College: Boonshoft School of Medicine
Department: Pharmacology & Toxicology
Academic Programs Reviewed (list in PED)
MS Pharmacology & Toxicology

Program Review Committee:

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Submitted, 1/23/15

Department Chair, Norma Adragna, Ph.D., (Interim Chair)

Dean, Marjorie Bowman, M.D., MPH.

Program 1. MS degree in Pharmacology & Toxicology

Enrollment and Graduate History Data in PED

	Fall 09	Fall 2010	Fall 2011	Fall 2012	Fall 2013
Enrollment	22	30	31	46	52
Graduates	8	8	11	17	31

Program description

Our innovative Master of Science in Pharmacology & Toxicology degree program provides a comprehensive introduction to the broad range of theoretical concepts that comprise pharmacology and toxicology, providing both historical context and state of the art technical approaches to solving pharmacological and toxicological problems. This goal of providing students with a career-oriented yet theoretically based education is accomplished within the core curriculum through the combination of traditional lectures and peer-based learning, complemented by advanced laboratory instruction and journal club seminars. The Research-based Master of Science program and a Leadership/Administration Master of Science program are available to our students. All Master of Science in Pharmacology & Toxicology candidates, regardless of the option chosen, are required to have an advisor and an advisory committee. The advisory committee helps formulate a study program, provide counseling and evaluate student progress. To qualify for the Master of Science degree a student must satisfy the requirements of the Wright State University Graduate School as well as the program requirements that are outlined in our MS Policy document.

Alignment with university mission, strategic plan

The education process, which is incorporated into the mission statement, includes an environment of inclusiveness (for all students, international, domestic as well as students with special needs). The department of Pharmacology & Toxicology is closely aligned with the WSU's mission and strategic plan. Our two MS graduate program tracks are quite innovative and are student success orientated. Research track students conduct advanced research in new areas of diseases and through the Pharmacology and Toxicology student research club they engage in meaningful community service. We empower all of our students, faculty, and staff to develop professionally, intellectually, and personally through workshops, meetings, and social functions. Much of our faculty meeting time (held monthly) is spent to enhance academic quality and program distinctiveness by utilizing the results of student and program assessments to improve learning. Our statistics show an increase in enrollment and retention to completion from our program. We encourage faculty to focus not only on the courses but also long-term career goals through creation of a CV, practice interviews, and more. We offer more than 30 credit hours of online instruction and have been doing so since 2010. This provides a mechanism for students who cannot be on campus to complete courses required for the MS degree, thus increasing our ability to graduate a higher percentage of students who might be lost due to forced moves, e.g., military.

Program distinctiveness

1. One of the major goals of a graduate program is to educate and produce quality students that can compete with other students on a global scale. This is necessary because as we compete on a global level, other graduate programs worldwide have become our competitors. To increase our

competitiveness in the global MS program pool, we identify and focus on variables/filters that must be met, e.g., only English speaking programs or technologically advanced programs. We also focus on recruiting only potential graduate students interested in a particular field of study, i.e., a graduate degree in Pharmacology & Toxicology.

