

# METABIOME: METABOLIC NETWORK AND BIOFILM MODELING OF THE GUT MICROBIAL

Tech ID: 33608 / UC Case 2024-153-0

## PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2026/006842	01/02/2026	2024-153

## BRIEF DESCRIPTION

The human gut microbiome exists largely within complex, multi-species biofilms where spatial organization and local nutrient gradients dictate microbial behavior and health outcomes. Traditional genomic modeling often fails to account for these physical and spatial constraints. Researchers at UC Berkeley have developed MetaBiome, an innovative multiscale framework that couples genome-scale metabolic models (GEMs) with agent-based and continuum modeling. By employing a systematic bottom-up approach, MetaBiome identifies the critical interrelationships between local substrate transport and dynamic biofilm characteristics. This framework enables researchers to translate raw genomic data into a deep understanding of microscale biofilm properties, providing a predictive window into how species interact and compete within the gut's physical environment.

## SUGGESTED USES

- » Personalized Nutrition: Predicting how specific dietary substrates affect the growth and metabolic output of gut biofilms in individual patients.
- » Drug Development: Assessing the penetration and efficacy of antimicrobial or probiotic interventions within a structured microbial community.
- » Microbiome Engineering: Designing synthetic microbial consortia for therapeutic use by modeling spatial stability and resource sharing.
- » Metabolic Disease Research: Investigating the link between biofilm-driven metabolic shifts and conditions such as obesity, IBD, and diabetes.
- » Pathogen Surveillance: Modeling the conditions that allow opportunistic pathogens to outcompete commensal species within a protective biofilm matrix.

## ADVANTAGES

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## CONTACT

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## INVENTORS

- » KaazemPur-Mofrad,  
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## OTHER INFORMATION

### CATEGORIZED AS

- » **Biotechnology**
- » Bioinformatics
- » **Computer**
- » Software
- » **Medical**
- » Diagnostics
- » Disease: Digestive System
- » **Research Tools**
- » Bioinformatics

### RELATED CASES

2024-153-0

Integrative Multiscale Analysis: Successfully bridges the gap between cellular-level metabolism and macroscale community structure.

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High Spatial Resolution: Captures the "bottom-up" effects of mediator transport that traditional well-mixed models overlook.

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Predictive Accuracy: Utilizes adapted continuum models to simulate the physical expansion and density shifts of the biofilm over time.

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Genomic-Physical Coupling: Provides a unique method for elucidating how genetic potential manifests as physical traits within a complex environment.

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Scalable Framework: Capable of incorporating diverse species and substrates, making it adaptable to various microbial ecosystems beyond the human gut.

## RELATED MATERIALS

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