

IGEM Grant Report

IGEM Grant # IGEM 22-002 Principal Investigator Owen McDougal

Submission Date 06/15/2023 Primary Institution Boise State University

Instructions: Complete each section of this report directly on this template. Completed reports must be 4 pages or less in 12 pt Arial font, excluding the expenditure report. Reports that do not follow these requirements will be returned for revision. Submit reports by the appropriate due date to HERC@osbe.idaho.gov

Section 1: *Summary of project accomplishments for the reporting period and plans for the upcoming reporting period.*

From 07/22 - 06/23, our team has completed the design and planning of FDIC labs, obtained bids, and contracted with state approved contractors for laboratory construction of FDIC lab modules 1 and 2 to be completed in 2024. In year 2 of the FDIC HERC award, we proposed to submit 10 grants and generate \$1M in external funding. Now, at the end of FY23, we have submitted 22 proposals with 14 of them funded and three pending, for a total of \$3,130,366 (see Table 1). Our team also received BUILD Dairy funds in the amount of \$421,848 to support dairy research conducted by six graduate students and contribute to the hiring startup package for Dr. Konrad Meister (\$25K). The FDIC team mentored 12 graduate students, 45 undergraduate students, and 6 full-time staff. Of the estimated 3-5 publications/patents for FY23, our team has published four papers with more submissions in progress. Our goal of 5-10 internships and jobs for FY23, has led to five internships and three pending jobs at this time. Our plans for FY24 are to continue grant submissions, student mentorship, publication submissions, and promote internship and job opportunities for students.

Table 1. Summary of extramural funding activity in FY23.

External Funding / Grants & funding	YR1 Goal - 6	Funding Goal - \$500K	YR2 Goal - 10	Funding Goal - \$1M	YR3 Goal - 12	Funding Goal - \$1.5M
Grant Submission			22	\$24,927,028		
Grants Awarded	5	\$668,541	14	\$3,130,366		
Foundations/Gifts	0	\$ -	4	\$446,848		

Section 2: *High-level summary of budget expenditures for the period just completed. If the budget is underspent at time of report, explain why and plans for expending funds.*

The overall budget expenditures equate to 100%, however, some funds shifted category due to personnel changes, travel and equipment purchases that were posted to OE (<\$5K) or capital (>\$5K). The funds spent are in the following categories: infrastructure, instrumentation and equipment (104%); salary (82%) and fringe (56%); OE (241%); travel (147%); student tuition and fees (96%). The expenditures equal the total budget of \$684K.

Section 3: *Demonstration of economic development/impact, including: patents, copyrights, plant variety protection certificates received or pending; technology licenses signed, start-up businesses created, and industry involvement; private sector*

engagement; jobs created; external funding; any other pertinent information.

The FDIC has been exceedingly engaged with private sector companies as partners on external grants and as sponsors of funded projects. The companies and organizations that have contributed time, resources, and funds in FY23 include Agropur, Glanbia Nutritionals, Daisy Brand, Jones & Company Flavorings, Valley Food Tec, Dairy West, Lactalis, High Desert Milk, Cinder Wines, Telaya Winery, Split Rail Winery, Food Physics, Anheuser Busch, Global Gardens - Jannis Inc., Clextrol, SREUS, Southern Fabrication Works, Giddy Group, Dairy West, and Chobani. These partnerships and collaborative grants have led to the hiring and continued employment of three postdoctoral researchers and two research technicians for the FDIC. Of the twenty-two grant proposals submitted in the past year, eleven of them included industry collaborators and described industry priority projects. Of twelve grants with industry partners, eight were funded, one is pending, and two were declined. Total external funding for the fourteen grants and BUILD Dairy contributions obtained during this reporting period amounts to \$3,577,241, with another \$259,183 pending. Industry partners have also provided internship opportunities for students in FY23. Table 2 gives an overview of our progress in securing internships and jobs for students since the FDIC was originally funded. The YR2 partners are DuBois Chemical (2 students), Lactalis (1 student), and Agropur (2 students). There are currently three FDIC students being considered for full-time employment with Food Physics Group.

