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February 2026

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CHALLENGES AND OPPORTUNITIES IN SUGAR AND SALT REDUCTION

How flavor developers and manufacturers are balancing better-for-you formulations with the quality consumers know and love.

Biotechnology as a 'Flexible Toolbox' for R&D: Q&A with SVP of IFF Scent

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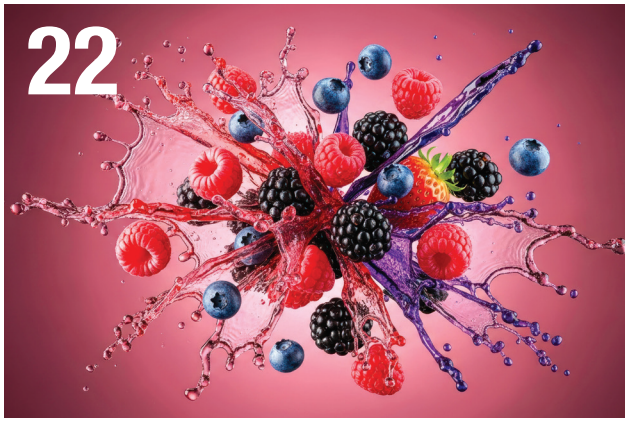
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You Are What You Eat



The idea of food as medicine is not new, but more and more people are beginning to use their food choices as a way to take control of their own personal health.

With the beginning of a new year, one of the most common resolutions across the board is to be healthier. Whether that means starting a new diet or signing up for a discounted gym membership, consumers often see Jan 1 as an opportunity to work towards those healthier goals. But all too often by February, those resolutions have fallen by the wayside. We're right back to the same foods we know and love and the gym shoes haven't come out of the closet in weeks.

I believe this is an area where the F&F community can step in and help consumers out a bit. If we want to return to comfort foods and things we already know, why not formulate these things to be a bit better for us?

Sugar and salt reduction are two of the most common technologies I've seen when researching new flavor innovations. Consumers want to enjoy their familiar snacks and treats without some of the negative side effects. Flavor companies are actively working to develop new sweeteners that take away the sugar but keep the same taste, texture and mouthfeel. This is part of that creative problem solving process that I love to see in our industry.

The idea of food as medicine is not new, but more and more people are beginning to use their food choices as a way to take control of their own personal health. We've seen the rise of probiotic sodas and functional foods as consumers explore more personalized nutrition that works best for their bodies. The key is always taste: can we formulate a better-for-you cola that still tastes like what we know and love? There is a ton of potential for flavor companies to continue to innovate in this direction and help consumers take ownership of their health through the foods they choose.

Maybe our resolutions don't have to be as drastic as completely changing our eating habits. Maybe it's about finding alternatives and blending the old with the new, something the F&F community has embraced wholeheartedly.





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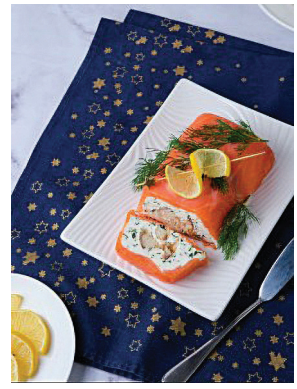


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Seafood Bisque Note is a reaction flavor that delivers a rich, savory seafood character with layered complexity. The aroma opens with shrimp lo mein and soy sauce nuances, accented by subtle bread and warm noodle notes that create mouthwatering warmth. On the palate, even a single drop provides an authentic shrimp-like flavor with smooth umami depth, reminiscent of shrimp scampi. At higher levels, the profile evolves into buttery, savory bisque with crust-like richness, balancing seafood intensity with comforting, soup-like warmth. Ideal for savory sauces, seafood soups, bouillons, noodle dishes, snacks, seasonings and flavor bases, where a robust yet smooth seafood character is desired. Avant Organics provides this material as EU Natural, Kosher, and non-GMO. For your free sample please email info@avantorganics.com.



Images courtesy of the manufacturers



Consumers are looking for healthier versions of their favorite indulgent treats, often with a reduced sugar or salt content.

Image by Martin Villadsen at Adobe Stock

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INDUSTRY INSIGHTS:
FLAVOR EXPERTS DISCUSS CHALLENGES AND OPPORTUNITIES WITH SUGAR, SALT REDUCTION FOR THE HEALTH-CONSCIOUS CONSUMER

This month's Industry Insights column explores how flavor developers and manufacturers are balancing better-for-you formulations with the quality consumers know and love.

It's no secret that consumers are becoming more conscious of their health and what they put into their bodies. But they still want to have bold, delicious flavors from the foods and beverages they decide to purchase.

This balancing act then falls on flavor houses and manufacturers, tasked with reducing unwanted aspects without letting quality suffer. Product developers are shifting and innovating to keep the same great tasting product but with reduced sugar or salt content to appease health-aware consumers. This, of course, creates certain challenges, but also lends itself to opportunities for creative solutions.

Perfumer& Flavorist+ spoke to four industry experts about these topics: Jacob Durbin, senior application scientist at Sensient Flavors& Extracts; Ketan Shah, president of Esha Flavor Solutions, LLC; Shanyn Seiler, product marketing manager for global flavor modulation at ADM; and Mark Webster, vice president of sales and marketing at T. Hasegawa.

What are the main challenges when formulating with sugar/salt alternatives in terms of taste, texture and mouthfeel?

Shanyn Seiler [SS]: It's challenging to maintain preferred tastes and textures in reduced sugar or sodium products because sugar and salt are foundational in many foods and beverages. Sugar not only imparts sweetness, but it also provides important bulking and binding properties to baked goods, granola bars and snacks, and body and mouthfeel to beverages and syrups. In addition to amplifying flavor profiles, salt makes doughs stronger, acts as a leavening agent to help baked goods rise and promotes protein binding in meat snacks. Formulators must understand these critical functional attributes while reducing sugar or sodium to ensure the end product's sensory experience is not negatively impacted.



Shanyn Seiler, product marketing manager, global flavor modulation, ADM

Mark Webster [MW]: One of the growing challenges with low- or no-sugar formulations is the bitter aftertaste caused by many sugar alternatives. While natural options such as stevia, monk fruit and erythritol are becoming mainstream alternatives to synthetic sweeteners like aspartame and sucralose, even natural sweeteners can leave a bitter aftertaste due to their processing. The intensity curve for sugar alternatives can be very short, with sweetness peaking quickly and leaving a lingering metallic aftertaste.



Mark Webster, vice president, sales and marketing, T. Hasegawa

Reducing or replacing sugar can also have an impact on mouthfeel, such as making beverages seem watery or frozen dairy desserts taste less creamy, because sugar is important for bulking and texture.

Most sugar alternatives are also unable to produce the distinct caramelized "browning" flavor profile that comes from the Maillard Reaction. All of these issues create a myriad of problems for manufacturers, especially in beverage, sports nutrition and dessert categories.

Are there any emerging technologies or ingredients that have made it easier to work with these alternatives?

Jacob Durbin [JD]: Many of the sugar alternatives on the market do a great job of adding the sweetness

L to R: Courtesy of ADM; T. Hasegawa;

that manufacturers are looking for but often come with other challenges that can be alleviated by flavor enhancers or maskers, or a combination of both. For example, aspartame provides a nice sweet upfront taste but gives a bitter or "chemical" aftertaste. Ace-K works best when used in tandem with aspartame but doesn't usually work well on its own. Stevia will give a delay of sweetness onset and have a bitter note depending on the type and quantity used.



Jacob Durbin, senior application scientist, Sensient Flavors & Extracts

Masking technology can also smooth out the exaggerated flavor curve of a high-intensity sweetener. Couple masking technology with a flavor booster to help bring out the underlying positive flavor profiles and improve mouthfeel. This can be especially effective in no-sugar-added or sugar-free formulations to provide the taste experience consumers expect.

Ketan Shah [KS]: Innovations in biotechnology and fermentation technology have made significant progress in the development of sugar and salt enhancement modulators. Despite these advances, further work remains to be done. Proprietary materials have enabled sugar reductions of over 70% without the addition of other sweeteners, though flavor raw materials which can provide mouthfeel, and texture must still be incorporated depending on the intended application.



Ketan Shah, president, Esha Flavor Solutions, LLC

What product segments are leading the demand for sugar alternatives? Salt alternatives?

[SS]: Non-alcoholic beverages continue to lead in priority for sugar reduction and alternative sweetening use[1]. Sugar content scrutiny in sauces and snacks follows closely behind, driving demand for sweetening solutions in these categories[1].

Additionally, with upcoming school lunch guidelines, there is heightened need for solutions to support reduced sugar and salt in lunch items like pizza sauce and dough. We also see better-for-you snacks and plant-based or blended meat products as top products for salt reduction and alternative solutions.

[MW]: Beverages are the leading category for sugar alternatives by a considerable margin, with product development accelerating globally using low- or no-sugar formulations. This is consistent across all sub-categories in beverages, from soft drinks and RTD tea or coffee to flavored sparkling waters and energy drinks.

While many of these products aim to be entirely sugar-free through the use of high intensity or natural sweeteners, there is also a growing trend of producing low-sugar beverages. These often have a trace amount of natural sugar to improve the overall taste and maintain a clean label, while still appealing to health-conscious consumers who are reducing their sugar intake.

Often, beverages are the entry point for consumers becoming familiar with natural sugar alternatives like stevia or monk fruit. For that reason, we're seeing growth of these natural sweeteners in other food categories like bakery, desserts, confectionery and dairy.

On the salt reduction side, the largest and most obvious product segment is the snack category. But while reduced sodium chips, crackers and popcorn have been around for years and continue to grow with advancements in salt alternative technology, we're starting to see momentum in other product categories like sauces and dressings. Consumers are becoming increasingly aware of the high salt content in many salad dressings, marinades and sauces, leading brands to formulate new options that reduce or eliminate sodium.

We're also seeing an increase in development throughout the processed meats and poultry category, where manufacturers have historically used sodium as a preservative to extend shelf life and improve the flavor profile. New technology in flavor technology and natural preservatives are enabling us to develop great tasting protein products with minimal salt.

How can flavor modulation address consumer demand for indulgent flavors with better-for-you ingredients?

[KS]: The health and wellness trend in food products is experiencing double-digit growth annually, with consumers increasingly seeking better-tasting options that resemble home-cooked meals. These preferences are driving demand for products with reduced or no sugar and low salt content, while still delivering indulgent flavors.

[SS]: Flavor modulation bridges the gap between indulgence and better-for-you offerings. Flavor modulation can mask off-notes, block bitter receptors, balance acidity, restore roundness in mouthfeel, support

From to: Courtesy of Sensient Flavors & Extracts; Ketan Shah



Salt reduction technologies are commonly used in the snack category.

sweetness perception, as well as bring back creaminess, richness and umami profiles. Sophisticated flavor modulation solutions help manufacturers achieve their sensorial, nutritional and clean label objectives.

