

**FORM D - IV A INSTRUCTION**

The faculty member is encouraged to use a range of evidence demonstrating instructional accomplishment, which can be included in portfolios or compendia of relevant materials.

**1. Undergraduate and Graduate Credit Instruction:**

Record of instructional activities for at least the past six semesters. Include only actual participation in credit courses (on- or off-campus instruction) or virtual university on-line courses. In determining the "past six semesters," the faculty member may elect to exclude any semesters during which s/he was on leave; additional semesters may be included on an additional page. Fill in or, as appropriate, attach relevant print screens from CLIFMS\*.

Semester and Year	Course Number	Credits (Number or Var)	Number of Sections Taught			Number of Students	Number of Assistants **	Notes
			Lec	Rec	Lab			
<b>FS12</b>	MMG 563	3	2 Lectures			110	0	Guest Lecturer
	MMG 499	2				1	0	
<b>SS13</b>	MMG 861	3	4 Lectures			19	0	
	MMG 499	2				1	0	
<b>FS13</b>	MMG 532	2	1 Lecture			312	0	
	MMG 563	3	8 Lectures			112	0	
	MMG 801	4	1 Lecture			10	0	
	MMG 499	2				2	0	
<b>SS14</b>	MMG 461	3	14 Lectures			28	0	
	MMG 499	2				1	0	
<b>FS14</b>	MMG 532	2	1 Lecture			315	0	
	MMG 563	3	4 Lectures			110	0	
	MMG 801	4	1 Lecture			17	0	
	MMG 499	1				1		
	PDI 851	1	1 Lecture			~10	0	
<b>SS15</b>	MMG 861	3	6 Lectures			14	0	
<b>FS15</b>	MMG 532	2	1 Lecture			212	0	
	MMG 563	3	4 Lectures			113	0	
	MMG 801	4	1 Lecture			19	0	
<b>SS16</b>	MMG 461	3	14 Lectures			48	0	
	VM 820	2	1 Lecture			~10	0	
	LC 811	2	Summer Lab			1	0	

\*Consult departmental staff who are authorized to enter data on the web-based CLIFMS (Course Load, Instruction, Funding and Modeling System) system and can search for course sections and enrollments by faculty name, per semester.

\*\*May include graduate and undergraduate assistants, graders, and other support personnel.

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<b>FS16</b>	MMG 532	2	1 Lecture	211	0	
	MMG 563	3	5 Lectures	111	0	
	PDI 851	1	1 Lecture	~10	0	
	MMG 499	2	Lab	1	0	
<b>SS17</b>	MMG 861	3	7 Lectures	18	0	
	MMG 499	2	Lab	1	0	
	BMB 490	2	Lab	1	0	
<b>FS17</b>	MMG 532	2	1 Lecture	~200	0	
	MMG 563	3	5 Lectures	~110	0	
	PDI 851	1	1 Lecture	~10	0	
<b>SS18</b>	MMG 461	3	14 Lectures	~50	0	

**2. Non-Credit Instruction:**

List other instructional activities including non-credit courses/certificate programs, licensure programs, conferences, seminars, workshops, etc. Include non-credit instruction that involves international, comparative, or global content delivered either to domestic or international groups, either here or abroad.

No activities to report.

\*Consult departmental staff who are authorized to enter data on the web-based CLIFMS (Course Load, Instruction, Funding and Modeling System) system and can search for course sections and enrollments by faculty name, per semester.

\*\*May include graduate and undergraduate assistants, graders, and other support personnel.

**FORM D – IV A INSTRUCTION, continued**

**3. Academic Advising:**

a. Faculty member's activity in the area of academic advising. The statement may include commentary on supplementary materials such as recruitment activities, international student advising, evidence of peer recognition, and evidence of student recognition.

**Undergraduate students mentored in my lab:**

1. [REDACTED] (2012-2013); lab technician at Wayne State University.
2. [REDACTED] (2014); deceased.
3. [REDACTED] (2012-2014)
4. [REDACTED] (2013-2015)
5. [REDACTED] (2013-2015); currently DO/PhD student at MSU.
6. [REDACTED] (2014-2015); currently PhD graduate student at Ohio State University.
7. [REDACTED] (2015-2016); currently dental student at UNC-Chapel Hill
8. [REDACTED] (2015-2017)
9. [REDACTED] (2016-present)
10. [REDACTED] (2016-2017)
11. [REDACTED] (2016-present)
12. [REDACTED] (2017-present)

**Graduate students mentored in my lab:**

1. [REDACTED] PhD student, 2012-2017); PhD 2017, currently completing medical school at MSU.
2. [REDACTED] (PhD student, 2012-2016); PhD 2016, currently a scientist at the Van Andel Institute.
3. [REDACTED] PhD Student, 2012-2017); PhD 2017 (Dec. 7), starting Feb. 2018 working as a R&D Scientist at [REDACTED] company.
4. [REDACTED] M (PhD student, 2014-16); currently a homemaker.
5. [REDACTED] M (PhD student, 2014-16); currently an Assistant Professor at University of New Hampshire.
6. [REDACTED] PhD student, 2017-present)
7. [REDACTED] D student, 2017-present)
8. [REDACTED] (PhD student, 2018-present)

**Graduate rotation students:**

1. [REDACTED] h (June 2012)
2. [REDACTED] n (November 2012)
3. [REDACTED] (November 2012)
4. [REDACTED] i (February 2012)
5. [REDACTED] (August 2016)
6. [REDACTED] (August 2016)
7. [REDACTED] (November 2016)
8. [REDACTED] (February 2017)
9. [REDACTED] (August 2017)
10. [REDACTED] (August 2017)
11. [REDACTED] (November 2017)
12. [REDACTED] (November 2017)

**Professional scientists mentored in my lab:**

1. [REDACTED] D (2014-2015), postdoctoral associate; currently Biosafety Officer at UNC-Chapel Hill.
2. [REDACTED] (2016-present), postdoctoral associate.
3. [REDACTED] tam (2017-present), postdoctoral associate.

**Summer research students mentored in my lab:**

1. [REDACTED] (2013, MD summer student)
2. [REDACTED] (2014, DVM summer student)
3. [REDACTED] (2015, NIH R25 summer student)

**FORM D – IV A INSTRUCTION, continued**

4. [REDACTED] (2015, DVM summer student)
5. [REDACTED] (2016, NIH R25 summer student)
6. [REDACTED] (2016 and 2017, DVM summer student)
7. [REDACTED] (2016, LCS811 summer research project)
8. [REDACTED] (2017, SROP summer student)
9. [REDACTED] (2017, NIH R25 summer student).

**b. Candidate’s undergraduate advisees (if applicable to individual under review):**

	Freshman	Sophomore	Junior	Senior
Number of current undergraduate advisees	0	1	2	2

**c. Candidate’s graduate/graduate-professional advisees (limit to principal advisor or committee chairpersonship status):**

	Masters	Doctoral	Professional
Number of students currently enrolled or active		3	0
Number of graduate committees during the reporting period	2	6	[REDACTED]
Degrees awarded during the reporting period		2	
Degrees awarded during career		3	

**Graduate Committees (in addition to graduate students in my lab):**

1. [REDACTED] (2012-2016), Rob Britton Lab, Microbiology and Molecular Genetics
2. [REDACTED] (2012-2017), Xuefei Huang Lab, Chemistry
3. [REDACTED] (2013-2016), Rich Lenski Lab, Microbiology and Molecular Genetics
4. [REDACTED] (2013-2015), Zhiyong Xi Lab, Microbiology and Molecular Genetics
5. [REDACTED] (2013-2016), Shannon Manning Lab, Microbiology and Molecular Genetic
6. [REDACTED] (2013-2014), Jetze Tepe Lab, Chemistry
7. [REDACTED] (2015-2016), Waters Lab, Microbiology and Molecular Genetics
8. [REDACTED] (2015-present), Xi Lab, Microbiology and Molecular Genetics
9. [REDACTED] (2015-present), Tepe Lab, Chemistry
10. [REDACTED] (2015-present), Kroos Lab, Microbiology and Molecular Genetics
11. [REDACTED] (2015-present), Sundin Lab, Plant, Soil and Microbial Sciences
12. [REDACTED] (2015-present), Kaneene Lab, Large Animal Clinical Sciences
13. [REDACTED] (2016-present), Waters Lab, Microbiology and Molecular Genetics
14. [REDACTED] (2016-present), Coussens Lab, Animal Sciences
15. [REDACTED] (2017-present), Hammer lab, Microbiology and Molecular Genetics
16. [REDACTED] (2017-present), Srevatasan lab, Pathobiology and Diagnostic Investigation

**Graduate Committees Preliminary Exam Chair:**

1. [REDACTED] (2014), Parent Lab
2. [REDACTED] (2015), Koslowsky Lab
3. [REDACTED] (2015), Yu Lab
4. [REDACTED] (2016), Waters Lab
5. [REDACTED] (2016), Manning Lab
6. [REDACTED] (2017), Manning Lab
7. [REDACTED] (2017), Dufour Lab
8. [REDACTED] (2017), Dufour Lab