2. One of our distinctions is the creation of teams in our MS program, a team with the group of students that vary in age, skills, marital status, language, and culture. Although the student population is diverse they often have similar difficulties and strengths and must be understood and portrayed as such and identifying those similar difficulties will be a step toward the creation of the team. A few learning strategies used to increase the cohort feeling is accomplished by having courses that are sequential, so they must experience them together, requiring attendance to departmental academic functions, and departmental support of student social outings. In the Pharmacology & Toxicology department we strongly recommend, as indicated above, sequential course timing, we also require attendance to seminars and defenses for all students in the department, and we have a university sanctioned student organization in clinical research for our students to operate, and determine its mission. During orientation, we share with the students how their collective backgrounds will aid each other when completing classes, and encourage shared study sessions. It is important to give them a sense of belonging to the organization, in this case the department.
3. One hurdle we had in generating a team cohort feeling was the creation of the Non-Thesis option in 2009. This was seen by the students as an inferior degree to the Thesis track and they felt displaced and separated. To overcome this obstacle we rebranded both degrees as either a “Research” track or a “Leadership/Administration” track, specifically outlining different career paths and goals. Approximately one half of the student population is in each track now. To market this innovative and exciting new degree approach, we created new courses that were suitable for the Leadership/Administration track, and specified existing classes that fit the new paradigm. New classes included Six Sigma, a green belt and a black belt certification offered over two semesters. Existing classes included Good Laboratory Practices (GLP), Laboratory Management, Communications in Science, and Lab Safety. The rebranding was successful, creating a sense of pride in the non-research students, and improved the cohort/team feeling overall, improving global cultural integration, and is highly recommended by students to their peers. This program is the only science program to do this at Wright State University.
4. To draw attention to our program as opposed to our competitors, we market or identify the research in the department based on the type of disease being studied. For example, faculty researchers in our program investigate diabetes, cardiovascular diseases such as stroke and hypertension, brain edema, pain and neurodegenerative diseases and immunological disorders. Alternatively, their research could be defined by the area of interest, e.g., genomics, proteomics, membrane transport, cell signaling and others because those terms would selectively fit as well. However, they would not set us apart from other basic science research programs, and thus, would not attract the students interested in clinical research/medicine. We also have developed courses taught by our MD faculty, e.g., a wound repair course and a cardiac function course, taught by two renowned local surgeons.
5. The department has 17 quite diverse faculty members (including joint and adjunct appointments), with the majority, i.e., 71%, not having been born in the United States. We also show diversity with faculty degrees, i.e., M.D., M.D./Ph.D., Ph.D./Pharm.D., Ph.D. and M.S. Several of the M.D. degrees are from other countries, and have much in common with our student population so they understand the education of our students, as well as cultural issues involved in living in a foreign country. Issues such as fear and stress, or homesickness that are prevalent in international learners can be understood and treated with empathy. The diversity of our student population is also

distinctive, and something we are quite proud of. More than 90% of the students are from 8 different counties.

Recognitions of quality of the program

1. Recognition of our program from our graduate school and our own BSOM dean has made it clear that our department is doing something right.
2. Student applications for the Leadership/Administration and Research degree programs are highly competitive.
3. A majority of our current and recent applications are from peers of current and past students in the Pharmacology & Toxicology MS program; thus, we are convinced that the students are positive about their experiences.
4. One look at employment and retention rates clarify the quality of the Research and Leadership/Administration track's success.
5. The quality of a program is perhaps best represented by the quality of the students. The students in our program have received numerous travel awards to regional and national meetings over the past 6 years. Likewise, they have received awards for platform presentations and poster presentations at national and regional meetings. The hard work that our students put into the preparation for these events is a testament to their sense of caring and responsibility for these milestones in their career.

Program learning outcomes

1. An in-depth understanding of core curricula (biokinetics, biodynamics, biostatistics).
2. An ability to perform research (if Research option) developed through the core courses: Introduction to Research Techniques and Research (in a laboratory under the guidance of a mentor).
3. The ability to read, synthesize and critique academic publications.
4. The ability to speak publicly on academic (science) topics.
5. Completion and defense of a thesis.

Description of learning outcomes assessment program

Learning outcome assessments include completion with a GPA ≥ 3.0 of the graduate program of study and defense of thesis and submission, as well as oral presentations of literature reviews for non-research MS students with potential for mini-review publications in some of the courses (i.e. Effective Scientific Writing I and II).

Summary of assessment findings for past five years

A self-assessment of the Pharmacology and Toxicology Master's program was initiated in two stages: 1) a program review survey of all faculty, staff and students, including recent graduates 2) a retreat to assess the Pharmacology and Toxicology Master's program.

The three main goals of the retreat were:

A) Define the target/goals of the MS Program.

B) Examine the current curriculum in detail. This entailed analyzing and discussing the contents of each of the courses taught in the program (what are we teaching and why) to be able to make decisions such as redesigning courses to avoid overlap, trimming materials if desired to reduce the number of class hours so the students spend more time working on their thesis.

C) Review admission criteria and departmental capacity.

