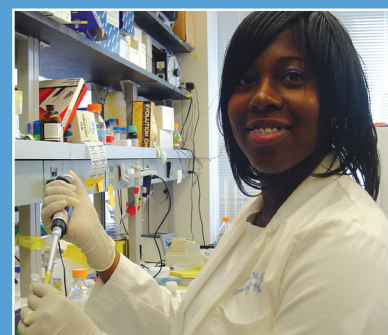
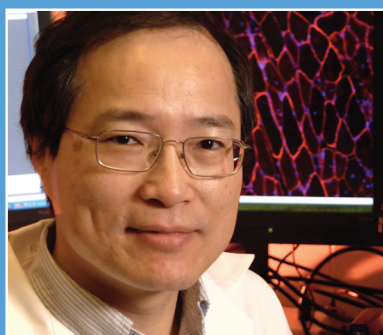
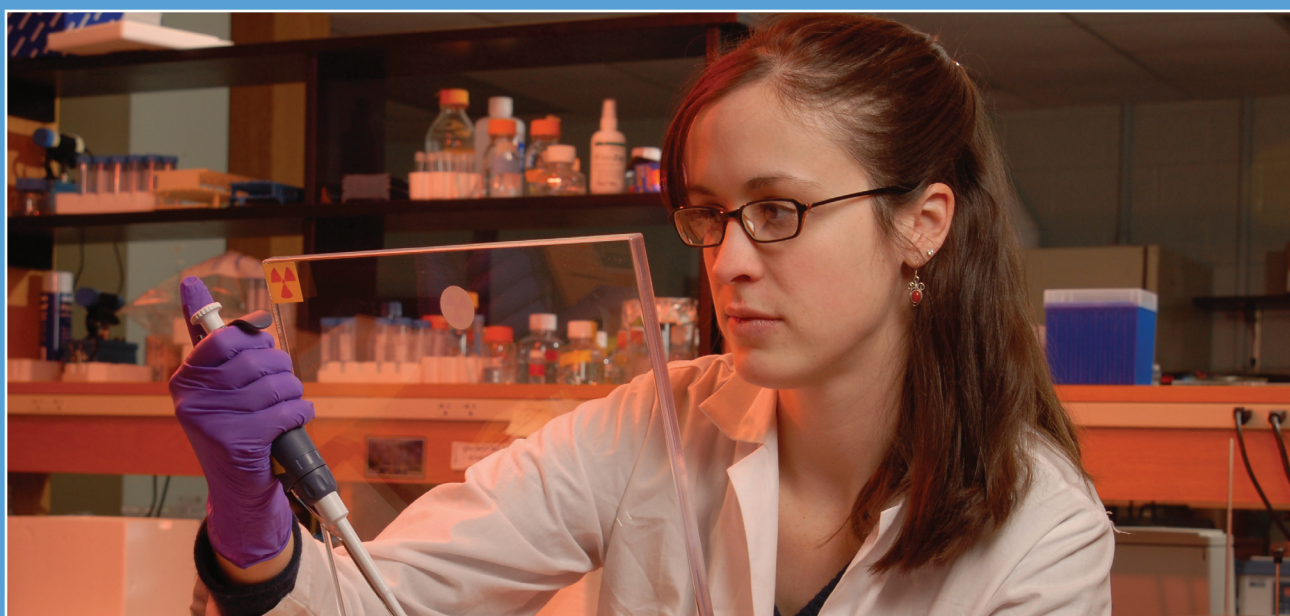


UNC School of Pharmacy

Self-Study Report

Volume I

Graduate Program Review
April 13-15, 2008



UNC
PHARMACY

The Graduate Program of the UNC-CH School of Pharmacy

1. Overview

The School of Pharmacy (SOP), the University of North Carolina at Chapel Hill (UNC-CH), is part of a health affairs campus of UNC-CH that includes the Schools of Medicine, Pharmacy, Public Health, Dentistry, and Nursing. It offers both a professional pharmacy program that confers a PharmD degree, and a graduate program in pharmaceutical sciences that confers PhD and MS degrees in a research-intensive environment. The UNC-CH SOP ranks third among PharmD-granting U.S. Schools of Pharmacy according to rankings published in the *U.S. News and World Report*, and currently ranks sixth among Schools of Pharmacy based on the research funding awarded by the National Institutes of Health as published by *American Association of Colleges of Pharmacy*. The UNC-CH SOP recently developed a strategic plan (<http://www.pharmacy.unc.edu/about-us/school-organization/office-of-the-dean>) that was guided by the following vision and mission statements:

Vision: To be the preeminent school of pharmacy where leaders in practice, education, and research are developed and nurtured.

Mission: To advance healthcare through innovation and collaboration in pharmacy practice, education, research, and public service.

The graduate program plays a key role in the School's pursuit of its vision, and is critically linked with the professional program in fulfilling the School's mission.

The Graduate School at UNC-CH, under the leadership of its Dean, oversees 89 graduate programs on the campus. Each School or Department is authorized to design and administer an individual program within the Graduate School guidelines and standards. The SOP, including its umbrella graduate program, is organized into five divisions based on research and/or practice emphasis in the Pharmaceutical Sciences.

- Medicinal Chemistry and Natural Products (MCNP)
- Molecular Pharmaceutics (MOPH)
- Pharmaceutical Outcomes and Policy (DPOP)
- Pharmacotherapy and Experimental Therapeutics (DPET)
- ^sPharmacy Practice and Experiential Education (PPEE)

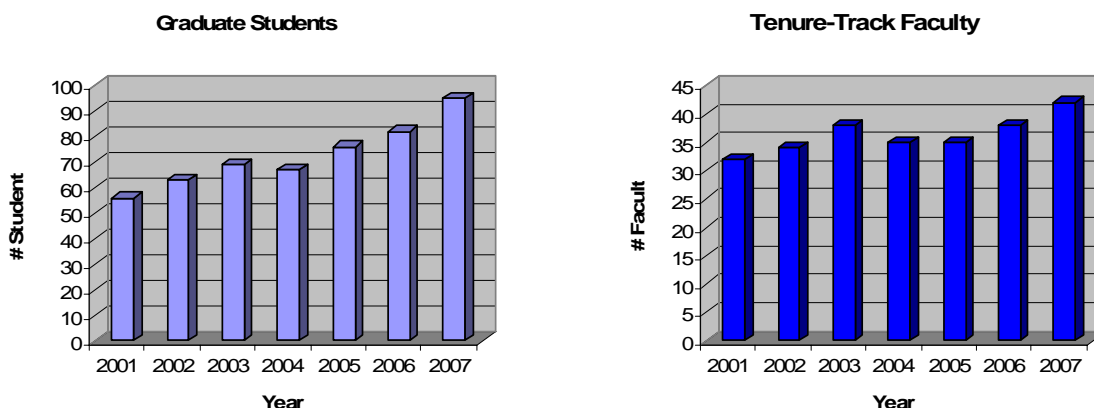
(^sPPEE was created recently as a new Division in the School of Pharmacy. Starting Fall of 2008, PPEE will offer a MS in Health Systems Pharmacy; see Appendix A in the "General" section of the Appendices for program description. For the remainder of this report, only the first four divisions will be discussed.) Each Division offers a PhD track within the Pharmaceutical Sciences Graduate Program designed to prepare students in a specialty area of: drug discovery and experimental biology (MCNP); drug delivery, formulation, and metabolism (MOPH); pharmacoepidemiology, pharmacoeconomics, and social/behavioral pharmacy (DPOP); and translational/clinical research in drug disposition, pharmacogenomics, and experimental therapeutics (DPET), respectively.

2. Growth in the Graduate Program since the Last Review (1999 – 2008)

The graduate program in Pharmaceutical Sciences has grown in scope and size since the last review in December, 1998. At that time, the SOP had 49 doctoral students in the MCNP and Drug Delivery and Disposition (predecessor of MOPH) tracks of the Pharmaceutical Sciences graduate program. In addition, there were 16 Master's students with a concentration in

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Pharmacoepidemiology, offered by the School of Public Health. A new program track in Pharmacotherapy and Experimental Therapeutics was conceived in 1998, and was endorsed by the external panel reviewing the SOP* graduate program; it enrolled its first students in 2001. A doctoral program track in Pharmaceutical Policy and Evaluative Sciences (now Pharmaceutical Outcomes and Policy) was also established in 2001 with enrollment of its first student. In the academic year 2007-08, there are 93 students in the graduate program among the four existing areas of concentration. It is anticipated that there will be well over 100 students in the Pharmaceutical Sciences Graduate Program at the beginning of the 2008-09 academic year. Similarly, the number of tenure-track faculty in the SOP has increased by 30% since 2001. The growth in the graduate program is also accompanied by an increase in the enrollment in the professional program from 120 to 155 entering students per year, with ~15 students per year enrolling at the satellite site of the program at Elizabeth City State University (ECSU).



The physical space allocated to the SOP has increased substantially in size and quality over the past five years, a change that was crucial to supporting growth of both the graduate program and the research enterprise. The School added Kerr Hall in 2002, representing 70,000 square feet of new laboratory, classroom, and office space. This new space complemented the existing 70,000 square feet of space in Beard Hall, most of which has now been renovated since the last graduate program review. The SOP will have an additional 70,000 square feet of laboratory and office space in the new Genetic Medicine Building, which will be ready for occupancy in the summer of 2008. The Genetic Medicine Building is a joint construction project between the SOP and the School of Medicine, and will be occupied by faculty and students of several School of Medicine departments (Pharmacology, Biochemistry and Biophysics, and Genetics). The Beard-Kerr facility is equipped with state-of-the-art video-conferencing

* **Abbreviations Used in this Report:**

AD-RGE	Associate Dean for Research and Graduate Education
DAC	Dissertation Advisory Committee
DDGS	Divisional Director of Graduate Studies
DGS	Director of Graduate Studies
DPET	Division of Pharmacotherapy and Experimental Therapeutics
DPOP	Division of Pharmaceutical Outcomes and Policy
GEC	Graduate Education Committee
GSO	Graduate Student Organization
MCNP	(Division of) Medicinal Chemistry and Natural Products
MOPH	(Division of) Molecular Pharmaceutics
PPEE	(Division of) Pharmacy Practice and Experimental Education
RA	Research Assistant
RGE	Research and Graduate Education
SAC	Student Advisory Committee
SOP	School of Pharmacy
TA	Teaching Assistants

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technology in its two large lecture halls, as well as in several classrooms and conference rooms. Although the video-teleconferencing capabilities were added primarily to support instructional delivery to the SOP's satellite campus at ECSU, the availability of this technology has enabled faculty and graduate students to interact with researchers, including members of graduate student advisory committees, from virtually anywhere in the world. A variety of factors, including the availability of research space of sufficient quality and quantity, has allowed the SOP to aggressively recruit talented scholars at all faculty ranks. These recruitment efforts, coupled with development of existing faculty, have resulted in extraordinary growth in extramural research funding. At the time of the last graduate program review, total extramural research funding was approaching \$3M (with less than \$2M in NIH funding); by the 2006-07 fiscal year, extramural funding had increased to more than \$11M, with more than \$9M in NIH support. Obviously, this robust level of extramural support has significant positive implications for graduate and post-graduate education in the UNC-CH SOP.

3. Governance of the Graduate Program

The faculty of each division have the responsibility to: develop a program of didactic curriculum and research training for graduate education in their respective track; to recruit and admit highly-qualified students; to assess the progress and performance of students pursuing graduate study in their program track; to assure that students are exposed to questions of and training in the responsible conduct of research; to facilitate the student's introduction to her or his scientific and scholarly community; to assist the student in developing a portfolio of accomplishment, including appropriate publications and presentations, that will serve as the foundation for her or his future career; and to ensure the successful and timely completion of graduate training. The graduate program in Pharmaceutical Sciences is administered by the Associate Dean for Research and Graduate Education (AD-RGE) in the Office of the Dean of the SOP, in close consultation and collaboration with the Director of Graduate Studies (DGS), who serves as the SOP's faculty representative to the Graduate School. The Dean, in consultation with the AD-RGE, appoints members of the Graduate Education Committee (GEC) to assist in the management of the graduate program.

The Graduate Education Committee (GEC)

The GEC assists in and oversees the recruitment, admission and progression of graduate students. In addition, the GEC reviews proposals for curricular and course changes, makes appropriate recommendations for those courses, develops policies and procedures related to the graduate program, manages nominations for fellowships, and is responsible for student affairs.

The GEC has six standing members in addition to the DGS, who serves as Chair. Each of the five divisions is represented by a Divisional Director of Graduate Studies (DDGS). Students are represented by the president of the Graduate Student Organization (GSO). A staff member in the Office of RGE (Graduate Student Services Manager) serves as Secretary. Ad hoc members occasionally are recruited for specific activities with defined terms or to achieve specific tasks. The GEC meets monthly, with additional meetings as required for specific activities.

Oversight of Curriculum and Courses

The GEC plays a pivotal role of guiding and overseeing approval and implementation of the graduate curriculum in a new track, or of significant curricular changes within an existing track. The GEC makes recommendations for curricular changes, through the AD-RGE, to the faculty, and finally submits the approved changes to the Graduate School. This role of GEC was critical in navigating significant growth and changes that occurred in the graduate program since the last review. At that time the graduate program in DPET had not been approved, and DPOP offered a master's program, while also training doctoral students in pharmaceutical policy and evaluative sciences who obtained their doctorate from the School of Public Health. The doctoral programs in both of these divisions

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have been implemented since then, and several students have already graduated from these tracks. In 2004 a realignment of direction and course content of graduate programs in DPET and MOPH (formerly Drug Delivery and Disposition) was facilitated by the GEC through review and approval of the transfer of some courses and the introduction of several new courses. In addition, a proposal from the PPEE Division for a Masters degree in Hospital Pharmacy Administration (Appendix A) was reviewed by GEC and approved by the faculty but has yet to admit students. The GEC also reviews and recommends approval of new courses (see end of Appendix A for a new course proposal) or significant changes in the existing courses. For example, GEC has facilitated introduction of several new courses recently, such as ethics (PHCY 801), statistics (DPET831), and clinical trial design (DPET833), that have school-wide impact.

Recruitment and Progression of Students

RECRUITMENT

The GEC has played a pivotal role in evolving a strong School-wide recruitment process since the last review that has contributed significantly to the improvement of the quality of students recruited into the program and helped to create a better balance between international and U.S. citizen/permanent resident students in the program. The most notable among GEC's many contributions toward a School-wide recruitment strategy is the development of the "recruitment weekend concept", a structured integrated program of events to showcase the graduate program, faculty, students, alumni and environment while facilitating the interview process of leading candidates. Featured activities, which are described in the Students Section, include: student poster presentations and orientation discussion with candidates; an address by a distinguished alumnus, and awards ceremony for current graduate students. A video clip of typical recruitment weekend activities, for 2007 as an example, is available at (<http://pharmapp.pharmacy.unc.edu/flash/gradRecruitment.html>).

The GEC co-ordinates the selection of the best candidates, among those who have been offered admission to the SOP's graduate program, to compete for several fellowships offered by the Graduate School to assist in recruitment. Through the GEC's efforts to coordinate the timing and selection of highly qualified candidates who are nominated by the SOP to compete for these fellowships, the incoming SOP students have consistently secured 3-4 Graduate School fellowships over the past several years.

PROGRESSION

The GEC's role in the progression of graduate students begins with a structured and information-rich orientation session that is conducted with the help of the Student Services Manager at the beginning of each Fall semester. During this session, incoming students receive information about the graduate program, the School, the campus, laboratory and public safety issues, the resources available to the students, management of the teaching assistantship program, etc. During this session, incoming students are informed of the expectations of the SOP graduate program including ethical conduct, work habits, collaboration, etc. The students also are advised during orientation (and are reminded annually) of the avenues available to air concerns or grievances, which sequentially include: direct discussion with Major Advisor; referral to committee Chair or other members of their Student Advisory Committees (SAC) or Dissertation Advisory Committees (DAC) (see Students section); meeting with the DGS, the AD-RGE, and ultimately the Dean of the SOP. A typical orientation program agenda is included in Appendix B. In certain instances, concerns about the work environment and collaborations may also be raised in GSO meetings (see Students section) and subsequently brought to the GEC.

While routine student progression is monitored by the DDGS, the Division Chair, and divisional faculty, the GEC sets broad progression policies and ensures implementation. An example of such a

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policy is the guidance developed by the GEC on external employment of graduate students (see Appendix C) to ensure that student progression is not adversely affected.

The GEC develops proposals for student recognition, incentives, and awards that encourage graduate students to excel in their research, teaching, and leadership, and to seek external competitive funding. Several awards are conferred annually (see Appendix D for details on Awards and Fellowships), and the GEC frequently develops and implements processes for nomination and selection of candidates for some of these awards.

Student Welfare

The GEC attends to the general welfare of graduate students, and develops guidelines and policies in consultation with the AD-RGE that affect student welfare. An example of such an action is the development and implementation of the family (maternity/paternity) leave for graduate students and post-doctoral fellows (Appendix E). This represents an important benefit to students in the graduate program. Student welfare also is supported by the GSO (see Students section).

4. PharmD/PhD Program

In the Fall of 2007, a sub-committee of the GEC made recommendations for a sequential PharmD/PhD degree (see Appendix F). This approach would not constitute a truly combined degree program but would allow some elements of a combined degree to be achieved due to the sequential nature of the course of study. This proposal was facilitated by the SOP's announcement in 2007 of the intent to award a Bachelors degree in Pharmaceutical Sciences to all students prior to completion of the PharmD curriculum, thereby making students eligible to apply for admission to the Graduate School. Each division put forward a curriculum employing the elective options of the PharmD degree to allow reduction in the time to completion of the PhD coursework (end of Appendix F). It is anticipated that this would reduce the time to completion of the sequential degree by one semester. In addition, participation of eligible students in the SOP's Honors program would allow an early start on a research project, resulting in additional time savings of one or more semesters. In total, it is anticipated that time to completion of the sequential degree program would be reduced by 1 year. In the best case, 7 years would be required to complete both degrees (4 years to complete the PharmD and 3 years to complete the PhD)

The Students

1. Preamble:

Graduate students are the life-blood of the graduate program. They provide a major driving force and intellectual resource for the research conducted by the faculty in the School. They also play a critical role in the teaching mission of the School through service as teaching assistants (TAs). As such, the students are encouraged to see themselves as important participants and partners in the research and educational missions of the School. They will become future scientists and leaders in pharmaceutical sciences within the biotechnological and pharmaceutical industries, federal and state government agencies, and other research foundations and organizations. Importantly, the students will represent the School and its graduate program to the world as future educators.

The following lists some key demographic information on the current 93 graduate students in the SOP.

