



National MMPC at UMass



18th Annual Meeting of the National MMPC, October 3rd, 2018


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The National Mouse Metabolic Phenotyping Center (MMPC) at UMass is a National Institutes of Health-sponsored resource (NIH Grant 5U2C-DK093000) that provides an array of sophisticated research tools to the global scientific community for the purpose of investigating mouse models of human diseases with particular focus on diabetes, obesity, and diabetic complications. The mission of the UMass MMPC is to advance medical and biological research by offering comprehensive, standardized, and high-quality experimental testing services to the academic and industry scientists. The UMass MMPC is composed of multidisciplinary group of investigators and leading scientists with state-of-the-art technologies at the UMass Medical School and consists of six complementary Phenotyping Cores. The collective goal of our research program is to find a cure for diabetes and improve human health.



Dr. Jason K. Kim, Director

Metabolism Core performs elegant, physiological, and non-invasive metabolic experiments to assess insulin sensitivity hyperinsulinemic-euglycemic clamp & GTT/ITT), glucose/lipid/protein metabolism using labeled metabolites, body composition using ¹H-MRS, energy balance (food/water intake, energy expenditure, physical activity) at varying temperature and light/dark cycle using TSE Metabolic Cage System with Environmental Chamber, and exercise capacity using treadmill in mice. The Core also conducts comprehensive drug trial studies for PK/PD, efficacy, and toxicity analysis with academic and pharmaceutical institutions.

Analytical Core utilizes Luminex, Cobas Clinical Chemistry Analyzer, and molecular experiments to perform a high-throughput, multiplexed analysis of serum/tissue/urine levels of hormones, cytokines, chemokines, electrolytes, and metabolites, liver/kidney/thyroid function panels, and metabolic/inflammatory signaling pathways. Samples can be directly sent to the Core or obtained from mice by the Core.

Islet Core conducts sophisticated *in vivo*, *ex vivo*, and *in vitro* analysis of insulin secretion, islet function/structure, and pancreatic function using hyperglycemic clamp, perfusion, and molecular experiments in mice. The Core also performs histological and morphological analysis with islet isolation.

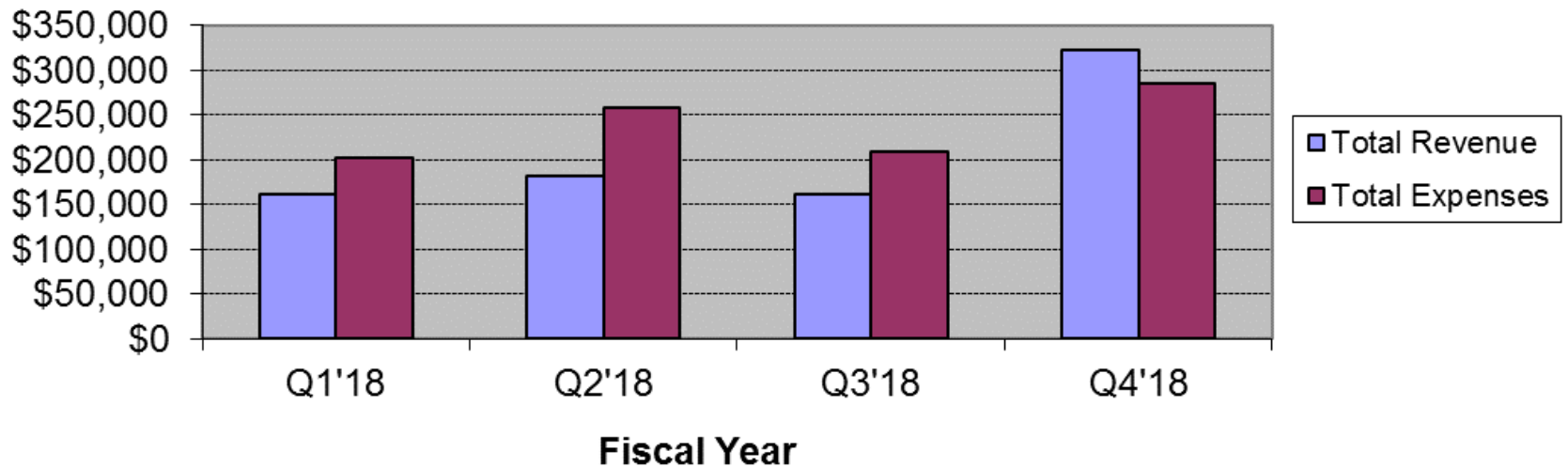
Cardiovascular Core applies state-of-the-art high-frequency and high-resolution digital imaging platform with color Doppler mode (VisualSonics Vevo2100) to perform 2-D and M-mode echocardiography to non-invasively assess cardiac function and structure in mice. The Core also measures ECG/blood pressure and vascular/endothelial function, and conducts elegant micro-surgery procedures to generate mouse models of cardiovascular and peripheral vascular diseases.