Dr. Bill Ayers, Assistant Dean for the Graduate School was a neutral evaluator. He defined the Master's program as using technical skills, knowledge base and soft skills and that the mission was to produce researchers and PhDs, and to provide flexibility for the students. There are two tracks: Thesis which prepares students for research and lab work, and the Leadership/Administration track which prepares them for medicine, career advancement and as science administrators

Major curricular changes since last review (or past five years)

1. 2009 – Created a Non-Thesis option
2. 2010 – Introduced several new courses, online and classroom
3. 2012 – CBRN Defense certificate approved
4. 2014 – Rebranding of Non-Thesis to Leadership/Administration Option
5. 2014 – To address the need for more MS programs, we have begun working on two new programs (described under **New program opportunities** below)

Graduate placement data, employer satisfaction

As an example of graduate placement, we have gathered information corresponding to the date from graduation 2008-2012 (2 year typical program length)

Greater than ninety-three percent of Pharmacology and Toxicology Master of Science students are gainfully employed or seeking an advanced education in their field of study. Continued employment and promotions are strong indicators of employer satisfaction, as shown in Appendix A

If program has professional accreditation, attach most recent review findings and recommendations

Departmental Summary

Faculty demographics Data in ADS

	2008	2009	2010	2011	2012
Full	5	5	5	5	5
Associate	3	6	6	5	5
Assistant	4	1	1	1	2
Inst/Lect	0	0	0	0	1
Total	12	12	12	11	13

Staffing Summary

	2008	2009	2010	2011	2012
Unclassified	13	16	19	16	16
Classified	3	4	4	3	1
Total	16	20	23	19	17

Student/faculty ratio Data in ADS

	2008	2009	2010	2011	2012
Student TE/Fac FTE	1.83	2.5	2.58	4.18	4.0

Average class size Data in ADS

	2010	2011	2012
Lecture	12	19	18
Lab only	1-2	1-2	1-2
Lecture/Lab	10	10	10

Total of student data for all programs in unit Data in PED

	Fall 09	Fall 2010	Fall 2011	Fall 2012	Fall 2013
Enrollment	22	30	31	46	52
Graduates	8	8	11	17	31

Total courses taught and credit hours generated for unit Data in PED

	Fall 09	Fall 2010	Fall 2011	Fall 2012	Fall 2013
Undergraduate	NA	NA	NA	NA	NA
Graduate	579	734	890	1166	1112
Total	579	734	890	1166	1112

Course completions Data in ADS*

	2008	2009	2010	2011	2012
Undergraduate					
Master's					

***No data available in ADS for BSOM.**

Expense per student and revenue to expense ratio Data in ADS

	2008	2009	2010	2011	2012
Expense per student	9192.35	7723.76	10033.69	9239.6	11499.36
Rev/Expense	1.363565	1.587059	1.341979	1.424196	1.200108

Research and External Funding Data in PED

	2008	2009	2010	2011	2012
External funding	$2,451,319.00	$1,651,504.90	$2,286,220.10	$1,482,573.79	$797,171.00

Future employment projections for discipline (to be provided to unit)

In 2012, CNN Money reported zero unemployment in pharmacology. As demonstrated in employment table (Appendix A) more than 93% of our former students are employed or furthering their education.

Description of how unit programs and curricula are "mission critical" to the core Wright State educational experience

The Pharmacology & Toxicology MS program and its curriculum enhance Wright State's educational experience by providing a solid curriculum of translational, basic research, and clinical education geared toward the global student. We address the culture diversity challenges and have a program that enables our students to compete at a global level and portray themselves as global citizens.

The department of Pharmacology and Toxicology has created a program with an attitude of one that is creative, one that connects, bridges the gaps of cultural differences, while giving back to the global community through education and cultural awareness. The opportunities such as those in the Leadership/Administration degree increase global awareness, cultural blending and help us to operate at a global level. Through awareness and the use of new laboratory technologies and advances in science the graduate program promotes a more diverse student population with unique backgrounds and experiences. The advances also allow the program to reach out at an international level through distance learning. Our program is interested in being part of the global academic/science market, either by bringing the students to the university departmental program or by reaching out to them via online education.

Faculty accomplishments and recognitions

1. Recognitions: 13 of our faculty have been selected to serve in 82 editorial boards of reputable scientific journals.
2. Promotions: 11 of our faculty were promoted to Research Instructors, Research Assistant, Assistant, Associates and Full Professors.
3. Awards: 14 of our faculty received awards from AHA, NIH, NSF, DOD and others.
4. Publications: There are 174 total publications in peer reviewed reputable journals.
5. Accomplishments: Our faculty members have excelled in book publications, scientific meetings and symposia organizing, invitations as members of study sections and participation in international, national and local scientific and educational meetings.

