The Female Sensory Economy and the Birth of Sensory Intelligence

How Biology-Based Personalization Changes Coffee — and Everything After

Dr Sumit Kesarkar

BitterMatrix Research / AshZero Ltd

December 2025

Executive Summary

Taste recommendations fail. Not occasionally, but systematically. Reviews describe someone else's biology. Tasting notes are metaphors, not predictions. The coffee that delighted one person disappoints another — not because either lacks sophistication, but because their receptor configurations differ substantially — in some cases by an order of magnitude or more.

This paper introduces **Sensory Intelligence**: a framework for mapping product chemistry to individual biological response. Rather than aggregating preferences or tracking behavior, Sensory Intelligence predicts how specific chemistry will interact with a specific person's receptor system. The system predicts compatibility — it doesn't recommend.

While the Sensory Intelligence framework encompasses taste, olfaction, and other chemosensory domains, this paper establishes the theoretical foundation primarily through taste — the domain where receptor biology is most extensively documented and where initial validation data was collected. Cross-domain extension to olfaction is validated separately through the PiriZero olfactory platform, which applies the same receptor-biology architecture to predict individual olfactory experience across hormonal states.

The hardest place to test this framework is female taste variation. Hormonal fluctuations across the menstrual cycle produce statistically significant changes in taste sensitivity — particularly for sweet and bitter compounds — in multiple studies, though the magnitude and pattern varies between studies and individuals. Lifecycle transitions create further shifts. This variation has historically been dismissed as noise: moodiness, indecision, decline. It is signal. Measurable, documented, and addressable.

If a system can calibrate for hormonal variation, it demonstrates that biology-based personalization works. Female taste variation is not a feature of Sensory Intelligence — it is the proving ground where the framework faces its most demanding test.

BitterMatrix is the authors' implementation of this framework in coffee, currently in early validation with select users. Coffee serves as the initial domain: daily consumption enables rapid feedback, chemistry is well-documented, and individual variation is universally acknowledged but never explained. The same approach works wherever product chemistry meets individual biology — whisky, wine, olive oil, and similar products.

This paper establishes two linked concepts: Sensory Intelligence as the translation layer between product chemistry and biological experience, and the Female Sensory Economy as the proving ground that makes the framework's validity testable. These concepts are inseparable. Anyone serious about biology-based personalization must reckon with both.

1. The Problem with Taste

Consider a familiar experience. A friend recommends a coffee with enthusiasm — rich, smooth, perfectly balanced. You buy it, brew it carefully, and taste something entirely different. Sharp where they described smooth. Thin where they promised body. The coffee is not defective. Your friend is not wrong. You are experiencing the same chemistry through different biology.

The gap is not an edge case. Genetic variations in taste receptor genes create substantial individual differences — studies show genotype-related variations in bitter detection thresholds and intensity ratings of several-fold or more, depending on compound and individual. What registers as pleasantly bitter to one person overwhelms another. What one palate perceives as balanced acidity, another experiences as sour. The same molecular compounds, the same concentration, meaningfully different experiences.

Current recommendation systems ignore this reality. Reviews aggregate opinions from people whose biology you do not share. Ratings average experiences that may have nothing to do with yours. Tasting notes — "hints of blueberry, chocolate finish, bright citrus" — describe one person's associative experience, not the chemistry itself or how your receptors will respond to it.

Consumers currently accept this satisfaction gap as normal. They assume highly-rated products should satisfy them, and when they don't, they question their own palate. "Maybe I just don't understand good coffee." This is the wrong conclusion. The chemistry wasn't wrong. The individual match was.

Behavioral personalization — the dominant approach in recommendation systems — offers no solution. Tracking what someone purchased tells you what their programming led them to choose, not what their biology will find satisfying. Past behavior is contaminated by marketing, memory, and cultural conditioning. A consumer who always buys Ethiopian light roast because reviews said "fruity and complex" may have receptor biology far better suited to something they've never tried.

The distinction matters: content personalization (Spotify, Netflix) succeeds because the content doesn't change — the same song sounds the same to everyone. Taste personalization fails because the product interacts with variable biology. The coffee is not constant across consumers; the experience of it varies.

The gap between what people choose and what will satisfy them is the territory Sensory Intelligence addresses. Not by learning preferences, but by predicting biological compatibility.

2. Sensory Intelligence: A Framework

Sensory Intelligence begins with a simple observation: both products and people undergo journeys from potential to expression.