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Current Student Demographics

- by Division: MCNP (39), MOPH (29), DPET (12), DPOP (13)
- 50 U.S., 43 international
- 36 male, 57 female
- 7 minority students (6 female, 1 male)

2. Recruitment

Recruitment of new graduate students is one of the most important activities for any graduate program. The four divisions recruit outstanding students and continue to attract more high-quality candidates than ever before. Although the divisions take responsibility for recruiting students who fill the needs of their respective tracks, the recruitment of graduate students is supported by the Office of RGE in close collaboration with the GEC and divisional staff.

All inquiries from potential candidates are fielded by the Graduate Student Services Manager in the Office of RGE, who also assists potential candidates in completing applications to the UNC-CH Graduate School. The inquiries are referred to the respective divisions (DDGS and Division staff), and the divisions directly respond to program-specific inquiries. Applications are received in the Fall of the academic year prior to admission and are accepted until April of the Spring semester.

Potential candidates (international and the U.S.) are often interviewed by telephone, and among those who are in the U.S., a certain number are invited to UNC-CH during the recruitment-weekend (Friday-Sunday) held in late January. During this weekend, the candidates have an opportunity to meet faculty members in their targeted program who are recruiting graduate students, and hear about their research programs. Much of the organization for this recruitment event is provided by the GSO and GEC in coordination with the Office of the RGE. When applicants arrive at UNC-CH, each candidate is assigned to a graduate student host who accompanies them to their campus housing. All candidates are greeted at a reception in the School, where they can meet with faculty, current graduate students, and administrators. On Saturday, students have one-on-one interviews with faculty, attend a poster session and an informational podium session organized by the graduate students, and attend a banquet where current students are honored for their achievements. A distinguished alumnus is selected to present their current research/activities and to discuss the impact their training has had on their career. The recruits are free to socialize with graduate students for the rest of the evening, and they typically leave on Sunday morning (<http://pharmapp.pharmacy.unc.edu/flash/gradRecruitment.html>).

Candidates for nomination to Graduate School Fellowships are identified following recruitment weekend. The GEC reviews each Division's nominees and selects the best candidates (usually 4 or 5 from a total of approximately 30 interviewed). However, recruitment of individual students continues until close of applications to accommodate each division's requirements to fill available positions for the coming year.

3. Student progression

The progression of students through their coursework and dissertation research in each division is an important responsibility that is shared by the Major Advisor, the division faculty, the GEC, and the administration, including the Division Chair, the DGS, the AD-RGE, and the Dean. The following is a general description of progression through the PhD program in Pharmaceutical Sciences, including coursework, research, qualifying examination components, and dissertation defense/submission. This progression sequence is essentially the same for each of the specialty tracks in the graduate program. Any additional or variable requirements are discussed in the division-specific sections of this report.

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On average, students complete their training in 5 years, consistent with the expectations of the UNC-Chapel Hill Graduate Program. The major milestones are:

1. (by end of 4th semester) Completion of required courses and research rotations
2. (by end of 4th semester) Selection of Major Advisor for dissertation research
3. (by end of 2nd year) Passing the written qualifying exam
4. (3rd year) Preparation of dissertation proposal
5. (by end of 3rd year) Passing oral qualifying exam and/or defense of dissertation proposal
6. Defense of completed doctoral dissertation

Full descriptions are provided below and in divisional sections of this report. The University's time limit for completion of all PhD requirements is eight years from the date of first registration.

Coursework and Qualifying Exams

The graduate program curriculum for each track is comprised of core courses and electives to provide students with a strong foundation in their respective areas of graduate study. The curriculum and course sequences for each track are provided in the respective divisional sections of this report. The coursework is completed by the students in three to five semesters. The curriculum for each track, and any changes in the curriculum, are approved sequentially by the respective division faculty, GEC, AD-RGE, the entire SOP faculty, and then forwarded to the Dean of the Graduate School.

The Graduate School requires that, after completing core coursework and prior to advancement to candidacy, all students must fulfill the qualifying examination requirement, which is based on testing core competencies and consists of written and oral components. These qualifying examinations (see below) are administered by the divisions for their respective track, and will be discussed in the division-specific sections.

Selection of Major Advisors

During their first four semesters, graduate students are required to complete research rotations. This activity allows students to gain direct experience with research in specific laboratories and to observe the dynamics of research and managerial styles within the associated research groups. Rotations are typically for the length of a semester and are performed concurrently with coursework and any TA responsibilities. (DPOP does not have research rotations but has a required research practicum which is discussed in the division-specific section). By the end of the second year, the student should reach a mutual agreement with a faculty member to join his/her research group. Upon selection by the student, the faculty member takes over formal responsibility as the Major Advisor. The student's dissertation research is conducted in the Major Advisor's research group; the Major Advisor must have a close affiliation with the student's division within the SOP. Typically, only a tenure-track faculty member with an active research program can assume the responsibility as a Major Advisor. Fixed-term faculty members (e.g. Research or Clinical) may accept students under co-supervision of a tenure-track faculty member.

Dissertation Advisory Committee

When the PhD candidate has identified the Major Advisor, a committee is formed to formally guide the development of the student and provide an "outside" perspective of the dissertation project. Initially this is a three-member committee called the SAC, and eventually expands to a five-member (minimum) committee called the DAC. The purpose of the SAC is to assist students in planning the program of study prior to formation of the DAC. The SAC consists of the student's Major Advisor as Chair and two other members of the graduate faculty.

Typically during the third year, the SAC committee is expanded to the DAC by adding (at least) two members. The DAC should meet at least once a year to maintain oversight of the student's progression

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and development of the dissertation project, until the dissertation is completed. The DAC forms the panel that ultimately participates in the dissertation defense and accepts the final, written dissertation. In DPET and MOPH, one of the members of the DAC who is not the student's Major Advisor serves as the Chair of the DAC, while in MCNP and DPOP the Major Advisor serves as the Chair of the DAC. A majority of the members of the DAC (and a majority of the faculty passing the student on an examination or approving a doctoral dissertation) must be regular members of the UNC-CH Graduate Faculty in the SOP; two of these three must be from the same division as the student. In addition, at least one member of the DAC should be from outside of the division, and may be from other departments or institutions. In principle, the committee also provides a mechanism to mediate any concerns that may arise between the student and the Major Advisor regarding the student's dissertation research.

Written Qualifying Examination

The purpose of the written qualifying examination is to test students on core competencies appropriate to the student's graduate program track. This examination is administered differently depending on the division (see divisional sections of report).

The Dissertation Proposal and Oral Qualifying Examination

The selection of a dissertation topic is a joint decision between the student and the Major Advisor. The student must prepare a written dissertation proposal which includes a survey of the research literature, a statement of research objectives, a detailed description of the research methods, and the significance of the proposed research. Before any studies are performed and data are collected, research involving human or animal subjects must have the approval of the student's Major Advisor and the appropriate Institutional Review Board (IRB) or the Institutional Animal Care and Use Committee (IACUC).

Students usually defend the dissertation proposal during the third year of graduate studies. The student must conduct a dissertation proposal defense that focuses on subject matter related to the proposed research. For all divisions except MOPH, the defense is synonymous with the oral qualifying examination. In MOPH, the dissertation proposal defense is separate from the oral qualifying examination (see MOPH section). All members of the DAC must be present for the oral examination. A "pass" is based on the presentation of an acceptable proposal and on the demonstration of a satisfactory level of knowledge in the subject matter of the dissertation and related areas. A majority of committee members must vote to pass the student. A student who fails the proposal defense is given a second opportunity. If a student fails a second time, she or he becomes ineligible to continue in the Graduate School. Upon passing the oral qualifying exam, the student is advanced to the doctoral candidacy. The proposal defense is scheduled after passing the written qualifying examination (and in the case of MOPH, both written and oral components) and after obtaining permission from the Graduate School.

Dissertation Research and Defense

After advancement to candidacy, the dissertation research becomes the primary focus of the graduate student. While the Major Advisor has responsibility for close supervision of the student and research on a regular basis, it is the responsibility of the DAC to assess the overall direction and progress of the project and advocate for timely completion of the dissertation. The final defense occurs upon completion of research and dissertation preparation. Majority committee approval of the dissertation and defense is considered sufficient for a "pass" by the Graduate School. The dissertation is submitted to the Graduate School after approval by the DAC. General Graduate School guidelines and procedures are followed for signing and submission of students' written dissertations. The students must be registered during the semester in which they defend.

4. Student Advising and Mentoring

Mentoring of graduate students is a critical aspect of graduate education. The mentoring process begins with advice on program requirements from the DDGS. As students progress into the research phase of the program of study, the formal committee structure described above provides a framework for scientific advisory of each student. However, most mentoring occurs in laboratories between the student and her/his Major Advisor, as well as between the student and other more experienced members of the research group. Individual mentoring is the responsibility of faculty advisors, who frequently are reminded of the importance of effective mentoring. One mechanism for this is the new Bill and Karen Faculty Mentoring Program, currently led by Kenan Professor Harold Kohn (<http://www.pharmacy.unc.edu/faculty-research/campbell-mentoring>). Twice a year, Professor Kohn brings together assistant professors from within the SOP to discuss pertinent issues that include effective mentoring of graduate students. Issues relating to student advising and mentoring are also frequently brought up in both divisional and School-wide faculty meetings. The individuals with various administrative responsibilities within the graduate program make every effort to be accessible to the students, and often seek out their views and opinions on individual or collective student issues. The AD-RGE meets with students in each division once every semester to have a conversation with them about their progress and about any issues they may have.

5. Graduate Teaching and Teaching Assistantships

Purpose

It is the philosophy of the SOP that graduate students obtain valuable teaching experience by working as TAs. Teaching assistantships are awarded to graduate students, typically in their first and second years of study, to provide instructional support for courses and laboratory sections. These service awards include a stipend and payment of health insurance fees for the student. The majority of TA assignments are for courses in the PharmD program. However, some graduate courses and core facilities also employ TAs.

Requirements

Assistantships begin with the start of classes in August. TAs are assigned to specific courses at the beginning of each year by the AD-RGE in close consultation with the Associate Dean for Professional Education. The requirements of the courses and the student's scientific background, language skills, other experience, and his/her course schedule are all taken into consideration in making the assignments. The course directors weigh in if they have specific requirements for their TAs. During the summer and winter breaks, students are expected to assist the faculty in revising previously taught courses and developing new ones.

Each teaching assistantship carries a service commitment of 15 to 20 hours per week. Assistantships constitute full employment, and as such, are not consistent with holding concurrent appointments, either salaried or hourly (see Appendix C). While course-related duties may not always require this amount of effort, particularly during summer sessions, the remaining obligated time is reserved for the student's research and professional development. In general, teaching assistantship duties include assisting with course material preparation, grading, holding office hours for students, leading recitations/discussion groups, and/or providing assistance in a laboratory setting. TAs are expected to regularly attend the assigned courses and also may be asked to present a limited number of lectures.

6. Funding of Students

With rare exception (e.g. students with scholarships covering both tuition and living expenses, part-time students with employment), graduate students are admitted to the program with full financial support, which includes stipend (as a TA or research assistant [RA]), health insurance,

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(including the SOP endowment, managed by the Pharmacy Foundation of North Carolina, Inc.), sponsored research funding of the Major Advisor, and fellowships/scholarships awarded to students.

Each graduate student receives a stipend either as a TA or as an RA. The stipend level, which is established by the Dean in consultation with the AD-RGE and GEC, currently is \$22,500 per year. The stipend to TAs is paid by the School, and to RAs is paid by the student's Major Advisor unless the student is on a fellowship or scholarship. The tenure for TAs was recently reduced from two calendar years to four semesters (summers funded by faculty), and will be further reduced to one calendar year starting in Fall 2008; a few TAs may serve for an additional period on an as needed basis.

Academic year tuition for 2007-2008 is \$4,613 for North Carolina residents, and \$18,611 for non-residents; both groups of students pay student fees of \$1,618 per year. Students who are U.S. citizens or permanent residents can apply for North Carolina residency beginning in the second year of graduate study. The students can register for a minimum of 3 credits after they have completed course work and passed the written qualifying examination, and are charged half the tuition compared to students who are registered for full credit (9 credits).

International students are not eligible for North Carolina residency throughout their graduate studies; and they are not eligible to be trainees in federally funded training grants or for many of the federally and privately funded pre-doctoral fellowships and scholarships. This makes it particularly challenging to fund highly-qualified international students.

The Graduate School offers merit assistantships (1- and 5-year) and other scholarships (diversity and specialized interests) to entering doctoral students in all Schools and Departments on a competitive basis. These merit assistantships are awarded based on GRE and GPA scores, academic and personal achievements, and the principle of fostering diversity in its selection process. The School has, in recent years, received 3-4 of these awards each year.

7. The Graduate Student Organization

The SOP GSO (see Appendix B) was established in 1998. The purpose of the GSO is to promote the varied interests of the graduate students. The objectives of this organization include (1) improving and sustaining the quality and reputation of graduate education at the SOP; (2) facilitating rapport among graduate students in different tracks of the Pharmaceutical Sciences graduate program; (3) encouraging interaction between graduate and professional students; (4) facilitating communication between graduate students, faculty, and administration; (5) discouraging and revealing discrimination against graduate students based on sex, race, religion, national origin, age, disability, or sexual orientation; (6) encouraging participation in University, State, and National graduate student and scientific organizations. The GSO plans at least one outside social activity per month. These activities allow graduate students to relax and interact outside of the confines of the school. In addition to social events, the GSO organizes and holds an annual fundraiser at the school for student-selected local North Carolina charities, thus making contributions on behalf of the graduate students and the School to the local community. The GSO invites a guest speaker of national/international reputation to the School, and hosts the visit. Graduate students and the GSO also play a major role in the recruitment of graduate students by actively participating in many activities of the recruitment weekend each year. The GSO is allocated an annual budget, currently \$2,500.

Membership in the GSO is extended to all graduate students in the SOP including students whose primary affiliation is outside the school (e.g. Public Health, Pharmacology, Toxicology, etc.) but whose Major Advisor is a faculty member in the SOP. There are many rights and privileges granted to each member of the organization. Each member has the right to vote on all non-executive decisions made by the

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organization. The GSO serves as an outlet for students to voice individual opinions. In turn, the organization then provides a unified voice for suggestions to faculty and administration. The GSO Chair, elected from the general membership, is responsible for presiding over all meetings and serves as the official representative of the graduate student body to the faculty/administration. The GSO president is a member of GEC, and represents students on that committee. Each division of the school elects a GSO Co-Chair that represents the divisional interests at executive meetings. There is a faculty advisor to the GSO who provides a source of guidance, support, and insight as related to graduate student issues.

8. The UNC-CH Student Chapter of the American Association of Pharmaceutical Scientists (AAPS)

The UNC-CH Student Chapter of AAPS was established in 2005. AAPS, the largest international organization for pharmaceutical scientists, devotes significant resources to support and encourage high standards of education for pharmaceutical scientists. In this vein, the organization provides annual funding for local university chapters to promote science and community in the pharmaceutical sciences. The UNC-CH AAPS student chapter has brought prominent scientists in the field to talk, not only about their research and current work, but also to provide career perspectives on science in industry, academia, and government. The student-led organization also provides social events for graduate students to interact with each other outside of the School, and to network with other student chapters and scientists across the country and globe. Membership in the UNC-CH AAPS student chapter is open to all graduate students, post-doctoral students, and professional students. Membership in the AAPS organization is not a requirement to become a member and participate in the AAPS student chapter. The UNC-CH AAPS student chapter is expanding and providing resources for the graduate students to help them network and begin their careers following their graduate education.

9. 2007 Student and Alumni Survey

In the Fall of 2007, surveys were administered to current graduate students and recent alumni of the SOP (refer to Appendix G and H, respectively, for complete survey results) to assess levels of student and alumni satisfaction with the graduate program.

Overall, the student survey results were quite positive with the majority of students satisfied with the graduate program. Among students, the most significant aspect of their training was the quality of research (90% responded 'very important'). The scope and areas of research being pursued at the SOP rated as the most important factor in the decision of current graduate students to join the program (73% responded 'very important'). The reputation of the School was viewed by the students as not only an important factor in recruitment of students (~70% responded very important), but also a main strength of the program. The availability of faculty for mentorship and help with coursework was considered a major strength of the program. Many short-answer responses confirmed this, and ~60% of the students responded that they were very satisfied with their Major Advisor's help in building their graduate experiences around their anticipated career path (e.g., industry, government, or academia).

Some aspects of the graduate program received mixed responses. For example, 38% of the students considered the graduate coursework as very important, 47% as moderately important, and 15% as not important. Research collaborations and networking, both inside and outside the students' divisions, also received mixed responses - 37% of the students were very satisfied, 46% moderately satisfied, and 17% not satisfied with opportunities to collaborate outside the division. While 38% of the students were very satisfied with their ability to interact within their division, 40% of the students were not satisfied with their ability to network with local scientists outside UNC-CH, and 48% were not satisfied with their ability to network with UNC-CH SOP alumni. Nevertheless, at least two-thirds of the students were at least somewhat satisfied with the overall level of collaborations and interactions at the SOP. The short

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answers regarding both coursework and collaborations/networking revealed that the mixed responses were likely due to differences among the four divisions related to coursework and availability/accessibility of collaborations/networks; these observations deserve closer analysis and attention to these issues by each division. This survey result was somewhat unexpected since many of the faculty and research groups have ongoing collaborations within the SOP, the UNC-CH campus, and in the Research Triangle Park area, and the graduate students are exposed to these collaborative opportunities. For example, some students are co-mentored by two faculty members from the same or different divisions within the SOP, and some SOP faculty members accept students from a division other than their own or from other programs on the campus (e.g., Interdisciplinary Program in Biomedical Sciences (IBMS), Curriculum in Toxicology, etc.). Another example of a networking opportunity is the monthly seminar series sponsored by the Office of Technology Development at which faculty entrepreneurs, venture groups, patent law firms, and biotechnology start-up companies make presentations and meet informally after the seminar. A joint seminar series is organized by MOPH and MCNP. The seminars within the SOP are open to all students, post doctoral fellows and faculty, and the announcements are posted on the SOP website to encourage broad participation; seminars on the UNC-Chapel Hill campus are also open to all students, post doctoral fellows, and faculty.