Detailed information may be obtained from the departmental Annual Reports available online.

Programs and areas of recognized excellence with supporting evidence

1. Enrollment increased from 22 in fall 2009 to 52 in fall 2013, representing an increase of 107 %.
2. Degrees awarded increased from 8 in fall 2009 to 31 in fall 2013, representing an increase of 288 %.
3. Course credit hours taught increased from 579 in fall 2009 to 1,112 in fall 2013, representing an increase of 92 %.
4. Our program has been lauded as the most successful MS program in the Boonshoft School of Medicine, and one of the most successful in the university by Dean, Dr. Andrew Hsu.

Capacity for growth of programs

We have qualified applicants but must turn them down (~60-70% of applicants) due to lack of space in the department (See Proposals to enhance programs).

New program opportunities

A) An MD/MS program that would utilize current common coursework with the medical school, supplemented by a 2 semester of technological specialization.
B) An online MS program that would take advantage of the Leadership/Administration courses already developed.
These two programs would provide an increase in students without overly stressing the faculty and resources in the department. Our goal is to have these two programs up and running by 2016.

Proposals to enhance programs (if desired) (reference floor plan in Appendix B)

Almost 70 % of the student body is not research based; they take courses, attend seminars and theses, and other departmental functions. Without space in the building (LAR facility = basement, and SOPP = first floor) our environment is far from ideal to allow for a cohort/team feeling. Due to the lack of space, the students are crowded. At times we have up to 100 faculty, staff and students and the space to gather is limited to a table that seats 10, a conference room at the other end that seats 12 and is enclosed, and a make shift study/lunch area in the hall. When 90 % or more of our students are willing to pay $ 30,000 each for a degree in spite of our department offering walls without paint (lunch area), very cold or very hot (floor to ceiling windows) study areas in the hall, it may mean that our program must be exceptional to still attract top students. In reality, until they arrive, the majority of the students do not know the conditions in which they will be spending their next 2 years. A student study center would enhance the program greatly.

With the advent of new teaching paradigms, e.g., peer based learning, which is more interactive, the old style traditional classroom is not appropriate anymore. Old classrooms need to be revitalized by removing the regular tables and putting in round tables that can hold up to 6 students at a time. This would provide an environment that would promote discussion amongst peers and allow for unique and advanced teaching styles that are replacing traditional lectures.

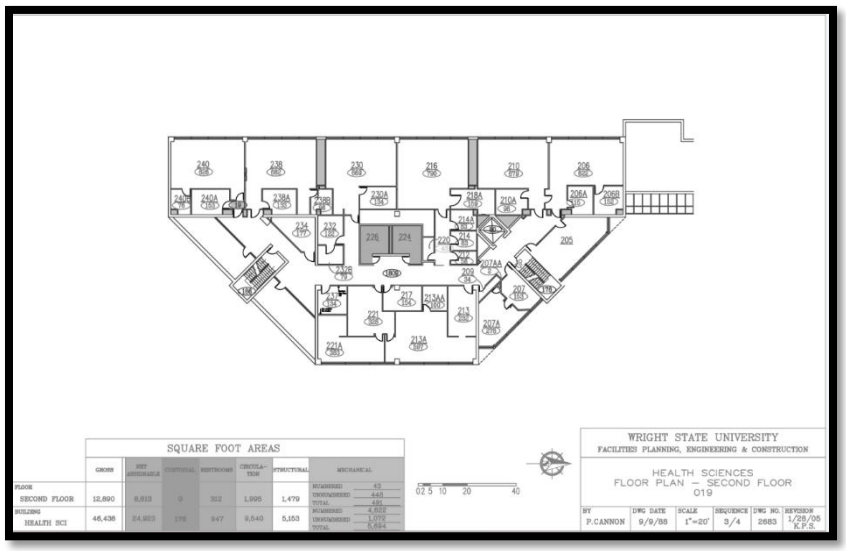
Appendix A

Start Year	Name	Current employment/education status
2006	Sean Harshman	Graduate of OSU BMS PhD program, Employed at WPAFB
2006	Scott Kerns	Cellular Technology Limited lab manager (Cleveland OH)
2007	Alicia Castle	Law Student Indiana University McKinney School of Law
2007	Chester Gut	WPAFB, Dayton OH
2007	Avik Das	Pharmacology Lecturer Royal College of Pharmacy, India

