

Year-End Newsletter 2025

iCAMP CENTER OF EXCELLENCE

INTEGRATIVE CENTER FOR ALTERNATIVE MEAT & PROTEIN

Accelerating the commercialization of food innovation and biomanufacturing to meet global need by 2050 through:

RESEARCH & TECHNOLOGY

EDUCATION & TRAINING

PUBLIC OUTREACH

INDUSTRY PARTNERSHIP



PLANT BASED

Enhancing taste, texture, and nutrition of plant-based products through innovative crop breeding, plant cell cultures, and food processing.



MYCOPROTEINS

Developing nutritious and delicious foods and food ingredients sourced from microorganisms through strain selection and bioprocessing.



CULTIVATED

Growing animal cells to produce fats, meats & proteins through cell line development and process optimization.

IN PARTNERSHIP



iCAMP RESEARCH & INNOVATION HIGHLIGHTS



UC Davis Bean & legume trials

PLANT-BASED PROTEIN INNOVATION

iCAMP leaders advanced research in plant breeding and genetics focused on improving protein quality and nutritional performance in legumes and cereals. A newly published dynamic simulated gastrointestinal digestion platform more accurately mimics stomach contractions, providing improved assessment of plant protein digestibility and nutrient release. **Featured publications:** *Food Chemistry* / *Frontiers in Plant Science* (selected works).

FUNGAL-BASED FOODS & MYCELIAL MATERIALS

iCAMP teams scaled fungal biomass production using agricultural byproducts (almond hulls, fruit pomace, and cheese whey permeate) successfully in a pilot scale 140L bioreactor. Using this biomass, researchers developed prototype foods—jerky, mousse-style spreads, and protein bars—validated through safety testing and sensory evaluations with industry partners. Parallel work demonstrated that fermentation media enrichment can significantly enhance nutritional profiles, including concentration of bioactive compounds such as ellagic acid. Complementary materials research revealed that fungal developmental control can improve the mechanical strength and tunability of mycelial materials, enabling food and biomaterial applications. **Featured publications:** *ACS Biomaterials Science & Engineering* (2025); *Advanced Functional Materials* (in revision); *Journal of Food and Bioprocess Technology* (submitted).



Myco Boba! Fungal protein based food
<https://youtu.be/PUTFzv6GlpU>



PhD Student Madison Stewart
working to immortalize UC
Davis bovine cells

CULTIVATED MEAT & CELL-BASED SYSTEMS

iCAMP researchers advanced scalable cultivated meat production through breakthroughs in edible scaffolds, bioreactor design, and cell biology. Recent studies demonstrated the use of edible mycelium as functional scaffolds for anchorage-dependent animal cells and modeled large-scale bioreactor flow environments relevant to commercial production. Additional work showed that undifferentiated muscle stem cells can deliver comparable nutritional protein to differentiated muscle cells, suggesting differentiation may not be required for nutritional equivalence. Co-culture systems combining muscle and fibro-adipogenic progenitor cells

improved proliferation, differentiation, and fatty acid uptake, supporting more realistic tissue formation. **Featured publications:** *npj Science of Food* (2024); *Biochemical Engineering Journal* (2025); *Annual Review of Food Science and Technology* (2024); *Physiological Reports* (2025).



UC Davis Biomanufacturing graduate group visiting nearby IFF Innovation Center – employer of many UC Davis alumni

Bioprocessing, Scale-Up & Techno-Economic Analysis

iCAMP continues to lead in techno-economic analysis (TEA) for alternative protein systems. Researchers advanced **Cultivision**, a web-based TEA dashboard for cultivated meat, while completing economic analyses of novel feedstocks, including almond hull hydrolysates, recombinant sweet proteins, and mycoprotein systems. Recent modeling shows pathways to price parity with conventional beef protein and provides actionable cost benchmarks for industry and policymakers. **Featured publications:** *Biotechnology and Bioengineering* (Top Downloaded); *Frontiers in Sustainable Food Systems*; Academic Press (Elsevier) book chapter.

iCAMP LEADERSHIP TEAM



iCAMP GRANTS & AWARDS HIGHLIGHTS

iCAMP faculty secured **\$10M+ in competitive funding** and national recognition advancing alternative proteins, biomanufacturing, and workforce development.

Flagship Federal & National Awards

- **NSF** – *Laying the Scientific and Engineering Foundation for Sustainable Cultivated Meat Production* (\$2.4M, 2023–2026), David Block, establishing core engineering and scale-up foundations.
- **NSF** – *Bioindustrial Engineering for Sustainable Tomorrow (BEST)* National Research Traineeship (\$3.0M, 2024–2029), supporting interdisciplinary food and biomanufacturing workforce training.
- **USDA–NIFA AFRI** – *Scalable Production of Palatable and Nutritious Cultured Meat Using Edible, Tunable Scaffolds* (2022–2025), Amy Rowat.