Areas that received a less favorable rating and represent priorities for the GEC's consideration were the quality and structure of laboratory rotations, TA assignment organization, and student compensation. Approximately 20% of the students were not satisfied with the quality of the learning experience from the research rotation; when asked to suggest improvements, many students preferred more organized and formal laboratory rotations during the first year. Research rotation organization and procedures are varied across divisions and therefore opinions may appear to be conflicting in these survey data. TA assignments, in terms of fairness and organization, were viewed by students as an area that needed improvement. This issue has been brought to the attention of the SOP administration previously. As a result, the AD-RGE and the Associate Dean for Professional Education have been given the responsibility for TA assignment. Significant efforts are made by the Associate Deans to meet the teaching needs of the professional and graduate programs by assigning graduate students with relevant scientific background, language skills, and experience to different courses; they also have been working together to address the issues surrounding equity, organization, and communication of TA assignments. Student compensation was cited by many students as an area in need of improvement: 24% of the students were very satisfied, 48% were moderately satisfied, and 28% were not satisfied. Short-answer responses revealed that students were not satisfied with the requirement that students, rather than the program, are responsible for student fees, which is not consistent with other departments at UNC-CH. Sustained effort has been made to make the stipend level competitive, with an increase in annual stipend from \$ 16,500 to \$22,500 over past five years. The current stipend is competitive with respect to peer Schools of Pharmacy nationally (average of 15 peer institutions is \$19,821; UNC-CH ranks at the 87th percentile within this group), and comparable to other departments and schools at UNC-CH.

Alumni opinions were in many areas similar to those of current graduate students. Alumni were mostly pleased with their educational experience. Research training was the primary reason for the alumni attending the SOP, and each person was very satisfied with the majority of areas of training. Preparation to teach and to supervise personnel did not receive a good rating. Alumni were not satisfied with the financial support and the extent of contact with graduate students or research laboratories from other divisions within the SOP during their graduate training. Manuscript and grant writing training was the most helpful component of graduate education for recent alumni when beginning their careers. The alumni also were asked how we could improve our graduate program; the suggestions for improvement were in line with those from current graduate students. For example, the alumni suggested an increase in networking opportunities with local industrial and academic programs. In short, both current graduate students and recent alumni in general were satisfied with the status of the graduate education in the SOP,

but recommended an increase in opportunities for school-wide and external interactions and collaborations.

The Faculty

The faculty members of the SOP are the architects of the graduate program, and have the responsibility for the curricular content of the program, training of graduate students, and oversight of the graduate curriculum and graduate student training. Out of a total SOP faculty of approximately 100, over one half is actively involved in graduate education. The graduate faculty is populated with internationally-reputed experts in their respective fields. The faculty of each division, including adjunct faculty, is described in the divisional sections and their biographical sketches appear in the respective appendices.

The tenure-track faculty consists of 42 professors (assistant, associate, full), with 78% / 22% males /females, respectively, none of whom are considered of minority status. Of the graduate faculty, 33 have the PhD, 12 have the PharmD, 3 have both the PharmD and the PhD, 1 has an MD/PhD combination, and 1 has the DrPH degree. The graduate faculty has grown in size significantly over the past five years. Indeed, 13 new tenure-track faculty members have joined the SOP. This growth in the graduate faculty has fueled the growth in the graduate program over the same period: the enrollment has increased from 63 to 93. The average ratio of graduate students to faculty is 2.2. The faculty members play an important role in creating resources to support the graduate program, contributing 46 % of the total stipend and tuition cost of the graduate program.

The faculty is engaged in very diverse scholarly activities, enriching the graduate training. In order to recognize the scholarly accomplishments of SOP faculty members in diverse fields, the appointment, reappointment, promotion and tenure document was revised recently (pharmacy.unc.edu/about-us/school-organization/office-of-the-dean/arpt-final-january-2007.pdf/view?searchterm=Promotion%20and%20tenure).

Recruitment of the highest quality faculty, as well as their retention, is given high priority by the Dean of the SOP (see strategic plan of the SOP, <http://www.pharmacy.unc.edu/about-us/school-organization/office-of-the-dean>), recognizing the pivotal role of the faculty in both the professional program as well as graduate research and education. A formal program, led by Dr. Hal Kohn (Bill and Karen Faculty Mentoring Program, <http://www.pharmacy.unc.edu/faculty-research/campbell-mentoring>), is in place to provide mentoring to junior faculty. Significant efforts are being made to ensure that faculty compensation is competitive nationally. In addition, an incentive plan has been implemented to reward faculty members for superior performance in research and teaching. The distribution of faculty salaries is shown in Figure 1, with salaries color-coded according to rank. This distribution is for all tenure-track faculty members in all five divisions (DPET, DPOP, MCNP, MOPH, PPEE). To provide a frame of reference, salary ranges for assistant, associate, and full professors are compared to average salaries for corresponding ranks computed from four different groupings of peer institutions.

Peer Group #1: UCSF, U. of Utah, U. of Kansas, U. of Washington, U. of Illinois at Chicago.

Peer Group #2: U. of Arizona, U. of Montana, UNC-CH, Purdue Univ., U. of Pittsburgh, U. of Wisconsin – Madison.

Peer Group #3: UCSF, U. of Texas-Austin, UNC-CH, Purdue Univ., U. of Arizona, U. of Michigan - Ann Arbor, U. of Minnesota - Twin Cities.

Peer Group #4: U. of Illinois at Chicago, U. of Kentucky, U. of Maryland - Baltimore, Ohio St. Univ., U. of Florida, U. of Wisconsin - Madison.

Peer groups #1 and #2 correspond to the top 1-5 and 6-11 universities (UNC-CH ranked 6th and is excluded) ranked by NIH Grants and Contracts, as compiled by the *American Association of Colleges of*

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Pharmacy for the period 2006-2007. Peer groups #3 and #4 correspond to the top 1-4 (excluding UNC-CH) and 8-11 universities ranked by US News & World Report in 2005 (note that there were 3- and 4-way “ties” for certain rankings).

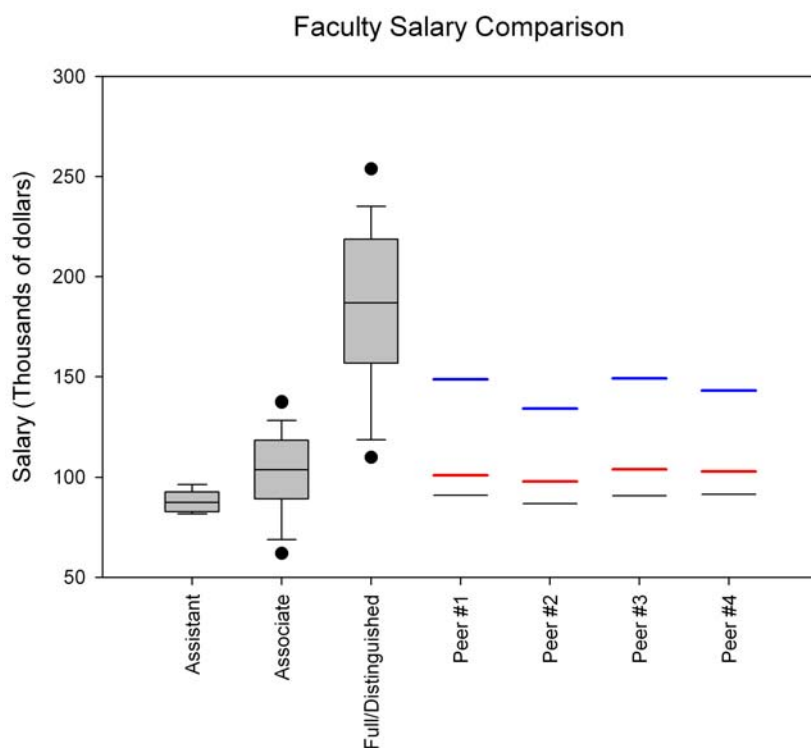


Figure 1. Faculty salaries (all 5 divisions, as of Fall, 2007) in comparison to peer institutions. Peer group averages are shown as horizontal lines for assistant professor (black), associate professor (red), and professor (blue) ranks. Box edges correspond to 25th and 75th percentiles; error bars correspond to 10th and 90th percentiles; middle black lines are medians; outliers are shown as black dots.

All faculty members submit annual merit review forms, which document research, teaching, and service activities. Faculty members are evaluated formally each year by their respective Division Chairs. Research grants, publications, teaching load and effectiveness, service-oriented activities, and overall impact are taken into consideration. Subsequently, the faculty members from all five divisions are ranked by the SOP leadership team comprising of Division Chairs, Associate Deans, and the Dean, based on their overall impact on the SOP’s mission. Annual salary raises are based on these rankings.

The Administration

The administrative structure of the SOP is shown schematically in Appendix I. The administrative team, headed by the Dean, is comprised of an Executive Associate Dean, four Associate Deans, and five Division Chairs. The responsibilities and accountabilities of the administrative team are defined in the faculty code document (<http://www.pharmacy.unc.edu/about-us/school-organization/office-of-the-dean/faculty-code.pdf/view>). Briefly, the Division Chairs are responsible for setting the academic and research directions of their respective divisions, including recruitment/retention of faculty and, in consultation with

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the division faculty, recruitment/progression of graduate students. The Associate Deans have administrative responsibilities that span across all divisions. The Executive Associate Dean is responsible for academic affairs as well as for business, HR, and IT infrastructure, managed by the Assistant Dean for Integrated Business Systems. The Associate Dean for Professional Education has responsibility for the PharmD program, and the AD-RGE is responsible for the graduate program as well as the research enterprise. The Associate Dean for Advancement is responsible for alumni relations and fund raising. The administrative team functions as a highly-integrated team, with each member of the team providing and seeking input on all major issues.

Future Directions

In order to manage the growth and bring focus to the rapidly growing research enterprise, the SOP has established several research centers – these include the Center for Integrative Chemical Biology and Drug Discovery, the Center for Nanotechnology in Drug Delivery, the Center for Experimental Therapeutics, the Center for Pharmaceutical Outcomes and Policy, and the Institute for Pharmacogenomics and Individualized Therapy. These centers are being developed currently, and will be populated fully over the next two years. Graduate students will benefit greatly from the opportunities to work in these integrated multidisciplinary research centers that will lead to discovery and development of new therapeutic entities and/or targets and new approaches to deliver drugs to patients.

Significant growth of the educational function and the research enterprise is anticipated in the near future. A major initiative, Educational Renaissance, a comprehensive effort to revolutionize our approach to educating both professional and graduate students, is underway. The new Centers that have been launched recently will provide focused areas of research/educational excellence, foster interdisciplinary efforts on the UNC-CH campus and beyond, and provide impetus for growth. The SOP has forged an agreement to partner with the School of Medicine for construction of a new research facility. This facility will be completed in 2011, and will add an additional 70,000 square feet of office and chemical fume hood-intensive research space to the existing 210,000 square feet of space (including the Genetic Medicine space). To accommodate the anticipated growth of the graduate program, a significant effort has been expended in developing a recruitment strategy (see Appendix J for the current draft) that outlines in-state, national, and international outreach. The goal is to sustain and continuously improve quality and diversity of the student body.

As the SOP's graduate program in Pharmaceutical Sciences grows in size, complexity, and stature, it must anticipate new challenges in the future. The program's current budget exceeds \$4M, and is expected to rise with the anticipated growth. A business model must be created that can sustain the current program and accommodate the anticipated growth in the face of relatively flat sponsored research funding and somewhat pessimistic near-term economic outlook. A less friendly immigration policy and economic considerations call for the development and implementation of an effective strategy for recruitment of high caliber graduates of U.S. educational institutions. The program must develop a culture that will maximize the opportunities for its students to train in a multi-disciplinary environment that will enable them to pursue highly successful academic, industry, or government careers in a global healthcare field. Current emphasis on NIH-funded hypothesis-driven research is likely to produce scientists who may find it somewhat difficult to adjust to applied, problem-driven science pursued in pharmaceutical companies where most of the graduates will seek employment.

Looking into the more distant future, globalization is inevitable, and is likely to affect the School's ability to recruit the highest quality faculty and students from other countries, particularly from countries in Asia. The SOP is actively seeking collaborations and strategic alliances with internationally-ranked educational

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institutions to expand the scope of its educational and research mission beyond boundaries of the United States, to be positioned favorably in competing for faculty and graduate students globally. Clearly the SOP is poised to meet the challenges and seize many opportunities that await it in the future; and the graduate program in Pharmaceutical Sciences will play a critical role as the SOP pursues its ambitious vision.

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Division Overview

Medicinal Chemistry is a dynamic, multifaceted scientific discipline dedicated to the improvement of human health through research leading to new concepts for the design and development of therapeutic and diagnostic agents including those based on natural products. The focus of Medicinal Chemistry is on using chemical agents to interrogate biological systems, which positions it at the interface between traditional chemistry and traditional biology. The field also has deep connections with medicine and computational and statistical sciences. While maintaining a traditional emphasis on the small molecule (drug candidate), the Division of Medicinal Chemistry and Natural Products (MCNP) has integrated contemporary biological methods to merge small molecule and target biomolecule research for elucidation of disease pathways and mechanisms of drug action. Thus, our program encompasses drug discovery, target discovery and validation, and the use of computational sciences to help describe and predict drug action. This information serves as the basis for the development of new therapeutic agents. As part of the emerging focus of the division on translational research we have recently established the Center for Integrative Chemical Biology and Drug Discovery (CICBDD), which is directed by Dr. Stephen Frye, a former global head of Medicinal Chemistry at GlaxoSmithKline.

The division has research strengths in:

- Synthesis and structure-activity characterization of pharmaceutically relevant synthetic organic molecules
- Synthesis and biological activity characterization of natural product derivatives
- Bioorganic and chemical biology studies of the properties of designed small-molecule ligands and their cognate drug targets, including proteins, nucleic acids, and glycoconjugates
- Combinatorial biochemistry and proteomics for the identification of novel signaling pathways and drug targets
- Biological screening of neuropharmacological agents
- Structural biology and biomolecular dynamics of drug-protein interactions
- Chemo- and bioinformatics and molecular modeling

The division has experienced a sustained growth, in part, due to recent renovation and expansion of the facilities and growth of the SOP endowment. Beginning in May 2008, the School will occupy an additional 75,000 square feet of state-of-the-art research space in the newly constructed Genetic Medicine Research Building, and the division will have a commitment of substantial space in this new building.

The division currently consists of 12 tenured/tenure-track faculty, spanning a wide range of expertise outlined above. Several additional members of the division hold the rank of adjunct or joint professors, and several full time members of the division have joint appointments in other departments, schools, and centers at UNC-Chapel Hill, emphasizing the interdisciplinary nature of our research. The division is currently chaired by Prof. Alexander Tropsha. The MCNP Division has the following Mission and Vision.

Mission Statement: The mission of the UNC-CH Division of Medicinal Chemistry and Natural Products is to advance nationally and internationally recognized research, training, and professional service in the discovery and exploitation of therapeutic agents and their biological targets.

Vision Statement: Our vision is to become the nation's leading academic research unit in the areas of medicinal chemistry and natural products.

Goals. The division has formulated the following goals as part of a strategic planning process that was completed in the Fall of 2006.

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- Garnering external funding.
- Recruiting and retaining top-quality students and faculty.
- Publishing in high profile journals.
- Organizing and presenting at international and national meetings.
- Serving as members of scientific advisory panels.
- Leading discovery of intellectual property.
- Establishing collaborations, partnerships and alliances to lead integration of chemistry and biology.
- Incorporating innovative methods and content of instruction.

Every goal has natural and measurable criteria of success such as the amount of yearly and long-term federal funding, GRE scores for incoming students, number of publications and patent applications by faculty, etc. The Strategic Plan has established several directions for the MCNP Division and named individual faculty accountable for implementing various plans and initiatives to achieve our goals.

Need/demand for medicinal chemistry and natural products research: The pipeline of new, efficacious therapies is inadequate to address current health needs. The recent report by the Government Accountability Office (GAO: www.gao.gov/cgi-bin/getrpt?GAO-07-49) cited science and intellectual property among key issues that “hamper the development of new drugs”. The same report noted that the rate of submission of New Molecular Entities to the FDA has become nearly stagnant. These trends emphasize the need for greater investment in medicinal and natural product chemistry as primary disciplines responsible for the discovery of potential drug candidates. With the support of the SOP administration and fueled by the success of its faculty and students, the MCNP Division plans substantial expansion in its faculty base in the next several years.

Interdisciplinary Activities: Medicinally chemistry is a highly interdisciplinary area of research; it requires deep understanding of major principles of organic chemistry, biology, pharmacology, biochemistry and biophysics, and informatics. The research projects in the MCNP Division capture this diverse nature of the discipline with the increasing focus on chemical biology and chemical genomics. Chemical Biology (or closely related chemical genomics) is concerned with studying vital biological processes in living organisms using specially designed chemical probes. It is widely regarded as one of the pillar areas of the NIH Roadmap. It is also one of the key areas of development identified by the division.

One measure of interdisciplinary research within the division can be found in faculty participation, membership, and joint appointments in other units on campus. Two excellent examples are the joint recruitment of David Lawrence with the Chemistry Department in the School of Arts and Sciences, and partnering with the School of Medicine for the recruitment of Dr. Bryan Roth by the Pharmacology Department.. Of the twelve tenure-track faculty, joint appointments with other departments are held by Dr. Kohn (Chemistry), Dr. Lawrence (Chemistry), Dr. A. Lee (Biochemistry and Biophysics), Dr. R. Liu (Genome Sciences Center), Dr. Roth (primary appointment in Pharmacology), and Dr. Tropsha (Genome Sciences Center, adjunct in Biomedical Engineering). In addition, four MCNP faculty have membership with the Lineberger Comprehensive Cancer Center (LCCC) on campus and four faculty are members of the Cell and Molecular Biophysics Program. Finally, Dr. Tropsha is a member of the training program in Toxicology and the training program in Material Science and Engineering.

One example of a new highly interdisciplinary initiative is the launching the CICBDD in October 2007. While university-based research has been an important source of concepts enabling development of novel medicines and vaccines, translation of academic discoveries into clinical application has been inefficient. Bridging this translational gap will afford new opportunities for discovery of medicines that might otherwise perish. The CICBDD will provide a technology-driven research infrastructure that supports the

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drug discovery workflow by combining discovery research, undertaken primarily in faculty laboratories, with development efforts led by the Center. This workflow includes target identification (genetic/genomic approaches), target characterization/validation (biochemical/structural approaches), biological assay development, chemical library design and screening, hit identification, follow-up medicinal chemistry, ADME-Tox analysis, and lead identification for further development into drug therapy. The CICBDD will leverage many existing Centers and Programs at UNC-CH, already involved in the discovery and characterization of potential drug targets. The Center is directed by Stephen Frye, PhD, one of the world leading industrial medicinal chemists who recently left his position at GlaxoSmithKline as World Wide VP, High Throughput Chemistry & Discovery Medicinal Chemistry.

Inter-institutional Perspective: The division currently has 12 faculty members, including 5 full professors (two of them have primary appointments in the Department of Pharmacology), 5 Associate Professors, and 2 Assistant Professors. Most of the faculty members have been recruited in the last six years, and 10 out of 12 have major federal funding as PIs, with several of them having multiple federal grants. The division plans to recruit 5 additional faculty members in the next four years; approximately half of the division will move their labs into the new Genetic Medicine building some time during the summer of 2008.