# COLLEGE OF NATURAL SCIENCE

## CNS RPT Numerical Student Evaluation Summaries

Semester and Year	Course Number	Number of student responses	Instructor Involvement (average of SIRS items 1-4)	Student Interest (average of SIRS items 5-8)	Student-Instructor Interaction (average of SIRS items 9-12)	Course Demands (average of SIRS items 13-16)	Course Organization (average of SIRS items 17-20)
Spring 2017	MMG 861	18	1.45	1.92	1.52	1.88	1.80
	COMP	18	2.02	1.92	1.83	2.05	2.11
	MMG 499	1	1.50	1.75	2.00	2.00	2.00
	COMP	1	1.00	1.00	1.00	1.00	1.00
Fall 2016	MMG 563	73	1.64	1.79	1.71	1.93	1.68
	COMP	73	1.39	1.79	1.62	1.93	1.56
	MMG 532	88		2.27		2.78	2.62
	COMP	88		2.27		2.78	2.62
Spring 2016	MMG 461	30	1.21	1.47	1.25	1.46	1.38
	COMP	30	1.22	1.47	1.21	1.50	1.41
Fall 2015	MMG 801	14	1.84	2.17	2.01	2.02	2.07
	COMP	14	1.68	2.17	1.73	1.92	2.03
	MMG 563	77	2.01	2.08	2.20	2.37	2.05
	COMP	77	1.69	2.08	2.08	2.19	1.80
	MMG 532	118		2.55		3.01	2.85
	COMP	118		2.55		3.01	2.85
Spring 2015	MMG 851	11	1.31	1.65	1.34	2.09	1.59
	COMP	11	1.45	1.65	1.38	2.18	1.77

**From the CNS P&T Guidelines adopted March 16, 2011:**

For each course taught, list semester and year, course number, number of student responses, and average SIRS (or equivalent) scores (1.0-5.0, with lower numbers better) in each of the categories listed, along with corresponding average scores in comparable ("COMP", either same course taught by other instructors, or courses at same level and with a comparable audience) courses immediately below. **If department-specific evaluations are used, provide appropriate average scores corresponding to categories listed above and rescale to SIRS 1.0-5.0 scale.**

# COLLEGE OF NATURAL SCIENCE

## CNS RPT Numerical Student Evaluation Summaries

Semester and Year	Course Number	Number of student responses	Instructor Involvement (average of SIRS items 1-4)	Student Interest (average of SIRS items 5-8)	Student-Instructor Interaction (average of SIRS items 9-12)	Course Demands (average of SIRS items 13-16)	Course Organization (average of SIRS items 17-20)
Fall 2014	MMG 801	11	2.25	2.09	2.09	2.09	2.00
	COMP	11	1.53	2.09	1.79	2.00	1.72
	MMG 563	62	2.00	2.44	2.35	2.37	2.50
	COMP	62	1.96	2.44	2.26	2.60	2.28
	MMG 552	61	2.11	2.02	2.39	2.42	2.52
Spring 2014	COMP	61	2.24	2.02	2.31	2.53	2.33
	MMG 461	15	1.40	1.78	1.43	1.86	1.73
Fall 2013	COMP	15	2.06	1.78	1.76	2.33	2.20
	MMG 801	8	1.93	2.25	2.06	2.00	1.87
	COMP	8	1.56	2.25	1.62	2.00	1.81
	MMG 532	57	2.42	2.30	2.50	2.63	2.46
	COMP	57	2.72	2.30	2.64	3.01	2.69
Spring 2013	MMG 861	17	1.52	1.86	1.50	2.00	1.88
	COMP	17	1.82	1.86	2.00	2.23	2.05
	COMP						
	COMP						
	COMP						

**From the CNS P&T Guidelines adopted March 16, 2011:**

For each course taught, list semester and year, course number, number of student responses, and average SIRS (or equivalent) scores (1.0-5.0, with lower numbers better) in each of the categories listed, along with corresponding average scores in comparable ("COMP", either same course taught by other instructors, or courses at same level and with a comparable audience) courses immediately below. **If department-specific evaluations are used, provide appropriate average scores corresponding to categories listed above and rescale to SIRS 1.0-5.0 scale.**

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### 4. List of Instructional Works:

List publications, presentations, papers, grants received (refer to Form D-IVE), and other works that are primarily in support of or emanating from instructional activity.

I do not have any publications or grants associated with instructional activity. However, as an assistant professor, I have dedicated a significant amount of time to preparing new lectures for my various teaching duties.

MMG 461 (14 lectures): For MMG461 (Microbial Pathogenesis) there was no assigned textbook and I researched and designed 14 new lectures. As a senior level class, I took care to make sure that these lectures included the most up-to-date knowledge regarding the molecular mechanisms of pathogenesis. Each lecture amounted to conducting a literature review on 14 disparate topics in pathogenesis. I also designed the lectures so that the broader themes would build upon one another and encourage group-work and classroom discussions as the course progressed (see section 5, below).

MMG563 (4 lectures): For MMG563 (Veterinary Microbiology), I researched and designed 4 new lectures on fungal diseases of animals. This is a professional class for veterinarians and therefore required a detailed review on both the basic biology as well as the practical management of fungal diseases. Veterinary mycology is not the primary area of my expertise, therefore, these four lectures accounted for a significant effort as I gained a broad applied and basic understanding of the topic.

I also prepared lectures on *M. tuberculosis* physiology for MMG532 and MMG80; these lectures were more straightforward to prepare as they are related to my primary research interest.

### 5. Other Evidence of Instructional Activity:

Cite other evidence of instructional productivity such as works/grants in progress or under review (refer to Form D-IVE). Address instructional goals and approaches; innovative methods or curricular development; significant effects of instruction; and curatorial and patient care activities, etc. Include evidence of instructional awards and peer recognition (within and outside the university).

### **Course and Instructional Development:**

My goal as a teacher is to design and present instructional content that encourages active and participatory learning in the classroom. It is also important to me that the material is challenging and at the cutting-edge of knowledge in the field. One way I helped fulfill these goals is by intentionally designing my MMG461 lectures to reinforce common themes in various aspects of pathogenesis. For example, when introducing new bacterial pathogens, I emphasize the theme of Adaptation to Environmental Cues (the subject of my own research). In the early lectures, I presented the various environmental cues and immune pressures the pathogen must sense and adapt to when causing disease. As the class progressed, and we considered new bacterial pathogens, after a brief introduction I would ask the class to discuss which cues the pathogen may need to sense and respond to. In one of the later lectures, I presented a slide entitled "Brain Storming: what signals might *Salmonella Typhimurium* need to detect during pathogenesis?" that included a schematic of *Salmonella Typhimurium*'s passage through the human body. I had the classroom break into small groups of 3-4 students and discuss the problem. There were animated discussions in the groups and by integrating the knowledge from the earlier classes the students successfully identified over 10 different cues. We then spent the remainder of the class exploring the molecular mechanisms of these adaptation regulatory networks. I similarly included several other themes in my lectures. For example, I reinforced the learning concept of two-component regulatory systems, by emphasizing their role in several lectures including quorum sensing, toxin production and gene regulatory networks. By intentionally organizing my lectures into reinforcing themes, many of the students were able to effectively master the challenging material presented in my lectures.

There are several lines of evidence supporting that my teaching approach in MMG461 was effective. My most recent student evaluation scores show all of my instructor scores above 1.5, with an instructor involvement score of 1.2. A score of 1 is considered "superior" on a scale from 1 to 5. As I refine and improve my lectures, I hope to further improve my teaching outcomes, student learning and SIRS scores. Student exam scores and answers to essay

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questions also support a strong understanding of microbial pathogenesis by many of the students. However, there are other less tangible examples of effective teaching. For example, the students were asking questions before, during and after class and as the semester progressed the discussions became increasingly sophisticated. I have a passion for the topic of microbial pathogenesis and it is my hope, and belief, that teaching this class has engaged other students to become interested in the field.

I also teach microbial pathogenesis at the graduate level (MMG861). Teaching this class involves reading primary research papers and encouraging students to identify the hypotheses being tested and then interpret and discuss the data and conclusions. For my section of this class, I have been assigning papers that relate to the theme of metabolism during intracellular pathogenesis. We cover diverse pathogens (fungi, gram-positives and gram-negatives) and each section provides opportunities to compare and contrast the various mechanisms pathogens have evolved to survive inside host cells. The students have also been very receptive to my teaching with my instructor scores averaging 1.6.

Teaching professional students at the Colleges of Veterinary Medicine and Osteopathic Medicine has been an area where I have worked hard to improve my teaching. I teach mycology to veterinary students (4 lectures in MMG563) and I teach one lecture on tuberculosis to medical students (MMG532). I have always received excellent teaching scores from the students in these classes, but some comments suggested that the students wanted more objective-driven lectures with practical examples. One of my ongoing goals has been to improve teaching of professional students and I have done so by devising specific learning objectives, reorganizing material, providing additional clinical case studies as examples, and generating interactive questions (that students can respond to on their computers). This past year for MMG563, across all categories, I had an average rating of 4.6/5 (five is the best), including numerous positive comments, suggesting the modifications to my teaching material are having a positive impact on student learning and satisfaction. Teaching at the undergraduate, graduate and professional student levels requires very different strategies to engage the students. My goal is to keep improving my teaching abilities to better educate and engage with students.

## FORM D - IV B RESEARCH AND CREATIVE ACTIVITIES

### 1. List of Research/Creative Works:

Attach a separate list of publications, presentations, papers, and other works that are primarily in support of or emanating from Research and Creative Activities. Indicate how the primary or lead author of a multi-authored work can be identified. The list should provide dates and, in particular, accurately indicate activity from the reporting period. Items to be identified:

- 1) Books
- 2) Book chapters
- 3) Bulletins or monographs
- 4) Articles
- 5) Reviews
- 6) Papers and presentations for learned professional organizations and societies
- 7) Artistic and creative endeavors (exhibits, showings, scores, performances, recordings, etc.)
- 8) Reports or studies

Indicate peer-reviewed or refereed items with a "\*\*\*".