[MW]: When it comes to indulgent foods and beverages, consumers want to figuratively "have their cake and eat it, too." Indulgent flavors are incredibly popular, but many consumers want to enjoy their favorite treat without sacrificing their health goals. These two opposing consumer demands are the catalyst for a lot of innovation in the flavor industry over the past decade. A lot of our new flavor modulation technologies and applications were developed specifically to create great-tasting, indulgent foods with less sugar, fat or salt, or with plant-based alternatives and even functional ingredients.

How do you balance flavor complexity with authenticity when working with flavor modulators?

[JD]: The goal is always to meet mainstream consumer expectations for flavor, texture and mouthfeel. Sometimes that means reformulating an existing product. Other times it means starting from scratch to get the best result. From a scientific standpoint, we use control groups paired with altered formulations to compare and contrast and tweak through trial and error.

There is no one solution that fits every application. I think it's important to understand that there are different ways to incorporate any ingredient, whether we look at different formats or a different part of the process. Our goal is to provide a solution that adds the most value for the customer. We always start by identifying the real problem so that we can use the right technology at the right time to create the right result.

In short, the details matter. Let the essence of the flavor shine through while limiting the impact of off-notes and creating a multi-sensorial experience that consumers can connect with.

[KS]: Most raw materials used as sweetness enhancers also contribute to overall flavor complexity. Balancing authenticity and complexity can be challenging, but with expertise and creative thinking, it is achievable. Success requires stepping outside one's comfort zone and applying innovative approaches, while still adhering to essential formulation principles.

[SS]: Flavor modulation balances complexity with authenticity by preserving the flavor's true character while smoothing off-notes, improving richness and mouthfeel, and adding nuances to build back more multidimensional profiles.

Reference:

1. ADM Outside Voice™, Sugar Reduction Insights Tool, Surveys Conducted 2022-2024

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MANE Group Celebrates 20 Years of Presence in the Middle East, Opens New Dubai Headquarters



The new headquarters is equipped with cutting-edge creative and application laboratories, fully digitized sensory facilities and advanced sensory booths.

On December 15, 2025, the MANE Group celebrated 20 years of uninterrupted presence in the Middle East and inaugurated its new regional headquarters in Dubai. The new headquarters is equipped with cutting-edge creative and application laboratories, fully digitized sensory facilities and advanced sensory booths.

MANE was one of the first fragrance houses to have a presence in the Middle East in 2005 with a dedicated perfumer. Today, the company holds a regional market share of 8.5%, driven by innovation, long-term partnerships and deep consumer insights on the region.

"MANE's identity as an independent, family-led company strongly resonates with the Middle East's entrepreneurial culture, where long-term partnerships and shared values are essential," chief executive officer Samantha Mane said. "This alignment has enabled MANE to develop deep-rooted relationships and a strong market understanding over its 20 years in Dubai. With expansion plans already underway in the larger Middle East, I am confident this spirit will lead us to new successes in the region."

According to the company's press release, the new Dubai headquarters will offer over 2,000 square meters of usable space and will bring together 68 employees from more than 15 nationalities. Further, a team of dedicated regional perfumers will work alongside fragrance and technical experts to design fragrances tailored to regional preferences and product formats.

MANE plans to expand into the region in the coming years, including countries such as the United Arab Emirates, Saudi Arabia, Turkey, Pakistan, Egypt and Jordan.

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Courtesy of MANE

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IMH Fragrances Inks Deal with Quicksilver for Fragrance Collection



The debut collection will include two men's scents and two women's scents.

IMH Fragrance, a leading fragrance developer and manufacturer, announced a new partnership which will introduce Quiksilver's first-ever fragrance collection. Set to launch in early 2026 in the U.S. and Canada, Quiksilver fragrance will translate the brand's adventurous spirit and connection to nature into a sensory experience.

The debut collection will introduce four signature scents, including two for men and two for women, each inspired by the contrast and energy of the Quiksilver brand.

"These four fragrances were inspired by the rush of the wave and the thrill of the slopes, to embody Quiksilver's iconic surf-and-snow DNA through scent," said Hanan Malul, chief executive officer of IMH Fragrance.

"Quiksilver has defined surf and snow culture for over five decades with an unwavering commitment to passion, authenticity and innovation," said David Brooks, EVP, Action & Outdoor Sports, Lifestyle, Authentic Brands Group, owner of the Quiksilver brand. "Through our partnership with IMH Fragrance, we're extending that heritage into a new category—capturing the brand's adventurous spirit and the energy of the mountain and the wave in a fresh, expressive way."

The partnership was established through a licensing agreement with Authentic Brands Group, a global brand development, marketing and entertainment platform. It underscores the company's commitment to extending its brands into new categories that foster meaningful consumer connections through best-in-class partners with deep expertise and category leadership.

The full Quiksilver fragrance collection is expected to be available through select retail partners, online at the brand's website and on Amazon in February of 2026.

Click above to listen to this exclusive podcast.

Courtesy of OceanProd

Researchers at Jeonbuk National University Examine Impact of Seasonings on Flavor Perception of Doenjang Soup



Doenjang sou is a traditional Korean dish made from a fermented soybean paste.

In a recent study, researchers from the department of food science of human nutrition and the K-Food Research Center at Jeonbuk National University in Korea examined how monosodium glutamate (MSG) and nucleotide-based seasonings influence the kokumi perception in doenjang soup. The findings were published in the October issue of the journal Food Quality and Preference.

Doenjang soup is a traditional Korean dish made from a fermented soybean paste. The soup's flavor comes from the fermentation process with microbial cultures, which produce both umami and kokumi compounds.

The researchers tested various seasonings of the soup on a panel of 113 untrained consumers. The samples included a control group, 1% MSG, 1% disodium 5′-inosinate, 1% disodium 5′-guanylate and 1% disodium 5′-ribonucleotide.

According to the results of the study, MSG boosted both umami and kokumi tastes, but the nucleotide-based seasonings mainly increased umami alone. The researchers believe that these results demonstrate that the two types of flavor enhancers work differently, even within the same food system.

"Our results show that umami is a major sensory driver of kokumi perception – shaping how consumers experience depth, richness and lingering flavor in doenjang soup," said Professor Mina K. Kim, director of the K-Food Research Center. "These insights offer a clear-evidence based direction for formulating more impactful seasoning systems and advancing premium doenjang-based product development."

Further, the researchers believe that this methodology can be applied to other kokumi-rich foods, including aged cheeses, long-simmered broths and certain seafood dishes.

"Our research can help develop fermented foods that retain the complex flavors of traditional doenjang while meeting modern consumer expectations," Kim concluded. "By showing how umami and kokumi interact in consumer evaluations, our findings support flavor-standardization efforts and the creation of healthier, more satisfying fermented products. As Kokumi research progresses, we expect the industry to adapt to more precise, evidence-based approaches to enhancing flavor depth and persistence."

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FlavorSum Releases 2026 Seasonal Flavor Guide



The guide highlights the top 10 seasonal flavor launches in North America.

North American flavor producer FlavorSum announced the publication of its 2026 Seasonal Flavor Guide for food and beverage developers. The report is built with input from industry experts, flavorists and application scientists.

"The number of North American shoppers who will respond to new flavors in foods and beverages increased to 46%, up five points in the last year," said Dave Franz, chief commercial officer. "And seasonal launches grew 9% annually in the last five years, outpacing the -0.5% CAGR in total new product activity."

The report includes data for the four major seasons (spring, summer, fall, winter) across various categories, including bakery, ice cream, beverages and confections. Further, the guide highlights the top 10 seasonal flavor launches in North America as well as predictions for next year's leading seasonal flavors.

Report Highlights

- The top flavor associated with spring and summer in the bakery category is blueberry.
- Seasonal and LTO flavors influence buying decisions for approximately one in five North Americans.
- FlavorSum's "Flavors to Watch" in the ice cream category for fall and winter include matcha, caramel banana, toffee, chocolate cheesecake and peanut butter vanilla.
- The sugar confectionery category had the largest share of seasonal and LTO launches over the last five years.
- The top flavor associated with fall and winter in cultured dairy is peach.

Image by VGV at Adobe Stock

Coty Appoints Markus Strobel Executive Chairman and Interim CEO



As executive chairman and Interim CEO, Strobel will lead Coty at a pivotal moment.

Coty has announced that Markus Strobel will become executive chairman of the board and interim chief executive officer, effective January 1, 2026.

Strobel succeeds Peter Harf, who will retire from Coty's board after more than three decades of service, and Sue Nabi, who will step down as chief executive officer following a five-year tenure. Harf's leadership helped shape Coty into a global beauty leader, while Nabi oversaw the launch of several blockbuster fragrances, including Burberry Goddess, and materially reduced Coty's financial net leverage to ~3x.

Strobel joins Coty after a distinguished 33-year career at Procter & Gamble, where he most recently served as president of P&G's global skin and personal care business that included a multi-billion-dollar portfolio of more than 12 global brands.

He is widely recognized for driving category and organizational transformation across P&G beauty and for revitalizing SK-II into a leading prestige skin care brand in Asia. During his tenure, Strobel held senior roles across beauty and grooming. This included leading prestige brands like Gucci, Dolce & Gabbana, Valentino and Hugo Boss as part of his fragrance assignment. He spearheaded the modernization of innovation, product supply, marketing and go-to-market strategies and operating capabilities across North America, Greater China, Japan, Korea and Europe for his businesses.

As executive chairman and Interim CEO, Strobel will lead Coty at a pivotal moment. With a strategic review of the consumer beauty business underway, and the full support of the board, Strobel sees a significant opportunity to reinforce Coty's leadership in beauty and unlock multiple avenues for profitable growth and expansion.

Strobel commented, "I am delighted to join Coty at this important juncture. Building on Coty's strong foundations, I see tremendous potential to accelerate growth, strengthen our position in prestige and mass beauty and deliver sustainable value for shareholders, partners and consumers worldwide."

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Bedoukian Research Appoints Robert Sobel as New CEO

Flavor and fragrance company Bedoukian Research announced the appointment of Robert Sobel, PhD as its new chief executive officer.

Sobel brings over 25 years of leadership experience in the science and technology sectors and most recently served as vice president of research and innovation at McCormick. The company hopes that he will lead Bedoukian Research into its next phase of growth and innovation.

"Bob Sobel has a proven track record of driving organizational success through scientific innovation and operational excellence," said Robert Weinstein, PhD, chair of the board at Bedoukian. "We are confident that under his leadership, Bedoukian Research will continue to accelerate its mission of high-quality products and service along with our commitment to the well-being of our employees and community, continuing to honor the legacy started by Robert H. Bedoukian."

"Its an honor to join Bedoukian Research during this pivotal period of growth," Sobel said. "The team's scientific expertise and the company's forward-looking approach are unmatched. I'm eager to work alongside this talented group to deliver on our promise of innovation for customers and stakeholders."



Sobel most recently served as vice president of research and innovation at McCormick.



Courtesy of Bedoukian Research

Flavored Water Market Expected to Reach $57 Billion Over Next Ten Years



The carbonated segment of the flavored water market currently holds the largest share, seen as an alternative to sodas.

The global flavored water market is expected to grow from $22.1 billion to $57.3 billion from 2025 to 2035, according to a new report from Market Research Future. This represents a compound annual growth rate of 10% over the forecast period.