Take coffee. Origin, processing, roast level, extraction — each step transforms the same starting material into different chemistry. Light roast versus dark roast: measurably different com-

pounds. Espresso versus pour-over: different again.

This isn't subjective. It's documented chemistry.

People have their own version of this journey. Every person is born with the same taste receptor gene families — the potential for sweet, sour, salty, bitter, and other sensations. But expression varies. Genetic variations create baseline differences: some people have receptor variants that bind bitter compounds tightly, experiencing intense bitterness where others taste almost nothing. Life experience calibrates further. A palate trained on spicy food from childhood develops different sensitivity thresholds than one raised on mild cuisine. Current physiological state — stress, diet, hydration, hormonal fluctuation — modulates receptor response in the moment.

The result: two people tasting the same coffee, prepared identically, have genuinely different experiences. Not because one is sophisticated and the other unsophisticated, but because their receptor configurations differ.

Sensory Intelligence is the translation layer between product chemistry and individual biological response. It maps compounds to receptors, predicting alignment rather than inferring preference from behavior.

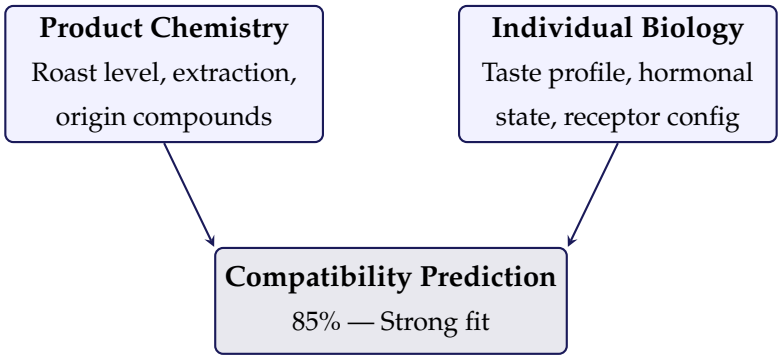

Figure 1: The Sensory Intelligence Translation Layer

The framework distinguishes between two phenomena that common language conflates:

Psychological drivers — what we reach for — are shaped by memory, culture, and marketing. It is the coffee we choose because a friend recommended it, because the bag design appealed, because we loved something similar five years ago. These drivers reflect programming, not current biology.

Physiological response — what will satisfy — is determined by receptor biology in the present moment. It is the chemistry that will deliver the experience of completion rather than the experience of something missing. This reflects how specific compounds will interact with specific receptors, right now.

These often diverge. The highly-rated Ethiopian a consumer thinks they want may align poorly with their biology. The overlooked Colombian they would never choose may match

precisely. The gap between psychological driver and physiological response is the source of chronic dissatisfaction — the vague sense that something should have been better, that the promise wasn't quite kept.

A Sensory Intelligence system does not tell people what to choose. It shows both paths: what their programming is chasing, and what their biology predicts. It makes the gap visible. The choice remains theirs.

How assessment differs from behavioral tracking: Behavioral systems infer preferences from choices — what you clicked, purchased, rated. This captures contaminated data: your history of acting on marketing, memory, and social influence. Assessment measures something different: receptor response patterns. By presenting controlled stimuli and measuring response, assessment captures current biological state rather than accumulated behavioral history. The distinction matters: behavioral data reflects the question "what have you chosen?" while assessment answers "how does your system respond to this compound?"

In our own work, we refer to this as a proprietary taste profile framework — a method for capturing individual biological configuration without requiring genetic testing. The approach measures current biological state: how receptors actually respond today, given everything that has shaped them. This is more actionable than genotype alone, because expression changes while genes do not. A person's taste profile at 25 differs from their profile at 45, even with identical DNA.

The practical output is compatibility prediction. Given a specific product chemistry and a specific individual's taste profile, the system estimates receptor-compound alignment. A compatibility score of 85% indicates strong predicted alignment between the chemistry and the individual's receptor configuration — not that 85% of people will enjoy it, or that satisfaction is 85% guaranteed, but that the biological fit is strong. Whether strong biological fit translates to enjoyment depends on factors beyond receptor alignment: context, mood, expectations. But weak biological fit rarely produces satisfaction regardless of context.

This framework matters far beyond coffee. Any domain where product chemistry meets individual receptor biology is addressable: spirits, wine, olive oil, fermented foods. But frameworks require demonstration. Abstract claims about biological variation mean little without a concrete test.