Microbiome Core provides expert knowledge and metagenomics 16S rRNA NextGen sequencing tools for state-of-the-art analysis of gut microbiota to investigate their role in altered energy balance and metabolism in mice. The Core also offers Fecal Microbiota Transplant (FMT) and antibiotic treatment procedures to facilitate alterations in gut microbiota population.

The Humanized Mouse Cell Transplantation and Assessment Core offers unique “humanized” mice engrafted with functional human cells/tissues to conduct clinically relevant *in vivo* experiments of human cells, tissues, and immune system. The Core also provides expert and standardized techniques to assess *in vivo* function of transplanted human islets and stem cell-derived beta-cells in immunodeficient mice.

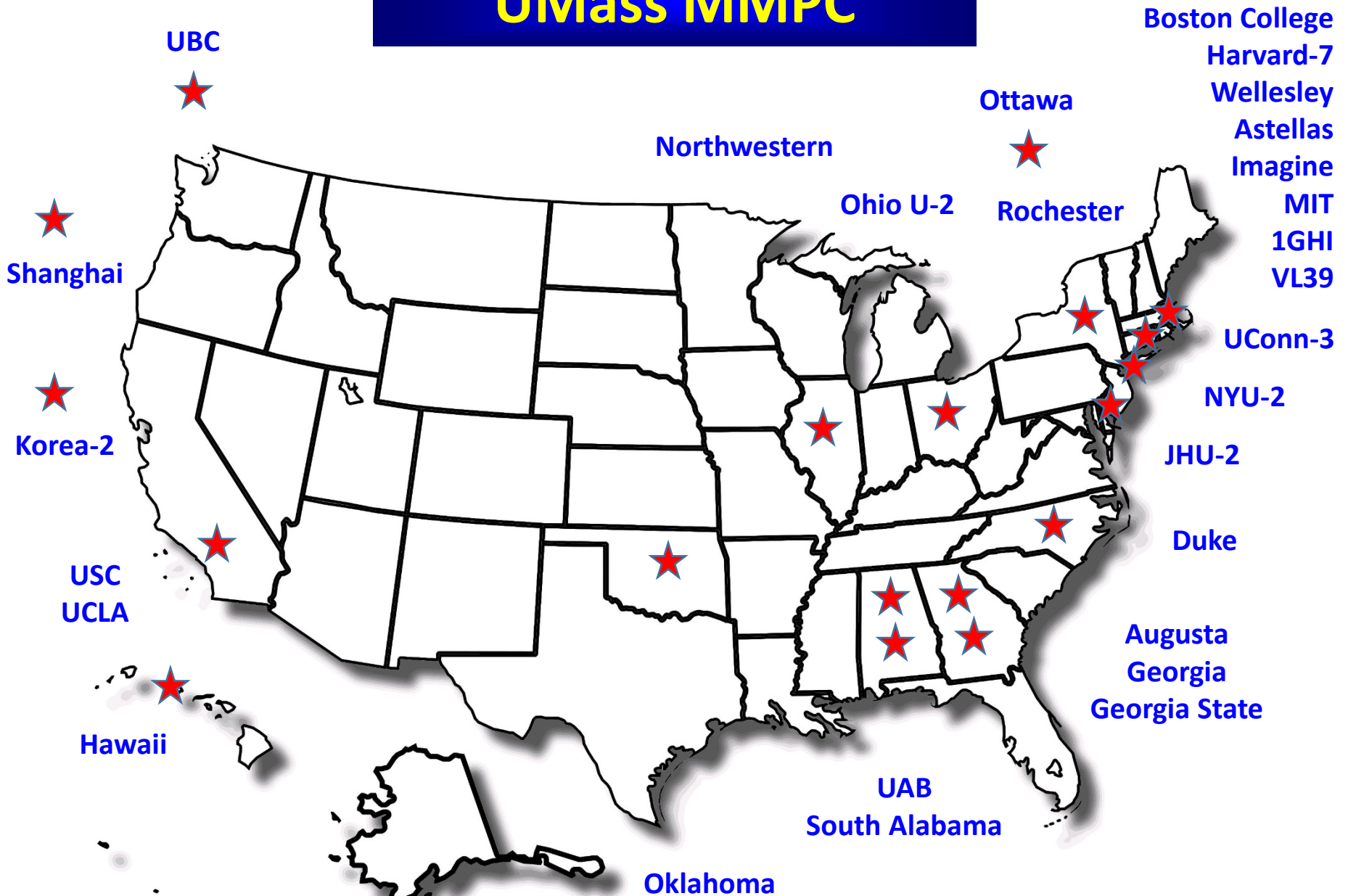
UMass MMPC in Year 7

UMass MMPC



Beginning Fund Balance		107,621				
	FY17 YTD	Q1-18	Q2-18	Q3-18	Q4-18	FY18 YTD
Revenue	813,182	65,997	48,934	37,851	183,759	336,541
U2C Grant						
Total Revenue	913,662	161,701	181,706	161,796	323,142	828,645
Expenses	640,913	106,237	126,390	85,043	145,562	463,232
U2C Grant						
Total Expenses	807,926	202,241	259,162	208,988	284,945	955,336
Net Balance	172,269	(40,540)	(77,456)	(47,192)	38,197	(126,991)
		Ending Fund Balance (19,370)				