The data comparing medicinal chemistry programs in different schools of pharmacy are not readily available. However, among the US Pharmacy schools, the UNC-CH SOP is ranked 6th in NIH funding. The MCNP Division contributes to approximately 40% of the School's funding. Arguably, the MCNP Division is one of the youngest and rapidly growing medicinal chemistry programs in the country.

The Curriculum

The MCNP graduate program offers a PhD degree. All descriptions here are for PhD students unless mentioned otherwise. A Masters of Science degree, when awarded, requires the same coursework but a lighter research component. The MCNP Graduate Handbook is provided as Appendix A in the MCNP appendices.

Course Requirements. There are two major tracks for fulfilling course requirements for MCNP students: 1) the "MedChem track" and 2) the "Biophysics track". The two tracks are described below in Table 1.

Table 1. Core Courses Required for PhD and MS students:

MedChem Track			Biophysics Track		
Course	Name	Credits	Course	Name	Credits
CHEM 466	Advanced Organic Chemistry I	3	BIOC 650, 651, 652	Biophysics Modules (Theory)	3
PHCO 644, BIOC 601 or BIOC 505	Cell Biology II, Enzymology, Mol. Biology	3	PHCO 644, BIOC 601 or BIOC 505	Cell Biology II, Enzymology, Mol. Biology	3
MEDC 804	Medicinal Chemistry I	3	MEDC 804	Medicinal Chemistry I	3
MEDC 833	Medicinal Chemistry II	3	MEDC 833	Medicinal Chemistry II	3
MEDC 805	Molecular Modeling	3	MEDC 805	Molecular	3

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				Modeling	
MEDC 899	Advanced Topic Seminar	4	BIOC 147 or equivalent	Macromolecular Spectroscopy Module	1
MEDC 991/992	Research in Medicinal Chem. (rotations)	6	BIOC 660 series (two electives)	Macromolecular Biophysical Methods (e.g. X-ray or NMR)	3
Research Skills A*	elective, typically course from other dept.	3	BIOC 704 (fall & spring)	Seminar in Biophysics	4
Research Skills B*	elective, typically course from other dept.	3		3 Rotations	-
	Total:	31		Total:	23

*This is taken in lieu of the foreign language requirement by the UNC-CH Graduate School. The student, in consultation with the Major Advisor, must register for six credits in courses closely related to the students' research interest. The SAC must approve the selection of these elective courses. The purpose of this requirement is to further the students' knowledge and enhance their expertise in areas related to their research and ability to carry out quality research.

As of the writing of this report, the required courses MEDC 804 and 833 have stressed breadth of knowledge in the area of medicinal chemistry, using the expertise of all the MCNP faculty members. Discussions are on-going about increasing the emphasis on depth for the material in these courses, as faculty and student reviews of these courses indicate a desire for more rigor.

Descriptions of courses offered by Medicinal Chemistry and Natural Products:

MEDC 804 Medicinal Chemistry I (3). Prerequisites: CHEM 261, 262; BIOC 100 or equivalent, permission of instructor. *Course Coordinator:* Michael Jarstfer (Spring). Concepts of drug discovery.

MEDC 805 Molecular Modeling (3). Prerequisites: Math 31-32; CHEM 181 and permission of instructor. *Course Coordinator:* Alex Tropsha (Fall). Introduction to Computer Assisted Molecular Design (CAMD) of small molecules. Emphasis on the practical use of molecular modeling software. Two lecture and three-four laboratory hours are required each week.

MEDC 833 Medicinal Chemistry II (3). Prerequisites: CHEM 262 or equivalent, permission of instructor. *Course Coordinator:* Rihe Liu (Fall). Chemical approaches to investigate biological processes at the biochemical and the cellular levels; cellular targeting for disease therapy.

MEDC 899 Advanced Topic Seminar (1). (Fall and Spring)

MEDC 900 Introduction To Research In Medicinal Chemistry (1-3). Prerequisites: Chem 261, 262 and permission of the instructor. One conference and three or more laboratory hours a week. (Fall and Spring)

Additional (elective) graduate courses offered by Medicinal Chemistry and Natural Products:

MEDC 806 Advanced Molecular Modeling (3). Prerequisite: MEDC 805. *Instructor:* Alex Tropsha (Spring). Introduction to macromolecular modeling and structure based drug design.

MEDC 842 Therapeutic Proteins (3). *Instructor:* Ken Bastow (Fall). This course covers the discovery, development, mechanism of action and clinical use of protein therapeutics, including classic and emerging examples from the enzyme, hormone, cytokine, antibody and enzyme inhibitor drug classes.

Special Topics in Medicinal Chemistry and Natural Products. Three additional MEDC courses are listed with the university (MEDC 821, 822, and 836), taught by Prof. K.H. Lee and staff. These courses are special topics courses, 2-3 credits, that cover the areas of selected topics in synthetic medicinal chemistry and natural products. They were last offered (and students enrolled) in 2001.

Teaching Experience. It is the philosophy of the division that graduate students obtain real teaching experience by working as a TA. Students are TAs for 4 semesters during their first 2 years. The teaching experience they obtain is variable. Some courses allow graduate student TAs to lead several 50 minute discussions, whereas others only require TAs to grade, hold office hours, make powerpoint slides, or provide assistance in a laboratory setting. The majority of TAs are for courses in the PharmD program.

Seminar Requirements. The division holds its own seminar series, that requires the attendance of all graduate students and faculty. In the years 2001-2006, this was a single weekly “series”, in which approximately one-third of the seminars were from outside speakers, and two-thirds were talks presented by divisional graduate students. Each student is required to give three 50 minute seminars. The first is during their second year and must be on a topic outside their area of research. The second is typically given during their third year, and is strictly on their dissertation research. The third seminar is their doctoral defense seminar. Seminars have recently been expanded to accommodate 4-5 additional outside speakers that are invited jointly between MCNP and MOPH. In addition, dissertation “defense” seminars are now held separately outside of the normal weekly divisional seminar time slot. For seminar schedules during the period of 2006-2007, (and evaluation forms for student presentations), see Appendix D.

Written Qualifying Examination: The “Cumes”. The purpose of the written qualifying examination (also known as “cumulative exams”) is to test the student’s scientific knowledge and problem-solving skills relating to a variety of medicinal chemistry subjects. The written examinations also help to prepare students for the oral qualifying examination. In lieu of a single comprehensive written examination, students take a series of monthly examinations that are cumulative in nature (i.e., successfully passing each monthly examination leads to completion of the written doctoral examination requirement). Cumulative examinations are scored as: High pass = 4 points, Pass = 3 points, Low Pass = 1 point, Fail = 0 points. Students must accumulate 24 points within 20 consecutively administered monthly examinations. Students are free to take a particular exam, or not. Successful completion of the cumulative written doctoral exam requirement is a prerequisite to proceed to the oral doctoral examination. Correspondingly, students in the master’s program must earn 15 points within 12 consecutively administered examinations.

Dissertation Advisory Committees. This is described in the General section of the report, along with a description of research rotations and student progression issues.

Oral Qualifying Examination. Before the student takes the oral qualifying exam, the five committee members approve the Dissertation Research Prospectus. The student, in consultation with the advisor,

determines the date of the exam at least three weeks prior to the examination. The oral exam assesses whether the student has the appropriate tools to undertake original research and has the ability to present the research problem effectively. It also provides an opportunity to refine the research goals.

Written Dissertation and Dissertation Defense. The final doctoral oral defense is held after at least one semester since completion of the oral qualifying exam and after all members of the doctoral committee have had adequate opportunity to review the formal draft of the written doctoral dissertation. The Major Advisor is responsible to the members of the student's doctoral committee in determining if the written dissertation draft is in appropriate form for their evaluation. For PhD candidates, scheduling of the dissertation defense must occur no later than eight years after beginning graduate education. Typically, the candidate presents a general seminar on their dissertation research, followed by the final doctoral oral examination. The committee may, at the time of the defense but not later, require alterations and corrections. The Major Advisor is responsible for verifying that the changes required by the committee have been made, and may delegate this responsibility to a committee member. Upon completion of the above requirements, the report of the final doctoral oral examination is submitted to the UNC-CH Graduate School at the time of the Dissertation. It must be in final typed form designed to meet the standards as defined in A Guide to the Preparation of Theses and Dissertations. This is prepared by the chair of the DAC (student's Major Advisor).

Masters Thesis and Final Oral Exam. For the Master of Science degree, at least three people (including two tenure track division faculty members) will constitute the committee to evaluate the student's work, approve the required thesis, and administer the final oral examination. The final oral exam shall be held only after all three members of the committee (SAC) have had adequate opportunity to review a draft of the Master's thesis. Scheduling of the final master's oral examination must occur no later than five years after beginning the graduate education.

The Faculty

The MCNP faculty comprises young and experienced scientists who are fully committed to the mission of the division. As evidence of their talent, drive, stature, and productivity, they are responsible for a substantial fraction (~40%) of the extramural funding secured by the SOP. They publish widely in high quality journals and present their research at national and international meetings. The research interests of the faculty range from traditional medicinal chemistry and natural products chemistry to telomere biochemistry, chemical biology, proteomics, glycobiology, structural biology, molecular modeling, and drug discovery. In addition, the faculty members teach a significant fraction of the basic science courses in the PharmD program, in addition to teaching graduate courses and mentoring graduate students. The faculty composition has changed dramatically since the previous review in 1998 - seven new faculty members have joined the division, all recruited from outside UNC-CH, and six faculty members have either retired or accepted positions elsewhere. Thus, the majority of tenured/tenure-track faculty members have been in the division for less than seven years. Brief CVs for the TT faculty are provided in Appendix B.

Demographics

There are 34 faculty members in MCNP, including 11 tenured/tenure-track (TT) faculty (not including Bryan Roth, as shown in Table 2), 9 research faculty, and 14 joint/adjunct faculty. For the TT faculty, the average age is 45, with an average number of years at the SOP of 9 years. Of the TT and joint faculty, four are Asian, and all are male. Of the research faculty, five are Asian and four are female. Thus, while there is some ethnic diversity, the gender diversity is limited within the TT faculty.

Table 2. Tenured/Tenure-track Faculty

Faculty Name	Rank (years of service)	Research Area
Harold Kohn	Kenan Prof. (8)	The examination of the biological mechanisms of therapeutic agents at the molecular level; the synthesis of peptidomimetics; and the discovery, development and evaluation of new medicinal agents.
David Lawrence	Eshelman Prof. (1)	Application of chemical tools to biological questions
Kuo-Hsiung Lee	Kenan Prof. (~30)	Research interests include Synthetic Medicinal Chemistry, Bioactive Natural Products, New Anticancer and Anti-AIDS Drug Discovery and Development, and Chinese Medicine
Alexander Tropsha	Professor (16)	Computer assisted drug design, Cheminformatics, Structural Bioinformatics.
Bryan Roth*	Hooker Professor (1)	GPCR structure and function
Kenneth Bastow	Associate Prof. (18)	Anticancer and antiviral lead discovery and tool development from natural product and chemically-derived “libraries” using ligand- and target-based cellular and <i>in vitro</i> assay screens.
Michael Jarstfer	Associate Prof. (6)	The mechanism of telomere maintenance, the mechanism of telomerase, RNA structure, and drug discovery.
Andrew Lee	Associate Prof. (6)	Structural biophysics, protein-ligand interactions, protein dynamics, and NMR spectroscopy.
Jian Liu	Associate Prof. (7)	Glycomics. Developing approaches to develop carbohydrate-based medicines.
Scott Singleton	Associate Prof. (4)	Examination of structural plasticity in proteins and nucleic acids, including its origins, influence on enzyme function, and implications for antimicrobial drug resistance.
Rihe Liu	Assistant Prof. (5)	The identification of proteins with desired functions from the proteomes of human and different model organisms, and the selection of target-binding antibody mimics from various protein libraries.
Qisheng Zhang	Assistant Prof. (1)	Endogenous small molecule regulated cell signaling and relevance to diseases.

*Professor Roth’s primary appointment is in the Department of Pharmacology, School of Medicine, although a portion of his salary is provided by the SOP. Dr. Roth’s information does not factor into Figures 1 and 2, as well as Table 5.

Table 3. Research (Fixed-term) Faculty

Faculty Name	Rank (years of service)	Associated Lab
Stephen Frye	Research Prof. (0.5)	Director of CICBDD
Alexander Golbraikh	Research Associate Prof. (8)	Tropsha Lab
Kyoko Nakagawa-Goto	Research Assistant Prof. (1)	K.H. Lee Lab
Clark Jeffries	Research Prof. (1)	Independent via Tropsha Lab
Susan Morris-Natschke	Research Associate Prof. (25)	K.H. Lee Lab
Qian Shi	Research Associate Prof. (3)	K.H. Lee Lab
Xiang Wang	Research Assistant Prof. (2)	Tropsha Lab
Donglei Yu	Research Assistant Prof. (1)	K.H. Lee Lab
Hao Zhu	Research Assistant Prof. (1)	Tropsha Lab

Table 4. Joint/Adjunct Faculty

Faculty Name	Home Department	Research Area
Arnold Brossi	Emeritus	Natural products chemistry
Phil Bowen	UNC-Greensboro	Molecular modeling
Michael Crimmins	UNC-CH, Chemistry	New methodology and synthesis of natural products
Vijay Gombar	Eli Lilly, Indianapolis	Computer aided drug design
Klaus Hahn	UNC-CH, Pharmacology	Tools for studying signaling dynamics
Richard Mailman	UNC-CH, Psychiatry	Dopamine receptor structure and function
Lars Pederson	NIEHS	Structural biology, heparan sulfate enzymes, DNA repair
Richard Tidwell	UNC-CH, Pathology	Treatment of AIDS-associated infections
Connie Vance	Endacea, Inc.	Neuropharmacology
Chris Waller	Pfizer, Inc.	Cheminformatics
Li-An Yeh	NCCU, BRITE Institute	Biological screening
Stanley Young	Nat. Inst. Statistical Sciences	Cheminformatics
Weifan Zhang	NCCU, BRITE Institute	Molecular modeling

Rank and Salary of Faculty.

Faculty salary (tenure-track/tenured) information is shown in the General section, combined with faculty from the other divisions. Age information is shown in Figure 1.

The Research Faculty.

There are eight research (fixed-term) faculty members (Table 3). These faculty members play an important role in the research mission of the division by sharing their expertise with their groups and others in the division. Their contributions are made largely through their publications, typically associated with the corresponding tenure-track faculty member, and through their efforts for securing sponsored-research funding. Two research faculty members are worth special note for their additional contributions to the division. Dr. Alexander Golbraikh provides important contributions to the teaching mission by teaching PHCY 426 (Pharmacoinformatics), which consists of 14 lectures and 24 labs, and is a part of the professional PharmD curriculum. Dr. Clark Jeffries contributes to the research mission, and is noted for supporting his own salary since 2006 as a co-investigator on a grant from the Pardee Foundation. Because the majority of the research faculty members are supported by tenure-track faculty (see Table 3), they are not included in most of the charts and tables, unless otherwise noted; their CVs are included in Appendix C.

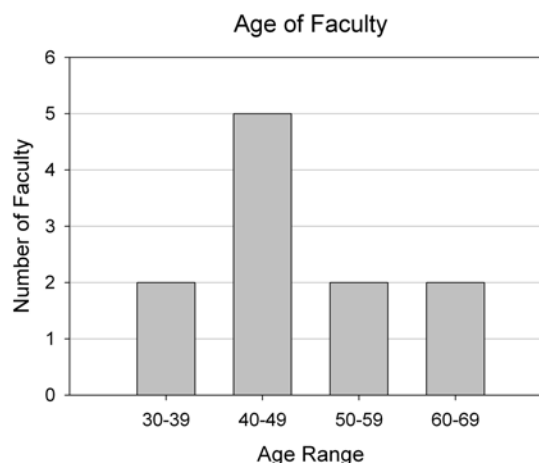


Figure 1. Distribution of ages for tenure-track/tenured faculty in MCNP.

Research Mentoring.

Faculty research is driven by graduate students, postdocs, and undergraduate students. Thus, mentoring of young scientists is inextricably tied with the pursuit of research goals. The distribution of graduate students and postdocs among the faculty are shown in Table 5. It should be noted that because of the cross-disciplinary programs (e.g. Cellular and Molecular Biophysics Training Program) at UNC-CH, some of the students are not formal members of the MCNP Division. The total number of current MCNP graduate students is 41.

Table 5. Faculty Research Mentoring

Faculty PI	Stdnts graduated in last 5 years	Stdnts currently in lab	Postdocs (last 5 years + current)	Students + Postdocs (total)
Bastow	0	0	1	1
Jarstfer	2	6	2	10
Kohn	2	2	7	11
Lawrence	0	1	20*	21*
Lee, A.	1	6	3	10
Lee, K.H.	6	3	18	27
Liu, J.	4	6	1	11
Liu, R.	0	1	9	10
Singleton	4	2	5	11
Tropsha	8	11	9	28
Zhang	0	0	1	1
Total:	27	38	76	141

* trained at Dr. Lawrence's previous institution.

Research Funding.

Research funding in MCNP has grown steadily over the last six years (Figure 2). The totals shown below represent total dollars (direct + indirect) obtained from agencies outside of UNC-CH. It should be noted that these data do not include Dr. David Lawrence's funding, who recently joined the faculty and is the PI on three R01 research grants from the National Institutes of Health.

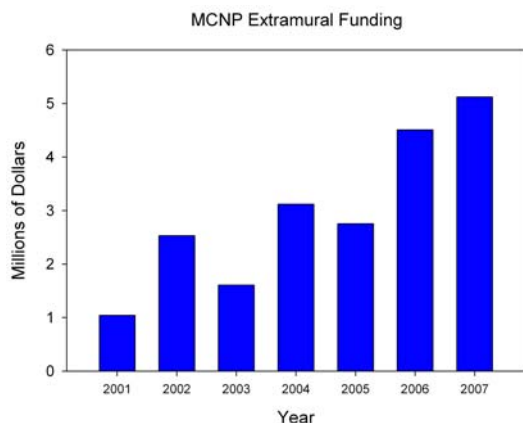


Figure 2. Extramural funding secured by MCNP faculty. The numbers include both direct and indirect dollars. Years shown are for July through June.

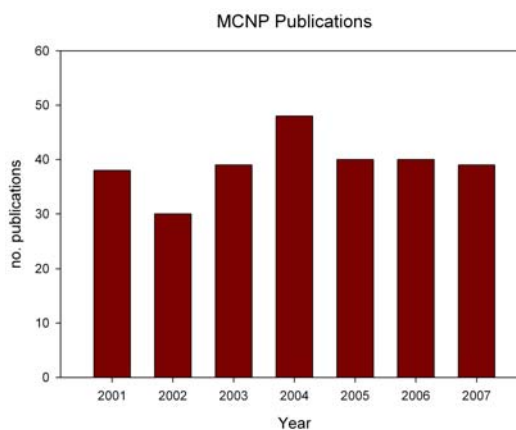


Figure 3. Publications by MCNP faculty, in which the faculty member was the corresponding author.

