

## IGEM Grant Report

⓪ **Progress (due Jan. 1)** X Annual (due Jul. 31) Final (due Aug. 31)

IGEM Grant # IGEM22-002 Principal Investigator Owen McDougal

Submission Date 1/1/2024 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](mailto:HERC@osbe.idaho.gov)*

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

Reporting period: July - December 2023 - In year 3 of the IGEM HERC project, we proposed to construct Food and Dairy Innovation Center (FDIC) labs and submit 12 grants to generate \$1.5M in external funding. Our accomplishments associated with lab construction and grant activity are as follows. Construction of three FDIC lab modules, of 650 sq ft per lab for a total of nearly 2,000 sq ft., began on October 25, 2023. Completion of FDIC lab modules is expected in the summer of 2024. Our project team is currently managing 17 sponsored projects, for a total budget of \$35,032,287. In 2023, the project team submitted 19 grant proposals, 12 of which have been awarded, for a total of \$16,937,649, and the other 7 grants are pending (see **Table 1**). The FDIC team has trained 16 graduate students, 17 undergraduate students, and employed 6 staff since July 2023. Of the estimated 5-10 publications/patents for FY24, our team has published 1 paper with three additional manuscripts under review, and more submissions planned. Our goal of 10-20 internships and jobs for FY24, has led to 5 internships and 1 job at the halfway point. Our plan for the second half of FY24 is to continue grant submissions, student mentorship, publication submissions, and promote internship and job opportunities for students.

**Table 1.** Summary of FDIC extramural funding activity.

External Funding / Grants & funding	YR1 (\$500K)	\$	YR2 (\$1M)	\$	YR3* (\$1.5M)	\$
Grants Administered			15	\$4,579,541	17	\$35,032,287
<b>Grants Awarded (FDIC-direct)</b>	5	<b>\$668,541</b>	8	<b>\$2,437,351</b>	10	\$6,586,469
<b>Grants Awarded (FDIC-indirect)</b>					2	\$10,351,180
<b>Grants Pending</b>					7	\$18,174,104
Foundations/Gifts	0	\$ -	1	\$25,000	1	\$25,000

\* partial year

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

The overall budget expenditures equate to 60% of total funds having been spent on infrastructure, instrumentation, and equipment. The budget categories that have been spent down less than 50% are salary and fringe (66% & 69% respectively, remaining).

The reason for the budget expenditure anomalies is that summer salary and fringe will make up for the budget excess from the academic year.

**Section 3: Demonstration of economic development/impact, including the following as applicable: 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 that have contributed time, resources, and funds over the past six months include, Agropur, Glanbia Nutritionals, Daisy Brand, Jones & Company Flavorings, Valley Food Tec, Genesis Organics, Ingredion, Dairy West, Cinder Wines, Telaya Winery, Food Physics, Anheuser Busch, Mountain Malt, Southern Fabrication Works, J.R. Simplot Co., McCain Foods USA, Gibby Group, Top Onion USA, Amalgamated Sugar, Chobani, Brabender, National Dairy Council, Global Gardens, and Agilent Technologies. These partnerships have led to the continued employment of three postdoctoral researchers, two research technicians, and program director. Of the 19 grant proposals in 2023, 11 of them are with industry partners, 12 were funded, 7 are pending, and none have been declined at this time. Total external funding for the 12 grants that have been funded in 2023, together with industry collaborators, amounts to \$16,937,649, with another \$18,174,104 pending.

Industry partners have also provided internship opportunities for students in FY24. **Table 2** gives an overview of our progress in securing internships and jobs for students since the FDIC was originally funded. The YR3 partners are Daisy Brand, Food Physics, Carollo Engineering, and National Renewable Energy Laboratory (NREL).

**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	5
Jobs	2	0	1

\* partial year

**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. The students work with FDIC faculty in independent research through Vertically Integrated Project (VIP) courses in Food Systems and Plasma Medicine and Agriculture. The staff are postdoctoral researchers and research technicians working with FDIC faculty. The faculty are FDIC team members and the expanded network of professors that collaborate on extramural grant activity or industry engagement through FDIC sponsored projects.

FDIC Student Training	YR1 (3-5)	YR2 (5-10)	YR3* (5-10)
Undergraduate Students	25	40	17
Graduate Students	6	11	16
Staff	6	6	6
Faculty	5	16	4

\* partial year

**Table 4** provides a summary of students, their degree program, and a brief description of their project activity associated with the FDIC. 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.

Student (graduate*)	Title/Position	Project/Topic
Mark Skinner*	MSMSE PhD	PEF in potato chip processing
Alyssa Hendricks	CHEM BS	PEF in potato chip processing
Taurus Rimkus	CHEM BS	PEF in potato chip processing
Rianat Lukman*	CHEM MS	Dairy protein analysis by NIR and HPLC
Matt Lorentz*	CHEM MS	PEF treatment of grapes to make wine better
Kylie Johnson*	CHEM MS	Separations Technologies that Enable Production and Use of High-Value Biomass Streams from Agricultural and Food Processing Wastes
Alder Escobar	CHEM BS	PEF treatment of grapes to make wine better
Mia Rheede*	BMOL PhD	Bioactive ingredient degradation in ready-to-mix drinks and protein bars
Amber Hawley	CHEM BS	PEF treatment of grapes to make wine better
Morgan Fong	CHEM BS	PEF in potato chip processing
Anna Shuey*	BMOL PhD	Investigating Bioactive Alkaloids in Kratom
Jordan Hoover	BIOL BS	Investigating Bioactive Alkaloids in Kratom
Delaney Odell	CHEM BS	Investigating Bioactive Alkaloids in Kratom
Christopher Orizaba		Investigating Bioactive Alkaloids in Kratom
McKenzi Riggs	CHEM BS	Investigating Bioactive Alkaloids in Kratom
Gracie Garringer	CHEM BS	Cold atmospheric-pressure plasma array for inactivation of plant pathogens
Sarah Knowlton	CHEM BS	Gas mix impact on ROS generation by cold atmospheric-pressure plasma discharge
Mason Fearar	BIOL BS	Cold atm.-pressure plasma array for inactivation of plant pathogens
Jocelyn Stephens	CHEM BS	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Krystal Sosa*	BMOL PhD	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Kaden Falkner	CHEM BS	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Hassan Mohammed	CHEM BS	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Sumona Islam*	ECE MS	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Gretchen Kunz*	BMOL PhD	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Matthew Ostapovich	BIOL BS	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Stephanie Rood*	BIOL MS	Gas mix impact on ROS generation by cold atmospheric-pressure plasma discharge
Konnor Sjulie	BIOL BS	Cold atmospheric-pressure plasma devices for inactivation of foodborne pathogens
Dalton Miller*	CHEM MS	Biofilm experiments in Medicine; Gas mix impact on ROS generation by cold atmospheric-pressure plasma discharge; Cold atmospheric-pressure plasma inactivation of bacterial biofilms in porcine wound models
Cale Thorton*	CHEM MS	In cell NMR, analysis of metabolites
Joseph Collins*	BMOL PhD	Whey protein isolation, structure evaluation and degradation monitoring
Madison Dirks*	BMOL PhD	GMP bioactivity assessment
Elizabeth Ryan*	BMOL PhD	PEF to improve whey protein spray dry efficiency and powder quality
Habeeb Babatunde*	CS PhD	Chemometric software development for real time monitoring of casein protein throughout a processing facility

\* Graduate Student

**Table 5** provides a summary of publications and patents associated with FDIC activity. In FY23, we proposed to publish 5-10 papers/patents and have 1 published and three under peer review within the first six months, with more submissions planned.