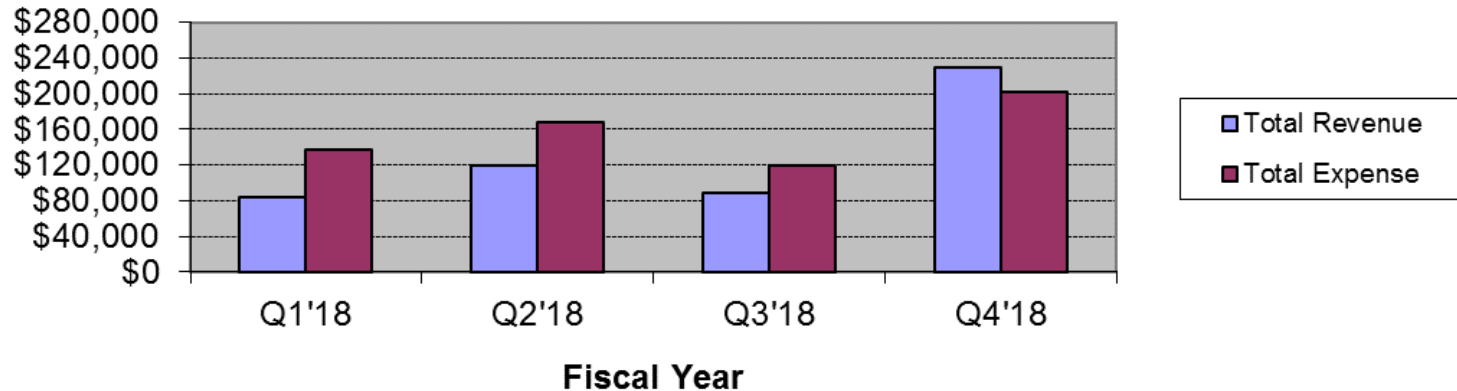
UMass MMPC



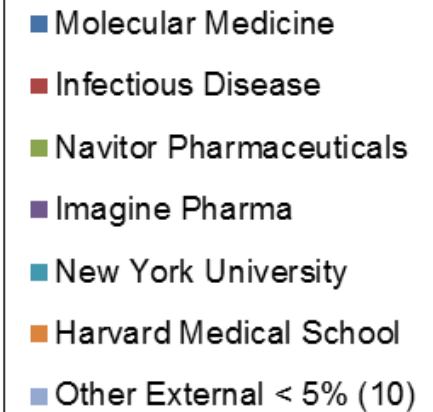
Drug Trial Study



Metabolism Core

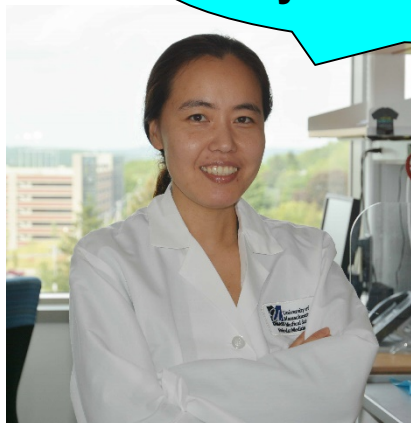


Molecular Medicine	4.7%
Infectious Disease	0.6%
Navitor Pharmaceuticals	31.8%
Imagine Pharma	19.9%
New York University	11.3%
Harvard Medical School	5.6%
Other External < 5% (10)	26.2%