The market is being primarily driven by consumer demand for health-centered beverage options and new, innovative flavors.

"The flavored water market is currently experiencing a notable transformation, driven by evolving consumer preferences towards healthier beverage options," the report states. "As individuals increasingly seek alternatives to sugary drinks, flavored water emerges as a refreshing choice that combines hydration with taste. This market appears to be expanding, with a growing emphasis on natural ingredients and innovative flavor combinations."

The carbonated segment of the flavored water market currently holds the largest share, seen as an alternative to sodas. However, still flavored water is gaining momentum and is projected to be the fastest-growing segment over the forecast period.

Asia-Pacific's flavored water market accounted for nearly $7 billion in 2021 and is expected to show a significant CAGR during the forecast period. Europe's market share is growing as consumers make the switch to flavored waters. Within Europe, Germany held the largest share of the market and the United Kingdom is expected to be the fastest growing region.

The report gives three primary drivers for the flavored water market: flavor diversity, health consciousness and sustainability. Flavored waters can incorporate functional ingredients, appealing to consumers seeking healthier alternatives to traditional sodas and soft drinks. Further, flavored waters are seen as a more sustainable and convenient option for busy consumers.

"Many companies are adopting eco-friendly packaging solutions and sourcing ingredients responsibly, which resonates with consumers who prioritize sustainability in their purchasing decisions," the report states. "This trend indicates a shift towards a more conscientious approach to consumption, where flavor and health benefits are balanced with environmental impact."

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PERFUMER PROFILE:
DELPHINE PERDON RUPNOW

Perfumer at Bell Flavors & Fragrances explains the importance of agility and adaptability in the fragrance industry.

What led you to the fragrance industry?

My passion for scents began early in my youth, driven by the profound emotional connection I felt with the sense of smell. Knowing this was my calling, I strategically chose to study fine chemistry to prepare for a career in the perfume industry, and I obtained two master's degrees specializing in organic chemistry and flavors& fragrances from the Universities of Versailles and Montpellier in France. This dedication eventually led to key internships in the Paris region, at an essential oil company, Duclos Trading (now Azelis), where I developed a deep understanding of natural ingredients, as well as at the Colgate Palmolive Creative Center in Paris.

Can you share a defining moment or breakthrough in your career as a perfumer?

I had several significant moments in my career, which corresponded each time to a move to a different country! The first was moving from France to Singapore to join Sillage Aromatique (now Bell Flavors& Fragrances) in 2009. This was a pivotal moment: the start of my industry career through an analytical lens. I had the privilege of working with talented perfumers, such as Philippe Barberousse, who helped guide my initial steps.

The next crucial transition was my move to the Bell Flavors& Fragrances headquarters in Northbrook, Ill., USA in 2017. This marked a time when I truly began to spread my wings as a perfumer and work alongside exceptional colleagues, including my mentor, Robert Siegel.

What were some of the biggest challenges you faced when entering the perfume industry, and how did you overcome them?

When I relocated to the U.S., one of my biggest challenges was finding a perfume community that offered the same sense of belonging I had experienced with the SFP (Société Française des Parfumeurs) back home. Despite the fragrance industry being largely concentrated on the East Coast, the American Society of Perfumers (ASP) stood out, and its members were incredibly welcoming! I decided to support the organization, starting by managing their social media while working my way up to membership. My involvement on the board grew from apprentice director to director, and now I proudly serve as one of the co-vice presidents with Paula Kundu, working closely with our President Roger Howell. I am so grateful for the amazing people I get to meet along the way!



Delphine Perdon Rupnow, perfumer, Bell Flavors & Fragrances

Name: Delphine Perdon Rupnow

Title: Perfumer

Location: Northbrook, Ill, USA

Courtesy of Delphine Perdon Rupnow

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Can you describe a time when a fragrance formulation didn't turn out as expected? How did you address the issue?

It is a reality that mistakes happen in formulation, particularly during a perfumer's initial training or when testing a new unfamiliar ingredient. A frequent example is overdosing on raw material. Though a possible, if often laborious, workaround is to try to dilute the overpour by adding more"noise" to the formula, the most effective solution is to simply start fresh and increase slowly the level of the target material to pinpoint the ideal dosage for the desired effect, working with an accord or a"coeur" if needed.

With time and consistent practice, these errors diminish, as we learn how to use and tame the ingredients, and yet the occasional surprise (good or bad) remains possible. That's the unpredictable magic of creative formulation!

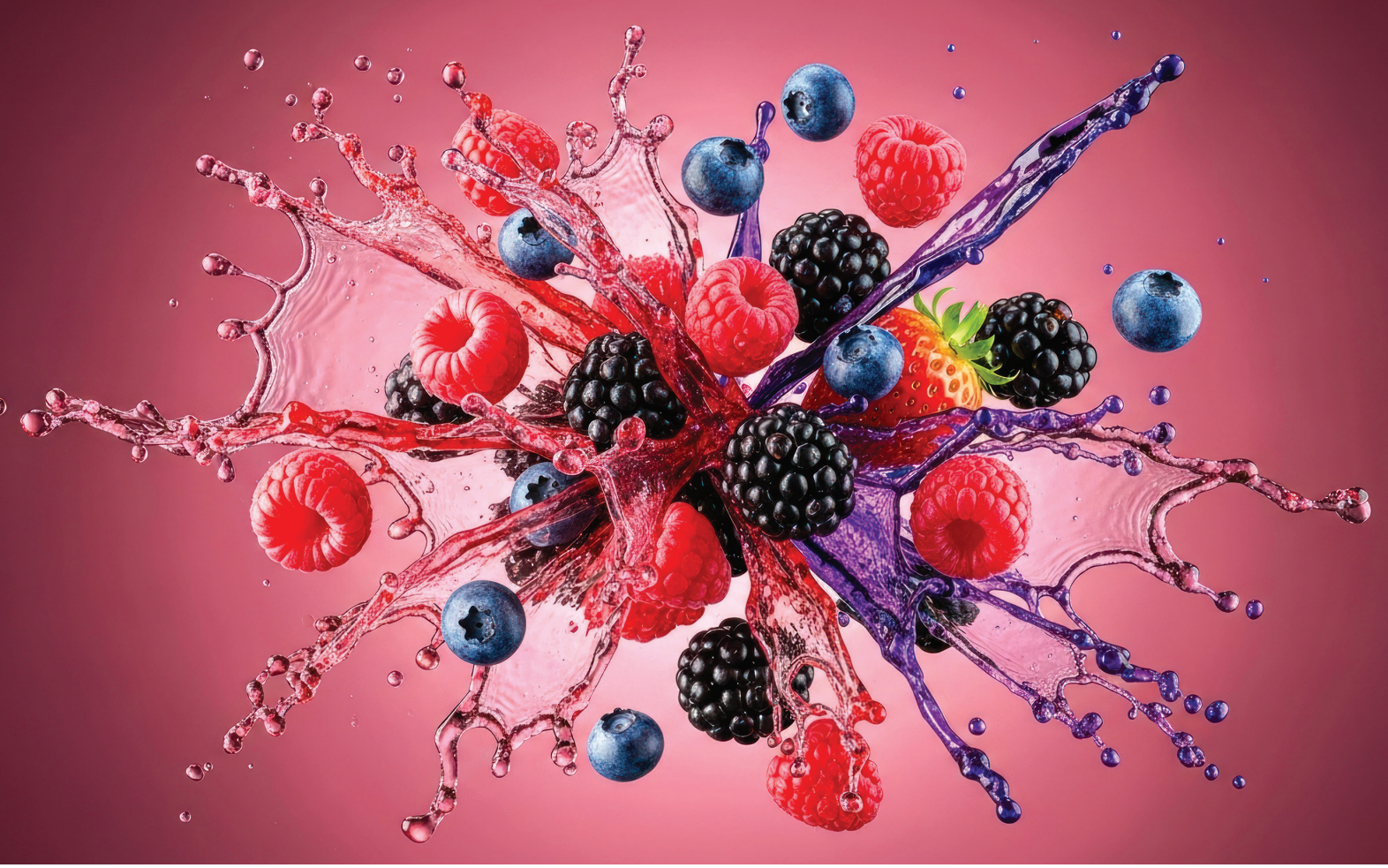
How do you find the right balance between artistic expression and the technical limitations of perfume formulation?

I find that the relationship between creativity and constraints becomes a strength over time. As young perfumers, we start with unrestricted artistry, trying to perfectly capture nature with almost no restriction but the palette itself. However, when technical challenges are introduced, having to achieve a specific result, whether maintaining a very low cost for an impactful fragrance, an increased list of allergens, or dealing with sourcing issues — is both complex and incredibly rewarding. In a constantly evolving world of restrictions, the perfumer's agility is essential, proving that nothing is truly impossible. Navigating those limitations rationally is also a form of creativity on its own, one that keeps us alert, grounded and sparks excitement.

Are there specific skills or knowledge areas you believe are crucial for a perfumer to master?

In my opinion, success as a perfumer demands several key qualities. Firstly, the agility I mentioned, and the ability to embrace challenges by working outside one's comfort zone, maintaining a flexible work approach. Secondly, a perfumer must possess a deep historical and contemporary market knowledge, meaning they must have a sharp memory for iconic references and an ongoing curiosity for current products. This extensive portfolio of scented memories is as important as maintaining ingredient knowledge. They are also the common professional language used to work within the creative team, with peers and evaluators. Finally, and perhaps most importantly, passion must drive the work, backed by a resilient and diligent character, necessary to face the frequent rejections and the numerous required reworks.





Benzyl butyrate is found widely in nature.



BY JOHN WRIGHT
johnwrightflavorist@gmail.com

Flavor Bites: Benzyl Butyrate

Learn about the diverse range of flavor applications for benzyl butyrate.

Benzyl butyrate, sometimes known as phenyl methyl butyrate, (FEMA GRAS#2140, CAS#103-37-7, COE#277) is found widely in nature, notably in papaya, passionfruit, plum, tea and vanilla, often at very modest levels. The aroma is clearly a close relative of benzyl acetate, with more noticeable substantivity and taste contributions.

The two benzyl esters can often work very well in partnership, particularly when benzyl acetate is added at a significant level. Cost sensitive flavorists (which includes pretty much all of us) may shy away from benzyl butyrate because it does not seem to add as much "bang for a buck" as benzyl acetate. There is some truth to this sentiment, but it should be tempered by an obvious level of synergistic effect between the two chemicals. This does not make benzyl butyrate a cost saving addition, but it does eliminate the cost penalty.

Note that the dose rates given throughout this article are the levels suggested for use in flavors intended to be dosed at 0.05% in ready-to-drink beverages or in a simple bouillon.

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Berry Flavors

Blackberry: Moderate levels, around 100 ppm, add attractive depth and taste characteristics to the more obvious impact of benzyl acetate.

Blackcurrant: This flavor category exhibits the same type of variability as other berry flavors. Simplistic, traditional flavors that rely heavily on buchu oil can benefit from levels of addition of benzyl butyrate as high as 200 ppm, but more realistic flavors are very different. Here levels nearer to 20 ppm function much better.