Bioprocessing, Fermentation & Circular Bioeconomy

- **NSF** – *Systems Analysis of Fungal Responses to Cell Wall Damage* (\$1.75M, 2025–2028), advancing fermentation science (Marten, UMBC).
- **NSF** – *Engineered Plants in Culture (EPiC): Biomanufacturing in Low-Resource Environments* (\$3.0M, 2025–2029), resilient plant-based biomanufacturing (McDonald).
- **BioMADE Academic Challenge – Future Food** (Phases I–II, 2024–2025), converting agricultural waste into nutritious fungal foods (McDonald).

Applied Food Innovation & Sustainability

- **Resnick Agricultural Innovation Program** – *Transforming Nut Hulls into Nutritious and Sustainable Food Products* (Phase II, 2024–2025).
- **California Dept. of Food & Agriculture** – Conversion of almond and walnut hulls into fungal protein, biogas, and biofertilizers (2022–2025).
- **iCAMP-Funded Research** – Mycoprotein production from dairy byproducts (2024–2025).

Space, Frontier & Emerging Food Systems

- **TRISH** – *Future Foods for Space* (\$998K, 2024–2026), advancing food systems for extreme environments.
- **NSF/BioMADE** – *Reducing Cost Drivers for Cell-Cultured Chocolate* (2025–2027), addressing cost and scale barriers.

Faculty Awards: Allen Distinguished Investigator Award, Gold Shield Faculty Prize, NSF BRITE Fellow

HIGH-IMPACT SPEAKING ENGAGEMENTS

David Block, Center Director (UC Davis)

- **Bezos Center for Sustainable Proteins Summit**, NC State (Oct 2025) – Protein sustainability and scale-up
- **GEA Food Application & Technology Center Grand Opening**, Madison, WI (Jul 2025) – Fermentation and commercialization panel
- **Japanese Association for Cellular Agriculture**, University of Tokyo (Nov 2025) – Cost reduction strategies for cultivated meat
- **Fermentation Enabled Alternative Protein Summit**, San Francisco (Feb 2024) – Transition to commercial scale through early partnering

Amy Rowat, Co-Director (UCLA)

- **California Assembly Select Committee on Alternative Protein Innovation** (2025) – Industry policy and scale-up insights
- **Johns Hopkins University**, Cell Biology Colloquium (2024)
- **Carnegie Mellon University**, Bioengineering Seminar (2024)

Mark Marten, Fermentation Co-Lead (UMBC)

- **ACS National Meeting**, San Diego (Mar 2025) – Mycelial materials research
- **David F. Ollis Memorial Lecture**, NC State (Sep 2025)

Kara Leong, Executive Director

- **Future Foodtech**, San Francisco & Chicago (2024–2025)
- **Meat Evolution Summit (MEVO)** (2024–2025)
- **International Summit on Sustainable Protein**, Singapore (2025)
- **Bridge2Food**, Minneapolis (2025)

Karen McDonald, Bioprocessing Lead (UC Davis)

- **DEVCOM Webinar** (Jun 2025) – Forward-deployable biomanufacturing
- **Protein Central Panel** (Nov 2025) – Plant cell culture innovations

Lucas Smith, Cultivated Meat Lead (UC Davis)

- **NASA Investigators Workshop**, Galveston (Jan 2025) – Optogenetic enhancement for cultivated meat
- **ASCB Annual Meeting**, San Diego (Dec 2024) – Bovine muscle cell culture

Additional Faculty Highlights

- **Janet Tomiyama** – **International Summit on Sustainable Protein**, Singapore (2025)
- **Andrew Gravelle** – **AOCS Annual Meeting** (2025)
- **Christine Diepenbrock** – Multi-university plant protein seminar series



EDUCATION & WORKFORCE TRAINING

iCAMP delivers an **industry-integrated workforce pipeline** designed to meet the technical, operational, and leadership needs of the rapidly scaling food biomanufacturing sector.

Graduate & Professional Training

iCAMP anchors the **NSF-funded Bio-industrial Engineering for a Sustainable Tomorrow (BEST) National Research Traineeship (\$3M; 2024–2029)**, training approximately **45 graduate students** in metabolic engineering, industrial bioprocessing, and food biomanufacturing. Training emphasizes bioprocessing, techno-economic and life-cycle analysis (TEA/LCA), project management, science communication, bioethics, and **industry-mentored capstone projects**.