Publications.

Publications represent perhaps the most obvious and immediate outcome of research activities in the division. Since 2001, the divisional faculty has averaged 45 publications per year, with a standard deviation of 4.7 (Figure 3). Only journal publications in which an MCNP faculty member is corresponding author are included in this count. Journals in which multiple papers have been published include: *Journal of Medicinal Chemistry*, *Journal of Natural Products*, *Journal of the American Chemical Society*, *Proceedings of the National Academy of Sciences*, *ChemBioChem*, *Biochemistry*, *Journal of Biological Chemistry*, and *Journal of Molecular Biology*. This is an abbreviated list and many more papers are published in other high-quality journals. In summary, the division has been highly productive by the measure of number of publications in high quality peer-reviewed journals.

Teaching.

Distribution of Teaching. Classroom teaching is an integral component of the division's activities. The faculty members teach in both the PharmD curriculum and the MCNP graduate curriculum, corresponding to approximately 60% and 40% of the total teaching responsibilities for the division. On average, the amount of teaching per faculty member is approximately one full semester course per year. Many of the courses are team-taught, with one course director who is responsible for organization of the course. The graduate courses are detailed in the Curriculum section above. The PharmD courses in which the faculty members teach are primarily Biochemistry (I and II) and the Medicinal Chemistry modules (I-III).

Teaching Assignments. Teaching assignments are made by the divisional chair. The current teaching assignments largely reflect those made by Professor Harold Kohn while he was the Chair (1999-2005). As current chair, Dr. Tropsha has not yet needed to make significant changes to teaching assignments.

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Evaluation of Teaching and Awards. Every course every semester is evaluated by the students, and students evaluate all faculty instructors at this time. Typically, faculty members are formally evaluated by other faculty only prior to tenure-promotion. Formal evaluation by administrators is not practiced in MCNP.

Evidence of Excellence

The following is a small sampling of honors and activities that are evidence of excellence within the division. Additional awards are listed in the Appendix (CVs).

- 2001 Kenneth Bastow - Learning Disabilities Services Access Award

- 2002 Andrew Lee - AACP New Investigator Award

- 2003 K.H. Lee - Taiwanese American Foundation Achievement Award in Science and Engineering
 Michael Jarstfer - AACP New Investigator Award

- 2004 K.H. Lee - Member of the Editorial Advisory Board of "*Journal of Natural Products*" (USA) -
 1994-present.
 David Lawrence - Editorial Advisory Board, *Accounts Chemical Research* (2004-present)

- 2005 K.H. Lee - Kitasato Microbial Chemistry Medal, Japan
 David Lawrence - AAAS Fellow
 Scott Singleton - PY2 (2nd year PharmD students) Instructor of the Year
 Alex Tropsha - Member, Editorial Board, *Journal of Chemical Information and Modeling*

- 2006 Rihe Liu - Research Scholar Grant Award, American Cancer Society, 2006-2009
 Kenneth Bastow - Carolina Entrepreneurial Initiative (CEI) "Innovator Award" recipient
 Michael Jarstfer - Organizer of the ACS Mini Symposium on Telomerase Inhibition
 Scott Singleton - PY2 (2nd year PharmD students) Instructor of the Year
 Alex Tropsha - Permanent member, BDMA Study Section, NIH

The Students

The graduate students represent the core of the research program in the division. Providing them with high quality training is one of the major goals of the division. They also provide support and receive training as TAs. As of the fall of 2007, there were 41 students in MCNP.

Demographic Profile of Graduate Students.

Below is a chart of the diversity of the current MCNP graduate students. Of the 41 students enrolled in Fall of 2007, approximately 40% of the students are from the U.S., with an equal proportion from Asian countries, predominantly from the P.R. China. Such demographics are not unusual in the physical or chemical sciences. Of the 41 students, 19 are male and 22 are female.

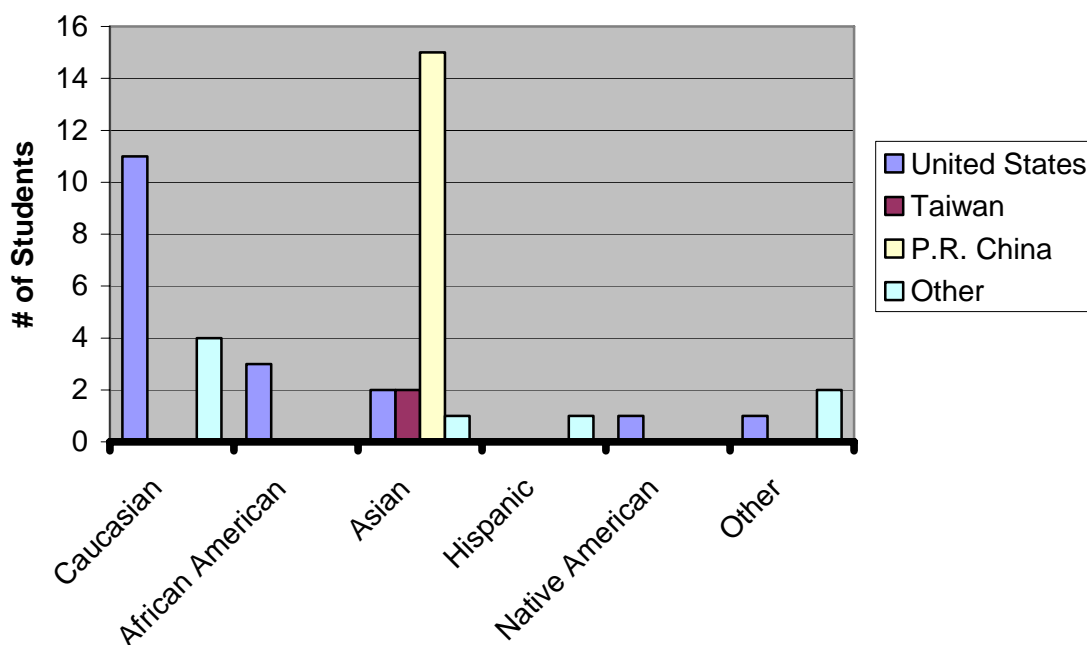


Figure 4. Demographic distribution of current graduate students in MCNP. The figure legend indicates nationality, and the categories along the x-axis indicate ethnicity.

Table 6. Data on incoming classes: 2001-2007

Year	Verbal	Quant.	GPA (BS)	GPA (MS)	# of Students
2001	516	705	3.34		8
2002	476	677	3.35		7
2003	520	727	3.51	3.55	4
2004	458	751	3.48	3.69	6
2005	501	723	3.52	3.55	10
2006	467	713	3.14	3.63	9
2007	479	736	3.16	3.2	10
Avg.	488	719	3.36	3.52	7.7

Undergraduate Institutions of the Incoming Students. Of the domestic students, approximately half graduated from an undergraduate institution in North Carolina. The undergraduate institutions of the current U.S. students are shown below.

Table 7. Undergraduate Institutions of current U.S. MCNP graduate students.

<u>Institution</u>	<u># students</u>
NC State Univ.	4
UNC-Chapel Hill	2
UNC-Greensboro	1
Wake Forest (NC)	1
Georgia Inst. of Tech (GA)	1
Univ. of Michigan	1
William and Mary (VA)	1
Elizabethtown Coll. (PA)	1
Montclair St. Univ. (NJ)	1
Norfolk St. Univ. (VA)	1

Current Graduate Students.

Table 8 shows a complete list of the current graduate students in the division. Students, who entered in 2007, have not yet chosen an advisor and therefore have no area of research indicated.

Table 8. Current MCNP Graduate Students

Student	Year Entered	Advisor	Support	Areas of Research
Charles Barham	2007	N/A	TA	-
Heather Bethea	2005	J. Liu	RA	Studies of heparan sulfate enzymes
Laura Bonifacio	2006	Jarstfer	AFPE fellowship	Mechanisms regulating microRNA biogenesis and expression
Ryan Bullis	2007	N/A	TA	-
Miao Chen	2003	J. Liu	RA	Biosynthesis of an AT-binding heptasccharide
Mary Carroll	2006	A. Lee	TA	Dynamics of dihydrofolate reductase by NMR spectroscopy
Steve Cotten	2005	R. Liu	RA	Identificaton of the targets of (R)-lacosamide using mRNA display
Yizou Dong	2006	KH Lee	TA	Anti breast cancer
Keri Flanagan	2006	Singleton	TA	Screening inhibitors of the RecA protein
Chris Grulke	2004	Tropsha	RA	Chemical information extraction and QSAR on publicly available data
Rima Hajjo	2005	Tropsha	RA	QSAR analysis
Jui-Hua Hsieh	2005	Tropsha	RA	Ligand-based and structure-based approaches in drug discovery
Chia-Wen Hsu	2007	N/A	1 st 9 mo – self support /RA	-
Courtney Jones	2005	J. Liu	RA	Identifying biologically active heparins
Ana Kamilaris	2007	N/A	TA	-
Wujian Ju	2001	R. Liu	RA	Identification of biological substrates of using

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				mRNA-protein fusion library
Raed Khashan	2003	Tropsha	RA	Computational drug discovery tools from frequent subgraph mining
Amber King	2006	Kohn	TA	Development of a novel series of neurological agents and the examination of their activity.
Tanarat Keitsakorn	2004	Tropsha	RA	Computational analysis of protein structures
Jason Legassie	2001	Jarstfer	RA	Telomerase RNA: Structure and function
Renpeng Liu	2005	J. Liu	RA	Chemoenymatic synthesis of heparin sulfate oligosaccharide
Man Luo	2007	N/A	TA	-
Ian Moon	2002	Jarstfer	RA	Telomerase structure and function with DNA
Pierre Morieux	2005	Kohn	NIH NRSA fellowship	Design and synthesis of molecules to identify the targets of the neurological agent lacosamide
Sherket Peterson	2007	N/A	GEM Fellowship (Pfizer)	-
Keduo Qian	2004	K.H. Lee	RA	Triterpenes as potent anti-HIV-1 agents; their synthesis, modification, structure-activity relationship and mechanism of action study
Joseph Rittner	2005	Roth	RA	Structure-function relationships in the activation of the kappa opioid receptor by salvinorin A.
Flori Sassano	2004	Jarstfer	RA	Involvement of oxytocin in developmental disorders.
Tanya Scarlett	2002	J. Liu	RA	Biochemical characterization of human heparan sulfate 6-O-endosulfatase
Vijay Sekaran	2005	Jarstfer	RA	Autosomal dominant (AD) dyskeratosis congenita by focusing on the structural changes in the human telomerase RNA (htR) that lead to the development of this genetic disease
Joana Soares	2004	Jarstfer	RA	Chemical and pharmacological modulation of telomerase
Wei Sun	2007	N/A	TA	-
Kun Wang	2003	Tropsha	RA	Cancer and hERG K ⁺ channel toxicity
Tim Wigle	2003	Singleton	RA	Inhibition studies on the RecA protein to suppress bacterial drug resistance
Weichen Xu	2007	N/A	TA	-
Xioming Yang	2006	K.H. Lee	TA	Tylophorine derivatives as anticancer agents
Berk Zafer	2006	Tropsha	TA	Structural bioinformatics
Chao Zhang	2007	N/A	TA	-
Liyang Zhang	2006	Tropsha	TA	Development of ADME QSAR models and predictions of drugs' ADME properties
Guiyu Zhao	2007	N/A	TA	-
Ting Zhou	2006	K.H. Lee	RA	Design, synthesis and eval. of anti-HIV agents

Recruitment practices.

Recruitment of graduate students into MCNP is coordinated with the entire SOP (see General Section). Over the last 5-6 years, the quality of the applicants and recruitment weekend attendees have improved noticeably. This is likely, in significant part, due to the dedication of an assigned faculty member to facilitate the application process and coordinate recruitment efforts with the rest of the School. Over the

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last 5-6 years, the number of attendees has risen from ~7 to ~12 students. The percentage of students who attend the recruitment weekend and subsequently join the program, however, remains at approximately 30% (Table 9). It should be noted that this number has decreased for each of the last three years. Interestingly, approximately half of the current graduate students in the program did not attend a recruitment weekend. Many of the students who enroll are international students (and thus can't be invited for on-site visit) or apply late and simply are admitted after many of the recruitment weekend attendees decline the offer. The division wishes to increase its success rate of admitting students who attend the recruitment weekend.

One question that is being considered is whether MCNP should hold its recruitment weekend with the other divisions. MCNP is unique among the divisions in that it must directly compete with other prominent and traditional chemistry and biochemistry departments.

Table 9. Results from Graduate Student Recruitment Weekend.

Year	Admitted/Weekend attended	success rate
2001	2/3	67 %
2002	3/6	50 %
2003	0/7	0 %
2004	3/6	50 %
2005	3/7	43 %
2006	3/10	30 %
2007	2/11	18 %

Honors and Awards

2001

Andrew Brogan (Kohn Lab), American Chemical Society Predoctoral Fellowship (2003 - 2005)
Ronald Copeland (J. Liu Lab), David and Lucile Packard Foundation Scholarship (2001-2006)
Michael Duncan (J. Liu Lab), David and Lucile Packard Foundation Scholarship (2001-2006)
Janelle Saulter (Tidwell Lab), David and Lucile Packard Foundation Scholarship (2000-2004)

2005

Brian Keppler (Jarstfer Lab), UNC-CH Impact Recognition Award
Brian Keppler (Jarstfer Lab), American Foundation for Pharmacy Fellowship
Ding Xu (J. Liu Lab), American Heart Association Predoctoral Fellowship (2005-2007)
Renpeng Liu (J. Liu Lab), Merit Assistantship \$15,000
Shuxing Zhang (Tropsha Lab), CCG Excellence Award (ACS, COMP Division) \$1,150.

2006

Flori Sassano (Jarstfer Lab), Amgen Fellowship
Laura Bonifacio (Jarstfer Lab), American Foundation for Pharmaceutical Education Fellowship for 07-08 \$6000
Raed Kashan (Tropsha Lab), Dissertation Completion Fellowship \$15,000; CCG Excellence Award (ACS, COMP Division) \$1,150
Tim Wigle (Singleton Lab), UNC-CH Impact Recognition Award

2007

Pierre Morieux (Kohn Lab), Ruth Kirschstein NRSA Predoctoral Fellowship - \$27,000/year for 3 years
Sherket Peterson, GEM Fellowship (Pfizer, \$14,000)

Assessment of Attrition (and how to reduce it)

Since 2001, there have been approximately seven students who left prior to obtaining the intended Ph.D. degree. They left as early as during the 1st year to as late as just prior to obtaining their Ph.D. degree. Six out of the seven students left before completing their 3rd year. Reasons for leaving are in many cases personal in nature and/or represent special cases with special or unusual circumstances. However, it appears that half of those students left because the program turned out to be something different from what they expected. The exact reasons varied for each student.

Based on the available information, it appears that attrition may be reduced by allowing prospective students to obtain more accurate information about the graduate program in MCNP. Many of these attritions occurred during a period when the amount of actual chemistry being performed in the division was limited to just a few labs, which may have been disappointing to some of the students who may have been misled because “medicinal chemistry” appears in the division name. This problem is expected to be alleviated, since two additional faculty members, Qisheng Zhang and David Lawrence, have joined the division recently. The division plans to recruit additional chemistry-oriented faculty.

Performance and placement of graduate students. Students who received their Ph.D. degrees during the period 2001-2007 from the MCNP Division appear to be quite successful after leaving the program. It was not possible to track all students. Nevertheless, of the graduates from this period, 4 currently hold academic positions (3 tenure-track), 12 have positions in industry, and 5 are postdoctoral associates in academic labs. These data do not include students from the labs of Ray Booth (U. of Florida) and Iris Hall (retired).

Leadership, Administrative Support, and Facilities/Equipment

Leadership

The division is led by its Chair, Prof. Alexander Tropsha, who works with the AD-RGE, other Associate Deans, and the Dean to meet the needs of students and faculty of the division. The Chair conducts annual performance evaluations of the division faculty and provides appropriate feedback, as well as makes teaching assignments. With relatively small number of faculty in the division, the Chair often chooses to reach key decisions based on discussions and recommendations of the MCNP faculty at monthly meetings. The faculty relies on the Chair to provide leadership in maintaining and improving laboratory space and facilities, faculty recruitment and retention, and student affairs. The Chair is also responsible for providing administrative structure and supervision of the divisional support staff.

Description/overview of Administration and Support Staff

The administrative infrastructure of the division includes the Chair (Dr. Tropsha), Assistant to the Chair (currently, Paula Press), Administrative Assistant (currently, Jeannie Stroud) and a Graduate Coordinator (currently, Carrie Goldsmith). A map of this structure is provided in Appendix I of the General section. This group serves to support major functions of the division such as recruitment and retention, budgeting, purchasing, graduate recruitment, and student support. In addition, the School provides centralized support for such critical functions as human resources, grant management, and facilities.

Overview of Faculty Needs/Satisfaction of Space and Facilities

The division has undergone a substantial transformation in the last six-seven years. During this time, due to senior faculty retirement and some attrition, the division recruited 8 out of its 12 current members, mostly junior faculty. To support research and professional growth of the division faculty, the School renovated almost all research labs in the division. Currently, all labs have adequate space and research

environment. Additional state-of-the-art research facilities will become available in Spring 2008 when some of our research labs will move into the new Genetics Medicine building.

Resources Outside the SOP

As one of the leading research universities in the country, UNC-CH provides highly stimulating environment for its faculty across campus. MCNP faculty members have access to state-of-the-art computing and library resources. Members of the division are using many available core facilities (see the complete listing at <http://www.med.unc.edu/cgi-bin/roadmap/index.pl>). Furthermore, several members of the division, who are conducting their research in cancer-related areas, have access to resources at the Lineberger Comprehensive Cancer Center.

The Future

In the last 7 years, the MCNP Division has been on the growth trajectory as evidenced by the growth in its faculty base, diversity of faculty research interests, funding, and graduate students. The emerging overall research focus of the division is on Chemical Biology (or closely related chemical genomics), which is concerned with studying vital biological processes in living organisms using specially designed chemical probes. It is widely regarded as one of the pillar areas of the NIH Roadmap. It is also one of the key areas of development identified by the scientific leadership of UNC-CH that will allow the university to reach its goal of becoming the leading public university for translational research. Another target area of development that is closely related to chemical biology is drug discovery and development; this area can be viewed as translational chemical biology. The focus on drug discovery is exemplified by recent recruitment of Dr. Stephen Frye to direct the CICBB. In the next several years, with the support of the School administration, the division plans to expand by recruiting 3-5 additional faculty with research interests in the broad areas of chemical biology, structural biology, medicinal and natural product chemistry, and drug discovery. The planned move of at least half of the research laboratories in the division to the new Genetic Medicine building, which will house many scientists specializing in diverse biomedical research, is expected to enrich the research enterprise in the division.