Blueberry: Blueberry and bilberry (wild blueberry) flavors are relatively subtle and the best level of addition of benzyl butyrate is a little lower, around 30 ppm.

Cherry: Cherry flavors with a heavily dominant benzaldehyde character can benefit from significant additions of benzyl butyrate, up to 200 ppm. More subtle and authentic flavors are better served by more moderate additions in the region of 50 ppm.

Cranberry: Fifty ppm of benzyl butyrate deepens and adds authenticity to the background berry character. It also significantly adds to the taste impact.

Raspberry: Levels of use of benzyl butyrate in raspberry flavors are linked to the level of benzyl acetate. A ratio of ten-one works well, typically leading to a level of 100 ppm of benzyl butyrate.

Strawberry: The ideal balance in strawberry flavors is similar, leading to 50 to 100 ppm of benzyl butyrate. Much higher levels, up to 1,000 ppm, can be effective in more traditional style flavors.



Benzyl butyrate can help with the attractive fruity note of mature vanilla bean extracts.

Tropical Fruit Flavors

Guava: Benzyl butyrate partners well with methyl cinnamate to add complexity and authenticity to guava flavors. Fifty ppm is a good starting point.

Mango: The deep berry character of benzyl butyrate adds complexity and authenticity to all styles of mango flavors. The best level of addition is in the region of 100 ppm.

Papaya: Three hundred ppm of this ingredient can have a real impact on authentic papaya flavors. Higher levels can also be interesting, particularly for confectionery applications, but 300 ppm is ideal.

Passion Fruit: Passion fruit flavors can tend to be dominated by ethyl butyrate and other related aliphatic esters, in combination with lower levels of benzyl acetate. Benzyl butyrate works well to deepen the flavor at 20 ppm.

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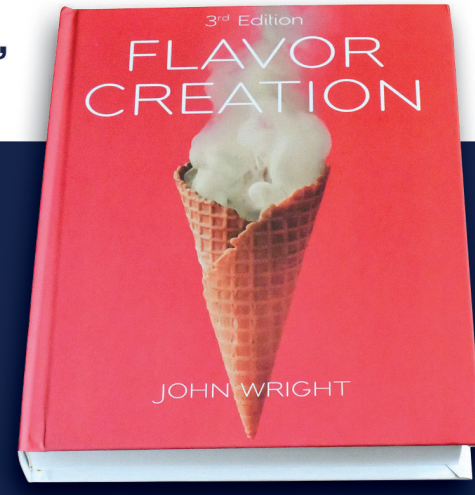


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Other Fruit Flavors

Apricot and Peach: Benzyl butyrate is very helpful in all the many different styles of apricot and peach flavors, adding useful depth and fruit character. The ideal level of addition varies but can be relatively high, around 1,000 ppm.

Damson: Damson flavors typically work well with significant additions of benzyl butyrate. Five hundred ppm is ideal.

Fruit Punch: Benzyl butyrate is a very attractive, albeit second tier, raw material for fruit punch flavors, enhancing the depth of taste at around 200 ppm.

Plum: In the average creative career we probably see relatively few projects for plum flavors, but it is an interesting and challenging category. Benzyl butyrate is helpful, at levels ranging from 500 to 1,000 ppm.

Rhubarb: The addition of around 200 ppm of benzyl butyrate adds complexity to the, sometimes overdone, impact of methyl phenyl carbinyl acetate.



The deep berry character of benzyl butyrate adds complexity and authenticity to all styles of mango flavors.

Other Flavors

Brown Sugar: This heated sugar profile should have a distinct fruity component, but that is normally perceived as more closely related to rum than berries. Benzyl butyrate is effective at deepening the fruity note at levels of addition around 500 ppm.

Hazelnut: A little of this chemical can be interesting in all nut flavors but it is especially useful in hazelnut flavors. It can add depth and complexity at levels around 50 ppm.

Hibiscus: Hibiscus flavors are a minor, but interesting category. The profile can be quite complicated and this ingredient can be very helpful at levels of addition in the region of 50 ppm.

Jasmine: Benzyl acetate is central to all jasmine flavors and can be used at levels where it begins to become very obvious. The berry effect can be maintained by dialing back the benzyl acetate and adding a little benzyl butyrate to keep complexity and realism. One thousand ppm of benzyl butyrate works well.

Tea: Black tea flavors are predominantly floral, but there should also be a subtle fruity background. This raw material contributes to that effect at around 100 ppm.

Vanilla Bean: The quest to create a realistic vanilla bean flavor is normally the search for numerous minor ingredients that will only really function effectively in combination. Benzyl butyrate can help with the attractive fruity note of mature vanilla bean extracts at around 100 ppm.

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WHAT FORMULATORS NEED TO KNOW ABOUT NATURAL FLAVORINGS WITH MODULATING PROPERTIES

FMPs can be used in combination with other flavorings to create a more authentic sensory experience for the consumer.

BY ALEX WOO, PHD, CEO, W2O Food Innovation



Alex Woo, PhD



As neuroscience and ingredient technologies advance, it's definitely possible to make reduced sugar foods and beverages taste better.

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High Potency Sweetener (HPS) Taste Challenges

Human flavor perception is a crossmodal integration of all five senses: taste, smell, sight, sound and touch.

There are five taste challenges when we formulate reduced-sugar foods and beverages with HPS. The first three problems are in the "sweetness time-intensity curve" (**F-1**). Sugar is in green and stevia in blue. Stevia sweeteners have delayed sweetness onset, lower sweetness peak, and lingering sweetness. This is due to HPS being more hydrophobic, less water soluble and having slower diffusion in the saliva to the sweetness receptor.

The fourth problem is "bitterness" (**F-1**). Stevia Reb A 95%/97% (RA) sweetness was nearly linear for the first 200ppm but plateaued at around 8% sugar equivalence (SE), while RA bitterness started above 300ppm and increased dramatically in beverages. This is because RA triggers not only the sweetness receptor T1R2, but also two bitterness receptors TAS2R4 and 14 above 300ppm.

The fifth perception problem is lack of "sugar mouthfeel". The descriptive analysis data (**F-1**) demonstrated that RA had negative oral touch sensations (astringent and metallic) and lacked desirable sugar mouthfeel. This is because HPS, unlike sugar, does not bind enough water to create viscosity that is described as sugar mouthfeel.

Sweetness modulators is a cottage industry that grew up together with plant-based HPS. There are seven types based on different modulation mechanisms. Most plant-based sweetness modulators are labeled as natural flavor in the US.

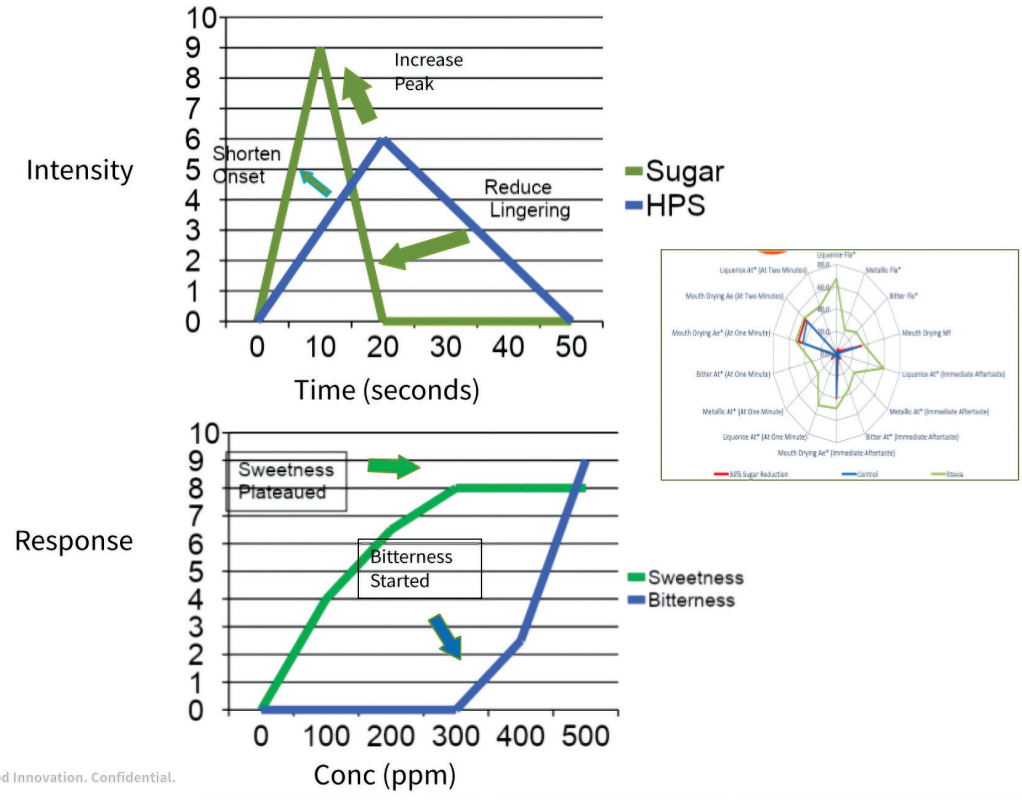
Flavorings with Modifying Properties (FMP) and FEMA Guidelines

"Sweetness modulator" in general is defined as substances that are themselves tasteless but increase, decrease or otherwise change sweetness detection in the mouth and perception in the brain. It is critical to understand that FMP- designated technical effect for FEMA GRAS status is limited to flavor modification.

So what do we must know before we formulate with FMPs?

There are approximately 2,800 flavor ingredients on the FEMA GRAS list. The vast majority of these are flavoring substances (>2,400 individual chemically-defined

F-1 **5 HPS perception problems that sweetness modulators can fix: Sweetness onset, peak, linger, bitter, mouthfeel**



Courtesy of W2O Food Innovation

flavor substances and >300 natural flavor complexes) that impart flavor, and a relatively small number of these are FMPs (less than 3%). 1,100 are also FDA GRAS.

FMPs may be used in flavorings (i.e. compounded flavors/flavor systems) to modify the flavor profile by altering the flavor attributes of the flavoring and the food to which it is added but may not impart a specific characteristic flavor on their own. The FMP-designated technical effect for FEMA GRAS status is limited to flavor modification.

It is important to understand the proper labeling for compounded flavors containing flavorings with modifying properties (FMPs), and the foods containing these compounded flavors. FMPs that have FEMA GRAS status as their sole regulatory authority to use in the U.S. are GRAS only for their technical effect of flavoring. The technical effect of individual FMPs can be verified through appropriate sensory testing conducted under the FMP's specified conditions of intended use as a flavoring substance.