The most demanding test lies in a population whose taste variation is measurable, documented, and systematically studied.

3. The Female Sensory Economy: The Ultimate Test

The case for Sensory Intelligence could be made abstractly — citing genetic variations, describing receptor variability, referencing population studies. But abstractions do not demonstrate that biology-based personalization works in practice. Demonstration requires a population whose taste variation is measurable, documented, and systematically studied.

That population is women.

3.1 The Biology

Female taste perception is not static. It varies with hormonal fluctuation in patterns documented across multiple studies over six decades.

Research shows that sensitivity to specific tastes shifts across the menstrual cycle in many women. Studies demonstrate that sweet taste sensitivity increases during the preovulatory phase when estrogen peaks, with women detecting sucrose at significantly lower concentrations than during other cycle phases — or compared to men, whose thresholds remain constant. Sensitivity to bitter compounds shifts with progesterone levels. These are statistically significant effects documented in multiple studies, though the magnitude and pattern varies between individuals and studies.

The mechanistic basis is increasingly understood. Several human studies report phase-linked shifts in taste thresholds that correlate with hormonal fluctuations across the cycle, though correlations are not uniform across all tastes or studies. Estrogen receptors exist in taste cells, and in rodents, estradiol changes how those cells respond. Whether the same mechanism drives human taste shifts isn't proven yet. What we know for certain comes from psychophysical studies: women's detection thresholds and intensity ratings change with hormonal state.

Newer longitudinal designs that follow women across all four phases of a complete menstrual cycle reveal important patterns. StaniÄ‡ et al. found that women tracked within a single complete cycle showed clear cyclic variation in gustatory perception — sweet preference shifts, altered intensity for salty, sour, and bitter toward cycle end — whereas women measured across phases from two different cycles did not show the same pattern. This suggests that cyclic variation is present in a substantial subset of women when properly measured, rather than being universal. The heterogeneity isn't a problem for the framework; it's information the framework must capture. A system that detects whether an individual shows cyclic variation can offer phase-adjusted calibration to those who benefit while providing stable baseline profiles to those who do not.

Beyond monthly cycles, female taste biology shifts across life stages. Menopause creates lasting changes in chemosensory function. Qualitative research documents self-reported changes including diminished taste perception, compensatory behaviors such as increased use of salt and spice, new aversions to previously enjoyed foods, and altered intensity of certain taste modalities. These changes are heterogeneous — experienced differently by different women — and quantitative studies of taste function across menopause remain limited. The extent to which self-reported changes reflect measurable shifts in receptor sensitivity versus other factors is still under investigation. What the research suggests is an association between hormonal transition and chemosensory changes, alongside psychosocial and health factors, rather than a simple universal pattern.

3.2 The Dismissal

This variation was not unknown to researchers. It was known and set aside.

The challenge female cyclical variation posed to taste research was methodological. If women's responses varied across a monthly cycle, controlling for that variation added complexity to study design. If women's responses differed from men's in ways that fluctuated over time, then using a mixed-sex sample required either controlling for cycle phase or accepting noise in the data.

The field often chose a simpler path. Male subjects became the default. When researchers included female subjects, they usually didn't control for cycle phase. The variation was treated as methodological inconvenience rather than data worth capturing. A review of sex differences in taste function notes that "studying one sex alone provides an incomplete picture of gustatory function" — an observation that implies decades of research did exactly that.

The consequence extended beyond the laboratory. Women whose preferences changed across their cycle received no framework to understand the change. The coffee that satisfied last week disappoints this week. In the absence of biological explanation, cultural explanations filled the gap. Variation was attributed to mood, to being difficult, to indecision — a systematic misattribution of biology to character.

3.3 Why Female Variation Tests Sensory Intelligence

Female hormonal variation is not an edge case for Sensory Intelligence. It is the most demanding test the framework can face.

Consider what a system must do to calibrate for cyclical variation. It must capture an individual's baseline taste configuration. It must model how that configuration shifts with hormonal state — accounting for the fact that the pattern varies between individuals. It must predict how specific chemistry will interact with the shifted configuration. It must update predictions as state changes over time.

If a system can do this — if it can accurately predict that a given coffee will align well with a user's biology during one phase but poorly during another — then it has demonstrated that individual taste configuration is real, measurable, and actionable. The prediction relies on biology, not preference. It works across time, not just at a moment. It accounts for dynamic variation, not static profile.

