IGEM Grant Report

⦸ **Progress (due Jan. 1)** ☐ Annual (due Jul. 31) ☐ Final (due Aug. 31)

IGEM Grant # _IGEM 22-002_____Principal Investigator_Owen McDougal____

Submission Date_1/1/2023_____ 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 July - December 2022, 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. At the halfway point of year 2 (FY23), we have submitted 15 proposals with 8 of them funded and two pending, for a total of $2,437,351 (see **Table 1**). Our team also obtained $25,000 from BUILD Dairy to the BSU Foundation to support a new faculty hire in chemistry, Dr. Konrad Meister, who will engage in dairy related research. The FDIC team has trained 11 graduate, 40 undergraduate, and 6 staff over the past six months. Of the estimated 3-5 publications/patents for FY23, our team has published four papers with more submissions planned. Our goal of 5-10 internships and jobs for FY23, has led to five internships and no jobs at the halfway point. Our plans for the second half of FY23 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 ($500K)	$	YR2* ($1M)	$	YR3 ($1.5M)	$
Grant Submission			15	$4,579,541		
Grants Awarded	5	**$668,541**	8	**$2,437,351**		
Foundations/Gifts	0	$ -	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 68% of total funds having been spent on infrastructure, instrumentation, and equipment. The budget categories that have been spent down less than 50% include salary (30%) and fringe (22%). The budget category that has been overspent is OE at 119%. The reason for the budget expenditure anomalies is that salary and fringe benefits will be spent at a faster rate in the second half of the fiscal year due to summer salaries for PI's and graduate students, and the delayed hire of a postdoc and recruitment of a graduate student. Both postdoc and graduate student are being compensated at this time, and salary/fringe benefits will be fully expended by

the end of FY23. The overspending of OE is due to instruments that have been purchased for less than $5,000, which require a budget transfer from capital to OE to compensate for the expenditures. There are sufficient capital funds to cover the cost of the less expensive instruments, which have been accounted for from OE, but require a fund transfer to balance.

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, Dairy West, Lactalis, High Desert Milk, Cinder Wines, Telaya Winery, Split Rail Winery, Food Physics, Anheuser Busch, Global Gardens - Jannis Inc., and Clextral. These partnerships have led to the hiring and continued employment of two postdoctoral researchers and one research technician. Of the fifteen grant proposals submitted in the past six months, eleven of them included industry collaborators and described industry priority projects. Of eleven grants with industry partners, seven were funded, two are pending, and two were declined. Total external funding for the seven grants that have been funded in the first six months of this reporting period, together with industry collaborators, amounts to $1,668,130, with another $347,771 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, and Agropur (2 students).

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	0	

* 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 or through Vertically Integrated Project (VIP) courses in Food Systems, Plasma Medicine and Agriculture, and Let's Light up Science. 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. In the past semester, PI McDougal has hosted visits by Dr. Anand Rao, VP Ingredients Innovation at Agropur, Dr. Eric Bastian, VP Industry Relations at Dairy West and Director of the Western Dairy Center, and Dr. Loren Ward, Chief R&D Officer at Glanbia Nutritionals, to meet with students and faculty at Boise State University.