Table 2. Summary of internships and jobs for students that have worked with the FDIC.

Internships/Jobs	YR1 (2-4)	YR2 (5-10)	YR3 (10-20)
Internships	6	5	
Jobs	2	3 pending	

Section 4: *Number of faculty and student participants as a result of funding, and brief description of student efforts.*

Table 3 provides a summary of student, staff and faculty participation in the FDIC. Students work together with FDIC faculty in independent research or through one of three Vertically Integrated Project (VIP) courses in (1) Food Systems, (2) Plasma Medicine and Agriculture, and (3) Let's Light up Science. The staff are postdoctoral researchers and technicians working with FDIC faculty. The faculty are FDIC team members and the expanded network of faculty collaborators for extramural grant activity or industry engagement through FDIC sponsored projects. In the past year, the team has hosted visits by Dr. Anand Rao, VP of Ingredients Innovation at Agropur, Dr. Eric Bastian, VP of Industry Relations at Dairy West and Director of the Western Dairy Center, Kristi Spence, Sr. VP of Marketing and Communication for Dairy West, Dr. Loren Ward, Chief R&D Officer at Glanbia Nutritionals, Neil Justesen, owner of Southern Fabrication Works (SFW), Kalen McKenzie, CEO of SFW, Don Thomason, VP Sales for Sustainable Renewable Energy Systems (SREUS), Paul Freeman, Co-owner of SREUS, Beau Lewis, Sr. Utilities Manager and Brett Hudson, Wastewater Supervisor for Chobani, Brian Meyer, Sr. Technical Director for Food Physics Group (FPG), and Brandon Nelson, Dir. Innov. Tech. Services, Fernando Munoz, Lab Ctrl. Mgr. and Ashraf Hassan, Mgr. R&D for Daisy Brand.

FDIC Student Training	YR1 (3-5)	YR2 (5-10)	YR3 (5-10)
Undergraduate Students	25	45	
Graduate Students	6	12	
Staff	6	6	
Faculty	5	16	

Table 4 provides a summary of students, academic degree programs, and a brief description of FDIC project activity. The student academic program has been provided to demonstrate the interdisciplinary nature of the work being addressed in the FDIC.

Table 4. Brief description of student effort associated with the FDIC.

Project/Topic	Student (graduate*)
PEF in potato chip processing	Mark Skinner* (MSMSE PhD), Alyssa Hendricks (CHEM BS), Tauras Rimkus (CHEM BS)
Dairy protein analysis	Rianat Lukman* (CHEM MS), Angelica Cabrera (CHEM BS), Joseph Collins* (BMOL PhD), Madison Dirks* (BMOL PhD), Elizabeth Ryan* (BMOL PhD), Habeeb Babatunde* (CS PhD)
PEF treatment of grapes for better wine	Matt Lorentz (CHEM BS), Kylie Johnson (CHEM BS), Alder Escobar (CHEM BS)
Bioactive ingredient degradation in ready-to-mix drinks and protein bars	Mia Rheede* (BMOL PhD), Nick Franklin (CHEM BS), Gennivyve Williams (CHEM BS), Morgan Fong (CHEM BS)
Bioactive alkaloids in kratom products; potato protein	Anna Shuey* (BMOL PhD), Delaney Odell (CHEM BS), McKenzi Riggs (CHEM BS), Jordan Hoover (CHEM BS)
Cold atmospheric-pressure plasma	Zahraa Alomar (BIOL BS), Kato Burgess (CHEM BS), Asher Chivvis (HealthSci BS), Zahraa Alomar (BIOL BS), Gracie Garringer (CHEM BS), Sarah Knowlton (CHEM BS), Taylor Koch (CHEM BS), Matthew Ostapovich (CHEM BS), Keaton Poe (CHEM BS), Christian Rainey (HealthSci BS), Stephanie Rood (BIOL BS), Konnor Sjulie (BIOL BS), Sevio Stanton (CHEM BS), Dalton Miller* (CHEM MS)
Biofilms in agriculture and biofilm experiments in medicine	Kyle McCleary (ECE BS), Cameron Waite (ECE BS), Madison Rizzo* (CHEM MS), Luca Manning (CHEM BS), Antonio Reyes (CHEM BS),
In-cell NMR analysis of metabolites	Cale Thorton* (CHEM MS), Wes Hirons (CHEM BS), Nicole Aughtry (CHEM BS),
Fluorescence detection of RNA	Steve Broyles* (CHEM MS), Aaron Stone (BIOL BS), Katie Matteo (BIOL BS), Jasmine Baclig (CHEM BS), Courtney Beard (CHEM BS)
Protein Characterization	Vyan Mohaamed (ChEM BS), Amber Hawley (CHEM BS), Hannah Herring (CHEM BS), Maddie Cardenas (BIOL BS), Chloe Day (BIOL BS), Kathryn Pierson (CHEM BS), McKenna Whiting (BIOL BS), Halle Torgerson (HEALTH STY BS), Kenzie Ballinger (CHEM BS), Gabe Miles (CHEM BS), Clariza Arteaga (BIOL BS)

