



UC DAVIS

Innovation Institute
for Food and Health

Faculty Collaboration Spotlight

Dr. Carlito Lebrilla



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“The Devil Is in the Quantitation”

Dr. Carlito Lebrilla and the Molecular Map of Health

Dr. Carlito Lebrilla, Distinguished Professor of Chemistry, Biochemistry, and Molecular Medicine at UC Davis, has navigated decades of scientific discovery with a blend of curiosity and humility. He often recalls a moment early in his career:

“I was watching that first mass spectrum of breast milk glycans on the screen—hundreds of peaks blinking back at me—I knew we had only scratched the surface of food’s molecular complexity.” - **Dr. Carlito Lebrilla**

The Fundamental Question of Food

During our conversation, Dr. Lebrilla posed what he calls the “fundamental question of food”:

“What is food at its molecular core, and how do those molecules orchestrate biological processes that determine health?”

He explained that answering this question requires precise quantitation of every chemical component—sugars, proteins, lipids, and beyond—and mapping their interactions with human biology to unlock novel pathways for nutrition-driven health innovation.



Publications

[Human Milk Glycomics and Gut Microbial Genomics in Infant Feces: A Proof-of-Concept Study](#)

[Function without structures: The need for in-depth analysis of dietary carbohydrates](#)

[Mass Spectrometry Approaches to Glycomic and Glycoproteomic Analyses](#)

[A Strategy for Structural Elucidation of Polysaccharides: Elucidation of a Maize Mucilage that Harbors Diazotrophic Bacteria](#)

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Lebrilla's glycomics research pinpointed how human milk oligosaccharides (HMOs), such as lacto-N-tetraose, selectively nourish *Bifidobacterium longum* subsp. *infantis* (*B. infantis*)—"nature's first probiotic." In the lab, he remembers, "We watched *B. infantis* feast on these sugars like never before—it was clear these bacteria had evolved to live in sync with infants." Collaborating with distinguished UC Davis professors Dr. Bruce German, Dr. David A. Mills, Dr. Daniela Barile, and Dr. Samara Freeman, Lebrilla demonstrated that modern diets and formula feeding prevent stable colonization of *B. infantis*—altering gut ecology in ways linked to inflammation and immune dysregulation.

These foundational findings, covered in [The New York Times](#), inspired the creation of [Infinant Health](#). As Infinant Health CEO Mike Johnson remarked in a recent company announcement, ***"Infinant Health is committed to improving the lifelong health of all infants through life-changing science and innovation to ensure all babies have a vital start to life. Today, up to 20% of US children are affected by atopic dermatitis, typically the first manifestation of the 'atopic march', a progression of allergic conditions, including food allergy. Studying the infant microbiome to inform potential solutions for this immune health issue is critical as we look to provide a healthier future for all children."*** Their flagship probiotic therapy, EVC001, has been shown in clinical trials to establish stable *B. infantis* populations and reduce intestinal inflammation by up to 55-fold.

Fiber, the Forgotten Nutrient

Driven by his belief that "even the simplest molecule can have profound effects," Lebrilla's team characterized dozens of soluble fiber fractions to determine which most robustly feed healthy gut bacteria. He shares, ***"I remember tasting our first prototype—remarkably neutral, but inside it, the bacteria were dancing."*** Dr. Lebrilla collaborated with co-founders Matt Barnard (CEO), Matt Amicucci, Ph.D., and distinguished UC Davis professors Dr. Bruce German and Dr. David Mills to launch [One.bio](#), developing fiber blends that mimic the biochemical diversity of natural fibers.

"Modern food processing techniques strip plant fibers from our foods and starve the microbiome of the nutrients it needs to make us healthy," explains Matt Barnard, co-founder and CEO of One.bio, in an interview with The Spoon. ***"Whether it's plant milks, cereals, or even sparkling water, we're able to offer high-dose, high-function, anti-inflammatory***

fibers in just about anything on the grocery store shelf.” Backed by a \$27 million Series A, One.bio is scaling its production to integrate these science-driven fibers into mainstream food products.

Glycomics Across Organisms — From Breast Milk to Indigenous Corn and Disease Biomarkers

Lebrilla’s lab applies glycomics tools to map carbohydrates across species. He recounts, *“The first time we looked at the secretion from indigenous Mexican corn, I thought we had discovered a new milk sugar.”* Through collaboration, his team published workflows that uncovered shared glycan motifs between corn mucilage and human milk, suggesting evolutionary parallels in microbe–plant and microbe–human interactions.

