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Enbiosis Biotechnology unveils proprietary nutraceutical formulation engine Enbiosis 2.0

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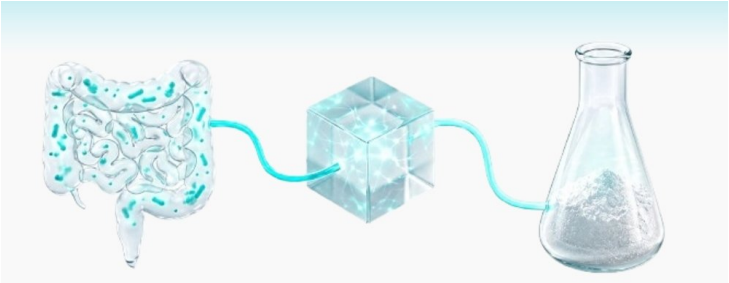
From computational design to clinical validation: a new standard for condition-specific formulations



Artificial intelligence (AI) has reshaped drug discovery, diagnostics, and genomics. The nutraceutical sector has been slower to follow. Most formulations are still built the same way they were decades ago: select an ingredient with a promising safety profile, run a small study, and hope the signal holds. The process is iterative, expensive, and often inconclusive.

A London-based biotechnology company, Enbiosis Biotechnology, has taken a different approach. Instead of starting with an ingredient, the platform starts with a biological target. The question is not which ingredient to use. It is which metabolites the body needs and which microbial pathways can produce them.

The Role of the Gut Microbiome

The gut microbiome is not a passive system. It processes dietary inputs, produces bioactive metabolites, and communicates with organs well beyond the digestive tract. Research across multiple disciplines has established that the gut microbiome plays a central role in regulating immune function, metabolic health, neurological signalling, and systemic inflammation. Yet most nutraceutical formulations are designed without accounting for how the microbiome will actually process their ingredients.

This is where the variability problem begins. The same ingredient can produce entirely different outcomes in two different guts. One person's microbiome converts a prebiotic fiber into short-chain fatty acids with measurable anti-inflammatory effects. Another person's does not. Generic formulations cannot account for this. They are designed for a population average that does not exist in practice.

A Computational Starting Point

Enbiosis 2.0 addresses this through genome-scale metabolic models of gut bacteria combined with an AI retrosynthesis engine. The platform builds a virtual model of the gut microbiome and runs simulations across thousands of real human microbiome profiles. For a defined health condition, it identifies which metabolic pathways are dysregulated and which beneficial metabolites the body is consequently failing to produce.

The retrosynthesis engine then works backwards from the target metabolite. It searches across the full landscape of gut microbial metabolism to find the minimal set of food-grade precursors that gut bacteria can convert into that molecule. Every ingredient in the final formulation already exists in the food supply. What changes is how they are combined and what the microbiome's own biosynthetic machinery will do with them.

The result is a formulation built around a defined biological outcome, with a mechanistic rationale established before a single clinical study begins.

Clinical Validation: The Gut-Eye Axis

The first clinical application was deliberately non-obvious. Enbiosis selected dry eye condition as its proof of concept, targeting the gut-eye axis. The rationale was grounded in published research: gut barrier function and systemic inflammation have documented associations with ocular surface health, and short-chain fatty acids produced through colonic fermentation carry known immunomodulatory properties.

Food-grade substrates were selected based on their predicted capacity to modulate this pathway. In a prospective pilot study, patient-reported symptom scores and objective tear production measures showed substantial improvements across the intervention period. The study documented a sequence of in silico prediction, formulation design, and clinical outcome that remains uncommon in nutraceutical research.

Beyond a Single Indication

The dry eye application demonstrated something more significant than a single clinical result. It showed that the same computational engine can be directed at any health condition with a gut microbiome connection. The platform is currently being applied to type 2 diabetes, inflammatory bowel disease, Alzheimer's disease, Parkinson's disease, psoriasis, vitiligo, eczema, and age-related macular degeneration.

Each of these represents a separate formulation design process, running through the same methodology. The engine identifies the relevant metabolic targets, works backwards to the food-grade inputs, and produces a formulation with a condition-specific mechanistic rationale.

The ability to design formulations around specific biological targets, using food-grade ingredients compliant with FDA and EFSA standards, reduces both the scientific risk and the regulatory complexity of bringing evidence-based products to market.

Computational models depend on the quality of underlying biological data, and in silico predictions require clinical confirmation. The approach informed and accelerated the path to evidence. It did not replace it.