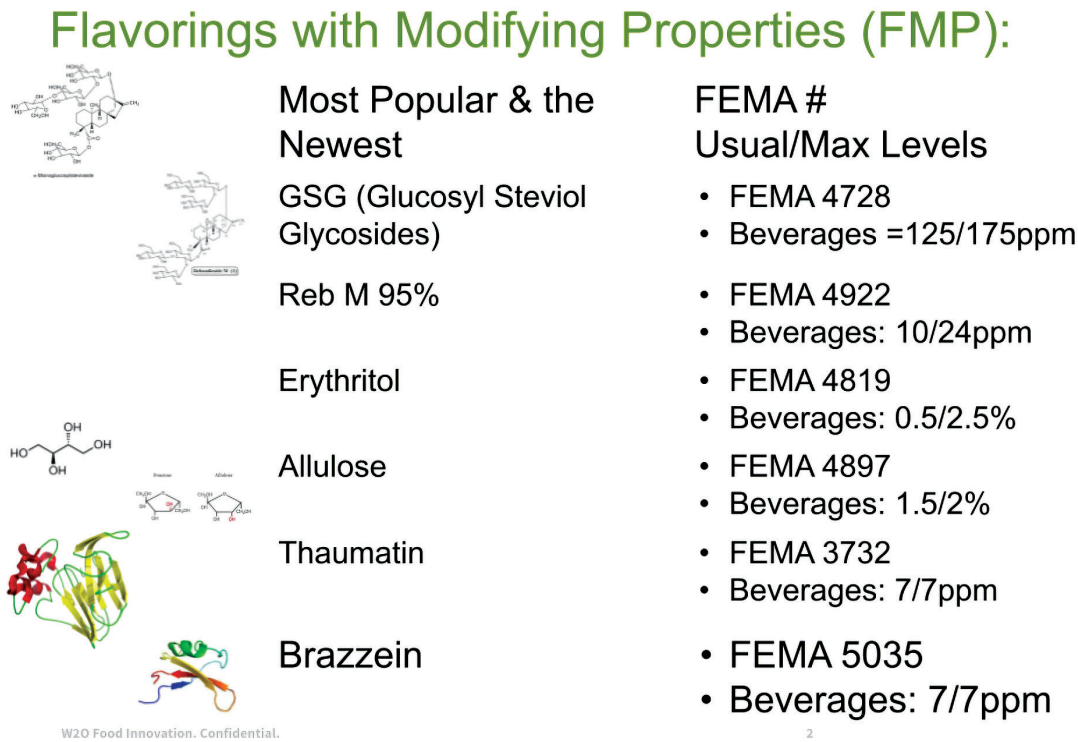
FEMA FMP Fact Sheet

FMPs have FEMA GRAS status for technical effect of flavoring and the conditions of intended use are consistent with FEMA GRAS levels. The FMP is used with other FEMA GRAS FMP's in the compounded flavor or in the finished food consistent with FEMA GRAS levels, and the combination (i.e. stacking) of FMP's results in a sweetening technical effect in the finished food. In this scenario, the technical effect is sweetening rather than flavoring, and appropriate regulatory authority to use would have to exist for the FMP(s), and declaration would be required on the finished food if appropriate regulatory authority to use was available for the sweetening technical effect.[6]

Guidance for the Sensory Testing of Flavorings with Modifying Properties within the FEMA GRAS Program

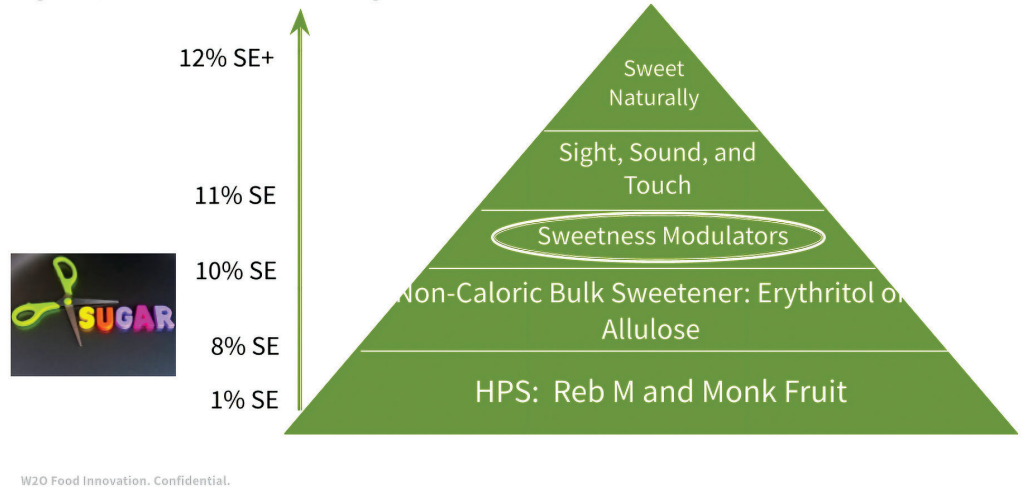
- "Test 1 is used to demonstrate that the FMP does not have inherent sweetness or saltiness under conditions of intended use as an FMP in the finished food product.
- Test 2 assesses the effect of the FMP on the finished food product.

T-1 New and common flavorings with modifying properties



Courtesy of W2O Food Innovation

F-2 **Blending as a sugar reduction strategy**



T-1 shows the most common or the newest FMP.

Glucosyl Steviol Glycosides (GSG) FEMA 4728. It's made by glycosylation of stevia leaf extracts. Non-alcoholic beverages' usual use and maximum use levels are 125ppm and 175ppm, respectively.

Reb M 95% FEMA 4922. It's made by stevia leaf extraction. Non-alcoholic beverages' usual use and maximum use levels are 10ppm and 24ppm, respectively.

Erythritol FEMA 4819. It's made by glucose fermentation. Non-alcoholic beverages' usual use and maximum use levels are 0.5% and 2.5%, respectively.

Allulose FEMA 4897. It's made by bioconversion. Non-alcoholic beverages' usual use and maximum use levels are 1.5% and 2%, respectively.

Thaumatin FEMA 3732. It's made by extraction. Non-alcoholic beverages' usual use and maximum use levels are both 7ppm.

Brazzein FEMA 5035. It's made by yeast precision fermentation. Non-alcoholic beverages' usual use and maximum use levels are both 7ppm.

Applications in Foods and Beverages

Blending is the umbrella strategy (**F-2**). It's about combining sweeteners and modulators to get to sweetness target level while formulated at low usage so to avoid the off flavor from each. Now that Reb M stevia sweetener is available, blending is necessary only in high SE (12% SE) zero sugar beverages like carbonated soft drinks (**F-3**). This is possible because 350ppm Reb M delivers 8% SE without the typical licorice and bitter RA off flavors.

Summary

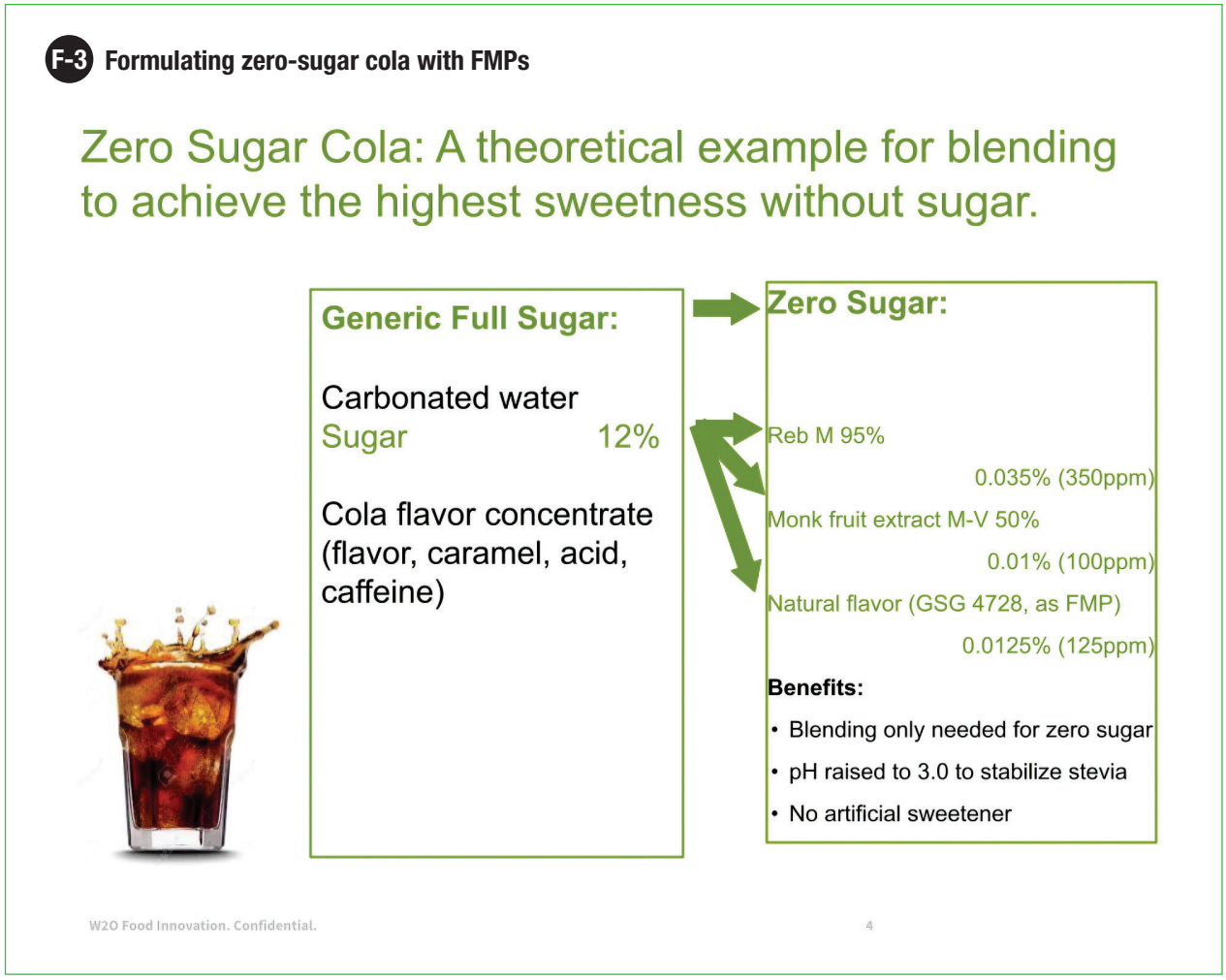
Sweetness modulators are defined as substances that increase, decrease or otherwise change the detection and perception of sweetness. Sweetness modulators are substances themselves tasteless, but make sweeteners sweeter. They are based on neuroscience and work on seven mechanisms that can include FMPs. FMP-designated technical effect for FEMA GRAS status is limited to flavor modification. As neuroscience and ingredient technologies advance, it's definitely possible to make reduced sugar foods and beverages taste better.

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Courtesy of W2O Food Innovation

F-3 Formulating zero-sugar cola with FMPs



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Biotechnology as a 'Flexible Toolbox' for R&D:
Q&A with SVP of IFF Scent

Charbel Bouez explains how IFF Scent uses several different technologies to innovate while maintaining its high quality.



IFF's R&D teams aim to move fast creating new moleules without compromising the integrity of the science.

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Product developers are always on the lookout for the latest technologies and next-generation molecules to add to their bag of tricks. Perhaps it's a new molecule that helps with long-lasting fragrance or a biotechnological process that increases yield and sustainability claims. These processes and technologies are part of the creative problem solving that is crucial for today's flavor and fragrance industry.