The MCNP Division remains committed to its mission of training the next generation of researchers specializing in drug discovery as well as contributing to the professional education of pharmacy students. The faculty members in the division take active part in the Educational Renaissance program sponsored by the School that is poised to change the ways our professional students prepare for the careers in the pharmacy field. The MCNP Division, with the full support of the School is committed to continuing growth in every aspect of its professional development.

DIVISION OF MOLECULAR PHARMACEUTICS

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MOLECULAR PHARMACEUTICS REPORT

A. Division Overview

Molecular Pharmaceutics Division (MOPH) is comprised of faculty members performing interdisciplinary research within the broader area of the pharmaceutical sciences. They conduct research, provide instruction and academic service in the scientific areas which include: (i) the design and evaluation of drug formulations and delivery strategies; (ii) mechanistic studies of novel drug delivery to tissues under disease states; (iii) extending such research and studies to macromolecule drugs candidates including proteins, oligonucleotides and genes; (iv) use of concepts central to drug delivery to develop other agents, such as nanomaterials and site specific contrast reagents for imaging tissues and physiological processes; and (v) understanding the processes that influence drug delivery, such as absorption, drug metabolism and disposition at both the organ/tissue and cellular level. These specialized research endeavors enhance our understanding of drug delivery and allow the development of novel strategies for modern drug molecules and formulations that improve drug therapies and aid drug development.

This division was previously known as the Division of Drug Delivery and Disposition and, under the direction of a new Chair, Leaf Huang, was refashioned in 2005 as MOPH with a stronger emphasis and main focus on drug delivery research. The division currently consists of 9 tenured/tenure-track faculty, covering a wide range of expertise in drug delivery and disposition. Several additional members of the division hold the rank of adjunct or joint professors, and several full time members of the division have joint appointments in other academic units and Centers at UNC-CH, emphasizing the interdisciplinary nature of our research.

Our Vision

Our Vision is to be the preeminent pharmaceutics program in the nation where scientists, leaders and innovators in education and research are developed and nurtured.

Our Mission

The mission of the Division of Molecular Pharmaceutics is to promote human health through innovative drug and vaccine delivery research and education. Our efforts focus on designing novel delivery systems and devices, and exploiting mechanisms affecting drug and vaccine exposure.

We will accomplish this by:

- Creating and maintaining outstanding, competitive research programs
- Creating, delivering and promoting graduate, professional, and post-graduate education and training for career and leadership development
- Recruiting, mentoring, and retaining quality faculty and staff with expertise in a wide range of contemporary research that is applied to Molecular Pharmaceutics
- Recruiting and mentoring exceptional students and trainees whose knowledge and talents will enhance the Division's research programs and educational experience
- Establishing and sustaining partnerships, collaborations and strategic alliances to advance the UNC-CH School of Pharmacy's mission
- Fostering an environment that values diversity, creative thought and academic freedom

Our Goals

The Division has formulated its goals as part of a strategic planning process that was completed in the Fall of 2006. We have stated these goals as follows:

DIVISION OF MOLECULAR PHARMACEUTICS

- Creating and maintaining competitive research programs and contemporary educational experiences to enhance the UNC-CH School of Pharmacy's mission
- Applying new knowledge to advance the field of drug delivery that contributes to the health and welfare of North Carolina, the nation, and the world.
- Recruiting, mentoring, and retaining the quality faculty and staff; and to recruit and mentor exceptional students and trainees
- Delivering and promoting post-graduate education and training for career and leadership development
- Establishing and sustaining partnerships, collaborations and strategic alliances to advance the UNC-CH School of Pharmacy's mission
- Foster an environment that values diversity, creative thought and academic freedom

Need/Demand for Graduate Level Training in Molecular Pharmaceutics Research: The most objective short term measure for the need and demand for our graduates with an advanced degree in MOPH is to determine whether they have employment opportunities after the degree is completed and the quality of the employment. Looking further over many years, one may then evaluate whether our graduates are successful as their careers mature. The first measure is provided in **Table B.1** of the MOPH Appendix, and it is clear that our graduates are in demand because most of them have taken positions immediately upon graduation with pharmaceutical companies, large and small. Some graduates have first pursued postdoctoral studies, moving on to pharmaceutical companies later or, to a lesser extent, a position in academia. The robust employment for graduates in the area of pharmaceutics has been common for many years and continues. Tracking later success of our graduates is more difficult and harder to quantify, however, our graduates have been favorably received by the pharmaceutical industry as shown by the survey of employers.

Interdisciplinary Activities: Research in pharmaceutics and drug delivery is inherently a multidisciplinary venture that requires integration of biological and physical sciences. Our faculty have these diverse research skills, but collaborate extensively to achieve their research objectives. The School of Pharmacy and UNC-CH provide a fertile environment for collaboration and our faculty interact across disciplines on campus. A number of faculty also hold joint appointments within UNC-CH, such as Dr. Xiao in Gene Therapy within the School of Medicine, Drs. Hickey and Smith within the Toxicology Curriculum, Dr. Thakker with Department of Pharmacology in the School of Medicine, and the Division of Medicinal Chemistry and Natural Products in the School of Pharmacy, Dr. Huang in the Lineberger Cancer Center, and Dr. Hickey with the Biomedical Engineering Dept in the School of Medicine. MOPH faculty are engaged in a number of collaborative research programs: Dr. Cho collaborates within the Program Project in Macromolecular Therapeutics (PMT), Dr. Mumper serves as the Director of the Center for Nanotechnology and Drug Delivery, and Dr. Hall is a member of the Gates Foundation Program on Infectious Diseases. Collaborations extend well beyond UNC-CH and more details are provided in the NIH biosketches of faculty in the Appendices. Relationships with local research institutions include an active RTP Drug Delivery Discussion Group started by Dr. Huang, the eight year old RTP Drug Metabolism Discussion Group with Division faculty as founding members and Dr. Smith as current Chair, collaborations with Duke U., GSK and other local companies.

In May 2006, the School of Pharmacy hosted the **1st Chapel Hill Drug Conference** founded and organized by Leaf Huang. This conference showcases cutting-edge research in drug discovery, delivery, disposition, and outcome, and has continued in subsequent years. The event has attracted more than 100 pre-eminent scientists from Europe, Asia, as well as U.S., yet provided students and post-doctoral scholars with the opportunity to present research and to interact with senior researchers. The conference was financed primarily by grants from industry sponsors, which allowed us to set registrations at

DIVISION OF MOLECULAR PHARMACEUTICS

affordable rates, and is managed so that at least \$20,000 remains to fund the conference for the following year.

Inter-institutional Perspective: The MOPH Division is unique among pharmaceuticals departments in most Schools of Pharmacy in that a breadth of disciplines is represented, including drug and vaccine delivery, formulation, biopharmaceutics, pharmacokinetics and drug metabolism. Some of these disciplines are also represented in DPET; however, the primary focus of drug delivery within MOPH provides a strong core and focus for the Division. Thus, with our current faculty and the plans for the future, the Division has one of the best pharmaceuticals programs within the U.S.

B. The Curriculum

The MOPH graduate program has a focus on the PhD program. All descriptions here are for PhD students unless mentioned otherwise. A Masters of Science degree is also available as a special case, which requires the same coursework but a lighter research component.

COURSE REQUIREMENTS

The incoming MOPH graduate students are potential Ph.D. students with varied undergraduate degrees such as biology, chemistry, engineering, and pharmacy.

Table 1. Courses Required for PhD and MS students

Course Title	Course Number	Credit Hour	Semester
Quant. Meth. in Clin. Res.	DPET 831	3	Spring
Ethical Dilemmas	PHCY 801	1	Fall
Drug Metabolism	MOPH 810	3	Fall (odd years)
Principles of PK	DPET 855	3	Fall (odd years)
Biopharm. In Drug Delivery	MOPH 840	2	Fall (odd years) ^a
Advances in Drug Delivery	MOPH 864	4	Fall (even years)
Pharmaceutical Analysis ^b	MOPH 850	2	Spring
Electives (variable, Appendix)		6 hrs total	
Seminar ^c	MOPH 899	1	Fall, Spring
Research	MOPH 991	variable	Fall, Spring
Masters Thesis	MOPH 993	variable	Fall, Spring
Doctoral Dissertation	MOPH 994	>3 ^d	Fall, Spring

a. Taught in conjunction with DPET 855; MOPH 840 begins in early Oct.

b. Lab Course

c. Students must register for seminar every semester in which they are in residence

d. A minimum of 6 credit hours required for graduation; must be registered for at least 3 credit hours in the semester in which the final defense is conducted

Specific Division course requirements for the Ph.D. degree are given above in **Table 1**. Course selection and sequence are based on essential core requirements supplemented, individually, in consultation with the Division Director of Graduate Studies (DDGS) and the student's chosen research mentor, to ensure a solid foundational knowledge and develop strengths in the area of the student's academic and research interests. This course of study may be amended as the student proceeds and develops other needs or interests. It is the responsibility of the DDGS and research mentor to advise in selecting elective courses to further develop the student's knowledge and research direction.

DIVISION OF MOLECULAR PHARMACEUTICS

Course Descriptions

DPET 831 and 855. See the Course Descriptions in the DPET section of this document.

PHCY 801 Ethical Dilemmas in Research (1).

Prerequisite: None. Ethical dilemmas in pharmaceutical research will be discussed. Issues include scientific fraud, dishonesty, misrepresentation of data, conflict of interest, new basic scientific research areas and dissemination of confidential information. Fall.

MOPH 810 Drug Metabolism (3).

Prerequisite: permission of instructor. The objective is to provide an understanding of 1) key metabolic transformation involved in clearance, detoxification, bioactivation of drugs/xenobiotics, 2) metabolic enzymes responsible for these transformations, 3) contemporary techniques used to study metabolic processes and the role of specific metabolic enzymes in the metabolism of drug molecules, 4) clinical implications of drug interactions, drug-induced toxicity and genetic polymorphism, and 5) integrating information on a drug metabolism for design and development of safe and efficacious therapeutic agents. Fall, odd years.

MOPH 840 Biopharmaceutics (2).

Prerequisite: Previously completed a course in Pharmacokinetics; concurrent enrollment in DPET 855. A course of study examining the physiological and pharmaceutical factors that influence the rate and extent of drug absorption in vivo. Various routes of administration will be considered, especially the oral route, as well as the factors that modulate tissue specific delivery. Fall, odd years.

MOPH 850 Pharmaceutical Analysis (2).

Prerequisite: Permission of the instructor. The course is designed to introduce first or second year graduate students to basic principles of modern analytical techniques used in pharmaceutical analyses. Techniques such as Liquid Scintillation Methods, Light Microscopy, Gas Chromatography, Mass Spectrometry, Metabolomics/MS Approaches, NMR, Assay Validation/Chiral Chromatography were covered in the most recent course. Spring.

MOPH 862 Industrial Pharmaceutics (3).

Prerequisite: PHCY 410 and 411 or equivalents. Discuss industrial approaches to pharmaceutical formulation development. Spring, even years.

MOPH 864 Advances in Drug Delivery (4).

Prerequisite: PHCY 51, PHCY 61, and CHEM 130.

The course explores physicochemical and transport properties of the drug in the context of method and route of drug delivery and targeting. Fall, even years.

MOPH 899. Seminar (1).

All students must attend the Division's weekly seminars and dissertation and defenses by other students, each semester that they are in residence. Beginning in the third year of study, each student is required to present one seminar each academic year on his/her research or other topic approved by the major advisor. The student's dissertation defense will satisfy the seminar requirement during the student's final year of study.

MOPH 991. Research (variable credit).

See Laboratory Rotation in the MOPH Graduate Student Handbook located in the Appendices.

MOPH 993 and 995 (variable credit).

Registration for thesis or dissertation research and writing.

New Courses in the process of approval:

Introduction to Metabolomics (2).

Prerequisite: PHCY 410 and 411 or equivalents. Basic principles of metabolomics including analytical and statistical methods will be covered along with major applications in areas such as toxicology, nutrition and drug discovery and development. Spring.

Nanomedicine (3)

An introduction to the interdisciplinary field of nanomedicine for students with physical, chemical or biological sciences background. This course will emphasize emerging nanotechnologies and biomedical applications including nanomaterials, nanoengineering, nanotechnology-based drug delivery systems, nano-based imaging and diagnostic systems, nanotoxicology, and translating nanomedicines into clinical investigation. Fall.

Electives Outside the Division

See MOPH Graduate Student Handbook, MOPH Appendix.

QUALIFYING EXAMINATIONS

The Qualifying Examination process consists of a written portion (QE Part I) and an oral defense of an independently developed proposal (QE Part II).

Doctoral Written Comprehensive Examination: Qualifying Examination Part I.

The Qualifying Examination (QE) Part I is a written comprehensive examination taken upon completion of required graduate course work, and must be taken and passed even if a Master's degree has been granted at this institution. For students in continuous registration, this is after the first three semesters of graduate study. A written qualifying examination is offered every year in January and is comprised of questions from the division faculty designed to test the student's ability to synthesize and apply knowledge acquired through coursework. There are three possible outcomes: pass, provisional pass entailing some remedial work, and fail. A student judged to have failed the examination, either in its entirety or a significant portion thereof, is required to retake the relevant portion(s) of the examination the following May. At the discretion of the Division Faculty, the student may be required to complete other assignments in lieu of retaking a portion of the examination. A student who fails the examination for the second time becomes ineligible for further doctoral work. No student may continue in the program, or take the examination a third time, without approval by the Administrative Board of the Graduate School.

Doctoral Oral Examination: Qualifying Examination Part II

The oral qualifying examination, QE Part II, should be completed no later than the end of April in the 4th semester. The student's oral examination consists of construction, presentation, and defense of a research proposal that is independent of the advisor's ongoing research projects. The proposed study should be designed either to test a hypothesis conceived by the student, or to develop a novel drug delivery system based on a proven hypothesis. A three-member Exam Committee administers the examination. The committee composition is at the discretion of the Division Chair, but excludes the student's research advisor. The student should submit a one-page pre-proposal to the committee, which will decide if the proposed study is sufficiently independent of the ongoing or planned research projects of the student's research advisor.

If the one-page study outline is deemed appropriate, the student is to submit a proposal to the Exam Committee members with a copy filed in the Division Office. The proposal should consist of: Specific Aims

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(1 page); Background and Significance (2 – 3 pages); Relevant Data (cited from the literature) (5-6 pages); Experimental Design and Methods (5-7 pages); and Literature Cited. Excluding the last section, the proposal length should be no longer than 15 pages. Detailed instructions such as font type and page margins are found in the NIH form PHS 398 (<http://grants.nih.gov/grants/funding/phs398/phs398.html>). The Exam Committee will conduct the examination, but the entire faculty is invited to participate. The student presents his/her project to the faculty and Exam Committee, which subsequently make a recommendation to the faculty regarding the student's performance. If a majority of the faculty members are present, a decision can be reached that day as to the result of the examination; however, if a quorum is not met or the student's performance requires discussion, the decision may be held until the next faculty meeting (held twice monthly).

Dissertation Advisory Committee. The make-up of this committee is described in more detail in the "school-wide" section. In MOPH the Administrative Chair is different from the Research Mentor of the student.

Admission to Candidacy and Dissertation Proposal

Subsequent to successful outcome of the QE Part II, the Ph.D. candidate and his/her Dissertation Advisory Committee (DAC) defines the dissertation research project at the first committee meeting. The DAC consists of five members, three of which must be from School of Pharmacy. The DAC may request that the student present an outline of the project for detailed discussion. It is desirable that the DAC receive presentation material at least one week in advance. At the meeting, the course of research direction is finalized and the student is responsible for producing minutes documenting the substance of the meeting. Upon approval of the student's dissertation project, Part II of the Report of Doctoral Composition is signed by the committee and submitted to the Graduate School. A student in the Ph.D. Program may apply for admission to candidacy after successful completion of the Written and Oral Qualifying Examinations.

Dissertation and Final Seminar: Final Doctoral Oral Examination

For Ph.D. candidates, the Final Doctoral Oral Examination should normally take place within five years after beginning graduate studies. The examination must be scheduled at least two weeks in advance. A copy of the final draft of the dissertation must be placed in the Division Office at least two weeks before the final examination.

This final examination is held only after all members of the DAC have had adequate opportunity (at least two weeks) to review a formal draft of the doctoral dissertation which the candidate has prepared. The Research Advisor is responsible to the members of the student's DAC for determining that the draft is in an appropriate form for their evaluation. The committee may, at the time of the Final Doctoral Oral Examination but not later, request alterations and corrections. The DAC Chair and Research Advisor are responsible for verifying that such changes have been made, and may delegate this responsibility to the Committee member who imposed the requirements. The Final Doctoral Oral Examination should be primarily a defense of the dissertation. It is open to all members of the Graduate Faculty, and to the public as well. The DAC makes the final decision on behalf of the Division faculty regarding whether or not the student passes or fails this examination.

Upon completion of the above requirements, the report of the Final Doctoral Oral Examination is prepared by the Chair of the Dissertation Committee and submitted to the UNC-CH Graduate School. The student must submit the Dissertation that meets the standards as defined in A Guide to the Preparation of Theses and Dissertations.

Masters Thesis and Final Oral Examination

Students are not admitted directly into the Master of Science program in MOPH. Typically, students would have participated in student orientation, first year coursework and laboratory rotations prior to deciding to complete the Master of Science instead of the Doctor of Philosophy program. Details about the Master's degree in the Division are included in the Appendix.

Many of the administrative requirements for the Master's degree are identical to those listed previously for the Doctoral degree, with the following exceptions:

Masters Committee. The Master's Committee should be formed as soon as possible (typically after completing three semesters of graduate study). The Report of Master's Committee Composition form must be completed and kept in the student's file within the Division.

Requirements for the Master of Science Degree. Master's students are required to complete the same coursework and qualifying examinations as Doctoral students; however, the time length for research is shorter and the depth of the research project is less rigorous than doctoral dissertation requirements. Also, Master's students must have registered for at least 3 credit hours of MOPH 993 (M.S. Thesis credit prior to the final thesis defense).