2007	David Ellis	Graduate student BMS PhD at WPAFB Dayton, OH
2007	Tharu Fernando	Weill Cornell Medical College
2007	Kaushal Joshi	Fisher Business School, Columbus OH
2007	Malav Madhu	Cincinnati Children's Hospital, OH
2007	Dhawal Oswal	Graduated WSU BMS PhD program 2014. Postdoctoral Position at Quintiles.
2007	Molly Burns	WPAFB, Dayton, OH
2007	Jennifer Edwards	Unknown
2008	Chou, Richard	
2008	Mullen, Lawrance	Miami Jacobs instructor, Dayton OH
2008	Ruark, Christopher	WPAFB, Dayton OH
2008	Drew Nedderman	Eli Lilly Head Scientist
2008	Swapnil Shewale	Wake Forest PhD program
2008	Jordan Williamson	Did not graduate (WPAFB employee)
2009	Beesetty, Pavani	Unknown
2009	Chmura, Doug	Renovo Neural, Cleveland OH
2009	Chodavarapu, Harshita	PhD candidate
2009	Elsellabi, Basma	Fairborn, OH
2009	Joshi, Amod	Raleigh, NC Research Assistant
2009	Kablan, Narges	Garyounis University, Benghazi, Libya
2009	Kramer, Denise	WSU Environmental Health Dept, Dayton OH
2009	Lepera, Michael	Windsor, Ontario, Canada
2009	Markopoulos, Marjorie	WSU Environmental Health Dept, Dayton OH
2009	Paluri, Sesha	BMS program, WSU Dayton OH
2009	Panchal, Jayharsh	Eli Lilly
2009	Rodwan, Naima	Unknown
2009	Sieber, Scott	unknown
2009	Wang, Jinju	BMS PhD program, WSU Dayton OH
2009	Shingirai Dossa	American Bio-Clinical Laboratories, CA
2010	Alghamri, Mahmoud	BMS PhD program, WSU Dayton OH
2010	Alshahrani, Saeed	Cincinnati, OH
2010	Ashawish, Wafa	Dayton, OH
2010	Fallahi, Fahimeh	EH PhD program, WSU Dayton OH
2010	Furman, Amanda	Maryland
2010	Ochs, Sharon	Medical School

2010	Reed, Beth	Battelle, Columbus Ohio
2010	Salem, Esam	Chair, clinical dept., Libya
2010	Whitlock, Joseph	WSU Environmental Health Dept, Dayton OH
2010	Wourms, Michael	Tech at University of Cincinnati
2014	Newman, Mackenzie	Tech at U. WVa., Morgantown
2014	Ebrahimian, Venus	Kettering Hospital

Appendix B: Pharmacology & Toxicology floor plan



The department is the home of the Proteomic Analysis Laboratory that provides specialized equipment, e.g., mass spectrometry and confocal microscopy, support and expertise to students, staff and faculty in the Pharmacology & Toxicology department, and other researchers in the university. Being part of the department, this facility does not have the ability to expand or grow, and it does not have a dedicated teaching space for research techniques classes in the MS program or for other techniques-based classes that could be taught. To remedy this and to enhance the Pharmacology & Toxicology department's profile and ability to support itself, a new facility should be built that would house the department and proteomic facility. This new area would provide not only adequate lab space for all the existing faculty and future hires, but also incubator labs for young investigators, e.g., research assistant professors, or other off campus researchers who need a minimum of space, e.g., ~170 sq. ft., to carry out preliminary studies. Furthermore, a teaching laboratory would be part of this space, allowing up to 35 students to be trained at any given time in research techniques in a well-supplied wet lab environment in adjacent proximity to all the equipment in the proteomic facility. This would also include a lecture/conference room with all the amenities.

Teaching research based courses or technique based courses or workshops would be another way to enhance the teaching in the department. These types of classes would enhance job skill sets required in a new age of science and technology. The future of diagnostic skills will rely more on the ability to adapt to new methods, technologies, and analysis. In an effort for our students to keep up with these changes, we need to provide as much up to date technology training as possible. Teaching these types of courses will prepare our students to successfully adapt to these changes.