Female taste variation is why the proving ground matters. Anyone who claims to personalize based on biology must demonstrate that their system handles the population whose biology varies most measurably and most systematically. A system that works only for static profiles has not proven it can handle biological reality.

We are explicit about what this means for BitterMatrix: female hormonal calibration is the test we have set for ourselves. Success would validate the framework. Failure would require us to revisit our assumptions. Validation is underway; results will be published.

3.4 The Economy

"Female Sensory Economy" refers to more than a market segment. It describes the value that emerges when female taste variation is treated as signal rather than noise.

When variation is dismissed, women compromise. They accept recommendations calibrated to a default that is not them. They purchase products optimized for a static palate they do not have. They absorb the cost of mismatch in disappointment, wasted purchases, and self-doubt. The satisfaction gap that all consumers experience is amplified for a population whose biology fluctuates systematically.

Recognizing variation changes the trade-offs. A system that accounts for hormonal state delivers predictions that match changing biology. This creates value by reducing systematic mismatch — products matched to biology as it is now, not as a static average assumes it to be.

The economic impact is substantial. Women make the majority of household purchasing decisions. They consume coffee at rates comparable to men. They represent an addressable market measured in hundreds of millions of individuals across developed economies. Yet no existing personalization system accounts for the biological variation that shapes their experience.

This is the largest underserved segment in taste-driven commerce. The barrier to serving it was never technological. It was the assumption that female variation was noise.

3.5 Privacy Architecture

A critical question arises: if calibration requires knowing hormonal state, does implementation require tracking menstrual cycles? The answer is no, and the distinction matters.

Cycle tracking applications exist. They serve users who wish to track fertility, symptoms, or health patterns. They collect sensitive personal data. They create privacy concerns that have intensified in contexts where reproductive health information carries legal or social risk.

Taste calibration requires none of this. The system does not need to track cycles. It needs only to know current state — information the user can provide at the moment of use without creating a historical record. A woman who wishes to receive phase-adjusted predictions can indicate her current phase using plain language ("beginning of cycle," "mid-cycle," "second half") without the system recording when her last period began, how long her cycles typically last, or any other data that constitutes cycle tracking.

The distinction is between calibration and surveillance. Calibration asks: what is your state right now? Surveillance asks: let me record your state over time so I can know it without asking. Sensory Intelligence requires the former. It explicitly rejects the latter.

This isn't just privacy protection — it's an ethical stance. The value of recognizing female taste variation should not be contingent on surrendering reproductive data. The system should serve users without requiring trust that the data will be protected, because the data is never collected.

Users can choose: share their current phase for calibrated predictions, or stick with a baseline

profile without phase adjustment. The user controls which path to take, and the choice is made freshly each time rather than locked in by a data trail.

4. Coffee: Initial Validation Domain

We chose coffee to test this framework.

The choice was deliberate. Coffee offers characteristics ideal for initial validation: high consumption frequency enables rapid feedback cycles; chemistry is well-documented through decades of food science research; individual variation is universally acknowledged ("I like it strong," "too bitter for me") yet never systematically explained; and the cultural density around coffee creates a context where precision matters to consumers.

The chemistry of coffee is knowable. Roasting transforms green coffee through documented thermal reactions, altering the balance of acids, sugars, and bitter compounds. Lighter roasts preserve more acidity; darker roasts develop more body and roasted character. Extraction method — espresso versus pour-over versus immersion — further determines which compounds reach the cup. The same roasted coffee yields meaningfully different chemistry depending on preparation.

That's the product side: knowable chemistry, transformed through documented processes, resulting in compound profiles that can be characterized.

Sensory Intelligence bridges this gap at the consumer level. Given a characterized compound profile and an individual's biological taste configuration, the system predicts compatibility — how well the chemistry aligns with the receptor system that will receive it. We predict biological fit. Flavor — shaped by memory and context — is something else entirely.

Our pilot implementation captures individual taste configuration through assessment, analyzes coffee chemistry through detection methods validated against laboratory standards, and computes alignment between the two. The output is a compatibility score alongside contextual information about how extraction method affects the prediction.

The system is currently in early validation with select users. Evaluation focuses on three dimensions: prediction accuracy (does the compatibility score correlate with reported satisfaction?), narrative truthfulness (do users recognize their experience in the system's descriptions?), and reduction in wasted purchases (do users report fewer disappointing cups?).