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

* 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
Tauras Rimkus	CHEM BS	PEF in potato chip processing
Rianat Lukman*	CHEM MS	Dairy protein analysis by NIR and HPLC
Angelica Cabrera	CHEM BS	Dairy protein analysis by NIR and HPLC
Matt Lorentz	CHEM BS	PEF treatment of grapes to make wine better
Kylie Johnson	CHEM BS	PEF treatment of grapes to make wine better
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
Nick Franklin	CHEM BS	Bioactive ingredient degradation in ready-to-mix drinks and protein bars
Gennivyve Williams	CHEM BS	Bioactive ingredient degradation in ready-to-mix drinks and protein bars
Morgan Fong	CHEM BS	Bioactive ingredient degradation in ready-to-mix drinks and protein bars
Zahraa Alomar	BIOL BS	Gas mix impact on ROS generation by cold atmospheric-pressure plasma discharge
Kato Burgess	CHEM BS	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Asher Chivvis	HealthSci BS	Cold atmospheric-pressure plasma inactivation of bacterial biofilms in porcine wound models
Gracie Garringer	CHEM BS	Use of 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
Taylor Koch	CHEM BS	Cold atmospheric-pressure plasma devices for inactivation of foodborne pathogens
Kyle McCleary	ECE BS	Biofilm experiments in Medicine
Matthew Ostapovich	BIOL BS	Use of cold atmospheric-pressure plasma array for inactivation of plant pathogens
Keaton Poe	CHEM BS	Cold atmospheric-pressure plasma inactivation of bacterial biofilms in porcine wound models
Christian Rainey	HealthSci BS	Cold atmospheric-pressure plasma inactivation of bacterial biofilms in porcine wound models
Stephanie Rood	BIOL BS	Gas mix impact on ROS generation by cold atmospheric-pressure plasma discharge
Konnor Sjullie	BIOL BS	Cold atmospheric-pressure plasma devices for inactivation of foodborne pathogens
Sevio Stanton	CHEM BS	Gas mix impact on ROS generation by cold atmospheric-pressure plasma discharge
Cameron Waite	ECE BS	Biofilm experiments in Medicine
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
Madison Rizzo*	CHEM MS	Biofilms
Cale Thorton*	CHEM MS	In cell NMR, analysis of metabolites
Steve Broyles*	CHEM MS	RNA based detection
Luca Manning	CHEM BS	Biofilms
Antonio Reyes	BIO BS/CHEM BS	Biofilms
Wes Hirons	CHEM BS	In cell NMR, analysis of metabolites
Nicole Aughtry	CHEM BS	In cell NMR, analysis of metabolites
Hannah Herring	CHEM BS	Protein Characterization

Maddie Cardenas	BIO BS	Protein Characterization
Chloe Day	BIO BS	Protein Characterization
Kathryn Pierson	CHEM BS	Protein Characterization
McKenna Whiting	BIO BS	Protein Characterization
Halle Torgerson	HEALTH STY BS	Protein Characterization
Kenzie Ballinger	CHEM BS	Protein Characterization
Gabe Miles	CHEM BS	Protein Characterization
Clariza Arteaga	BIO BS	Protein Characterization
Aaron Stone	BIO BS	RNA based detection
Katie Matteo	BIO BS	RNA based detection
Jasmine Baclig	N/A	RNA based detection
Courtney Beard	CHEM BS	RNA based detection
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 3-5 papers/patents and have four published within the first six months, with more submissions planned.

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	

* partial year

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), 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 industry to supplement financing for the center, (2) industry funds “facility use agreement” for their people to come in to use the center equipment, and (3) industry directly funds research. Incentivize start-up companies having access to the FDIC facilities to develop their IP for promotion of economic development.

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 Updated 12/14/2022								
	Year 2 Budget	BAR Rebudget 1	BAR Rebudget 2		Revised Budget	Total Expenses	Balance	Available Balance	Burn Rate
Salary	181,065.00				181,065.00	(53,677.52)	127,387.48	127,387.48	30%
Fringe	69,006.00				69,006.00	(14,867.21)	54,138.79	54,138.79	22%
OE	32,843.00				32,843.00	(39,208.27)	(6,365.27)	(6,365.27)	119%
Travel	3,900.00				3,900.00	$ (2,348.17)	1,551.83	1,551.83	60%
Student	10,626.00				10,626.00	(5,154.00)	5,472.00	5,472.00	49%
Capital	386,560.00				386,560.00	(351,622.9)	34,937.10	34,937.10	91%
Sub Total	684,000.00	0.00	0.00	0.00	684,000.00	(466,878.07)	217,121.93	217,121.93	68%
Indirect 0.0%	0.00				0.00	0.00	0.00	0.00	
Total Costs	684,000.00	0.00	0.00	0.00	684,000.00	(466,878.07)	217,121.93	217,121.93	68%