But with new technology, there is always the skeptical consumer. This consumer is wary of having too much science in their products, and words like "synthetic" and "artificial" are thrown around. But it's up to industry leaders to educate consumers and their partners on the benefits and efficacy of these breakthroughs.

Perfumer& Flavorist+ spoke with Charbel Bouez, senior vice president of global R&D for IFF Scent, about the company's use of biotechnology and next-gen molecules. He explained that the lines between "natural" and "synthetic" are beginning to blur, and that scientific advancements can help unlock the balance between authenticity and value when it comes to product development.

What types of biotech is IFF employing to create next-gen molecules?

For us, biotechnology is a powerful, creative engine and a catalyst for designing next-generation molecules with precision. We bring together three complementary biotech disciplines, all made possible by deep in-house expertise. Our scientists are able to re-engineer micro-organisms to produce ingredients of interest in large, sustainable quantities, as well as use biotransformation to direct microorganisms to convert feedstocks into entirely new materials. Thirdly, they can apply specific enzymes to achieve ultra-selective transformations beyond the scope of conventional chemistry.

These three techniques can be used individually or combined, creating a flexible "toolbox" that enables the whole IFF team, including us here at IFF Scent, to explore new molecular frontiers. Biotechnology is chosen not only for its sustainability, but also for its superb precision – nature's way of making only the modifications that are needed. Supported by AI to identify the most promising routes, our researchers are reimagining what's possible in fragrance, flavor and beyond. By uniting biology, chemistry and digital innovation, we hope to set the stage for a new era of molecule design that blends the authenticity of naturals with the performance of synthetics.



Charbel Bouez, senior vice president, global R&D, IFF Scent

To what extent have the traditional labels of 'natural' versus 'synthetic' become inadequate or even misleading in describing today's advanced molecules?

The old divide between "natural" and "synthetic" does not fully reflect the reality of modern molecule creation. At IFF, while we continue to reinforce our leadership in Naturals, we allow science to travel between these categories – a single innovation may begin in nature and evolve through synthetic or biotechnological refinement.

Both paths provide vital avenues for progress, from a scientific standpoint and a regulatory one. As biotechnologies advance, defining what's truly "natural" is becoming increasingly complex, demanding new clarity from regulators and new understanding across the industry. IFF is helping reframe this conversation. We see it as our responsibility, and privilege, to educate partners and consumers to look beyond the natural/synthetic binary.

How are your teams addressing the challenge of providing both authenticity (e.g., bio-identical or natural sourcing) and value (cost-efficiency) simultaneously?

Balancing authenticity, performance and value has long been one of the fragrance industry's biggest challenges – and one we're tackling by "crossing the streams"

Courtesy of IFF Scent

of natural, synthetic and biotech innovation. Through our brand LMR Naturals, we can tap into decades of expertise exploring every stage of an ingredient's life cycle to drive sustainability and safety from plant to product. The journey can start and end here, or alternatively, we can take inspiration from natural molecular structures and use advanced AI to identify alternative biotech-enabled production routes that improve efficiency, predict cost outcomes, or avoid the access challenges common in 100% natural sourcing. This convergence of disciplines allows IFF to offer the best of all worlds – authentic, high-performing, safe and sustainable molecules produced at a viable scale and value.



AI can help at both the earliest stages of molecule discovery and the refinement stage.

Let's talk about the role of AI. How is AI being deployed today to accelerate the discovery and design phase of new molecules? What specific tasks is it best suited for?

Right now, we see the greatest value from AI when it is embedded at the earliest stages of molecule discovery. In our workflows, the algorithms act as an additional scientist, working alongside our chemists, biotechnologists and agronomists to accelerate innovation by simulating countless potential pathways before a single experiment begins. There is also a lot of value to be found at the refinement stage of molecule development. For example, when a researcher faces the question, "How do I make this molecule better?" AI provides data-driven answers that help our teams identify the routes most likely to succeed faster and more efficiently.

Chemists, scientists and perfumers will continue leveraging AI to refine performance, sustainability and cost efficiency in real time as the technology progresses. This constant feedback loop transforms discovery from a linear process into a conversation between human expertise and AI efficiency. The result is true dynamism; more targeted innovation, performed quicker and with the ability to explore molecular spaces that were once out of reach. I believe this is how we will uncover the next generation of fragrance ingredients for scent creation.

How do you maintain the balance of faster product development with keeping high quality?

IFF maintains the balance between speed and quality through a tightly coordinated innovation pipeline designed to scale discovery responsibly. We employ dedicated early development and process R&D teams, each solely focused on their section of the production process but also working in tandem to transform promising molecules into viable, sustainable and cost-efficient ingredients. Their mission is not only to move fast, but to do so without compromising the integrity of the science.

To further accelerate progress, we pursue strategic alliances, opening our doors to leading universities, startups and specialist partners worldwide. By combining internal depth of expertise with external ingenuity, we believe we can solve complex challenges more efficiently while maintaining the rigorous standards of safety, performance and sustainability that define the way we do business. This fusion of collaboration and precision ensures that speed serves innovation, and never at the expense of quality.

Beyond traditional ingredients, what are some exciting future applications in fragrance that these next-gen molecules will unlock?

For me, the next frontier for fragrance lies in understanding how scents interact with human biology. Our research teams are already exploring how specific molecules can influence mood, memory and overall well-being – moving beyond just "it smells good," toward measurable benefits for emotional and physical health. By combining advances in biotechnology, AI and precision health, we aim to pioneer a new generation of fragrance ingredients designed with purpose, as well as pleasure, in mind. It's here, I think, that we will see the true value of our converging sciences approach. Our mission at IFF is always to Make Joy, and what better way to express that by unlocking applications that support wellness, cognition and even therapeutic outcomes, as well as simply making us happy.

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Recent scientific and agronomic research has renewed interest in V. pompona.

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Vanilla pompona's Comeback in the United States: A Sustainability Opportunity (Part 1)

V. pompona can help diversify vanilla cultivation and relieve sourcing pressures for one of the world's most active importers.

BY MARIA GALEAS, DAPHNA HAVKIN-FRENKEL, PHD and THOMAS HARTMAN, PHD, Rutgers University



Maria Galeas, director of regulatory and scientific affairs, Kerry

Courtesy of Maria Galeas

Natural vanilla is one of the world's most culturally embedded and economically valuable flavorings, yet its supply chain remains structurally fragile and highly exposed to disruption. Madagascar, responsible for approximately 75–80% of global vanilla bean production, is a high-risk origin where recurring climate shocks, fragile smallholder systems, and complex governance dynamics continue to drive volatility[9].

As Gaël Lescornec, executive director of the Sustainable Vanilla Initiative (SVI), has described, vanilla is "the Mount Everest of supply chains," not for lack of effort, but because its challenges are deeply rooted in the crop's biology, geography and institutional context[9].

Unlike cocoa, which diversified geographically and developed scalable production systems relatively early, vanilla has remained an artisanal crop reliant on hand pollination, long maturation cycles and smallholder cultivation. Its narrow genetic base and labor-intensive practices have long constrained scalability and resilience[6]. Despite decades of sustained private-sector investment to stabilize sourcing and improve livelihoods, Madagascar's vanilla market continues to generate global price shocks driven by tropical cyclones, governance challenges, and policy interventions that periodically disrupt supply. This pattern remains evident in recent history: since 2017, vanilla bean prices have again swung from record highs near US $500 per kilogram to lows around US $20 per kilogram in 2023, following changes in Madagascar's market structure[9,11].

Food manufacturers have largely shielded consumers from these fluctuations through reformulation, long-term contracts and the use of flavor alternatives. Synthetic vanillin, first commercialized in the late nineteenth century, has long served as a substitute for natural vanilla, and more recently, fermentation-derived vanillin has expanded its reach in flavor manufacturing. Today, more than 98% of vanilla-flavored products rely on non-bean sources, while natural vanilla beans account for only 1–2% of total use[9]. While this shift has preserved affordability and access, it has also decreased the demand for vanilla beans, the authentic source of natural vanilla flavor as recognized under established U.S. flavor labeling standards, even as agronomic, climatic, and geopolitical risks persist. SVI has emphasized that such periods of turbulence can also function as inflection points for strengthening long-term resilience across the vanilla beans sector[11].



Country-of-origin diversification has therefore become a central pillar of sustainability strategies for vanilla production.

Country-of-origin diversification has therefore become a central pillar of sustainability strategies, including the SVI 2030 Charter. The rationale is straightforward: growing vanilla in more places spreads production, mitigates risk and can help stabilize supply. Recent efforts have included investments in emerging origins such as Uganda, with a focus on standardized quality, traceability, and harvest management to reduce overreliance on Madagascar[11]. However, these initiatives remain constrained by entrenched market expectations that equate vanilla flavor with a single origin and a single default sensory profile, commonly known as the "Bourbon" vanilla profile. Moving past this perception is necessary to build long-term resilience[9].

Geographic diversification alone, however, does not fully address the structural vulnerabilities of vanilla. The global vanilla supply remains overwhelmingly dependent on a single species, *Vanilla planifolia*, resulting in a genetic monoculture that amplifies disease vulnerability and narrows the sensory expression of natural vanilla to one dominant chemical signature, vanillin[1,2]. Future-proofing vanilla therefore requires a broader approach that includes strengthening commercial cultivars for agronomic resilience, expanding production geographies and increasing genetic diversity within cultivated *Vanilla*. Beyond current active initiatives, there are also opportunities to revisit regions where vanilla was historically sourced and later diminished by a lack of market demand, including parts of the Americas and the United States[2,3].

Yet the genus *Vanilla* is botanically diverse, and one historically significant species, *Vanilla pompona*, once played a recognized role in American vanilla commerce.

Recent scientific and agronomic research has renewed interest in V. *pompona* due to its resistance to diseases like Fusarium and tolerance of adverse growing conditions, as well as its distinct aroma chemistry[3,10]. Comparative aroma studies have shown that anisyl-derived compounds in V. *pompona*, also found in *V. tahitensis*, can exhibit equal or greater sensory impact than vanillin within species-specific aroma profiles[12]. Sensory evaluation of Brazilian *V. pompona* extracts further demonstrated pronounced vanilla, floral, and fruity attributes with high consumer acceptance across multiple food matrices[5]. Taken together, these findings challenge the long-standing perception of V. *pompona* as an inferior-quality vanilla and highlight its potential to enrich and diversify the natural vanilla supply[8].

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Sensory evaluation of Brazilian V. pompona extracts further demonstrated pronounced vanilla, floral, and fruity attributes.

The United States, as the world's largest importer of vanilla beans and vanilla flavorings, occupies a uniquely influential position in shaping both market expectations and regulatory frameworks. U.S. industry stakeholders have historically played a central role in defining vanilla through commercial practice and engagement with federal regulation[4]. Recently, U.S. tariff decisions affecting imported vanilla included a temporary pause that reduced immediate cost pressures for the flavor and food industries[11].