Early validation is not proof. It is the necessary step between framework and evidence. The claims in this paper rest on the framework's logic and the research that supports its premises. Validation will determine whether implementation delivers on that logic. We are committed to publishing results — positive or negative — as the validation process matures.

What coffee demonstrates, even at this stage, is implementability. The framework can be built. Chemistry can be characterized at consumer scale. Individual taste configuration can be captured through assessment rather than genetic testing. Compatibility can be computed and

presented meaningfully. Whether these outputs have predictive validity — whether compatibility scores actually correlate with satisfaction — is the question validation will answer.

5. Beyond Coffee: The Platform Opportunity

Coffee is just the first testing ground. The same approach works wherever product chemistry meets individual receptor biology.

Consider whisky. The chemistry of spirits is well-documented: congeners, esters, aldehydes, and phenolic compounds vary by distillation method, barrel aging, and blending. Individual responses vary as they do with coffee — some palates find peat smoke overwhelming while others find it essential; some experience sherry-cask sweetness as cloying while others find it rounded. The same framework applies: characterize chemistry, capture individual configuration, predict compatibility.

Wine presents similar structure. Tannins, residual sugar, volatile acids, and aromatic compounds create chemistry that varies by grape, terroir, and winemaking decisions. Individual perception varies by receptor sensitivity and threshold differences. Olive oil, tea, chocolate, fermented foods — each domain has documented chemistry and acknowledged individual variation. Each is addressable by the same logic.

The Female Sensory Economy extends across these domains. Hormonal fluctuations modulate gustatory sensitivity for basic tastes — sweet, sour, salty, bitter — across the menstrual cycle, and these shifts are accompanied by documented changes in food preferences and intake. While direct studies on complex beverages like coffee or wine across cycle phases are limited, the basic-taste evidence supports an inference: if hormonal modulation affects how receptors respond to bitter, sweet, and acid, it should affect how those same receptors respond to the bitter, sweet, and acid compounds in coffee, wine, or whisky. The inference is testable. Profiles built on coffee should predict compatibility for wine if the framework is valid. Cross-domain validation will be critical to establishing whether portability holds in practice.

This points toward a platform opportunity: a taste layer that sits beneath specific product categories. Rather than building separate personalization systems for coffee, wine, and spirits, the framework enables a unified approach — capture individual biology once, apply it across any domain where chemistry data exists. The profile is portable; only the chemistry characterization is domain-specific.

The practical path is sequential. Coffee establishes the framework and validates the approach. Expansion to adjacent categories follows as chemistry characterization methods are developed for each domain. Cross-domain validation will test whether profiles built on coffee extend accurately to whisky or wine, or whether domain-specific calibration is required. The framework's portability is a design feature; validation will determine its practical limits.

There's one more area worth noting. Studies link bitter taste receptor variation, particularly TAS2R38 genotypes, with differences in dietary patterns and obesity risk — genotypes associated with lower bitter sensitivity tend to predict higher vegetable intake and, in some popula-

tions, higher odds of obesity. Research on extra-oral TAS2Rs — taste receptors expressed in gut and other tissues — suggests possible roles in appetite and metabolic regulation, though these mechanisms remain under active investigation. The correlations are real. Whether they're causal is still being worked out. Systems that accurately capture taste biology may, over time, reveal patterns worth investigating. However, any health-related findings would require independent validation and regulatory review before clinical application. The current framework is consumer personalization for product matching, not health screening or medical diagnosis.

6. Implications

What changes if Sensory Intelligence becomes standard practice?

For consumers: The end of guessing. When chemistry-to-biology matching replaces aggregate ratings, consumers gain a basis for prediction rather than hope. The satisfaction gap shrinks. Exploration becomes less risky — trying something unfamiliar carries information about likely fit. Self-doubt ("maybe I just don't understand good coffee") gives way to self-knowledge ("my biology responds differently than that reviewer's").

For producers: Understanding who your product actually serves. Current marketing describes products in terms the producer hopes will resonate. Sensory Intelligence reveals which biology profiles a product actually suits. A roaster learns that their flagship coffee matches well with certain configurations and poorly with others — not criticism, but targeting information. Product development gains a biological dimension: roasting decisions informed by which configurations are underserved in the market.

If the framework delivers accurate predictions, B2B value should follow: reduced mismatch-driven churn, better customer targeting, product development informed by biological fit data. The magnitude of this opportunity depends on factors not yet measured — what fraction of customer dissatisfaction is attributable to biological mismatch, and whether compatibility prediction sufficiently reduces this loss to justify adoption. These are empirical questions that validation will address.