Academic Coursework & Hands-On Experience

Faculty lead specialized graduate courses and **summer bioreactor training workshops** focused on biomanufacturing facility design, sustainability assessment, and techno-economic modeling.

Undergraduate & Early Pipeline Development

iCAMP supports undergraduate pathways aligned with alternative protein research, including **Future Foods for Space**, funded by the **Translational Research Institute for Space Health (TRISH)** in partnership with Tufts University. Earlier-stage engagement includes the annual **Teen Biotech Challenge**, reaching **~400 high school students** each year and featuring dedicated **cellular agriculture** award categories.

iCAMP FOUNDING PARTNERS



INDUSTRY ENGAGEMENT & STRATEGIC PARTNERSHIPS

The **iCAMP Formal Partners Program** provides sustained, high-touch engagement with industry, linking companies directly to academic expertise, pilot-scale infrastructure, applied research, and workforce pipelines that accelerate commercialization and reduce technical risk.

Program Value & Impact

- **20 founding iCAMP industry partners** spanning alternative proteins, food ingredients, biomanufacturing, and enabling technologies.
- **400+ industry meetings & consultations** supporting technical problem-solving, scale-up strategy, and market translation.
- **90 in-person facility tours** at the UC Davis Robert Mondavi Institute for Wine & Food Science, offering hands-on access to food-grade pilot facilities, sensory labs, and bioprocessing infrastructure.
- **Active research collaborations** with Beyond Meat, UPSIDE Foods, BlueNalu, Umami Bioworks, California Cultured, and Optimized Foods, advancing scalable plant-based, fermentation-enabled, and cultivated proteins.

Partner Benefits

- Early visibility into emerging research, technologies, and pilot capabilities
- Direct access to students, trainees, and future workforce talent
- Opportunities to inform research priorities, training programs, and infrastructure planning
- Priority participation in iCAMP events, demonstrations, and ecosystem-building initiatives

Together, these partnerships accelerate lab-to-market translation while strengthening California's leadership in sustainable food biomanufacturing.

EVENTS HOSTED SINCE LAUNCH

Building a critically needed food innovation and biomanufacturing ecosystem between industry, academia, economic development, and legislative leaders.

iCAMP monthly research seminars and leadership meetings

7 Protein Central mixers, convening industry and academic leaders to accelerate food innovation commercialization and foster collaboration with students and researchers

2 Annual iCAMP Summits focused on technology, regulation, food safety, policy, funding, and market trends. iCAMP25: Innovation Summit for Protein Rich Foods featured leaders from Mars, Cargill, ADM, Ingredion, Congressman Ami Bera, Good Food Institute Founder Bruce Friedrich, UCLA's Jack Bobo, and the Culinary Institute of America's VP Robert Jones.



iCAMP 2026 EVENTS

**PROTEIN
CENTRAL**

FEBRUARY 26, 2026
MAY 7, 2026
NOVEMBER 17, 2026

iCAMP
Experience

JULY 16, 2026

**iCAMP26
SUMMIT**

SEPTEMBER 1-2, 2026

**iCAMP26
PARTNERS
RETREAT**

SEPTEMBER 2, 2026

**CULTIVATED MEAT
RESEARCH RETREAT**

SEPTEMBER 3, 2026

iCAMP 2026 PRIORITIES & GOALS

- Launch **iCAMP Experience** starting at UC Davis—a new program introducing food innovation, research, and career pathways to academic audiences. To learn more, contact icampinfo@ucdavis.edu.
- Release additional **iCAMP Seed Grants** for alternative protein, food innovation and biomanufacturing research and projects to build a **Future Food Fellows** research leader cohort across our partnering institutions.
- Expand **UC Davis RMI critical infrastructure**: complete installation of **eight 2L benchtop bioreactors** (four research, four food-grade), relocate and certify **40L and 140L stainless steel food-grade bioreactors**, and broaden access to food and beverage sensory and chemical analytics for research & training across all our partnering institutions and provide industry support.
- **Advance public outreach and education** to build broad understanding and informed dialogue around alternative proteins, food innovation, and food-related biomanufacturing—engaging consumers and the general public domestically and globally, while supporting evidence-based decision-making among **state and federal policymakers and legislators**.

CLOSING MESSAGE

Together, we continue to **accelerate food innovation, workforce training, and sustainable biomanufacturing**—preparing the next generation of scientists, entrepreneurs, and industry leaders. We look forward to seeing you in 2026.

-Happy Holidays from the iCAMP Team!