an article by Vitafoods Insights suggests that one out of two preschool-aged children and two out of three women of reproductive age worldwide are affected by vitamin and mineral deficiencies.

Varying in size, shape, and colour, the three bean varieties aim to address micronutrient deficiencies in Colombia by providing more than sustenance.

María Carolina González, PhD research scientist and team leader at Biofortified Crop, told Vitafoods Insights: “The three released varieties focused on the micronutrient zinc, which helps the neurocerebral development of children from zero to five years old, pregnant women and increases people’s defences.”

Providing up to 39% of the daily iron requirement and 41% of the zinc requirement, they stand as nutritional powerhouses – 1.5 times richer in minerals than conventional beans.

Utilising traditional, non-GM plant crossbreeding techniques and field evaluations, these biofortified beans showcase not only their nutritional richness but also their adaptability to coffee intercropping.

“Planting beans intercropped with coffee does not interfere with coffee development,” said González. “[It] allows farmers to improve their food and nutritional security by consuming more nutritious food, while providing them with an alternative source of income during the growing phases of the coffee crop.”

Sustainability in every biofortified bean

Extending beyond addressing hidden hunger, these beans contribute to sustainability. González said: “As legumes, beans help to fix nitrogen from the atmosphere, which improves soil fertility.”

The beans, with tolerance to certain pests, diseases, and drought, align with the changing climate patterns in Colombian agriculture. González explained that these features reduce the need for chemical inputs, minimising the environmental impact.

Discussing the crossbreeding process, she said: “These lines were generated using a traditional breeding method. The method was a three-way cross and advanced for six generations by selfing.”

This process, spanning eight to ten years, involves advanced line generation, agronomic trait identification, molecular tools, farmer condition testing, and the final release.

Through crossbreeding and extensive field evaluations, these biofortified beans cater to the diverse needs of over half a million coffee-growing families across 23 Colombian departments, covering approximately 842,000 hectares.

Beyond addressing immediate nutritional needs, the initiative emphasises a broader perspective, integrating climate-resilient crops into the farming landscape. With a bushy growth habit that requires fewer inputs, these beans contribute to overall agricultural sustainability, reducing production costs.

As the project envisions the commercialisation of surplus beans, it isn’t just about income improvement for coffee growers.

González said: “The release of these varieties was carried out in conjunction with a private agent, which will allow their availability and commercialisation.

“The biofortified programme of the Alliance Bioversity – CIAT does a lot of work in promoting and disseminating biofortified varieties, which results in farmers being able to know and use them so that more families can access more nutritious foods.”

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