For the female market specifically: Validation rather than accommodation. The historical framing treated female taste variation as a problem to manage — inconsistency to tolerate. Sensory Intelligence reframes it as biology to respect. Changing preferences are receptor responses to hormonal states, not character flaws. The economic consequence is a market segment served with precision for the first time. The human consequence is women whose sensory experience is acknowledged rather than dismissed.

For personalization broadly: A shift from behavior to biology. The dominant paradigm learns from past actions: what you clicked, purchased, rated. This captures history, not current state. It conflates programming with biology. Sensory Intelligence suggests an alternative: model the biological system that will receive the stimulus, predict response, let history inform rather than determine. This philosophy may extend beyond taste to any domain where individual biology shapes experience.

7. Conclusion

Two concepts. Inseparable.

Sensory Intelligence is a framework for translating product chemistry into individual biological experience. It rests on documented science: genetic variations in taste receptors create substantial individual differences in perception; life experience calibrates receptor expression; current physiological state modulates response. The framework captures individual configuration, characterizes product chemistry, and predicts compatibility. The system informs choices; it doesn't make them for you.

The Female Sensory Economy is the proving ground. Female biology varies in ways that are measurable, documented, and systematically studied. Hormonal fluctuation alters taste sensitivity across monthly cycles; lifecycle transitions create lasting shifts. This variation was historically dismissed as noise. It is signal — the clearest demonstration that taste configuration is real, dynamic, and worth modeling. A system that handles female variation accurately has passed its most demanding test; a system that ignores it has not seriously engaged with biological reality.

These concepts are linked by necessity. You cannot claim to personalize based on biology while ignoring the population whose biology varies most measurably. You cannot claim that female variation matters without a framework that makes it actionable. Without the Female Sensory Economy, Sensory Intelligence remains incomplete theory; without Sensory Intelligence, the Female Sensory Economy stays an unmet need. Together, they offer a different way to think about how people experience products.

We are explicit about what remains to be demonstrated. Coffee is the initial validation domain. BitterMatrix is the pilot implementation. Female hormonal calibration is the test we have set for ourselves. Validation is underway. This paper sets out the ideas, explains why they matter, and marks out the space; it does not claim validated results. Those will follow — and we commit to publishing them regardless of outcome.

The territory this paper stakes is broader than one product or one company. Sensory Intelligence is infrastructure — a translation layer wherever chemistry meets biology. The Female Sensory Economy is both a major underserved market and the test that makes biology-based personalization credible.

What comes next is evidence. Validation data will show whether the framework delivers on its logic. Technical papers will detail methodologies currently described only in principle. Expansion to adjacent domains will test the framework's portability. This paper lays groundwork. The final word comes with validation data.

We close with the observation that began this inquiry. The coffee that delighted your friend may disappoint you. This is not mystery, and not failure of sophistication. It is biology — documented, addressable, and finally being taken seriously.

References

1.5em1

Alberti-Fidanza, A., Fruttini, D., & Servili, M. (1998). Gustatory and food habit changes during the menstrual cycle. *International Journal for Vitamin and Nutrition Research*, 68(2), 149–53. PMID: 9565832

Chupeerach, C., et al. (2021). The influence of TAS2R38 bitter taste gene polymorphisms on obesity risk in three racial groups. *Biomedicine (Taipei)*, 11(3), e110307. https://doi.org/10.37796/2211-8039.1103

Costanzo, A. (2024). Temporal patterns in taste sensitivity. *Nutrition Reviews*, 82(6), 831–847. https://doi.org/10.1093/nutrit/nuad097

Dahir, N.S., Calder, A.N., McKinley, B.J., Liu, Y., & Gilbertson, T.A. (2021). Sex differences in fat taste responsiveness are modulated by estradiol. *American Journal of Physiology: Endocrinology and Metabolism*, 320(3), E566–E580. https://doi.org/10.1152/ajpendo.00331.2020

Smith, J.L., Estus, S., Lennie, T.A., Moser, D.K., Chung, M.L., & Mudd-Martin, G. (2020). PAV haplotype predicts vegetable consumption in community-dwelling Caucasian adults at risk for cardiovascular disease. *Biological Research for Nursing*, 22(3), 326–333. PMID: 32207317. https://doi.org/10.1177/1099800420913935