Indicate items with a significant outreach component with a "\*\*\*" (determined by the faculty member)

The following items pertain to this reporting period:

#### Book Chapter:

1. [REDACTED] (2014). Macrophage Infection Models for *Mycobacterium tuberculosis*. *Mycobacteria Protocols*, Third Edition. Edited by [REDACTED]. Springer. *In press*.

#### Peer Reviewed Publications\*:

2. [REDACTED] (2014) Slow growth of *Mycobacterium tuberculosis* at acidic pH is regulated by *phoPR* and host-associated carbon sources. *Molecular Microbiology*, 94 (1): 56-69.  
--Highlighted as an Editor's Choice in *Science Translational Medicine* (July 9, 2014).
3. [REDACTED] (2013) *Mycobacterium tuberculosis* responds to chloride and pH as synergistic cues to the immune status of its host cell. *PLOS Pathogens*, 9 (4): e1003282.
4. [REDACTED] Abramovitch RB (2015). The carbonic anhydrase inhibitor ethoxzolamide inhibits the *Mycobacterium tuberculosis* PhoPR regulon and Esx-1 secretion and attenuates virulence. *Antimicrobial Agents and Chemotherapy*, May 18. pii: AAC.00719-15. PMID: 25987613. --Highlighted in *The Pharmaceutical Journal*
5. [REDACTED] (2015). Novel inhibitors of cholesterol degradation in *Mycobacterium tuberculosis* reveal how the bacterium's metabolism is constrained by the intracellular environment. *PLOS Pathogens*, 11(2): e1004679. PMID: 25675247
6. [REDACTED] (2016) Immune activation of the host cell induces drug tolerance to *Mycobacterium tuberculosis* both *in vitro* and *in vivo*. *Journal of Experimental Medicine*, 213 (5): 809-825.
7. [REDACTED] (2016). SPARTA: Simple Program for Automated reference-based bacterial RNA-seq Transcriptome Analysis. *BMC Bioinformatics*, 17:66.
8. [REDACTED] (2016) Polysorbates prevent biofilm formation and pathogenesis of *Escherichia coli* O104:H4. *Biofouling*, 32 (9):1131-1140.

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9. [REDACTED] (2017). A nonsense mutation in *Mycobacterium marinum* that is suppressible by a novel mechanism. *Infection and Immunity*, 26;85(2). pii: e00653-16.
10. [REDACTED] (2017). Inhibitors of *Mycobacterium tuberculosis* DosRST signaling and persistence. *Nature Chemical Biology*, 13(2):218-225. --Highlighted on the American Society of Microbiology homepage
11. [REDACTED] (2017). 2-aminoimidazoles potentiate  $\beta$ -lactam antimicrobial activity against *Mycobacterium tuberculosis* by reducing  $\beta$ -lactamase secretion and increasing cell envelope permeability. *PLOS One*. Jul 27;12(7):e0180925.
12. [REDACTED] (2017). A bioluminescent *Pseudomonas aeruginosa* wound model reveals increased mortality of Type I diabetic mice to biofilm infection. *Journal of Wound Care*, 26(sup7): S24-33
13. [REDACTED] (2017). Targeting *Mycobacterium tuberculosis* sensitivity to thiol stress at acidic pH kills the bacterium and potentiates antibiotics. *Cell Chemical Biology*. Jul 17. pii: S2451-9456(17)30232-5
14. [REDACTED] WhiB6 regulation of ESX-1 gene expression is controlled by a negative feedback loop in *Mycobacterium marinum*. *Proceedings of the National Academy of Sciences*. *In press*.

**Reviews\***

15. [REDACTED] (2017). Small molecules that sabotage bacterial virulence. *Trends in Pharmacological Sciences*, 38(4):339-362.  
--Journal Cover and Featured Review.

**2. Quantity of Research/Creative Works Produced:**

For each of the categories listed in question one above, list the number of research and creative works produced.

	1	2	3	4	5	6	7	8
During the reporting period	0	1	0	13	1	28	0	0
During career	0	5	0	23	5	31	0	0

**3. Number of Grants Received (primarily in support of research and creative activities; refer to Form D-IVE):**

During the reporting period: 11 During career: 13

**Grants Summary:** Over the reporting period I have submitted 30 research proposals totaling \$24,731,880, with \$16,435,961 of the proposed funding applied to me as a PI or Co-PI. I successfully competed for funding on 11 of these proposals, along with a \$30,000 award from the [REDACTED] award, for a total of \$4,014,064 awarded to me as a PI.

## FORM D - IV B RESEARCH AND CREATIVE ACTIVITIES

### 4. Other Evidence of Research/Creative Activity:

Cite other evidence of research and creative productivity such as: seminars, colloquia, invited papers; works/grants in progress or under review (refer to Form D-IVE); patents; formation of research-related partnerships with organizations, industries, or communities; curatorial and patient care activities, etc. Include evidence of peer recognition (within and outside the university).

#### Invited Seminars:

1. "Chemical biology of *Mycobacterium tuberculosis* pathogenesis"  
**Gordon Research Conference on Microbial Toxins and Pathogenicity**, Waterville Valley, NH.  
*--National meeting, July 8-13, 2018*
2. "Chemical biology of *Mycobacterium tuberculosis* pathogenesis"  
**ASM Microbe 2018**, Atlanta GA.  
*--National meeting, June 8-13, 2018*
3. "Small molecules that inhibit *Mycobacterium tuberculosis* environmental sensing and virulence"  
**Johns Hopkins University**, Department of Medicine, Baltimore, MD.  
*--Departmental Seminar, November 8, 2017*
4. "Chemical biology of *Mycobacterium tuberculosis* pathogenesis"  
**Worcester Polytechnic Institute**, Department of Biology and Biotechnology, Worcester, MA.  
*--Departmental seminar, November 14, 2017*
5. "Chemical biology of *Mycobacterium tuberculosis* pathogenesis"  
**University of Tennessee-Knoxville**, Department of Microbiology, Knoxville, TN.  
*--Departmental seminar, October 30, 2017*
6. "Small molecules that inhibit *Mycobacterium tuberculosis* environmental sensing and virulence"  
**Ohio State University**, Department of Microbial Infection and Immunity, Columbus, OH.  
*--Departmental seminar, October 20, 2017*
7. "Small molecules that inhibit *Mycobacterium tuberculosis* environmental sensing and virulence"  
**Washington University**, Department of Molecular Microbiology, St. Louis, MO.  
*--Departmental seminar, September 19, 2017*
8. "Small molecules that inhibit *Mycobacterium tuberculosis* environmental sensing and virulence"  
**Gordon Research Conference on Tuberculosis Drug Discovery and Development**, Lucca, Italy.  
*--International Meeting, June 29, 2017*
9. "Chemical Biology of *Mycobacterium tuberculosis* pathogenesis"  
**MSU Pediatric Research Rounds**, College of Human Medicine, East Lansing, MI.  
*--Local seminar, May 3, 2017*
10. "Inhibitors of *Mycobacterium tuberculosis* DosRST signaling and persistence"  
**ASM Conference on Tuberculosis: Past, Present, and Future**, New York, NY.  
*--National meeting, April 4, 2017*
11. "Inhibitors of *Mycobacterium tuberculosis* persistence and pathogenesis"  
**Oregon Health Sciences University**, Department of Molecular Microbiolog, Portland OR.  
*--Departmental Seminar, December 12, 2016*

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12. "Inhibitors of *Mycobacterium tuberculosis* persistence and pathogenesis"  
**Tufts University**, School of Graduate Biomedical Sciences, Boston, MA.  
*--Departmental seminar, November 8, 2016*
13. "Inhibitors of *Mycobacterium tuberculosis* persistence and pathogenesis"  
**Notre Dame University**, Department of Biological Sciences, Notre Dame, IN.  
*--Departmental seminar, October 11, 2016*
14. "Small molecules that inhibit *M. tuberculosis* two-component regulatory systems."  
**Banff Conference on Infectious Diseases**, Banff, Canada.  
*--International Meeting, June 3, 2016.*
15. "Tuberculosis therapeutics that inhibit bacterial sensing and resistance to host immunity."  
**TB Summit 2016**, London, UK.  
*--International Meeting, June 23, 2016*
16. "Glow Green! Using fluorescent biosensors to find new treatments for tuberculosis." Summer research opportunity research seminar, The Graduate School, **MSU**, East Lansing, MI.  
*--Local seminar, June 28, 2016*
17. "Small molecules that inhibit *M. tuberculosis* two-component regulatory systems."  
**University of Toledo**, Department of Medical Microbiology and Immunology.  
*--Departmental seminar, December 2, 2015*
18. "Tuberculosis therapeutics that inhibit bacterial sensing and resistance to host immunity."  
**Drug Discovery and Development in Michigan - Cutting Edge**, East Lansing, MI.  
*--Statewide meeting, September 10, 2015*
19. "Targeting *M. tuberculosis* pH-driven pathogenesis."  
**22<sup>nd</sup> Annual Midwest Microbial Pathogenesis Conference**, Indianapolis, IN.  
*--Regional meeting, August 29, 2015.*
20. "Small molecules that inhibit *M. tuberculosis* two-component regulatory systems."  
**77th Harden Conference: Two Component Signaling in Bacteria: Integrating Approaches and Science**, Warwickshire, UK.  
*--International meeting, August 26, 2015*
21. "Jumpstarting the development of new treatments for drug resistant tuberculosis."  
**Robert J. Schultz Family Research Day**, Arcadia, MI.  
*--Local meeting, June 23, 2015*
22. "Glow Green! Using fluorescent biosensors to find new treatments for tuberculosis."  
**Classes Without Quizzes**, MSU College of Natural Sciences Alumni Weekend, East Lansing, MI.  
*--Local meeting, April 25, 2015*
23. "Glow Green! Using fluorescent biosensors to find new treatments for tuberculosis."  
**MSU Drug Discovery Seminar**, East Lansing, MI.  
*--Local seminar, February 13, 2015*
24. "Glow Green! Using fluorescent biosensors to find new treatments for tuberculosis."  
**MSU Respiratory Research Initiative**, East Lansing, MI.  
*--Local seminar, January 23, 2015*