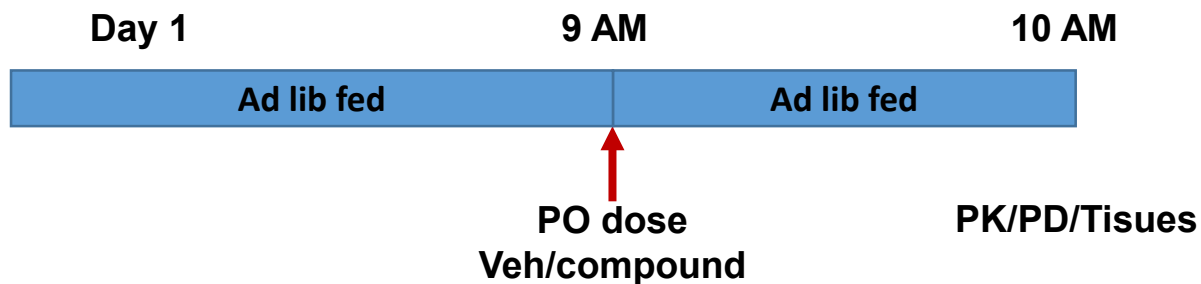


Metabolism Core

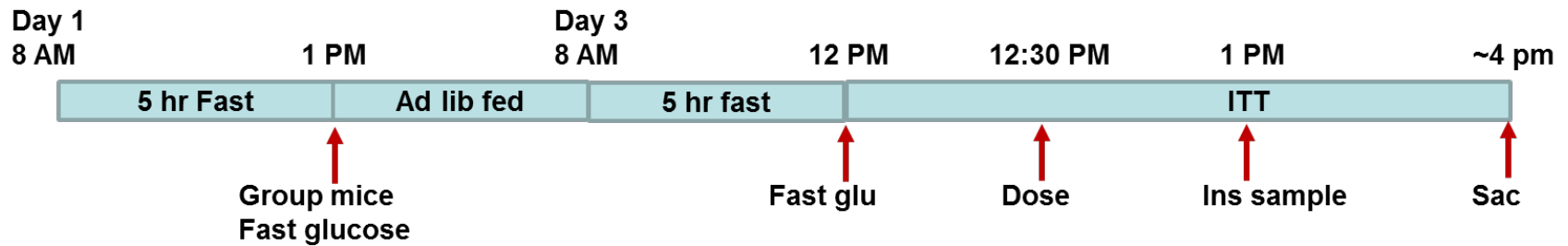
**Core Director
Hye-Lim Noh, Ph.D.**



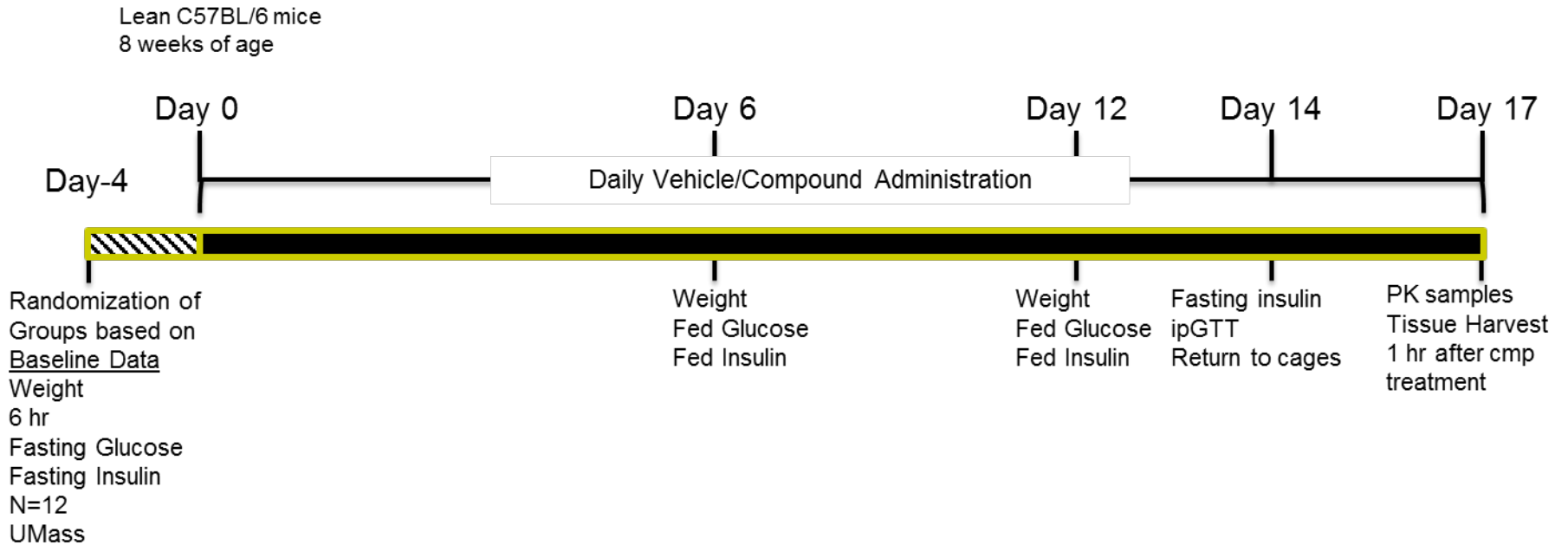
Sujin Suk, Ph.D.