Glanville, E.V. & Kaplan, A.R. (1965). The menstrual cycle and sensitivity of taste perception. *American Journal of Obstetrics and Gynecology*, 92, 189–94. https://doi.org/10.1016/s0002-9378(65)80006-0

Hayes, J.E., Bartoshuk, L.M., Kidd, J.R., & Duffy, V.B. (2008). Supertasting and PROP bitterness depends on more than the TAS2R38 gene. *Chemical Senses*, 33(3), 255–265. https://doi.org/10.1093/chemse/bjm084

Hayes, J.E., Wallace, M.R., Knopik, V.S., Herbstman, D.M., Bartoshuk, L.M., & Duffy, V.B. (2011). Allelic variation in TAS2R bitter receptor genes associates with variation in sensations from and ingestive behaviors toward common bitter beverages in adults. *Chemical Senses*, 36(3), 311–9. https://doi.org/10.1093/chemse/bjq132

Kim, U., Wooding, S., Ricci, D., Jorde, L.B., & Drayna, D. (2005). Worldwide haplotype diversity and coding sequence variation at human bitter taste receptor loci. *Human Mutation*, 26(3), 199–204. https://doi.org/10.1002/humu.20203

Lenell, C., Peña-Chávez, R., Burdick, R.J., & Rogus-Pulia, N. (2022). The Relationship Between Menopause and Dysphagia: A Scoping Review. *Women's Health Reports*, 3(1), 990–997. https://doi.org/10.1089/whr.2022.0078

Martin, L.J. & Sollars, S.I. (2017). Contributory role of sex differences in the variations of gustatory function. *Journal of Neuroscience Research*, 95(1–2), 594–603. https://doi.org/10.1002/jnr.23819

O'Donovan, S., Monaghan, S., Murphy, A., & Conroy, P.M. (2025). From Disruption to Control: Insights from Focus Groups Exploring Nutrition and Chemosensory Changes During Menopause. *Nutrients*, 17(21), 3411. https://doi.org/10.3390/nu17213411

Roudnitzky, N., Behrens, M., Engel, A., Kohl, S., Thalmann, S., Hübner, S., Lossow, K., Wooding, S.P., & Meyerhof, W. (2015). Receptor Polymorphism and Genomic Structure Interact to Shape Bitter Taste Perception. *PLOS Genetics*, 11(9), e1005530. https://doi.org/10.1371/journal.pgen.1005530

Stanić, Ž., et al. (2021). Does each menstrual cycle elicit a distinct effect on olfactory and gustatory perception? *Nutrients*, 13(8), 2509. PMID: 34444669. https://doi.org/10.3390/nu13082509

Than, T.T., Delay, E.R., & Maier, M.E. (1994). Sucrose threshold variation during the menstrual cycle. *Physiology & Behavior*, 56(2), 237–9. https://doi.org/10.1016/0031-9384(94)90189-9

Author Notes & Disclosures

The authors acknowledge that this paper establishes a framework and describes an implementation in early validation. Claims regarding prediction accuracy and user outcomes await completion of validation studies. Results — positive or negative — will be published as the validation process matures.

About the Authors: The authors have worked in coffee and sensory personalization since 2011, combining backgrounds in traditional health systems, regulatory auditing, and product development.

Conflicts of Interest: The authors are founders of BitterMatrix and have financial interest in its success. This relationship is disclosed in the interest of transparency. The scientific claims in this paper are grounded in peer-reviewed literature cited in the references; the implementation claims are clearly marked as in early validation.

Data Availability: Validation data will be made available following completion of the validation study, subject to user consent and privacy protections.

A Note on Authorship and AI Use: The constitutional framework, research methodology, observational findings, and all core concepts presented in this work are the original intellectual contribution of Dr Sumit Kesarkar, Founder and Chief Architect, AshZero Ltd. AI language tools were used in a supporting editorial capacity to assist with paraphrasing technical and mathematical content into accessible English prose, to refine sentence-level clarity, and to cross-reference PubMed identifiers for citation accuracy. No part of the conceptual framework, analytical structure, or research findings was generated by AI. The authorship of this work — its architecture, its arguments, and its conclusions — is entirely the work of Dr Sumit Kesarkar.

This paper is offered as a working document to assist researchers and practitioners in understanding

and deploying the engine. It is not submitted for peer review and does not seek academic validation of its findings.

The Female Sensory Intelligence engine and its underlying methodology are proprietary to AshZero Ltd. Licensing enquiries: hello@ashzero.com.