## FORM D - IV B RESEARCH AND CREATIVE ACTIVITIES

25. "High throughput screens for inhibitors of *Mycobacterium tuberculosis* two-component regulatory systems." **Keystone Symposium on Novel Therapeutic Approaches to Tuberculosis**. Keystone, CO.  
--International meeting, April 1, 2014
26. "Targeting compounds and genes that modulate *Mycobacterium tuberculosis* pH-driven adaptation." **Great Lakes Regional Center of Excellence Annual Meeting**, Chicago, IL.  
--Regional meeting, August 14, 2013
27. "Glow Green! Using fluorescent biosensors to find new treatments for tuberculosis." **Meriel-NIH Veterinary Scholars Symposium**, East Lansing, MI.  
--National meeting, August 3, 2013
28. "Targeting compounds and genes that modulate *Mycobacterium tuberculosis* pH-driven adaptation." **Great Lakes Regional Center of Excellence Annual Meeting**, Chicago, IL.  
--Regional meeting, August 4, 2012

### Meeting organization activities:

1. Planner and Moderator, "Recent advances in understanding the implications of persistence in microbial pathogenesis". Plenary Session. American Society for Microbiology, Microbe 2018, Atlanta, GA.  
-- National meeting, June 22, 2018.

### Abstracts for posters presented at meetings:

1. "Reporter-based phenotypic screens to discovery inhibitors of *Mycobacterium tuberculosis* two-component regulatory systems" Poster presented at the 2016 Keystone Symposium on Phenotypic Drug Discovery, Big Sky, MT.
2. "The carbonic anhydrase inhibitor ethoxzolamide inhibits the *Mycobacterium tuberculosis* PhoPR regulon, Esx-1 secretion and attenuates virulence." Poster presented at the 2015 Gordon Research Conference on Tuberculosis Drug Development in Barcelona, Spain.
3. "A whole cell phenotypic screen in *M. tuberculosis* identifies ethoxzolamide as an inhibitor of the *phoPR* regulon." ASM Interscience Conference on Antimicrobial Agents and Chemotherapy. Washington, DC. September 2014.
4. "Chemical biology investigations of *Mycobacterium tuberculosis* pH- and hypoxia- driven adaptation." Microbial Pathogenesis and Host Response meeting, Cold Spring Harbor, NY. September 2013
5. "High throughput screens for inhibitors of pH- and hypoxia-regulated fluorescence biosensors in *Mycobacterium tuberculosis*." Midwest Microbial Pathogenesis Conference, Columbus, OH. August 2013
6. "High throughput screens for inhibitors of pH- and hypoxia-regulated fluorescence biosensors in *Mycobacterium tuberculosis*." Gordon Research Conference on Tuberculosis Drug Development in Lucca, Italy. July 2013.
7. "*reduced aprA* expression mutants identify pathways involved in *Mycobacterium tuberculosis* pH-driven adaptation" Tuberculosis 2012 meeting in Paris, France. September 2012.

### Publications submitted for peer review:

1. [REDACTED] Genetic and metabolic regulation of *Mycobacterium tuberculosis* acid growth arrest. Submitted. Preprint available at *BioRxiv* <https://doi.org/10.1101/186551>

## FORM D - IV B RESEARCH AND CREATIVE ACTIVITIES

**Grants in progress or under review:** I currently have \$4,544,581 of grant funding pending:

National Institutes of Health, NIAID, R01, "New compounds and targets to combat tuberculosis persistence and drug resistance." \$2,705,678 (Revised application to be submitted February 2017).

Department of Defense, Investigator Initiated Award "Inhibiting Mycobacterium tuberculosis DosRST-dependent signaling to kill drug resistant bacteria, reduce drug tolerance and shorten TB therapy" \$1,838,903.05 (Invited full proposal following successful preproposal).

### **Peer-reviewed, In-kind Support:**

The National Screening Lab for the New England Regional Center of Excellence for Biodefense and Emerging Infectious Diseases (NSRB) at Harvard Medical School provided substantial financial and logistical support for my screening projects. Following external, peer review of both screening projects, my team was provided at no cost: consumables, compound libraries (a total of 540,000 compounds), shipping and user facility fees. This support was worth approximately \$63,000.

### **Invention Disclosures:**

1. Identification of Chemical Compounds that Limit the Growth of *Mycobacterium tuberculosis* Growth *In Vitro* or *In Vivo* Using a Hypoxia Inducible Biosensor. [REDACTED]
2. Identification of Chemical Compounds that Limit the Growth of *Mycobacterium tuberculosis* Growth *In Vitro* or *In Vivo* Using an Acidic-pH Inducible Biosensor. [REDACTED]
3. Inhibition of the *Mycobacterium tuberculosis* virulence using ethoxzolamide. [REDACTED]
4. Inhibition of *Mycobacterium tuberculosis* persistence using chemical inhibitors of the DosRST two-component regulatory system. [REDACTED]
5. The acidic pH-dependent compound AC2P36 depletes *M. tuberculosis* thiol pools and potentiates the bactericidal activity of antibiotics and oxidizing agents [REDACTED]
6. Chemical inhibitors of Mycobacterium tuberculosis DosRST signaling and persistence. [REDACTED]
7. The Novel Anti-Mycobacterial Agent HC2091 Kills Mycobacterium Tuberculosis by Targeting MmpL3. [REDACTED]

### **Patent Applications:**

1. [REDACTED]. Compositions and methods for inhibiting bacterial growth. U.S. Patent Application PCT/US2016/030689, WO2016179231 (Ethoxzolamide)
2. [REDACTED]. Compositions and methods for inhibiting bacterial growth. U.S Patent Application PCT/US2017/055244 (DosRST inhibitors)
3. Prodrugs of AC2P36 (5-Chloro-N-(3-Chloro-4-Methoxyphenyl)-2-Methylsulfonylpyrimidine-4-Carboxamide). *Provisional patent application submitted.* (Thiol targeting antibiotic).

## FORM D - IV C SERVICE WITHIN THE ACADEMIC AND BROADER COMMUNITY

### 1. Service within the Academic Community

#### a. Service to Scholarly and Professional Organizations:

List significant committee/administrative responsibilities in support of scholarly and professional organizations (at the local, state, national, and international levels) including: elected and appointed offices held; committee memberships and memberships on review or accreditation teams; reports written and submitted; grants received in support of the organization (refer to Form D-IVE); editorial positions, review boards and ad hoc review requests; and programs and conferences planned and coordinated, coordinated or served on a panel or chaired a session. Include evidence of contributions (e.g., evaluations by affected groups or peers).

#### i) Fellowship and Grant Reviews:

**American Society for Microbiology Undergraduate Research Fellowship (2013-Present):** For the past 5 years I have served on the review panel to select recipients of ASM undergraduate fellowships. On this panel, I review ~16 fellowship applications, per year, to select students for this highly competitive fellowship. I anticipate continuing to serve on this panel.

**The Wellcome Trust and India Alliance (2014):** I served as a reviewer for the Wellcome Trust and India Alliance on a grant proposal in the field of *M. tuberculosis* academic drug discovery. The request to review this proposal demonstrates my international reputation in academic drug discovery.

**The Irish Health Research Board (2015):** I served as a reviewer for the Irish Health Research Board on a grant proposal in the field of *M. tuberculosis* pathogenesis and host pathogen-interactions. The request to review this proposal demonstrates my international reputation in microbial pathogenesis.

**NIH Study Sections (2016 & 2017):** I served on 7 NIH study section panels in the past two years, including:

- R01 Special Emphasis Panel "U.S. China Program for Biomedical Collaborative Research (2016)
- R01 Special Emphasis Panel "Topics on Infectious Diseases and Drug Discovery (2016)
- R15 "AREA applications Infectious Diseases and Microbiology" (2017)
- R01 Special Emphasis Panel "Topics on Infectious Diseases and Drug Discovery" (2017)
- R21/R03 "Topics in Bacterial Pathogenesis" (2017)
- R61/R33 "Dysregulation of Immune Cell Regulatory Pathways by Mtb in the Context of HIV Infection". (2017)
- R01 "International Research in Infectious Diseases including AIDS" (2017)

Inclusion on these panels demonstrates recognition of my expertise in the fields of bacterial pathogenesis and drug development.

**US Department of Defense (2016 & 2017):** I have served on 2 Department of Defense review panels, including:

- Peer Review Medical Research Panel member: Discovery Awards – Tuberculosis (2016)
- Peer Review Medical Research Panel member: Discovery Awards – Antimicrobial Resistance (2017)

## FORM D - IV C SERVICE WITHIN THE ACADEMIC AND BROADER COMMUNITY

### ii) Editorial activities:

1. Editorial Board, Review Editor, **Frontiers in Cellular and Infection Biology** (2015-present)
2. Editorial Advisory Board, **The Journal of Infectious Diseases**, Oxford University Press (2016-present)
  - Inclusion of the editorial advisory board was based on "Our peer review records indicate that you are one of the best reviewers (top 5%) for The Journal of Infectious Diseases in terms of number of reviews completed, quality of reviews, and promptness in completing reviews.
3. Editor, **Microbiology**, (2017-2022).
  - The invitation to serve as an editor at microbiology was due to "The Senior Editors of Microbiology wish to appoint **a world-class expert in the field of mycobacteriology to the Editorial Board** of the journal, beginning in July 2017. We considered that you would be an ideal candidate". Microbiology is the flagship journal for the Microbiology Society, a scholarly society based in Europe. I act as an editor for approximately one manuscript per month.