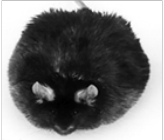
Metabolism Core



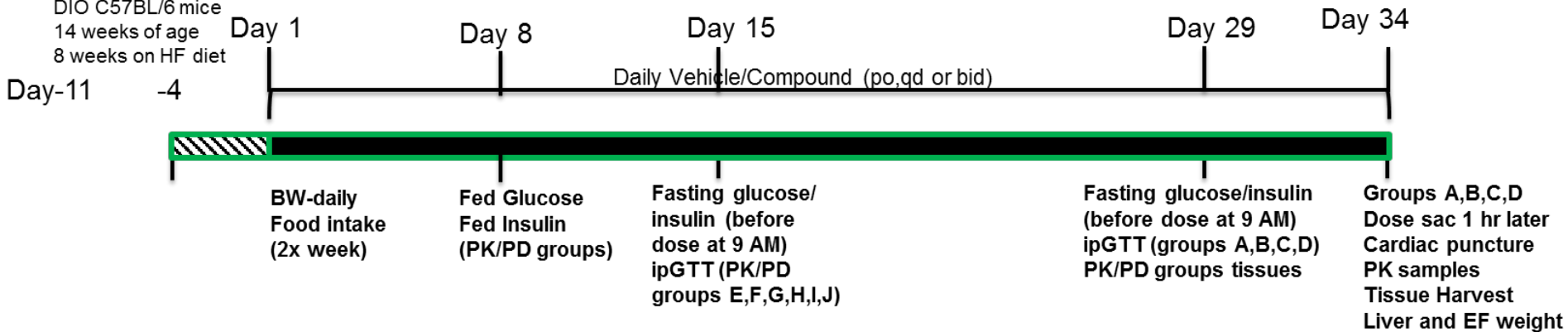
Metabolism Core



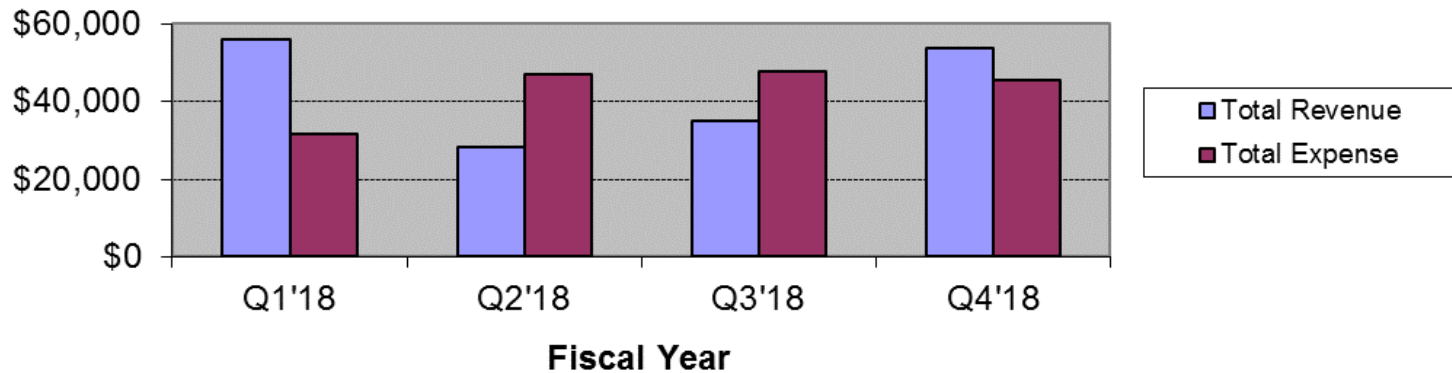
Metabolism Core



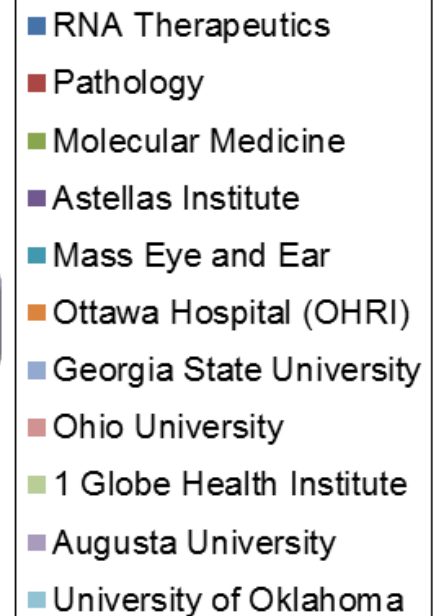
DIO C57BL/6 mice
14 weeks of age
8 weeks on HF diet



Analytical Core



RNA Therapeutics	11.7%
Pathology	5.5%
Molecular Medicine	2.9%
Astellas Institute	33.9%
Mass Eye and Ear	22.5%
Ottawa Hospital (OHRI)	7.3%
Georgia State University	5.2%
Ohio University	3.8%
1 Globe Health Institute	3.6%
Augusta University	2.5%
University of Oklahoma	1.1%



Analytical Core

**Core Director
Randall Friedline, Ph.D.**



WORK ORDER NO. UMLUPPUB170405

To the Master Laboratory Services Agreement by and between ASTELLAS INSTITUTE FOR REGENERATIVE MEDICINE ("Astellas") and UNIVERSITY OF MASSACHUSETTS MEDICAL SCHOOL ("Laboratory"), dated January 2, 2018 ("Agreement"). This Work Order is by and between Astellas and Laboratory.