In addition to ongoing sustainability initiatives in Madagascar, revisiting the U.S. standard of identity for vanilla could support regulatory modernization aligned with increased scientific understanding, including advances in genetics and breeding, analytical chemistry and sensory science. Any changes to the vanilla standard of identity would require formal regulatory review and stakeholder engagement, but such a revision could also restore botanical diversity by allowing additional cultivated species, such as *Vanilla pompona*, to contribute to long-term supply stability.

Recognizing V. *pompona* under vanilla flavor definitions would align with broader sustainability goals and echo the SVI's call for a more resilient supply chain that supports smallholder livelihoods and conserves biodiversity across a wider range of producing regions [11]. Species-level diversity is also being acknowledged in Codex Alimentarius discussions on international vanilla standards, where V. *pompona* is recognized as a legitimate source of natural vanilla flavor in its native regions.

In this context, the historical presence of V. *pompona* in U.S. commerce, particularly prior to 1958, provides a factual basis for regulatory reconsideration grounded in documented common food use. If *V. pompona* was commonly traded and consumed as "vanilla" before current standards were established, that record can inform safety assessments under common food use and support its reintegration into today's regulatory framework. Part 2 examines the documented role of *Vanilla pompona* in U.S. commerce prior to 1958, as vanilla rose to prominence in American food systems, and explains why this history matters for species-level diversification, regulatory scope, and long-term supply resilience.

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For All the Spirit Minded:
RECAP OF 2025 BSF WHISKY SYMPOSIUM

The British Society of Flavourists traveled to Scotland's capital to learn all about the complex spirit.

BY ANNABELLA VAN RUTH, SABRINA UTECH, WENDY THU LE; BSF



Day 2 of the symposium included a visit to the Glenkinchie Distillery, known for its Lowland whisky.

Courtesy of BSF

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Edinburgh Whisky has a long and fascinating history. From its early days in Ireland and Scotland, it has evolved from a raw, strong spirit stored in barrels to the rich and complex drink we enjoy today. Early whisky would have been almost unrecognizable to the modern drinker. As barrels were mainly used for storage, rather than aging of whisky. These casks had led full previous lives: hosting products like fish, meat, nails, or other products.

However, over time people noted that wood has memory, and that memory may taste rather good. Today, casks, grain, yeast, and careful distillation, all play a role in shaping each bottle's character. Moreover, whisky is no longer just for traditional neat-drinking gentlemen. Today it is enjoyed by younger audiences, cocktail lovers and a growing number of women, which shows that this golden spirit truly has something for everyone.



Day 1 of the symposium included several several lectures and talks on the flavor complexity of whisky.

This spirit of discovery and innovation set the tone for the 2025 BSF Whisky Symposium in Edinburgh, hosted by Diageo at the fabulous Johnnie Walker Experience venue on Prince Street. Over two days, distillers, flavor experts, scientists and whisky enthusiasts explored the journey of whisky flavor, from barely to barrel to bottle. The event highlighted that whisky isn't just a drink. It is a journey of craftsmanship, science, and shared passion.

Symposium Day 1

On the first day of the symposium the presentation session was kicked off by Kristiane Westray, introducing her book *Savour – A Guide to Tasting and Exploring Whiskies of the World.* She highlighted how whisky drinking has changed: from the traditional neat-drinking gentleman in a leather armchair to a more diverse world where whisky is enjoyed in cocktails by all. The numbers confirm the shift: 30–40% of whisky consumers in the USA and UK are women, and 39% are aged 21–35.

After breaking the barrier of whisky stereotypes, we moved on to its legal framework, discussed by Irene Baxter. These regulations exist to maintain the quality and heritage of the product, protect the consumer from inferior/unsafe products and maintain sensory characteristics. Despite the complexity of flavors found within whiskies, the ingredient list is simple. For scotch whiskies, only cereals, water and yeast are allowed. After maturation for at least 3 years, the bottled whisky needs to contain an alcohol content of a minimum of 40% ABV. All the flavors you might discover from this golden liquid must come from the short ingredient list and processing involved.

No flavorings or sweeteners may be added. However, places like Ireland, Japan and across the Atlantic, will play by different rules. Even though the rulebook might differ where you are in the world, commonalities can be found in the flavor formation. Douglas Murray took the stage to tell us more about flavor development. He described the impact of wooden versus steel wash bags, the copper in the stills, and the influence of ripening time on the recognizability of the spirit's distillery. Even the curvature of the still, size and location of the curvature influence the degree of vapor chemistry and copper-contact chemistry.

All these flavors found in whisky extend beyond the glass. Karine Kormann from Robertet showed the use of counter current CO_2 supercritical fluid extraction to isolate whisky extract aroma. Whisky is rather challenging to work with due to the low aromatic volatile content, but the evidence arrived during our coffee break, when Karine and her colleagues Gaëlle Joyaux and Julie Blanchoin brought us whisky and rum flavored sweets. Peer reviewing at its finest.

After the break Binod Maitin shared how flavor travels through our nose and mouth. Even though hundreds of volatiles can be found in whisky, a great fraction cannot be smelled. Yet some of the marginally present compounds have a great impact on the flavor complexity.

Courtesy of BSF

Next, the story travelled to the Annandale-Distillery, where David Thomson introduced us to "Annandale-ness" in their whisky. Their bottles, Man O-Words and Man O-Sword, carry not only great narratives behind their names, but also detailed labels with distillation year, bottling year and bottle numbers to share their individual story for you to grasp.

Next one up was Marco Cardin who shared his work on accelerated whisky aging. Up to 40 years! Not by cheating time, but by understanding it. Here he also focussed on esters, including long chain esters. The latter are often overlooked due to their poor solubility, even though they can bring smoothness and softness to your drink.

Before lunch, the room had travelled from history and law to the whisky distillation processes and its complexity in developing flavors. Yet, to broaden the flavor innovation even further, we need a reliable method to measure the flavor. Which can be complex, as Irene Baxter noted. Some flavor compounds are below the limit of detection of conventional analytical techniques, making our nose, surprisingly, a greater detector. One such compound, 2,4,6-trichloroanisole (TCA), can enter the whisky due to a faulty cask or packaging and flattens the flavor profile. Using descriptive and quantitative sensory analysis, TCA can be identified to avoid the loss of a great drink.

Kami Newton then widened the lens even further by showing the creative side of looking at flavor. He addresses how taste is often overlooked as there is a large focus on odour. Burning, cooling, fizziness and tingling can be also added to the list of sensations when experiencing your whisky. And have you ever considered the turbulence in your nose affecting the flavor?

After these great presentations we still had one job to do: find the best chocolate to pair with some incredible whiskies. Under the guidance of Spencer Hyman from Cocoa Runners we created some great matches of sourdough chocolate with Black Ruby label by Jonnie Walker and 70% Dark chocolate from the Solomons Islands with Lagavulin whisky.

A day full of learning, tasting, and shared passion set the stage perfectly for the Jonnie Walker experience and the evening diner, held at the Scotch Malt Whisky Society.



Members of the British Society of Flavourists were treated to a dinner held by the Scotch Malt Whisky Society.

Courtesy of BSF

Symposium Day 2

After a day immersed in flavor science, sensory analysis, and spirited discussion, the visit to Glenkinchie Distillery stood out as a highlight of the Whisky Symposium. From a flavorist's perspective, Glenkinchie offered a clear and confident expression of what Lowland whisky stands for: purity, elegance, and precision.

Whisky production may be complex, but at its heart it follows a clear journey from barley to bottle. Each step offers opportunities to shape flavor, and at Glenkinchie, these decisions are made with remarkable consistency. From the outset, the distillery commits to an unpeated style, staying true to the Lowland tradition. By avoiding peat during kilning, smoky phenolic notes are excluded, allowing lighter, floral, grassy and fruity aromas to shine.



Whisky production may be complex, but at its heart it follows a clear journey from barley to bottle.

This early decision sets the foundation for Glenkinchie's house style. The malt's natural sweetness remains intact, and the focus shifts to freshness and balance rather than intensity. Fermentation further reinforces this approach. With a fermentation time of around three days, the distillery favours the development of grassy and floral esters over heavier tropical fruit notes.

Distillation plays an equally important role. Glenkinchie's large, tall copper pot stills encourage reflux, helping to refine the spirit and remove heavier compounds. An early tail cut ensures that only the cleanest part of the spirit is collected, resulting in a light, dry new make. This philosophy is often referred to at Glenkinchie as "Purityism": tight control at every stage to highlight elegance rather than weight.

Maturation takes place mainly in refill ex-bourbon casks. These provide gentle notes of vanilla and cream from American oak without overpowering the spirit's delicate character. The final whisky expresses crisp green apple, soft sweetness, fresh grass, and floral notes such as honeysuckle.

Fermentation insights added another layer to the visit. Glenkinchie continues to use traditional wooden washbacks, maintaining both heritage and consistency. Sensory observations during fermentation revealed a clear evolution: from malty cereal notes to grassy and floral aromas, a profile that was later confirmed in the tasting room.

We were also introduced to a simple but effective sensory technique: observing the "collar" and "legs" of the spirit in the glass. Faster-forming, finer legs indicate a lighter whisky with lower oil content, offering a quick visual cue to mouthfeel and style.

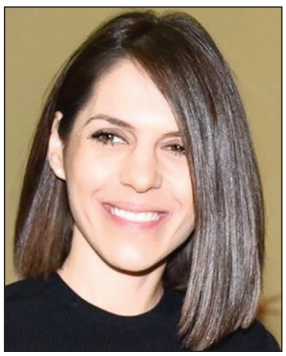
Beyond the distillery visit, the Whisky Flavor Challenge organized and supported by VCF-Online highlighted the creative side of flavor science. Using a limited number of ingredients (naturally found in specific bottles), participants recreated whisky styles with impressive depth and authenticity. The winning entry by Vanessa Robert of Givaudan showed how balance, warmth, and subtle floral notes can come together in a convincing whisky profile, described by the judges (our speakers) as aged in a rejuvenated cask.

The second day of the symposium beautifully connected theory with practice. Glenkinchie demonstrated how technical precision, sensory understanding, and respect for tradition can result in a whisky of clarity and refinement. A fitting conclusion to a symposium that celebrated whisky not just as a drink, but as a shared craft rooted in science, creativity, and passion. p&f+

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RCB International supplies essential oils of peppermint, spearmint, erospicata and other mint varieties.



BY MARIA PALASSAROU
Flavorist, Givaudan

Flavor Reports: EU Edition

Our BSF panel evaluates several mint ingredients for their applications in flavor.