C. The Faculty

The MOPH faculty is a group of experienced scientists with expertise in varying but related fields of research. The research interests of the faculty range from formulation science, novel drug and vaccine delivery systems, nanotechnology, drug metabolism and pharmacokinetics. They train graduate students and post doctoral fellows, and publish their scholarly work widely in high quality journals and present their research at national and international meetings. The faculty members also teach the basic science courses in Pharmaceutics, Drug Delivery, and Pharmacodynamics in the PharmD curriculum. The faculty composition has changed substantially since the previous review in 1998. With the restructuring of the Divisions, some faculty have left to join DPET, while several experienced faculty, including the Chair of MOPH and the Director of the Center for Nanotechnology have been recruited to the Division.

Demographics There are a total of 23 faculty members in or associated with MOPH, which consist of 10 tenured/tenure track (TT) faculty (including the Dean), 7 research faculty, and 6 joint/adjunct faculty. For the TT faculty, the average age is 58, with an average number of years at the SoP of 14 years. Of the ten TT faculty, four are of Asian origin and two are of European origin; there is one female faculty. Of the fixed-term faculty, four are of Asian origin, one of Hispanic origin, and four are female. Thus, while there is ethnic and gender diversity over the entire MOPH faculty, the gender diversity is limited within the TT faculty.

Table 2. Tenured/Tenure-Track Faculty

Robert A. Blouin	Vaughn and Nancy Bryson Distinguished Professor and Dean (5)*	Effects of disease and altered physiologic states on the expression and regulation of drug metabolizing enzymes.
Moo J. Cho	Associate Professor and Division Director of Graduate Studies (17)	Targeted delivery of nucleicacids and proteins by means of synthetic or endogenous drug carriers
Boka W. Hadzija	Professor (37)	Stability and solubility of drugs; transdermal

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		iontophoresis
Anthony J. Hickey	Professor and School of Pharmacy Director of Graduate Studies (14)	Microparticulate drug delivery systems; pharmaceutical aerosols
Leaf Huang	Fred N. Eshelman Distinguished Chair and Professor (4)	Liposomes and immunoliposomes for drug delivery; development of non-viral vectors for gene (including oligonucleotides) therapy, and receptor mediated drug and vaccine targeting using self-assembled nanoparticles.
Richard J. Kowalsky**	Associate Professor (36)	Preparation, stability and clinical research applications of radiopharmaceuticals.
Russell J. Mumper	John A. McNeill Distinguished Professor and Director, Center for Nanotechnology in Drug Delivery (1)	Nanoparticles for tumor and dendritic cell targeting and vaccines ; biocompatibility and toxicology of nanoparticles; mucoadhesive for (trans)mucosal delivery; anticancer and anti-inflammatory properties of berries and berry extracts
Philip C. Smith	Associate Professor (15)	Pharmacokinetics and metabolism of drugs subject to glucuronidation; stability and reactivity of acyl glucuronides; quantitative proteomics in ADME
Dhiren R. Thakker	Ferguson Distinguished Professor and Exec. Associate Dean for Research and Graduate Education (12)	Mechanisms of drug transport; structure-transport relationships; prodrug strategies for tumor-targeting; metabolism of drugs and xenobiotics; delivery and disposition of macromolecules
Xiao Xiao	Fred N. Eshelman Distinguished Professor of Gene Therapy (2)	Gene delivery; gene therapy for Duchenne Muscular Dystrophy, diabetes

*The number in parentheses refers to the number of years service in the Division.

**Professor Kowalsky's primary appointment is in the Division of MOPH, although a portion of his salary is associated with an appointment in the School of Medicine's Dept of Radiology, Division of Nuclear Medicine.

Table 3. Fixed-Term ("Research Level") Faculty

Faculty Name	Rank (years of service)	Research/Associated Lab
Arlene Bridges	Research Assistant Professor	Mass Spectrometry/SOP
Lucila Garcia-Contreras	Research Assistant Professor	Pulmonary and Nasal Drug Delivery; Therapies for Respiratory Disease/Hickey Lab
Peiqi Hu	Research Assistant Professor	Dermatology/Xiao Lab
Juan Li	Research Associate Professor	Gene Therapy/Xiao Lab
Feng Liu	Research Associate Professor	Gene therapy; drug delivery and targeting; liposome technology /Huang Lab
Thomas M. O'Connell	Director, UNC-CH Metabolomics Lab	Metabolomics, NMR/SOM
Chunping Qiao	Research Assistant Professor	Gene Therapy/Xiao Lab

Table 4. Joint/Adjunct Faculty

Faculty Name	Institution	Research Areas
Ronald Brashear	GlaxoSmithKline RTP, NC	Solid Dosage Form Research and Development
Matthew D. Burke	GlaxoSmithKline RTP, NC	Chemical and Biochemical Engineering
Joseph DeSimone Professor of Chemistry and Chemical Engineering	UNC-CH	Polymer Synthesis, Liquid & Supercritical CO ₂ Processing, Gene Therapy & Drug Delivery
Ramprakash Govindarajan	GlaxoSmithKline RTP, NC	Pharmaceutical Formulation/Product Development
Xiaorong He	GlaxoSmithKline	Solid-State Bulk Drug
Weili Lin Professor of Radiology, Neurology and Biomedical Engineering	UNC-CH	Magnetic Resonance Imaging
Cosette Serabjit-Singh Adjunct Assistant Professor	GlaxoSmithKline RTP, NC	Computational approaches to predicting ADME parameters/Pharmacogenetics
Zhiyang Zhao Adjunct Associate Professor	Amgen, Inc. Cambridge, MA	Pharmacokinetics and Drug Metabolism

Rank and Salary of Faculty. Faculty rank and age distributions are shown in **Figures 1** and **2**. Salary (tenure-track/tenured) information is shown in the general section for the School, combined with faculty from the other divisions.

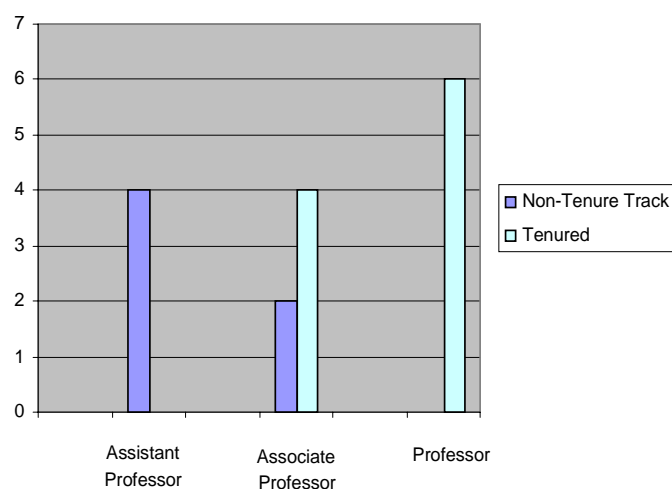


Fig. 1. 2007 Faculty Rank Distribution (Excluding Adjunct Faculty).

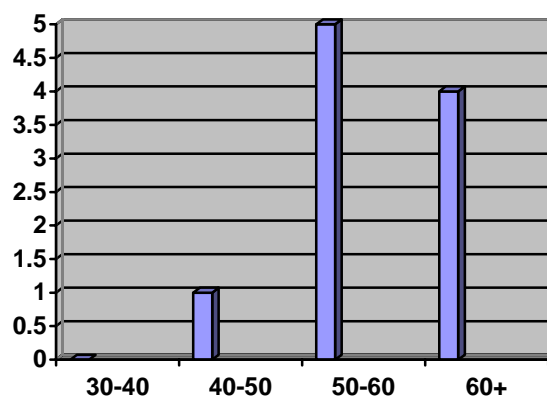


Figure 2. Distribution of ages for tenure-track/tenured faculty in MOPH.

The Research-Level Faculty. There are seven research-level (fixed-term) faculty members (**Table 3**). These faculty members provide invaluable assistance through their expertise to the labs with which they are associated. Their contributions are made largely through their research, publications, mentoring graduate students in the laboratory setting.

Research Mentoring. Faculty research is often conducted primarily by graduate students, postdocs, technicians and undergraduate students. Thus, mentoring of young scientists is tied with the pursuit of research goals. The distribution of graduate students and postdocs among the faculty are shown in Table 5. It should be noted that because of the cross-disciplinary programs (e.g. Toxicology) at UNC-CH, some of the students are not formal members of the MOPH Division. The total number of current MOPH graduate students is 27.

Table 5. Faculty Research Mentoring

Faculty PI	Students graduated in last 5 years	Students currently in lab	Postdocs (last 5 years + current)	Students + Postdocs (total)
Blouin	0	0	0	0
Cho	3	4	2	9
Hadzija	0	0	0	0
Hall	2	0	2	4
Hickey ^d	5	4	6	15
Huang ^a	0	4	5	9
Kowalsky	0	0	0	0
Mumper ^a	0	4	1	5
Smith	2	2	5	9
Thakker	10 ^c	4	4	18
Xiao ^a	0	3	7	10
Total:	22	25^b	32	79

^a These faculty members have relocated to UNC-CH within the last five years; only UNC-CH students are included.

^b Two MOPH students have primary research mentors outside of MOPH faculty.

^c Includes three students co-mentored with other faculty members.

^d Includes one student from Biomedical Engineering Dept.

Research Funding. Research funding in MOPH has grown steadily over the last six years (Figure 2). The totals shown below represent total dollars (direct + indirect) obtained from agencies, federal and industrial, outside of UNC-CH. It should be noted that these data do not include funding from several faculty who recently joined the Division with years of service at UNC-CH that is less than five.

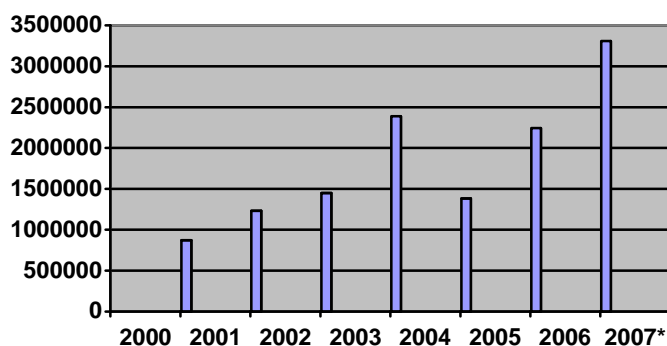


Figure 3. Extramural funding for MOPH. These include both direct and indirect dollars. Years shown are for July through June. *In late 2007, Dr. Huang received notice of two grants to be awarded totaling \$250,000 each for funding in early 2008 (number not included in these figures).

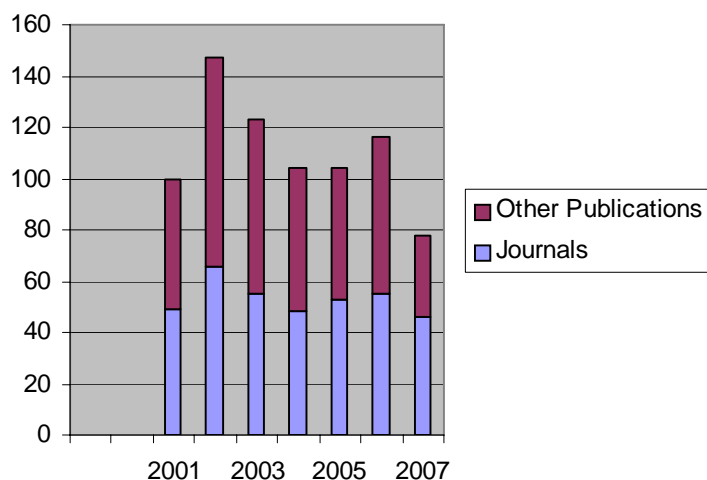


Fig. 4. Total MOPH faculty publications by year.

Publications. Publications are perhaps the most obvious and immediate outcome of research activities in the Division. Since 2001, the Divisional Faculty as a whole has averaged 40 publications per year, with a standard deviation of 8.0. Only journal publications in which a MOPH faculty member is corresponding author are included in this count. Journals in which multiple papers have been published include: *JCR*, *JPET*, *Pharm Res*, *J Gene Medicine*, *PNAS*, *Macromolecules*, *Drug Metabolism Disposition*, and *Molecular Pharmaceutics*. This is an abbreviated list and many more papers

are published in other high-quality journals. In summary, the Division has been highly productive by the measure of number of publications in quality peer-reviewed journals.

Teaching

Distribution of Teaching. Classroom teaching is a high priority of the Division's activities. The faculty teaches in both the PharmD curriculum and the MOPH graduate curriculum, as well as within the Toxicology Curriculum. The MOPH faculty contributes an average of 40% of their effort towards the didactic curriculum, i.e., course instruction and administration; however, this number does not take into account graduate student mentoring. Many of the courses are team-taught, with one course director who is responsible for organization of the course. The graduate courses are detailed in the Curriculum section above. The professional PharmD courses in which the faculty teach are primarily two pharmaceutics courses, Basic Pharmaceutics I (PHCY 410), Basic Pharmaceutics II (PHCY 411), and Principles of Pharmacodynamics (PHCY 412, Intro to Pharmacology), and electives, such as Radiopharmaceuticals (MOPH 801 and 802), Drug Metabolism (MOPH 810) and Industrial Pharmaceutics (MOPH 862).

Teaching Assignments. Teaching assignments are made by the Division Chair. The expertise of the faculty members, as well as their ongoing research efforts are employed to determine the assignment of courses and the load for teaching both professional and graduate courses.

Evaluation of Teaching and Awards. Every course every semester is evaluated by the students, and students evaluate all faculty instructors at this time. Some faculty members within the Division have received teaching awards from pharmacy students (see Evidence of Excellence, below).

Evidence of Excellence

The following is small sampling of honors and activities bestowed from outside the SOP that are evidence of excellence within the Division. Additional awards are listed in the Appendix (CVs).

DIVISION OF MOLECULAR PHARMACEUTICS

Teaching Awards, Honorary Degrees, Honorary Awards by Societies, Special Appointments.

Boka W. Hadzija, University of North Carolina Award for Lifetime Achievement in Teaching and Mentoring, April 2001
Boka W. Hadzija, University of North Carolina Edward Kidder Graham Teaching Award, 2002-2005
Boka W. Hadzija, University of North Carolina Edward Kidder Graham Teaching Award (Superlative) 2004, 2005
Boka W. Hadzija, C. Knox Massey Distinguished Service Award, April 2005
Boka W. Hadzija, School of Pharmacy Academic Excellence Award in Teaching, June 2006
Boka W. Hadzija, North Carolina College Personnel Association for Outstanding Service, December 2006
Boka W. Hadzija, University Professor of Distinguished Teaching Award, April 2007
Boka W. Hadzija, Graduate School Award for Significant Contribution to Graduate Education, April 2007
Anthony J. Hickey, Elected Fellow of the Institute of Biology, United Kingdom, 2000
Anthony J. Hickey, Elected Fellow of American Association of Pharmaceutical Sciences, 2003
Anthony J. Hickey, Elected Fellow, American Association of Advancement of Science, 2005
Leaf Huang, Elected Fellow, American Institute for Medical and Biological Engineering, 2003
Leaf Huang, Alec D Bangham MD FRS Achievement Award, Liposome Research Days Conference, 2004
Richard J. Kowalsky, William H. Briner Distinguished Achievement Award in Nuclear Pharmacy Practice, Academy of Pharmacy Practice and Management, American Pharmaceutical Association, 2000
Richard J. Kowalsky, Nuclear Pharmacy Pioneer Award, Section on Nuclear Pharmacy, American Pharmaceutical Association, 2000
Russell J. Mumper, Best Paper Award 2003 – *European Journal of Pharmaceutics and Biopharmaceutics*, 2004
Russell J. Mumper, VivaGel™, a topical dendrimer-based microbicidal gel developed by the CPST for Starpharma, was named one of the Top 5 Nanotech Breakthroughs of 2004 in the Forbes/Wolfe Nanotech Report (December 2004).
Russell J. Mumper, AAPS Lipid-Based Drug Delivery Systems Award sponsored by Gattefossé Corporation, 2006
Russell J. Mumper, Great Teacher Award sponsored by the UK Alumni Association, 2007
Philip C. Smith, Edward Kidder Graham Award for Undergraduate Teaching, UNC-CH, 2003
Philip C. Smith, Elected to Council of the International Society for the Study of Xenobiotics, 2006
Dhiren R. Thakker, Elected Fellow, American Association for Pharmaceutical Scientists

D. The Graduate Students

The graduate students represent the core of the research program in the Division. Providing them with high quality training is one of the major goals of the Division. They also provide support and receive training as teaching assistants. As of the fall of 2007, there were 29 students in MOPH.

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Demographic Profile of Graduate Students. Below is a chart of the diversity of the current MOPH graduate students. There were 29 students at the beginning of the Fall of 2007. Roughly 48% of the students are domestic, with an equal proportion from Asian countries. Such demographics are not unusual in the physical or chemical sciences. Of the 29 students, 16 are male and 13 are female.

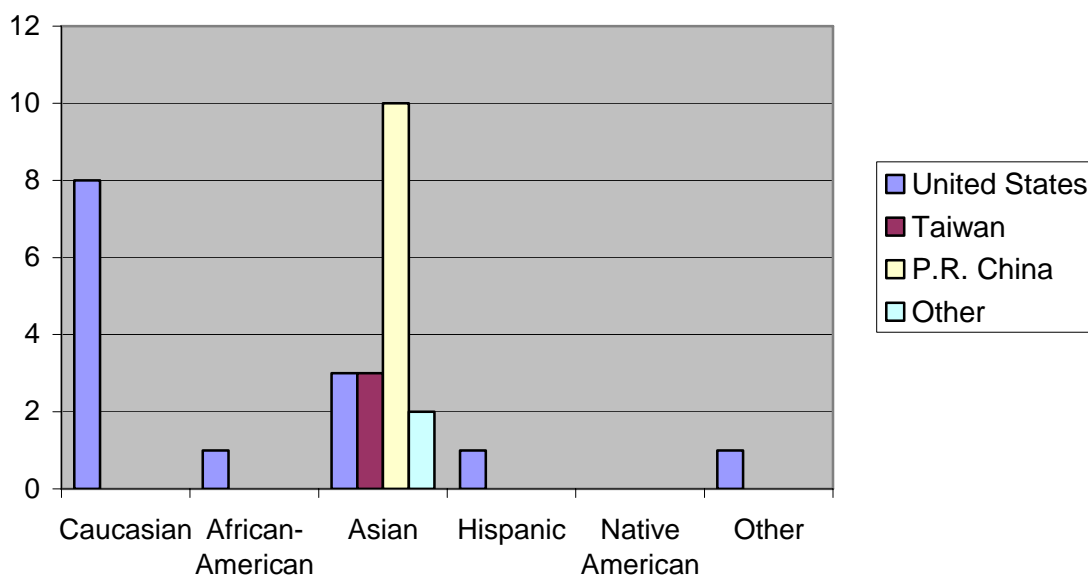


Figure 5. Demographic distribution of current graduate students in MOPH.