Analytical Core

UMass MMPC 25650-Astellas Analytical Data Summary

Sampling: BUN, Creatinine

Sample #: 341

Source: Mouse Blood

Matrix: Serum

Sample ID	Animal ID	Group	Serum Volume	Comments
1	1	17-05 Terminal (End Study)	80	
2	2	17-05 Terminal (End Study)	80	
3	3	17-05 Terminal (End Study)	80	lipidemic
4	4	17-05 Terminal (End Study)	80	
5	5	17-05 Terminal (End Study)	80	
6	6	17-05 Terminal (End Study)	80	
7	7	17-05 Terminal (End Study)	80	lipidemic
8	8	17-05 Terminal (End Study)	80	
9	9	17-05 Terminal (End Study)	80	
10	10	17-05 Terminal (End Study)	80	lipidemic
11	11	17-05 Terminal (End Study)	80	
12	12	17-05 Terminal (End Study)	80	
13	13	17-05 Terminal (End Study)	80	
14	14	17-05 Terminal (End Study)	80	
15	15	17-05 Terminal (End Study)	80	
16	16	17-05 Terminal (End Study)	80	
17	21	17-05 Terminal (End Study)	80	
18	22	17-05 Terminal (End Study)	80	
19	23	17-05 Terminal (End Study)	80	
20	24	17-05 Terminal (End Study)	80	
21	25	17-05 Terminal (End Study)	80	
22	26	17-05 Terminal (End Study)	80	
23	27	17-05 Terminal (End Study)	80	
24	28	17-05 Terminal (End Study)	80	
25	29	17-05 Terminal (End Study)	80	
26	30	17-05 Terminal (End Study)	80	
27	41	17-05 Terminal (End Study)	80	
28	42	17-05 Terminal (End Study)	80	
29	43	17-05 Terminal (End Study)	80	
30	44	17-05 Terminal (End Study)	80	
31	45	17-05 Terminal (End Study)	80	
32	46	17-05 Terminal (End Study)	80	lipidemic
33	47	17-05 Terminal (End Study)	80	
34	61	17-05 Terminal (End Study)	80	
35	62	17-05 Terminal (End Study)	80	

Randall Friedline and Xiaodi Hu

Dr. Kim's Laboratory

UMass MMPC is supported by NIH 5U2C DK093000-07.

Analytical Core

UMass MMPC 25650-Astellas Analytical Data Summary

Sample ID	BUN (mg/dL)	Creatinine (mg/dL)	Animal ID	Group
1	94.6	0.808	1	17-05 Terminal (End Study)
2	19.0	0.127	2	17-05 Terminal (End Study)
3	22.9	0.197	3	17-05 Terminal (End Study)
4	26.7	0.127	4	17-05 Terminal (End Study)
5	28.2	0.267	5	17-05 Terminal (End Study)
6	23.1	0.240	6	17-05 Terminal (End Study)
7	33.4	0.232	7	17-05 Terminal (End Study)
8	26.5	0.179	8	17-05 Terminal (End Study)
9	285	0.817	9	17-05 Terminal (End Study)
10	37.4	0.031	10	17-05 Terminal (End Study)
11	29.2	0.197	11	17-05 Terminal (End Study)
12	24.0	0.205	12	17-05 Terminal (End Study)
13	22.7	0.205	13	17-05 Terminal (End Study)
14	35.9	0.144	14	17-05 Terminal (End Study)
15	29.3	0.153	15	17-05 Terminal (End Study)
16	17.9	0.127	16	17-05 Terminal (End Study)
17	26.0	0.301	21	17-05 Terminal (End Study)
18	20.9	0.223	22	17-05 Terminal (End Study)
19	24.7	0.275	23	17-05 Terminal (End Study)
20	19.6	0.109	24	17-05 Terminal (End Study)
21	22.0	0.188	25	17-05 Terminal (End Study)
22	17.8	0.144	26	17-05 Terminal (End Study)
23	27.9	0.205	27	17-05 Terminal (End Study)
24	33.5	0.197	28	17-05 Terminal (End Study)
25	33.5	0.170	29	17-05 Terminal (End Study)
26	96.2	0.703	30	17-05 Terminal (End Study)
27	23.1	0.179	41	17-05 Terminal (End Study)
28	106	0.564	42	17-05 Terminal (End Study)
29	24.0	0.223	43	17-05 Terminal (End Study)
30	33.5	0.214	44	17-05 Terminal (End Study)
31	19.7	0.179	45	17-05 Terminal (End Study)
32	28.8	0.223	46	17-05 Terminal (End Study)
33	27.7	0.240	47	17-05 Terminal (End Study)
34	148	0.433	61	17-05 Terminal (End Study)
35	22.0	0.170	62	17-05 Terminal (End Study)
36	21.6	0.258	63	17-05 Terminal (End Study)
37	22.8	0.214	17	17-05 Terminal (End Study)
38	21.2	0.144	18	17-05 Terminal (End Study)
39	333	2.390	19	17-05 Terminal (End Study)
40	23.5	0.223	20	17-05 Terminal (End Study)

Randall Friedline and Xiaodi Hu

Dr. Kim's Laboratory

UMass MMPC is supported by NIH 5U2C DK093000-07.