### iii) Ad hoc reviewer for journal manuscripts:

I have reviewed **53** manuscripts (in **28** different journals) relating to *M. tuberculosis* physiology and drug discovery. The journals I have acted as a reviewer for include high quality, scholarly journals, such as: ACS Infectious Disease; Antimicrobial Agents and Chemotherapy; BMC Biotechnology; BMC Microbiology; Cell Chemical Biology; Cell Host & Microbe; Cell Reports; Gene; International Journal of Tuberculosis and Lung Disease; Journal of Bacteriology; Journal of Infectious Diseases; Journal of Medical Microbiology; Frontiers in Cellular and Infection Biology; mBio; MedChemComm; Microbiology; Molecular Microbiology; mSphere; Nature Communications; PLOS Computational Biology; PLOS Pathogens; PLOS One; PNAS; Scientific Reports; Trends in Pharmacological Sciences; Tuberculosis; Veterinary Record Case Reports; Virulence.

### b. Service within the University:

List significant committee/administrative responsibilities and contributions within the University. Include service that advances the University's equal opportunity/affirmative action commitment. Committee service includes: appointed and elected university, college, and department ad hoc or standing committees, grievance panels, councils, task forces, boards, or graduate committees. Administrative responsibilities include: the direction/coordination of programs or offices; admissions; participation in special studies or projects; collection development, care and use; grants received in support of the institution (refer to Form D-IVE), etc. Describe roles in any major reports issued, policy changes recommended and implemented, and administrative units restructured. Include evidence of contributions (e.g., evaluations by peers and affected groups).

**College Advisory Committee for the College of Veterinary Medicine** (2015-2019). As a member of the CAC, I take part in discussions on diverse issues pertaining to the College of Veterinary Medicine. In 2015, I was appointed to the CAC as an *ex officio* member due to my membership on the Faculty Senate/University Council. In 2016, I was appointed to the committee with vote. In 2017, I was appointed as the MMG representative to the CAC through June 30, 2019. I served as the Secretary of the CAC for my first two years on the committee. I was elected as the Chairperson of the CAC for the term beginning in July 2017. As a member of the CAC, I have provided input on a variety of issues important to the college, including major revisions to the College Bylaws, strategic planning, and changes to the veterinary student curriculum. As chairperson, I have been responsible for drafting the Search and Rating Procedure for the CVM Dean search and forming the search committee. This service represents significant leadership at the college-wide level.

**Faculty Advisory Committee for the Department of Microbiology and Molecular Genetics** (2017-2018): As a member of the FAC, I take part in discussions on diverse issues pertaining to my home department. I am also responsible for reviewing annual reports of MMG faculty. This service represents a leadership position at the department level.

## FORM D - IV C SERVICE WITHIN THE ACADEMIC AND BROADER COMMUNITY

**Faculty Senate and University Council, College of Veterinary Medicine Representative (2015-2018):** I have been elected by members of the College of Veterinary Medicine to represent the college at the Faculty Senate and University Council. As part of this responsibility, I have attended meetings, reviewed documents and reported back on the meetings to other committees at the college and department level. An example of an accomplishment on the faculty senate was to help shape the RSVM training materials and the revised training materials, by discussing the videos, tests and providing constructive feedback. This service represents a leadership position at the university-wide level.

**Dehn Endowed Chair Search Committee (2017):** This search committee was tasked with reviewing applications for a new endowed chair in Large Animal Clinical Sciences at the College of Veterinary Medicine.

**Chief of Division of Infectious Diseases Search Committee (2015-present):** As a member of this faculty search committee I worked to review applications and recruit a new chief of infectious diseases for the College of Human Medicine. This search committee has interviewed several rounds of applicants since its inception.

**Hugh Chair in Pathogenesis Search Committee (2015-2016):** As a member of this faculty search committee I worked to review applications and recruit new faculty.

**MMG graduate committee (2013-2016):** As part of the graduate committee, my responsibilities include serving as a preliminary exam chair for MMG graduate students, reviewing graduate student awards and other responsibilities.

**BMS graduate admissions committee (2013-2015):** As a member of the BMS admissions committee I was responsible for reviewing graduate school applications and recruiting efforts to bring talented graduate students to MSU.

**Hugh Endowed Chair in Microbial Pathogenesis Search Committee (2014):** As a member of this faculty search committee I worked to review applications and recruit new faculty. Vic DiRita was recruited to MSU as part of this search (and also through the MMG chair search).

**Faculty Search Committee for Microbiome/Infectious Disease Position (2014):** As a member of this faculty search committee I worked to review applications and recruit new faculty. This search successfully recruited Neal Hammer to our department

**MMG Strategic Planning Retreat Committee:** As a member of this committee I helped organize the agenda and implementation of the faculty strategic planning retreat.

**MMG Seminar Committee (2013):** As part of the MMG seminar committee, I helped organize the faculty seminar series. I also invited and hosted three speakers: [REDACTED] (University of Michigan), [REDACTED] (Dartmouth College) and [REDACTED] (University of Toledo).

**Promoting research with students in the College of Veterinary Medicine:** I have actively promoted research activities with veterinary medicine students. These efforts include: presenting a seminar on *M. tuberculosis* research to summer research students (June 2012), participating in a variety of student oriented events at the NIH-Merial Veterinary Scholars Symposium (August 2013), mentoring summer research opportunity students in the lab (2014-present), and judging oral presentations and chairing sessions at Phi-Zeta Day (2014-present).

## FORM D - IV C SERVICE WITHIN THE ACADEMIC AND BROADER COMMUNITY

**Promoting research with College of Human Medicine:** I have actively promoted research in the college of human medicine. These efforts include: mentoring a CHM summer research student in the lab ( [REDACTED] June 2013), taking part in a CHM faculty recruitment and 50<sup>th</sup> anniversary video production (August 2013), promoting research efforts to donors by meeting with [REDACTED] family for a day in Aracadia Bluffs, MI (June 2014, 2015) and at MSU-Rx (September 2014). I have also mentored a CHM MD/PhD student in the lab [REDACTED]

**Promoting research in AgBioResearch:** My research has been profiled in two independent articles in Futures magazine (Fall/Winter 2013 and Spring/Summer 2014). These profiles help show the broader community how AgBioResearch support of *M. tuberculosis* research impacts the lives of people in Michigan and beyond. I am also conducting a research project on the survival of the *M. bovis* in silage that is directly relevant to Michigan agriculture.

**University Development and Fundraising:** To promote MSU's efforts in international programs, my lab's research on *M. tuberculosis* was profiled in the International News magazine and videos. Also, my lab was selected as part of a capital campaign video by MSU to promote fundraising for endowed research chairs. To support this effort I was involved in a video interview and a luncheon with donors and members of the MSU administration. My lab was also featured in articles and videos generated for the Empower Extraordinary capital campaign (please see websites cited in Section 2 below).

**Promoting Diversity:** One reason I take pride in working at MSU is the university's commitment to having a diverse community. I share this commitment and have actively participated in promoting diversity at MSU. For example, I have met with underrepresented minority undergraduate students from historically black undergraduate colleges or McNair Scholar's programs, including: [REDACTED] and [REDACTED] (North Carolina A & M university), [REDACTED] (UW-Lacrosse), and [REDACTED] (GVSU). During these meetings I worked to recruit these students to MSU graduate programs in Biomolecular Sciences. Notably, three of these students [REDACTED] enrolled as microbiology graduate students at MSU in 2014, demonstrating how these pre-application visits can help MSU improve its diversity. I have also taken part in the SROP and AGEP programs to discuss academic careers and graduate school with underrepresented minorities. In 2017, I mentored a student in my lab, [REDACTED] through the SROP program. I have also mentored three summer students in my lab through the diversity promoting BRUSH program (funded by an NIH R25 grant, directed by Dr. [REDACTED]). One BRUSH summer student, [REDACTED], won a travel award to attend the Annual Biomedical Research Conference for Minority Students to present research from my lab. Another BRUSH student, [REDACTED], was an author on a paper from her summer project. Thus, the research experiences in my lab had a demonstrable positive impact on these student's careers. As a BMS graduate admission committee member, I sought to encourage diversity at MSU. As a member of the ASM-URF program I have also worked to promote diversity in undergraduate research at the national level.

## FORM D - IV C SERVICE WITHIN THE ACADEMIC AND BROADER COMMUNITY, continued

### 2. Service within the Broader Community:

As a representative of the University, list significant contributions to local, national, or international communities that have not been listed elsewhere. This can include (but is not restricted to) outreach, MSU Extension, Professional and Clinical Programs, International Studies and Programs, and Urban Affairs Programs. Appropriate contributions or activities may include technical assistance, consulting arrangements, and information sharing; targeted publications and presentations; assistance with building of external capacity or assessment; cultural and civic programs; and efforts to build international competence (e.g., acquisition of language skills). Describe affected groups and evidence of contributions (e.g., evaluations by affected groups; development of innovative approaches, strategies, technologies, systems of delivery; patient care; awards). List evidence, such as grants (refer to Form D-IVE), of activity that is primarily in support of or emanating from service within the broader community.