Organoleptic Evaluation Panelists

- **Andrea Albertino, Ph.D.,** Senior Flavorist, Esarom
- **Kavita Bhatnagar, Ph.D.,** CEO, Kanegrade Flavors & Ingredients
- **John Forbes,** Consultant, Ceressence Consultancy
- **Trevor Groome,** Consultant Flavorist – Director, Orchid Aromatech Ltd
- **Bimal Karmakar, Ph.D.,** Principal Flavorist, Givaudan
- **Britta Nobis,** Senior Flavorist, Silesia
- **Maria Palassarou, Ph.D.,** Flavorist, Givaudan
- **Aine Walsh,** Principal Flavorist, Keurig Dr Pepper
- **Dr Ján Peťka,** Head of Flavor Development, Austria Juice
- **Michele Pezzotta,** Flavorist, Silesia Flavors

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In this month's column we evaluate ingredients from RCB International, a supplier of globally sourced essential oils with emphasis on North American mint oils. RCB, located in the heart of the Willamette Valley of Oregon, was founded in 1992 by Mr. John G. Wendel, who serves as a senior advisor. RCB supplies essential oils of peppermint, spearmint, erospicata and other mint varieties.

Yakima Peppermint Oil

Product Description: Essential oil of the *Mentha piperita L.* plant grown in the Yakima Valley and Columbia River Basin area of Washington State, extracted by steam distillation.

Major Components: l-menthol 40.5%, l-menthone 15.7%, menthyl acetate 7%, menthofuran 4.2%, neo-menthol 4.4%, iso-menthone 2.7%.

FEMA#2848, CAS#8006-90-4.

Odor Descriptors@100%: Fresh, green, minty, herbal, mentholic, cooling sensation, leafy notes, sweet, honey-like, woody, warm spicy, musty, slightly rubbery, faint asphalt, sage notes, slightly acidic.

Taste Descriptors@10ppm: Cooling, minty, herbal, fresh, green, mentholic, sweet, honey-like, slightly floral chamomile notes, earthy, sage notes, hay, tingling sensation, musty, delayed bitterness, late asphalt note.

Possible Applications: The Yakima oil aroma complexity would complement peppermint and general mint flavor profiles for chewing gum applications, confectionery like mint hard candies and fondants, but also herbal and mint teas. Moreover, it would be a great addition in oral care mint tonalities for toothpaste and mouthwash applications.

Willamette Peppermint

Product Description: Essential oil of the *Mentha piperita L.* plant grown in the Willamette Valley of Oregon, extracted by steam distillation.

Major Components: l-menthol 42.6%, l-menthone 17.9%, menthyl acetate 4.7%, menthofuran 2.6%, neo-menthol 3.7%, iso-menthone 3%.

FEMA#2848, CAS#8006-90-4.

Odor Descriptors@100%: Minty, green, herbal, mentholic, cooling sensation, sweet, powdery, rubbery notes, wormwood-like, woody, warm, peppermint leaves, musty, hay, faint coconut notes.

Taste Descriptors@10ppm: Cooling sensation, fresh, minty, mentholic, herbal, green, sweet, hay, musty,



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Willamette Peppermint can be used in intense peppermint teas and herbal blends.

wormwood-like, earthy, slight bitter taste, pungent sensation, long lasting.

Possible Applications: Willamette oil complexity and intensity would complement all high-impact peppermint applications, like strong chewing gum and candy, "extra-cool" oral care mint tonalities, intense peppermint teas or herbal blends, and products where a vivid, punchy peppermint is required, like mint-flavored liquors.

Peppermint Oil Special Blend

Product Description: A proprietary blend of essential oils of *Mentha* species plants, grown in North America and extracted by steam distillation.

Major Components: l-menthol 42.6%, l-menthone 23.5%, menthyl acetate 5.5%, menthofuran 1.2%, neo-menthol 3.2%, iso-menthone 4.6% .

FEMA#2848, CAS#8006-90-4.

Odor Descriptors@100%: Strong cooling upfront sensation, fresh, clean, mentholic, green leafy, herbal, peppermint, spicy, warm, wormwood-like, woody, earthy, hay notes, slightly sweet musty, faint metallic.

Taste Descriptors@10ppm: Cooling sensation upfront, mentholic, peppermint character, green, fresh, herbal, warm, woody, spicy, sweet, musty, hay notes, slightly soapy, faint metallic notes, slight bitterness.

Possible Applications: The peppermint blend complexity would provide versatility to mint flavor profiles for a wide range of applications, like chewing gum, confectionery, chocolate, chocolate beverages paired with a mint note, herbal and mint teas and oral care applications.

Midwest Peppermint

Product Description: Essential oil of the *Mentha piperita L.* plant grown in the Midwest States of Indiana, Wisconsin, and Michigan, extracted by steam distillation.

Major Components: l-menthol 37.5%, l-menthone 25.1%, menthyl acetate 3.7%, menthofuran 2.5%, neo-menthol 3.2%, iso-menthone 3.7%.

FEMA#2848, CAS#8006-90-4.

Odor Descriptors@100%: Herbal, dried tea leaves notes, musty, warm, earthy, woody, slightly weedy, green, grassy, minty, cooling, mentholic, wormwood-like, sage notes, faint floral lavender.

Taste Descriptors@10ppm: Herbal, dried tea leaves notes, grassy, minty, cooling, earthy, woody, musty, hay, sage notes, weedy, slightly rubbery, faint brown notes, tingling sensation, mild bitterness, rounded balanced profile.



Midwest Peppermint's leafy character would complement mint flavor tonalities for chocolate mint beverages.

Possible Applications: Midwest Peppermint's leafy character would complement mint flavor tonalities for herbal and mint teas, chocolate and chocolate beverages paired with mint notes, chewing gum and confectionary applications like fondant cream candies, and also oral care profiles with a more herbal element. Lastly, it might be a great addition in savory tonalities where a "fresh herb" impression is needed rather than confectionery peppermint.

Idaho Peppermint

Product Description: Essential oil of the *Mentha piperita L.* plant grown in the Boise area of Idaho and the far east regions of Oregon near the Idaho border, extracted by steam distillation.

Major Components: l-menthol 43%, l-menthone 15.4%, menthyl acetate 7.3%, menthofuran 3.3%, neo-menthol 4.3%, iso-menthone 2.7%.

FEMA#2848, CAS#8006-90-4.

Odor Descriptors@100%: Minty, mentholic, clean cooling sensation, green, grassy, herbal, earthy, woody, musty, slight rubbery plastic nuances, sweet, hay, slight dried fruit notes, sage, faint hop aroma.

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Taste Descriptors@10ppm: Green, fresh, minty, grassy, mild cooling sensation, herbal, earthy, woody, slight rubbery, musty, dried fruit notes, hay nuances, tingling sensation, faint asphalt note, slight bitterness.

Possible applications: The Idaho peppermint profile would complement peppermint and general mint flavor profiles for chewing gum, confectionery, beverages and teas, as well as oral care applications.

Farwest Scotch Spearmint

Product Description: Essential oil of the *Mentha cardiaca* plant grown in the Yakima Valley and Columbia River Basin area of Washington State, extracted by steam distillation.

Major Components: l-limonene 17.1%, l-carvone 68.9%.
FEMA#4221, CAS#91770-24-0.

Odor Descriptors@100%: Fresh, green, spearmint, sweet, caraway notes, herbal, spicy, peppery, hay nuances, musty, earthy, mild cooling sensation, slight sulfur notes.

Taste Descriptors@10ppm: Green, minty, fresh, sweet, caraway notes, herbal, hay, powdery, woody, spicy, peppery, musty, earthy, slightly rubbery, mild cooling and tingling sensation, slight bitterness.

Possible Applications: Farwest Scotch Spearmint's fresh, green profile would provide complexity to various spearmint flavor tonalities for chewing gum, confectionary, herbal mint teas and beverages, as well as oral care applications.

Farwest Native Spearmint

Product Description: Essential oil of the *Mentha spicata* plant grown in the Yakima Valley and Columbia River Basin area of Washington State, extracted by steam distillation.

Major Components: l-limonene 12.3%, l-carvone 66%.
FEMA#3032, CAS#8008-79-5.

Odor Descriptors@100%: Sweet, fresh, green, herbal, spearmint, powdery, floral notes, musty nuances, earthy, spicy, slight cooling sensation, wormwood-like, full-bodied.

Taste Descriptors@10ppm: Sweet, fresh, green, minty, herbal, spicy, woody, hay notes, powdery, floral, warm, slight musty, rubbery, mild cooling and tingling sensation, slight bitterness.

Possible Applications: Farwest Native Spearmint's candy character would complement all sweet mint profiles for a wide range of applications like confectionery, chewing gums, beverages and herbal teas with a "garden mint" character, as well as mild mint oral care tonalities.

Erospicata

Product Description: Essential oil of the *Mentha spicata L.*, Erospicata plant grown in North America, extracted by steam distillation.

Major Components: l-menthone 56.4%, iso-menthone 17.6%, neo-menthol 1.6%, pulegone 1.8%, germacrene-d 5.3%.
FEMA#4777, CAS#1563063-07-9.

Odor Descriptors@100%: Minty, herbal, green, fresh, leafy, sweet, candy, earthy, musty nuances, woody, pungent terpenic, rubbery notes, mild cooling sensation, creamy, brown notes.

Taste Descriptors@10ppm: Minty, herbal, fresh, brown malty notes, musty, earthy, sweet, powdery, warm, woody, honey notes, slight spicy, creamy nuances, mild cooling and tingling sensation, faint soapy notes, slight bitterness.

Possible Applications: Erospicata's characteristic brown-cocoa element would complement chocolate flavor tonalities paired with mint notes for confectionery, desserts and beverages, apart from sweet mint profiles for a wide range of applications.



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- FEMA 3426 ACETALDEHYDE DMA
- FEMA 2144 BENZYL ETHYL ETHER
- FEMA 3333 3-BUTYLIDENE PHTHALIDE
- FEMA 2251 CARVEOL PROPIONATE
- FEMA 2298 CINNAMYL CINNAMATE
- FEMA 3733 P-CRESYL CAPRYLATE
- FEMA 2315 CITRONELLYL PHENYLACETATE
- FEMA 3142 CITRONELLIC ACID
- FEMA 2366 TRANS-2-DECENAL
- FEMA 3912 9-DECENAL
- FEMA 2374 DIETHYL MALATE
- FEMA 3137 2,6-DIMETHOXYPHENOL
- FEMA 4100 3,5,6-DIMETHYL-2-ISOBUTYLPYRAZINE
- FEMA 2431 ETHYL CYCLOHEXANE PROPIONATE
- FEMA 3492 ETHYL UNDECANOATE
- FLAVIS 13.132 FURFURYL HEXANOATE
- FEMA 2495 FURFURYLIDENE ACETONE
- FEMA 4121 GERANIC ACID
- FEMA 2535 GUAIACOL PHENYL ACETATE
- FLAVIS 2.163 2-HEXANOL
- FEMA 3983 TRANS-2-HEXENYL CAPROATE
- FEMA 3690 CIS-3-HEXENYL LACTATE NATURAL
- FEMA 2888 HYDRATROPIC ALDEHYDE DMA
- FLAVIS 9.643 METHYL GERANATE
- FEMA 2706 2-METHYL HEPTANOIC ACID
- FEMA 2865 PHENYLETHYL FUROATE
- FEMA 2952 PROPYLIDENE PHTHALIDE
- FLAVIS 13.17 L-ROSE OXIDE
- FEMA 3006 SANTALOL
- FEMA 3007 SANTALYL ACETATE
- FEMA 3599 TIGLIC ACID

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