In parallel, Lebrilla’s group has applied the same glycomics workflows to complex diseases—mapping glycan biomarkers in breast, ovarian, liver, and prostate cancers as well as early-stage Alzheimer’s disease. Lebrilla describes the challenge of sifting through thousands of molecular species to find meaningful signals: he and his team developed targeted panels that pinpointed glycan structures uniquely elevated in tumor and brain tissues. These candidate molecules are now under evaluation as non-invasive blood-based diagnostics, with preliminary data showing the potential to detect disease months before clinical symptoms appear. He recalls one landmark moment: *“When my postdoc saw a glycan signature in ovarian tumor samples that exactly matched a pattern from human milk, I realized we were uncovering a universal molecular code with vast diagnostic power,”* he reflects.

Mapping the Future of Food – The Periodic Table of Food Initiative

Dr. Lebrilla, as a key member of IIFH’s interdisciplinary research team at the North American Center of Excellence for the [Periodic Table of Food Initiative \(PTFI\)](#), has driven the development of standardized glycomic analytical methods for precise molecular profiling—from heirloom tomato glycomics to staple grain analyses—ensuring consistency across all PTFI centers.

Lebrilla has shared how analyzing diverse food samples—from heirloom tomato varieties to staple grains—revealed the immense biochemical diversity within our everyday meals. These insights underscore the initiative’s mission to create a comprehensive molecular atlas of foods—cataloging proteins, lipids, carbohydrates, vitamins, and phytochemicals—to empower industry stakeholders, researchers, and policymakers. The initiative’s mission is to create a comprehensive molecular atlas of foods—cataloging proteins, lipids, carbohydrates, vitamins, and phytochemicals—to empower industry stakeholders, researchers, and policymakers. This open-access database will enable food companies to tailor products to precise nutritional outcomes, accelerate discovery in functional foods, and support sustainable agriculture worldwide.

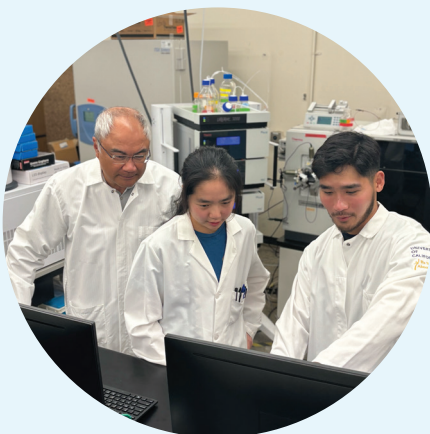
The Science of Quantitation

“The devil is in the... quantitation, as I like to say,”
Lebrilla emphasizes.

For Dr. Lebrilla, quantitation is more than a method—it is the lens through which the molecular world of food and health becomes intelligible. In our conversation, he explained, ***“Quantitation is the ability to measure every sugar, lipid, protein, and small molecule in a sample with high fidelity—and it’s only then that you truly see the biological story unfolding.”***

By pushing analytical limits to picomole and femtomole detection, his lab uncovered subtle shifts in HMO levels that guided probiotic formulations for infant health. He illustrated how this precision underlies every translational advance: when formulating EVC001, quantifying individual HMO structures allowed Infinant Health to optimize dosages of *B. infantis*—nourishing substrates, yielding a 55-fold reduction in intestinal inflammation. Likewise, in developing One.bio’s fiber blends, his team’s quantitation of fermentable fibers and resulting short-chain fatty acid profiles determined which fiber fractions most effectively modulate the gut microbiome.

Beyond specific products, Lebrilla underscores that robust quantitation is the foundation for reproducibility and trust in food innovation. “If you can’t measure it exactly, you can’t improve it,” he noted, underscoring how precise molecular data accelerates regulatory approval, investor confidence, and industry adoption.



Dr. Lebrilla’s work epitomizes IIFH’s mission to foster interdisciplinary collaboration, data-driven discovery, and translational science. His innovative research and dedication to practical applications advance our scientific understanding while delivering tangible improvements to human health and sustainability. By connecting rigorous molecular science to real-world food and health solutions, Lebrilla continues to make the foods we love healthier for both people and the planet.