**Microbiology Day at Impression 5:** In April 2014, I participated in Microbiology Day at Impression 5. This program, organized by [REDACTED] involved sharing the wonders of microbiology with children at a local science museum. I spent the day at Impression 5 teaching children about antibiotic resistance in microbes. I did so with a poster and hands on exercises, including identifying drug resistance in bacteria by examining zones of clearance on agar plates and by building "antibiotic resistance plasmid bracelets". For the bracelets, we added colorful beads to pipe cleaners, which were then tied into bracelets. It was explained to the children that each bead represented an antibiotic resistance gene on the plasmid, and just like how the kids would enjoy sharing bracelets, bacteria can share plasmids and spread drug resistance. The kids and I had a great time at this event.

**Educating the public about university research through the media:** It is important that the public is aware of the research being undertaken in labs at MSU. On multiple occasions and venues my research was profiled including articles in: Capital Gains, International News, the University Research Corridor, AgBioResearch Futures Magazine, College of Natural Science and College of Veterinary Medicine websites, Office of the Vice President of Research website, MSU Today, MSU technologies website and The State News. These profiles required that I take part in interviews to explain my research as well as edit articles and press releases for clarity.

#### **Selected examples of research in the press:**

May 9, 2012: "Biosensor illuminates compounds to aid fight against TB", [REDACTED] **MSU Today**  
(<http://msutoday.msu.edu/news/2012/biosensor-illuminates-compounds-to-aid-fight-against-tb/>).

May 23, 2012 "MSU Researcher searches for new tuberculosis drug with Gates Foundation grant", [REDACTED]  
**Capital Gains** (<http://www.capitalgainsmedia.com/innovationnews/TB0620.aspx>).

2012 "We have bad news for TB" **International Magazine**, No. 13.  
(<http://www.isp.msu.edu/resources/documents/MSUIntl2012.pdf>).

2013 "Illuminating science addresses TB threat", [REDACTED] **AgBioResearch Futures Magazine**  
([http://agbioresearch.msu.edu/uploads/futures/Fall\\_WinterFutures2013\\_Vol31\\_No3and4.pdf](http://agbioresearch.msu.edu/uploads/futures/Fall_WinterFutures2013_Vol31_No3and4.pdf)).

April 22, 2014 "MSU innovation center recognizes inventors and inventions" **MSU Today**,  
(<http://msutoday.msu.edu/news/2014/msu-innovation-center-recognizes-inventors-and-inventions/>).

June 10, 2014 "Priming the Pipeline, Embracing Risk", [REDACTED] **AgBioResearch Futures Magazine**,  
(<http://agbioresearch.msu.edu/uploads/futures/2014FuturesAntibioticResistance.pdf> and  
[http://agbioresearch.msu.edu/news/priming\\_the\\_pipeline\\_embracing\\_risk](http://agbioresearch.msu.edu/news/priming_the_pipeline_embracing_risk)).

April 28, 2015 "Illuminating Solutions", [REDACTED] **Empower Extraordinary Campaign**.  
(<http://givingto.msu.edu/stories/story.cfm?id=366>)

June 4, 2015 "Schultz Family Helps Shed New Light on Dark Disease", [REDACTED] **University Advancement**.  
(<http://givingto.msu.edu/stories/story.cfm?id=380>)

**FORM D - IV C SERVICE WITHIN THE ACADEMIC AND BROADER COMMUNITY, continued**

June 9, 2015 "Illuminating Solutions", Faculty Voices Video, **MSU Today**,  
(<http://msutoday.msu.edu/360/2015/robert-abramovitch-illuminating-solutions/>)

July 23, 2015 "MSU scientists set sights on glaucoma medication to treat TB", [REDACTED] **MSU Today** press release (<http://msutoday.msu.edu/news/2015/msu-scientists-set-sights-on-glaucoma-medication-to-treat-tb/>). Picked up by numerous news organizations.

December 19, 2016 "Ancient Chinese Malaria Medicine Fights TB", [REDACTED] **MSU Today** press release (<http://msutoday.msu.edu/news/2016/ancient-chinese-malaria-remedy-fights-tb/>)

December 20, 2016 "Ancient Chinese medicine shows promise in the treatment of tuberculosis", Léa Surugue. Interview with **International Business Times** (<http://www.ibtimes.co.uk/life-saving-malaria-drug-artemisinin-also-shows-promise-treatment-tuberculosis-1597276>)

December 21, 2016 "Ancient Chinese Herb Aids Fight Against TB", [REDACTED] Interview with **Voice of America**. (<https://www.voanews.com/a/tb-tuberculosis-artemisinin/3645555.html>)

December 29, 2016 "Dormancy Inhibitors' Promising for Combating TB, Slowing Resistance", [REDACTED] **Reuters Health**. (<http://www.medscape.com/viewarticle/873822>).

January 26, 2017 "Malaria drug artemisinin shows promise against TB" [REDACTED] Interview with **SciDev.net** (<http://www.scidev.net/asia-pacific/author.claudia-caruana.html>)

June 30, 2017 "Combating Tuberculosis with Ancient Chinese Malaria Meds", [REDACTED] Homepage of the **American Society for Microbiology** (<https://www.asm.org/index.php/general-science-blog/item/6645-combating-tuberculosis-with-ancient-chinese-malaria-meds>)

July 2017 "What I wish I knew when starting as an assistant professor: An interview with [REDACTED] [REDACTED] **Trends in Microbiology**. DOI: <http://dx.doi.org/10.1016/j.tim.2017.04.008>

## FORM D - IV D ADDITIONAL REPORTING

### 1. Evidence of Other Scholarship:

Cite evidence of "other" scholarship as specified on p. 2 in the "summary rating" table (i.e., functions outside of instruction, research and creative activity, and service within the academic and broader community). Address the scholarship, significance, impact, and attention to context of these accomplishments.

**Implementation of a next-generation sequencing computational pipeline:** My lab has made significant advances towards establishing easy-to-use, open-source, computational pipelines for analyzing next-generation RNA-sequencing data. These RNA-seq methods provide a step-by-step workflow for processing RNA-seq data using the MSU High Performance Computing Cluster (HPCC) at iCER and analyzing data using HTSseq and DESeq software. [REDACTED] a graduate student in my lab, prepared a detailed tutorial that covers topics including: i) Managing files on the HPCC, ii) Quality control and trimming reads using Trimmomatic, iii) Mapping the reads to a genome using Bowtie, iv) Counting maps and reads using HTSeq, and v) Differential gene expression analysis using EdgeR. This tutorial is available on my lab website (<http://www.abramovitchlab.com/#/rna-seq-computational-methods/>) and has been made broadly available under a creative commons license. Notably, our pipeline of methods is planned to be adopted by iCER and the HPCC as a standard pipeline for RNA-seq data analysis for researchers at MSU. There is also interest to incorporate our RNA-seq tutorial into an undergraduate class on microbial genomics. Therefore, our efforts in RNA-seq computation methods will have a university-wide impact in promoting computation approaches to gene expression profiling. We have also released easy-to-use RNA-seq analysis software called SPARTA (Simple Program for Automated RNA-seq Transcriptional Analysis) that was published (Johnson et al, 2016) and has been used at a variety of research institutes around the world. SPARTA also has a web-based tutorial that enables the use of SPARTA in the undergraduate teaching lab and the platform and teaching tool has been used at MSU in MMG434.

### 2. Integration across Multiple Mission Functions:

Discuss ways that your work demonstrates the integration of scholarship across the mission functions of the university—instruction, research and creative activities, and service within the academic and broader community.

**Integrating the land-grant mission with global health:** MSU is a land-grant university with a worldwide mission. Tuberculosis (TB) research is an excellent example of how research at MSU can fulfill the land-grant mission in the global context. TB is directly important to local health. Bovine TB is endemic in Michigan wildlife and has led to multiple outbreaks in bovine agriculture. Additionally, there are sporadic cases of human TB in Michigan. Having the capacity to understand *M. tuberculosis* and *M. bovis* physiology can help us better prepare to combat these immediate local problems. However, the larger threat to local health, is the ongoing international TB epidemic, largely centered in sub-Saharan Africa, Asia and Latin America.

TB causes ~8 million new active TB cases and ~1.8 million deaths per year. Notably, our inability to control TB has led to the emergence of multi-drug and extensively-drug resistant TB. These drug-resistant strains are extremely difficult and expensive to treat, often requiring >2 years of treatment with toxic drugs. Notably, anyone can catch TB, including drug resistant TB. Given the ease of global travel, the slogan "TB anywhere is TB everywhere" is true and worrisome. Therefore, to protect the citizens of Michigan from drug-resistant forms of TB, we must deal with the problem outside of our borders. That is, by improving international health, we are safeguarding local health. Additionally, reducing the global burden of TB and drug-resistant TB will have economic benefits. For example, controlling a multidrug resistant TB outbreak in New York City in the 1990s was estimated to cost ~\$1 billion. Additionally, a recent European Union (EU) study estimated that the current annual cost of TB surveillance and treatment in the EU is €536,000,000 and the cost of disability adjusted life years is €5.3 billion. My lab's research is focused on developing therapeutics that can shorten the course of treatment and reduce the spread and emergence of drug-resistance. Given the human suffering and economic costs of the global TB epidemic, research aimed at combatting this grand challenge in global health fulfills the university's land-grant mission.