Analytical Core



National MMPC - Analytical Core
55 Lake Avenue North
Worcester, MA 01655

Invoice - Industry

Date	Invoice #
3/5/2018	PA18-12

MMPC Order
22423

Bill To

Astellas Institute for
 Regenerative Medicine
 Dr. Gregory Yavarian
 Marlborough, MA 01752
 ***Must have PO ***

Remit Check Payments to:
UMass Medical School
55 Lake Avenue North
Worcester, MA 01655
Attn: Bursar's Office

FEIN# 04-316 7352

Visa or MasterCard
Also Accepted
Call 508-856-2248

The UMass MMPC requests that you notify us of all publications and presentations resulting from the use of our data and acknowledge the NIDDK, NHLBI, and MMPC program using the following statement: "Part of this study was conducted at the National Mouse Metabolic Phenotyping Center (MMPC) at the University of Massachusetts Medical School and supported by NIH grant 5U2C-DK093000-07." Thank you.

Terms	Purchase Order
Net 30	2400108578

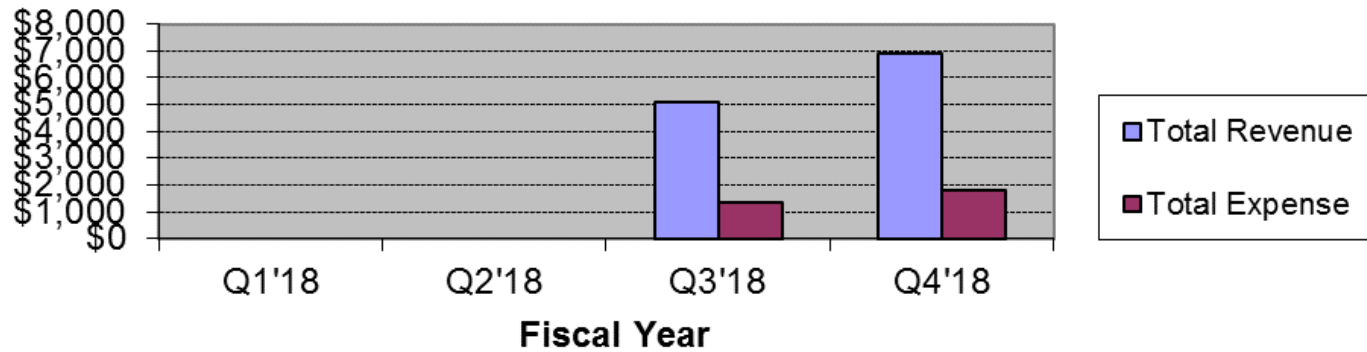
Description	Project	Quantity	Rate	Amount
Cobas Analysis of Creatinine (Plus)		197	36.00	7,092.00
Cobas Analysis of BUN		197	36.00	7,092.00
Volume Discount (30%)			-4,255.20	-4,255.20
Please Send A Copy of This Invoice to the Bursar's Office with Check Payment 114789				

FOR INVOICE QUESTIONS CONTACT Theresa Kane

Total \$9,928.80

Phone #	Fax #	E-mail	Web Site
508-856-6840	508-856-2303	Theresa.Kane@umassmed.edu	www.umassmed.edu/mmpc

Cardiovascular Core



Flagship Pioneering
Harvard

76.8%
23.2%

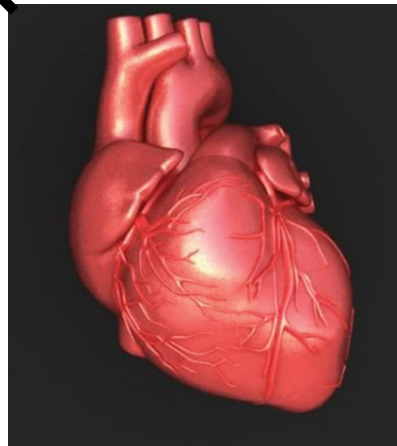
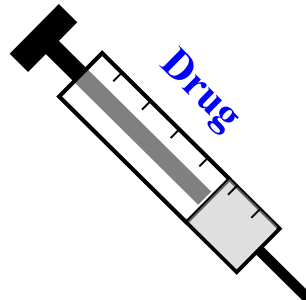


Flagship Pioneering
Harvard

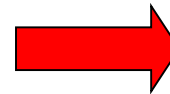
Cardiovascular Core



FLAGSHIP PIONEERING
SCIENTIFIC VENTURES FOR LIFE



NOD-scid Mouse



M-mode
Echocardiography

Histology



Acute MI Model



Troponin I

Islet Core



20% Glucose Infusion to Raise Plasma Glucose Levels to 300~350 mg/dl

0        120 min

Measurement of Plasma Insulin Levels

- ✓ In vivo mouse islet phenotyping (β -cell mass, structural analysis, proliferation, cell death)
- ✓ Ex vivo islet phenotyping using perfusion system to measure insulin secretion and content, islet culture, and molecular studies