Table 5 provides a summary of publications and patents associated with FDIC activity. In FY23, we proposed to publish 3-5 papers/patents and have four publications with more submissions in progress.

Table 5. Summary of publication and patent activity associated with the FDIC.

Patents & publications	YR1 (6)	YR2 (10)	YR3 (5-10)
Publications	6	4	
Patents	0	0	

Section 5: *Updated details and/or progress on the long-term sustainability plan for the project and description of future plans for project continuation or expansion.*

The long-term sustainability plan for the FDIC will be dependent on grant support and industry engagement. Our team will continue to submit proposals under the topics of NSF/USDA infrastructure (e.g., NSF Mid-scale Research Infrastructure-1, DOE EarthShot, NSF Convergence Accelerator Phase II, USDA NIFA Food and Nutrition Security, NSF RAISE, etc.), advanced manufacturing or center programs that build capabilities for support staff and academic programs to leverage sustainable operations that align with the CHIPS and Science Act. We will adopt (1) a recharge center model to include infrastructure for the industry to supplement financing for the center, (2) industry funds “facility use agreement” industry partners use the center equipment, and (3) industry directly funds research. In the final year of this IGEM HERC award, the PI will explore the initiation of a start-up company to facilitate the development of intellectual property for the promotion of economic development in Idaho.

Section 6: Expenditure Report – Attach an expenditure report as a separate document showing expenses toward the original budget submitted for this project. The expenditure report does not count toward the page limit. A written summary of budget expenditures should be provided in section 2 of this report.

Expenditure Report

Year 2 Budget Summary 6/30/2023										
	Year 2 Budget	BAR 4/6/2023	BAR 6/14/2023		Revised Budget	Total Expenses	Balance	Encumbrance	Available Balance	Burn Rate
Salary	181,065.00	(10,685.78)	(22,199.65)		148,179.57	(148,179.57)	-	-	-	100%
Fringe	69,006.00	(15,000.00)	(15,695.82)		38,310.18	(38,310.18)	-	-	-	100%
Other Expense	32,843.00	25,000.00	21,378.15		79,221.15	(79,233.70)	(12.55)	-	(12.55)	100%
Travel	3,900.00	1,123.78	714.72		5,738.50	(5,738.50)	-	-	-	100%
Student	10,626.00	(438.00)			10,188.00	(10,188.00)	-	-	-	100%
Capital	386,560.00		15,802.60		402,362.60	(402,362.60)	-	-	-	100%
Subtotal	684,000.00	0.00	-	-	684,000.00	(684,012.55)	(12.55)	-	(12.55)	100%
Indirect 0.0%	-				-	-	-	-	-	
Total Costs	684,000.00	0.00	-	-	684,000.00	(684,012.55)	(12.55)	-	(12.55)	100%

The BAR 6/14/2023 column which is highlighted in yellow, represents expenses that have yet to be approved by IGEM HERC at the time of submission of this annual report.