**Collaborative research:** Progress in science benefits from the open sharing of ideas and collaboration. To enhance research projects central to my main research foci (hypoxia- and pH-driven adaptations), I have developed collaborations with medicinal chemists (Profs. [REDACTED] at Univ. of Michigan, [REDACTED] at MSU); scientists with expertise in pharmacokinetics (Prof. [REDACTED] at Rutgers); and protein secretion (Prof. [REDACTED] at Notre Dame). My lab has also developed expertise in conducting RNA-seq transcriptional profiling and whole genome sequencing in *Mtb*. These techniques require significant bioinformatics expertise, which I have

## FORM D - IV D ADDITIONAL REPORTING

cultivated in my lab. I have collaborated with scientists at Notre Dame (Prof. [REDACTED]) and Colorado State University (Prof. [REDACTED]) where my expertise in genomics has supported three published, collaborative studies. To more broadly share our methods with the community, we have also published and made available open-source software, called SPARTA, to conduct processing and statistical analysis of bacterial RNA-seq data.

Michigan State University (MSU) is environment where collaboration is encouraged and I have had several productive collaborations with MSU researchers. Prof. [REDACTED] (Dept. of Chemistry) has developed novel imidazoline molecules that target the human proteasome via a novel mechanism. We found that these inhibitors also inhibit Mtb growth, likely by targeting the proteasome. This collaboration is ongoing and has been supported by an SPG grant from the MSU Foundation and an R21 from the NIH. Another collaboration is with Profs. [REDACTED] and [REDACTED] (College of Veterinary Medicine) where we are studying the persistence of *M. bovis* (an animal pathogen related to Mtb) in silage. *M. bovis* is endemic in Michigan deer populations and its survival in silage may represent a means of transmission to Michigan livestock. This work has been supported by a grant from the Michigan Animal Agriculture Alliance and is an example of how my research can directly impact animal agriculture in Michigan. I am also collaborating with Prof. [REDACTED] (College of Veterinary Medicine) on a project studying *M. bovis* transmission in dairy products in Brazil. This international project was supported by an Endowed Research Fund award. In summary, I have actively collaborated with researchers at MSU and at other institutions, on projects where I benefitted from others expertise, or where I could share my expertise. These collaborative projects promoted interdisciplinary approaches and expanded my intellectual horizons and I intend to continue the pursuit of new collaborations.

### 3. Other Awards/Evidence:

Cite other distinctive awards, accomplishments of sabbatical or other leaves, professional development activities, and any other evidence not covered in the preceding pages. (If the reporting period differs from the usual review period, then justify and support that period here.)

*Awards to* [REDACTED]

**Innovation of the Year Award (2014):** MSU technologies awarded me the Innovation of the Year Award for the development of tuberculosis anti-virulence chemical compounds. The university-wide award recognized the discovery of small molecule compounds that disrupt specific virulence pathways in *M. tuberculosis*.

**Jean P. Schultz Endowed Biomedical Researcher Award (2014):** This \$30,000 award, endowed by Robert Schultz and his family, supports a researcher in the College of Human Medicine.

**MSU Academic Competitiveness Award (2014 and 2015):** Awarded by the College of Human Medicine “in recognition of your achievements and progress in research or other scholarly activities during this past year... [and] to recognize selected faculty whose contributions are enhancing the national and international excellence and competitiveness of Michigan State University as a research university.”

**Zoetis Award for Research Excellence (2015):** Awarded by the MSU College of Veterinary Medicine for “creativity and productivity in your research targeting tuberculosis, a global problem in human and animal health.” The award notice from Zoetis reads “This award is given only to those faculty members who, through their dedication and investigation in research, are chosen from among their peers as an outstanding researcher in the field of veterinary medicine.”

## FORM D - IV D ADDITIONAL REPORTING

***Student Awards and Accomplishments:*** Graduate and undergraduate students in my lab have won several departmental, and college and national awards for their research efforts in my lab. These awards demonstrate the high quality of the students attracted by my lab and are evidence of successful mentoring of students in conducting and communicating research.

██████████ Rudolph Hugh Award (2015); Hsiang Everett Kimball Scholarship (2016).

██████████ Robert Schultz Award (2014); Duvall Award (2015); Wentworth Scholarship (2016); NIAID Scholarship for Keystone Symposium (2017, National Award); Whittam Award (2017).

██████████ Midwest Microbial Pathogenesis Conference Best Poster Award (2015); Rudolph Hugh Award (2016); Hsiang Everett Kimball Scholarship (2017); ASM Microbe 2017 Travel Award (National Award) ; CNS Dissertation Completion Fellowship (2017).

██████████ Duvall Award (2016); ASM Undergraduate Research Fellowship (2016, National Award); MSU nominee for Goldwater Scholarship (2017). Peabody Award (2017), NIH Fellow at Midwest Microbial Pathogenesis Conference (2017).

██████████ Annual Biomedical Research Conference for Minority Students Travel Award (2016, National Award).

██████████ Summer Research Experience, Mayo Clinic, Rochester, MN (2017); Lyman Briggs Research Symposium Grand Prize from MSUFCU (2017); Peabody Award (2017).

██████████ Summer Research Experience, Novartis Institute of Biomed Research, Emeryville, CA (2017).

**FORM D - IV E GRANT PROPOSALS**

List grant proposals submitted during reporting period relating to teaching, research and creative activities, or service within the academic and broader community. Include grants in support of outreach, international, urban, and extension activities.\*

	Name of Granting Agency (Grantor:) Focus of Grant (Focus:)	Date Submitted	\$ Amount Requested	Status			\$ Amount Assigned to Faculty Candidate (if Applicable)	Principal/Co-Investigators (if not faculty candidate)
				Pending	\$ Amt Funded	Not Funded		
<b>II. Research/Creative Activity</b>								
1	Grantor: <b>Bill and Melinda Gates Foundation</b>	11/05/11	\$100,000	<input type="checkbox"/>	\$100,000	<input type="checkbox"/>	\$100,000	
Focus: This <b>funded grant</b> was supported by the Grand Challenges Exploration program and was titled "Using a synthetic reporter strain to discover therapeutics targeting Mycobacterium tuberculosis persistence". As part of this Phase I grant we completed an innovative high throughput screen for inhibitors of persistent TB.								
2	Grantor: <b>National Institutes of Health, NIAID</b>	04/15/11	\$527,850	<input type="checkbox"/>	\$353,050	<input type="checkbox"/>	\$353,050	
Focus: This <b>funded grant</b> was part of a career development program at the Great Lakes Regional Center of Excellence and was titled "Targeting compounds and genes that modulate M. tuberculosis pH-driven adaptation". As part of this grant we completed an innovative high throughput screen for inhibitors of environmental adaptation and identified mechanisms by which Mtb integrates pH and carbon source availability to regulate growth. The final year of this 3-year grant was cut given the nation-wide cancellation of the regional centers of excellence program.								
3	Grantor: <b>National Institutes of Health, NIAID</b>	6/15/12	\$1,759,635	<input type="checkbox"/>	\$392,333	<input type="checkbox"/>	\$392,333	
Focus: This <b>funded R21/R33 grant</b> from the NIH was funded as a part of a highly competitive RFA for new treatments for chronic diseases and was titled "Screening for inhibitors of M. tuberculosis persistence-related lipid metabolism". The proposal received an "outstanding" priority score of 24. This funding allowed us to continue studies that were initiated as part of the Gates Foundation funded project. Notably, I was ineligible to apply for the R33 phase of funding, because the project was funded through end of year funds.								
4	Grantor: <b>Michigan Initiative for Innovation and Entrepreneurship</b>	10/03/13	\$44,022	<input type="checkbox"/>	\$44,022	<input type="checkbox"/>	\$44,022	
Focus: This <b>funded grant</b> from the MIIE was funded to establish mouse infection models in my lab to test the efficacy of newly discovered anti-infectives and is titled "In vivo efficacy studies of first-in-class compounds to treat chronic, drug-resistant tuberculosis"								
5	Grantor: <b>Bill and Melinda Gates Foundation</b>	5/01/14	\$999,997	<input type="checkbox"/>	\$819,539	<input type="checkbox"/>	\$819,539	
Focus: This <b>funded grant</b> was awarded as part of the Grand Challenges Explorations program and is a Phase II project that continues the experiments initiated in the Phase I project. The Phase II project is titled "Development of TB therapeutics that inhibit persistence and function with new mechanisms of action".								

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**FORM D - IV E GRANT PROPOSALS**

Name of Granting Agency (Grantor:) Focus of Grant (Focus:)	Date Submitted	\$ Amount Requested	Pending	Status		\$ Amount Assigned to Faculty Candidate (if Applicable)	Principal/Co-Investigators (if not faculty candidate)
				\$ Amt Funded	Not Funded		
6 Grantor: National Institutes of Health, NIAID	6/03/14	\$1,884,882	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: This R01 proposal "Mechanisms of Mycobacterium tuberculosis pH-driven adaptation" will undertake direct follow-up studies from the discoveries generated as part of the completed Great Lakes RCE career development grant.							
7 Grantor: National Institutes of Health, NIAID	06/04/14	\$389,675	<input type="checkbox"/>		<input checked="" type="checkbox"/>	\$175,353	
Focus: This R21 proposal "Non-competitive proteasome inhibitors to treat chronic, drug-resistant tuberculosis" is a collaborative project with the [redacted] labs to repurpose proteasome inhibitors, originally designed in the [redacted] lab as cancer chemotherapies, as TB antibiotics.							
8 Grantor: MSU Foundation	1/31/14	\$399,079	<input type="checkbox"/>		<input checked="" type="checkbox"/>	\$179,585	
Focus: This SPG proposal was selected for a full submission but was not funded and the focus is the same as that described for the R21 above.							
9 Grantor: National Institutes of Health, NIAID	7/15/13	\$1,734,164	<input type="checkbox"/>		<input checked="" type="checkbox"/>	\$780,373	
Focus: This R21/R33 proposal was submitted in response to an RFA for new drugs to treat antimicrobial resistant infections and was titled "Non-competitive proteasome inhibitors to treat chronic, drug-resistant tuberculosis". The proposals R21 section is similar to the R21 described above for the proposal with the same title. The R33 section was focused on testing efficacy in animal infection models. The proposal received an "excellent" priority score of 34 and very positive reviews, but was not funded.							
10 Grantor: National Science Foundation	9/30/13	\$600,000	<input type="checkbox"/>		<input checked="" type="checkbox"/>	\$30,000	
Focus: Developing rapid point of care diagnostics for bacterial diseases. My part in the project was to test the diagnostic platform on <i>M. tuberculosis</i> .							
11 Grantor: National Institutes of Health, NIAID	5/31/13	\$1,362,469	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: This R01 proposal was submitted as part of an RFA for new high throughput screening platforms and was titled "Screening for inhibitors of <i>M. tuberculosis</i> persistence-related lipid metabolism". The goals were essentially identical to those described in the funded R21/R33, however, this proposal was submitted prior to learning the R21/R33 would be funded.							