New Microbiome Core



Director: Beth A. McCormick, PhD

The Microbiome Core offers:

- Consultation service for the design and implementation of gut microbiome studies
- Sample preparation and quality control tests
- Metagenomic 16S rRNA NextGen sequencing methodologies
- Post-sequencing consultation for data analysis, interpretation, upload, and presentation
- Fecal Microbiota Transplant (FMT) procedure to selectively alter gut microbiota in mice
- Chronic and acute antibiotic treatment to induce altered gut microbiota in mice

UMass MMPC Throughout the Years

UMass MMPC Functions	Project Year 1	Project Year 2	Project Year 3	Project Year 4	Project Year 6	Project Year 7
Users of Metabolism Core (# local / # outside)	7 (4 / 3)	11 (3 / 8)	16 (6 / 10)	29 (9 / 20)	47 (10 / 37)	33 (8 / 25)
Services of Metabolism Core (# local / # outside)	72 (60 / 12)	57 (13 / 44)	63 (23 / 40)	139 (39 / 100)	233 (40 / 192)	317 (33 / 284)
Users of Analytical & Functional Core (# local / # outside)	5 (5 / 0)	10 (5 / 5)	12 (5 / 7)	20 (4 / 16)	30 (18 / 12)	34 (7 / 27)
Services of Analytical & Functional Core (# local / # outside)	16 (16 / 0)	27 (15 / 12)	27 (12 / 15)	152 (46 / 106)	205 (125 / 80)	189 (36 / 153)
Publications citing MMPC: With center co-authorship	5	11	8	6	13	12
Total Publications citing MMPC: No center co-authorship	0	0	0	2	2	3
Program Income	\$160,221	\$148,476	\$168,136	\$656,313	\$807,025	\$438,812

Providing Support for NIH Grant Applications

<u>Investigator</u>	<u>Institution</u>	<u>Department</u>
Ahmed Lawan, PhD	Yale University	Pharmacology
Andrea Zsombok, PhD	Tulane University	Physiology & Medicine
Andrew Wolfe, PhD	Johns Hopkins University	Pediatrics & Physiology
Beiyan Zhou, PhD	University of Connecticut	Immunology
David Hui, PhD	University of Cincinnati	Pathology
Emily Sims, MD	Indiana University	Pediatric Endocrinology
Fawaz Haj, PhD	UC Davis	Nutrition
Henry Ruiz, PhD	New York University	Endocrinology
Jianguo Wu, PhD	University of Connecticut	Physiology & Neurobiology
Michael Stitzel, PhD	JAX-Connecticut	Genomic Medicine
Rohit Kulkarni, MD, PhD	Joslin Diabetes Center	Diabetes
Vishwajeet Puri, PhD	Ohio University	Biomedical Sciences
Carmella Evans-Molina, MD, PhD	Indiana University	Endocrinology
John Campbell, PhD	Harvard Medical School	Endocrinology
John Kopchick, PhD	Ohio University	Biomedical Sciences
Noemi Polgar, PhD	University of Hawaii	Biochemistry & Physiology
Richard Lee, MD	Harvard Medical School	Cardiovascular Medicine
Russell Goodman, MD, PhD	Harvard Medical School	Systems Biology & Medicine

UMass MMPC Training

<u>Investigator</u>	<u>Institution</u>	<u>Core</u>
Seung Hahm	Navitor Pharmaceutical	Metabolism
Tony Kang	Navitor Pharmaceutical	Metabolism
Stephen Vatner	Rutgers University	Metabolism
Ruexin Wang	Rutgers University	Metabolism
Kalpana Acharya	Wellesley College	Metabolism
Tamar Aprahamian	Flagship Pioneering-VL39	Cardiovascular
Aldo Amaya	Flagship Pioneering-VL39	Cardiovascular
Michael Stitzel	JAX for Genomic Medicine	Islet

UMass MMPC Seminar Series



Malcolm J. Low, M.D., Ph.D.
David F. Bohr Collegiate Professor of
Physiology
Director, Michigan MMPC
University of Michigan Medical School

“Functional Characterization of Pro-opiomelanocortin (POMC) Neuron Heterogeneity In the Hypothalamus For Energy Balance”

Friday
June 2nd, 2017
12:00 pm

Hosted by: Dr. Jason Kim

Albert Sherman Center
9th Floor, AS9-2072
Conference Room



National MMPC Seminar Series



Martin J. Blaser, MD
Muriel G. and George W. Singer Professor of
Translational Medicine
Professor of Microbiology
Director, Human Microbiome Program
New York University
Langone Medical Center

“Perturbing the early life microbiota and its consequences”

Monday
February 12, 2018
4:00 pm

Hosted by: Dr. Jason Kim

Albert Sherman Center
8th Floor, AS8-2072
Conference Room



National Institute of
Diabetes and Digestive
and Kidney Diseases



Working to Cure Diabetes