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**FORM D - IV E GRANT PROPOSALS**

12	Grantor: <b>Bill and Melinda Gates Foundation</b>	5/01/13	\$100,000	<input type="checkbox"/>		<input checked="" type="checkbox"/>	\$50,000	
Focus: This proposal "Epidemiology and Functional Genetics of Zoonotic Bovine Tuberculosis in Uganda" was submitted in response to a Grand Challenges Exploration topic focused on One Health.								
13	Grantor: <b>National Institutes of Health, NIAID</b>	3/11/13	\$415,922	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: This R21 proposal "Exploring new genetic mechanisms of M. tuberculosis persistence-related virulence" was a revision of a prior R21 on the same topic. The goal was to examine the physiological and genetic interplay of hypoxia and acidic pH, with a focus on a the DosRST regulatory pathway. It received positive reviews and an "excellent" priority score of 39, but was not funded.								
14	Grantor: <b>National Science Foundation</b>	01/04/13	\$600,000	<input type="checkbox"/>		<input checked="" type="checkbox"/>	\$30,000	
Focus: Developing rapid point of care diagnostics for bacterial diseases. My part in the project was to test the diagnostic platform on <i>M. tuberculosis</i> .								
15	Grantor: <b>National Institutes of Health, NIAID</b>	05/30/12	\$415,533	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: This R21 proposal "Hierarchical genetic and environmental regulation of M. tuberculosis persistence" proposed to examine the physiological and genetic interplay of hypoxia and acidic pH, with a focus on a the DosRST regulatory pathway. It received positive reviews and an "very good" priority score of 43, but was not funded.								
16	Grantor: <b>National Institutes of Health, NIAID</b>	10/14/14	\$2,237,662	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: This New Innovators grant, titled "Developmental Biology of M. tuberculosis persistence", proposes to use quantitative single cell imaging in infected host tissues to define regulatory networks required for Mtb to establish a persistent infection.								
17	Grantor: <b>Bill and Melinda Gates Foundation</b>	10/28/14	\$75,000	<input type="checkbox"/>		<input checked="" type="checkbox"/>	\$75,000	
Focus: I was included on this proposal as a collaborator to conduct High Throughput Screening for small molecules that act by "Potentiating Anti-Tubercular Drug Action Through Inhibition of trans-Translation".								
18	Grantor: <b>MSU Strategic Partnership Grant</b>	2/6/2015	\$399,079	<input type="checkbox"/>	399,079	<input type="checkbox"/>	199,539	
Focus: This <b>funded grant</b> "Non-competitive proteasome inhibitors to treat chronic, drug-resistant tuberculosis" is a collaborative project with the [redacted] labs to repurpose proteasome inhibitors, originally designed in the Tepe lab as cancer chemotherapies, as TB antibiotics.								

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19	Grantor: National Institutes of Health, NIAID	2/26/15	\$1,900,987	<input type="checkbox"/>	\$1,900,987	<input type="checkbox"/>	\$1,809,605	
Focus: This <b>funded R01 grant</b> "Mechanisms of <i>Mycobacterium tuberculosis</i> pH-driven adaptation" will undertake direct follow-up studies from the discoveries generated as part of the completed Great Lakes RCE career development grant. We are using chemical genetics to dissect essential pathways of <i>Mtb</i> pathogenesis.								
20	Grantor: National Institutes of Health, NIAID	3/12/15	\$399,883	<input type="checkbox"/>	\$399,883	<input type="checkbox"/>	199,941	
Focus: This <b>funded R21 grant</b> "Non-competitive proteasome inhibitors to treat chronic, drug-resistant tuberculosis" is a collaborative project with the [redacted] and to repurpose proteasome inhibitors, originally designed in the Tepe lab as cancer chemotherapies, as TB antibiotics.								
21	Grantor: Michigan Alliance for Animal Agriculture	9/16/15	41,075.86	<input type="checkbox"/>	41,075.86	<input type="checkbox"/>	41,075.86	
Focus: This <b>funded grant</b> "Fate of <i>Mycobacterium bovis</i> in ensiled forages" is studying how the agricultural and zoonotic pathogen <i>M. bovis</i> survives and establishes persistence in animal feed.								
22	Grantor: Burroughs Wellcome Fund	10/27/15	\$500,000	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: This Investigator in Pathogenesis of Infectious Diseases project was selected as a full proposal submission by the Burroughs Wellcome fund. The goal of the project was to examine "Targeting pH-driven persistence to develop faster acting tuberculosis treatments".								
23	Grantor: Burroughs Wellcome Fund	7/1/16	\$500,000	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: This Investigator in Pathogenesis of Infectious Diseases project was submitted as a pre-proposal but was not invited for a full application. The goal of the project was to examine "New druggable pathways of <i>Mycobacterium tuberculosis</i> pathogenesis".								
24	Grantor: Michigan Economic Development Corporation	10/11/16	\$200,000	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: The goal of this proposal was conduct studies to promote the potential commercialization of ethoxzolamide as a TB treatment. The title of the proposal was "Repurposing ethoxzolamide as a new tuberculosis therapeutic".								
25	Grantor: College of Veterinary Medicine Endowed Research Funds	1/16/17	\$9,960	<input type="checkbox"/>	\$9,960	<input type="checkbox"/>		
Focus: This <b>funded grant</b> is in support of graduate student [redacted] to conduct studies on <i>M. bovis</i> transmission in Brazil. The title of the proposal is "Status of the <i>Mycobacterium bovis</i> and the interrelation with the human health in Amazonas State, Brazil".								

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26	Grantor: <b>MSU Molecular Discovery Grant</b>	3/3/217	\$23,650	<input type="checkbox"/>	\$15,000	<input type="checkbox"/>	\$15,000	
Focus: This <b>funded grant</b> is in support of medicinal chemistry optimizations of a small molecule called HC106A that inhibits DosRST signaling in <i>M. tuberculosis</i> . The grant is titled "Medicinal chemistry optimizations of lead compounds that inhibit <i>M. tuberculosis</i> persistence and drug tolerance."								
27	Grantor: <b>National Institutes of Health, NIAID</b>	1/31/17	\$2,705,678	<input type="checkbox"/>		<input checked="" type="checkbox"/>	~1,900,000	
Focus: The goal of this proposal is to further characterize and develop small molecules that inhibit <i>M. tuberculosis</i> DosRST signaling and persistence. The title of the proposal is "New compounds and targets to combat tuberculosis persistence and drug resistance". Although unfunded, the reviews were sufficiently positive to support a resubmission of a revised application for the November 2017 deadline.								
28	Grantor: <b>Burroughs Wellcome Fund</b>	7/14/17	\$500,000	<input type="checkbox"/>		<input checked="" type="checkbox"/>		
Focus: This Investigator in Pathogenesis of Infectious Diseases preproposal was submitted to the Burroughs Wellcome fund. The goal of the project was to examine "Chemical Genetics of <i>Mycobacterium tuberculosis</i> pathogenesis".								
29	Grantor: <b>Department of Defense</b>	7/13/17	\$1,200,000	<input checked="" type="checkbox"/>		<input type="checkbox"/>		
Focus: The goal of this pre-proposal is to further characterize and develop small molecules that inhibit <i>M. tuberculosis</i> DosRST signaling and persistence. The title of the proposal is "Inhibiting Mycobacterium tuberculosis DosRST-dependent signaling to kill persisters, reduce drug tolerance and shorten therapy."								
30	Grantor: <b>National Institutes of Health, NIAID</b>	02/05/18	2,705,678	<input checked="" type="checkbox"/>		<input type="checkbox"/>		
Focus: The goal of this resubmitted proposal is to further characterize and develop small molecules that inhibit <i>M. tuberculosis</i> DosRST signaling and persistence. The title of the proposal is "New compounds and targets to combat tuberculosis persistence and drug resistance".								

**Summary of Grant Proposals and Funding:**

Total grant proposals submitted: **30**. Total grant proposals funded: **11**. Additional funding includes \$30,000 from the Jean P. Schulz award.

Total funding applied for during reporting period: **\$24,731,880**

Total funding applied for assigned to faculty candidate: **\$16,435,961**

Total **pending** funding assigned to the faculty candidate: **\$4,405,678**

Total **awarded** funding assigned to the faculty candidate: **\$4,014,064**

Total **awarded** funding during reporting period: **\$4,504,928**

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