Table 6. GRE scores and data on incoming classes: 2001-2007

Year	Verbal	Quant.	GPA (BS)	GPA (MS)	# of Students
2001	529	729	3.08	3.87 (2)	7
2002	573	673	3.8		3
2003	540	740	3.63		3
2004	597	723	3.51	4 (1)	3
2005	541	688	3.54	3.77 (3)	6
2006	413	660	3.35	3.62 (5)	9
2007	591	766	3.3	3.62 (3)	9
Avg.	540	711	3.45	3/77	5.7

Undergraduate Institutions. Of the domestic students from 2001-2007, approximately half graduated from an undergraduate institution in North Carolina. The domestic institutions of the current students are shown below.

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Table 7. Prior institutions of MOPH graduate students entering from 2001-2007.

Institution	No. Students
North Carolina Institutions	
The University of North Carolina at Chapel Hill	10
North Carolina State University (Raleigh, NC)	3
Duke University (Durham, NC)	2
Wake Forest University (Winston-Salem)	1
Southeast Institutions	
Christian Brothers University (Memphis, TN)	1
Hollins University (Roanoke, VA)	1
Clemson University (Charleston, SC)	2
Old Dominion University (Norfolk, VA)	1
Other US Institutions	
University of Maryland (Baltimore, MD)	1
University of Washington (Seattle, WA)	1
University of Minnesota (Minn. MN)	1
Washburn University (Topeka, KS)	1
Case Western Reserve (Cleveland, OH)	1
University of Pittsburgh (Pittsburgh, PA)	1
Trinity College (Hartford, CT)	1
University of Iowa (Iowa City, IA)	1
Ohio State University (Columbus, OH)	1
Philadelphia College of Pharmacy and Science (PA)	1
Iowa State (Ames, IA)	1
University of Delaware (Newark, DE)	1
University of Rochester (Rochester, NY)	1
Duquesne University (Pittsburgh, PA)	1
University of Chicago (Chicago, IL)	1
Sterling College (Sterling, KS)	1
Skidmore College (Saratoga, NY)	1
International Institutions	
U.D.C.T. University of Bombay (India)	1
Beijing Medical University (Beijing, China)	3
Nanjing University (China)	3
China Pharmaceutical University	4
Seoul National University	3
National Taiwan University College of Medicine	2
Hubei College of Traditional Chinese Medicine	1
National Tsing Hua University	1
University of Delhi (India)	1
University of Rajasthan (India)	1
China University of Science	1
Bangalore University (India)	1
University of Bologna (Italy)	1
Birla Institute of Tech. & Science (India)	2
University of Montreal (Montreal, Canada)	1

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Current Graduate Students. Table 8 shows a complete list of the 29 current graduate students in the Division as of September 2007. For students that entered in 2007, some have not yet chosen an advisor and therefore have no area of research indicated. Some will have graduated by the time this report is reviewed in Spring 2008.

Table 8. Current MOPH Graduate Students

Student	Year Entered	Advisor	Support	Areas of Research
An, John	8/2001	Cho	RA	Drug Delivery Systems -
Chen, Yun-ching	8/2006	Huang	TA	SiRNA Delivery
Cheung, Roland	8/2004	Cho	RA	Drug Delivery Systems
Costales, Chester	8/2007	Thakker	TA	Drug Metabolism
Deng, Diexin	8/2007	Xiao	TA	Drug Delivery Systems
Dufek, Matthew	8/2006	Xiao	TA	Gene Therapy
Feng, Lan	8/2006	Thakker	TA	Drug Metabolism
Generaux, Claudia	8/2005	Thakker	RA	Pharmacokinetics of antiparasitic drug
Gresham, Venita	1/2005	McLeod#	Fellowship	Drug Metabolism
Hackett, Michael	8/2006	Cho	TA	Drug Delivery Systems
He, Bo	8/2006	Xiao	RA	Gene Therapy
Hung, Hsin-I	8/2005	Huang	Fellowship	Drug Delivery
Joy, Melanie	8/2006	Smith	K Award	Pharmacokinetics/Dynamics of MPA
Li, Shyh-dar	8/2005	Huang	RA	SiRNA Gene Delivery
Liu, Dongyun	8/2007	Mumper	TA	Nano-based Drug Delivery Systems
Ma, Ping	8/2007	Mumper	RA	Nano-based Drug Delivery Systems
Ming, Xin	8/2005	Thakker	RA	Aberrant Intestinal Absorption of Drugs
Minocha, Shalini	8/2007	Mumper	TA	Nano-based Drug Delivery Systems
Proctor, William	8/2005	Thakker	RA	Mechanisms of Intestinal Absorption
Roode, Luke	8/2007	Xiao	TA	Gene Therapy
Shi, Shuai	8/2007	O'Connell	TA	undecided
Telko, Martin	8/2004	Hickey	RA	Respiratory Drug Delivery
Vasievich, Elizabeth	8/2007	Huang	Fellowship	Drug Delivery
Wadhwa, Saurabh	8/2007	Mumper	RA	Drug Delivery Systems
Wang, Chenchen	8/2005	Hickey	RA	Respiratory Drug Delivery
Wang, Hailin	8/2006	Hickey	TA	Respiratory Drug Delivery
Xu, Zhen	8/2005	Hickey	RA	Respiratory Drug Delivery

RA = Research Assistant (supported by mentoring professor)

TA = Teaching Assistant (supported by the School)

PT = Part Time (not supported)

#student's mentoring advisor resides in another Division

Recruitment practices. The applicant pool to MOPH is generally 50-60 students per year. Although many are international students, a significant fraction is domestic. Completed applications for graduate study are discussed at semi-monthly meetings of MOPH faculty, with consideration of GRE scores, undergraduate or MS institution attended, GPA, research experience, letters of recommendation, and available tuition support. Highly qualified applicants that reside in the US are invited to attend the Recruitment Weekend, coordinated with the entire SoP (see General Section above). Applicants that cannot attend the Recruitment Weekend, or apply later are generally invited to visit the School for an interview at a later date. Strong international applicants are phone-interviewed by Division DGS. The

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School covers the costs associated with the Recruitment Weekend. Results of MOPH recruitment from Recruitment Weekend and interview efforts have been highly successful in recent years, as shown in **Table 9**.

Table 9. Results of Graduate Student Recruitment Efforts.

Year	Admitted/ Offers	Success Rate
2005	4/9	44%
2006	9/11	82%
2007	9/10	90%

Table 10. Honors and Awards of Graduate Students

Student	Honor/Award	Year(s)
William Proctor	PhRMA Foundation Fellowship	2007-2009
Martin Telko	PhRMA Foundation Fellowship	2007-2009
Elizabeth Vasievich	University Merit Fellowship	2007-2008
William Proctor	Amgen Fellowship	2007-2008
Robert Garmise	AAPS Outstanding Grad. Res. Award in Pharm. Tech.	2007
Dongmei Lu	AAPS Grad. Student Symp. in Biotechnology	2007
Dongmei Lu	Kathryne A. Brewington Grad. Stud. Res. Award	2006-2007
Martin Telko	Molecular Pharmaceuticals Grad. Scholar Award	2006-2007
Venita Gresham	Nat. Cancer Inst. Ruth L Kirschstein NRSA Fshp.	2006-2009
Xin Ming	Lilly Fellowship	2006-2008
Dongmei Lu	PhRMA Foundation Fellowship	2005-2007
Beverly Knight	PhRMA Foundation Fellowship	2005-2007
Martin Telko	USP Fellowship	2005-2007
Amanda Mathis	Amgen Fellowship	2005-2006
Chenchen Wang	Scholars for Tomorrow	2005-2006
Venita Gresham	Kathryne A. Brewington Grad. Stud. Res. Award	2005-2006
J. Cory Kalvass	Molecular Pharmaceuticals Grad. Scholar Award	2005-2006
Melanie Tallman	University Dissertation Completion Fellowship	2005-2006
Xin Ming	University Merit Fellowship	2004-2005
John An	Kathryne A. Brewington Grad. Stud. Res. Award	2004-2005
Stephanie Faucette	Drug Delivery and Disposition Grad. Scholar Award	2004-2005
Keith Hoffmaster	Dissertation Completion Fellowship	2004-2005
J. Cory Kalvass	Lilly Fellowship	2004-2005
Maciej Gamek-Gliszczyński	Lilly Fellowship	2003-2004
Cornelia Smith	Kathryne A. Brewington Grad. Stud. Res. Award	2003-2004
Aravind Asokan	Drug Delivery and Disposition Grad. Scholar Award	2003-2004
Enzo Palma	Nat. Cancer Inst. Ruth L Kirschstein NRSA Fshp.	2003-2005
David Bourdet	PhRMA Foundation Fellowship	2003-2005
Amanda Mathis	University Merit Fellowship	2002-2003
Enzo Palma	Kathryne A. Brewington Grad. Res. Award	2002-2003
David Bourdet	Drug Delivery and Disposition Grad. Scholar Award	2002-2003
Matthew Troutman	Drug Delivery and Disposition Grad Scholar Award	2001-2002
Matthew Troutman	PhRMA Foundation Fellowship	2000-2002

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Maciej Gamek-Gliszczyński	Scholars for Tomorrow Scholarship	2001-2002
Cornelia Smith	University Minority Doctoral Fellowship	2000-2001

Performance and placement of graduate students. Students who received their Ph.D. degrees from 2001-2007 from MOPH appear to be quite successful after leaving the program. It was not possible to track all students, as some faculty have retired or moved during this period. Of the 34 students that have graduated during this period, 29 obtained first positions within the pharmaceutical industry, and 5 did postdoctoral studies after receiving the Ph.D. This data is summarized in the MOPH Appendix, Table 1.

E. Leadership, Administrative Support and Facilities/Equipment

Leadership

The MOPH Division is led by its Chair, Prof. Leaf Huang, who works with the School Administration, Division Faculty and Graduate Students to operate the Division in a fair, equitable manner. The Chair has primary responsibilities to provide leadership and represent MOPH at School administrative meetings, consider space allocations and improvements, shared equipment resources, faculty recruitment and conduct yearly reviews of the faculty. The Chair also supervises and reviews Division support staff. The Division meets bimonthly, except in summer. Special Division meetings are scheduled as needed to address recruitment, graduate student progression and assess qualifying examinations. A full-day Divisional retreat is held yearly for divisional planning and review of the MOPH graduate program. Each graduate student is discussed at this yearly meeting.

Lab Facilities

The MOPH Division currently has 12,000 sq ft of lab space located in Kerr and Beard Hall, with Kerr Hall four years old and the lab in Beard Hall recently renovated in 2005. Additional new laboratory space is being added in the Genetic Medicine Building across campus that will be shared by several divisions within Pharmacy. The Genetic Medicine Building will house several other medical school departments, including Pharmacology, Biochemistry, and Genetics. The addition of space in the Genetics Medicine building will relieve rather crowded space in Kerr and Beard created by recruitment of faculty members who are slated to occupy space in the Genetic Medicine building, as well as provide access to modern, clean mouse facilities needed by some MOPH faculty research programs. This expansion will also allow sufficient space for the anticipated three new faculty to be recruited in the next five years. In addition, the Division is also part of a planning committee for a new Biomedical Research Imaging Center (BRIC) that will be completed in 2011 and will be the new home of the Center for Nanotechnology in Drug Delivery, directed by Dr. Mumper.

Associated lab resources within the School and UNC-CH are generally excellent. The Division of Laboratory Animal Medicine maintains modern mouse, rat and guinea pig space in Kerr, has a dog facility off campus for research on muscular dystrophy (Xiao) and is expanding mouse facilities in the Genetics Medicine Building. Large, expensive instruments such as NMR, mass spectrometry and electron microscopes are available on campus with some high field NMR and LC-MS/MS capability existing within the School of Pharmacy and more sophisticated instruments at shared facilities on campus. The campus maintains a large number of user core facilities (http://research.unc.edu/services/core_facilities.php), such as the Michael Hooker Proteomics and Mass Spectrometry Facility, a DNA and High Throughput Genotyping core, Electron Microscopy Facility and the Mutant Mouse Regional Resource Center.

Staff Resources

The Division has the services of three full-time, state-supported staff (an Administrative Officer, Kathryn Fiscelli, and two Administrative Assistants, Angela Lyght and Lee Daub). Dr. Fiscelli oversees all of administrative operations and divisional activities, provides student support, and supervises staff. Ms Lyght manages the human resources processes for the division and is the Chair's administrative assistant. Mr. Daub is responsible for the laboratory supply ordering and serves as the Division's liaison to the School's business office.

<h2>F. The Future</h2>

The MOPH Division was created as a distinct unit about three years ago and has been under the direction of Dr. Leaf Huang since its inception. During this period there has been reorganization and the recruitment of several senior faculty, including Dr. Huang himself, in the area of gene delivery, nano-formulations, and drug targeting. With the expansion into additional new labs within the Genetic Medicine Building, several faculty will move into this facility and allow the recruitment of several additional faculty to bring the Division up to 13 in number by 2010. The plan is to focus recruitment of faculty with research interests in nanotechnology-based drug, vaccine, and imaging systems. One apparent weakness in the division is the lack of tenure-track junior faculty and it is desired that at least one of the new faculty will be at the entry level of Assistant Professor.

With respect to graduate student recruitment and growth, it is anticipated that the Division will grow in the next five years to have an enrollment of 40 graduate students. The recruitment of quality graduate students has been a major strength in MOPH due to the faculty's and university's reputation, as well as the quality of our graduate program. One of the challenges the division will face is that much of the expansion of the graduate program will require additional resources that will need to come from increased research support of the Division faculty, since School resources and funding for graduate student support via teaching assistants are not anticipated to expand. Thus, the Division and the School are considering the steady reduction in time of graduate student support from the School which has evolved to a 12 month commitment, with subsequent years being borne by the faculty's research programs.

In addition to the funding challenge, there are several other issues that will need to be addressed more substantively. One such issue is for the Division to find ways to remain competitive with the excellent Biomedical Engineering programs available nation-wide, many of which are developing their own drug delivery components. In the aspect of graduate student training, the program tends to "overtrain" in NIH-sponsored basic research students who go on to find employment in industry in that, as graduate students they do advanced drug delivery research, yet find themselves engaged in comparatively basic activities in industry positions. In summary, while there are some challenges to be overcome, the Division has maintained its interdisciplinary character and will continue to build upon its strong drug-delivery foundation and new directions such as the area of nano-technology and gene therapy.

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1. PROGRAM OVERVIEW

The Division of Pharmaceutical Outcomes & Policy conducts pharmaceutical research using interdisciplinary methods to inform drug policy and improve patient outcomes. Historically it has been one of the smallest divisions within the School of Pharmacy; however, there are currently seven Division faculty with two more faculty joining the division during the 2007-2008 academic year. The faculty support the School's teaching mission by participating in its professional and doctoral programs. It supports the School's service mission by serving on committees at the school, university, state, national, and international levels.

In 2001, the division transitioned from offering a Master's program to a PhD program. Prior to that point the division had a collaborative PhD program with the Departments of Epidemiology and Health Policy and Administration at the UNC-CH School of Public Health. The division still has strong relationships with these departments and faculty members still serve on PhD committees in these departments, but in 2001 the focus changed to developing and implementing an in-house PhD program.

In 2006, the Division faculty wrote a strategic plan (Appendix A) to articulate the opportunities and challenges facing the Division. During this time, the faculty were also active participants in the School's strategic planning process, also conducted in 2006. The Division faculty hopes to bolster its ability to conduct its widely recognized research, promote quality teaching, and continue its commitment to service.

- The mission of the Division of Pharmaceutical Outcomes and Policy is to improve medication use and healthcare through innovative pharmaceutical outcomes research, professional and graduate education, and professional service.
- Our vision is to conduct innovative internationally recognized research that improves the use of medications and the healthcare of vulnerable populations and drives evidence-based pharmaceutical policy. We will train the next generation of leaders in policy-relevant pharmaceutical outcomes research.

While pharmaceutical outcomes research is often vaguely interpreted, we believe it can be translated into terms that are readily understandable. We focus our research and teaching in the areas of pharmacoepidemiology, pharmacoeconomics, behavioral sciences, and health services research as contributors to both research and policy. We are especially interested in innovative primary and secondary data management and analysis targeting issues affecting persons with chronic illness in vulnerable populations (the elderly or socially or economically disadvantaged) including the factors affecting medication use, interventions to improve medication use in pharmacy practice, identification and promotion of safe and effective medication use practices, and cost effectiveness of pharmaceutical and pharmacy services. Collectively, these characteristics are embedded in our graduate program.

While our training program is relatively young (having first started in 2001), the few graduates of this program have readily matriculated into excellent programs at eminent universities. Our work is interdisciplinary by nature. Our faculty and graduate students work closely with faculty from the UNC-CH Schools of Public Health, Medicine, and Nursing, several faculty members are research fellows at the Cecil G. Sheps Center for Health Services Research at the University of North Carolina at Chapel Hill (Betsy Sleath, Richard Hansen, and Michael Murray), and one faculty member has a joint appointment at the Durham VA (Matthew Maciejewski). This interdisciplinary breadth creates important opportunities for research by faculty and graduate students. We support the School's Institute for Pharmacogenomics and Individualized Therapy. Moreover our faculty are affiliated with a variety of external institutes and

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universities, including Regenstrief Institute at Indianapolis, University of Wisconsin, Johns Hopkins University, Washington University, University of Minnesota, and Case Western Reserve University's Center for Genetic Research Ethics and Law. Overall, the Division's program has undergone substantial change since the time of its last review in 1998. These changes are reflected in the change of leadership in 2004 when Dale Christensen stepped down as chair and Michael Murray was hired as the new chair of the Division. At that time, the faculty, staff, and graduate students decided to undertake the strategic planning process mentioned above and changed the name from Pharmaceutical Policy and Evaluative Sciences (PPES) to Division of Pharmaceutical Outcomes and Policy (DPOP).

2. CURRICULUM

Course Requirements

As a minimum requirement, DPOP PhD students must complete the courses specified in the table entitled Required Courses, below, plus a minimum of 6 hours of elective courses based on a chosen concentration area. The faculty of the Division periodically monitors and revises the list of recommended and required courses and sometimes changes their sequence, always with the intent of providing the students with the best available selection of courses for their program. It is always possible for the students to modify this course of study based on their background, experience, and professional aspirations. However, the student must work with their advisor to make any modifications to the required program of study and all modifications must be approved by the combined graduate faculty of the Division. Appendix B contains a mapping of our required courses to our program's educational competencies.

Table 1: Required Courses

Topic/course	Credit hours	Notes
Pharmacoeconomics	3	DPOP 801 (3) (SP) <i>Offered every other year (odd years)</i>
Social and Behavioral Aspects of Pharmaceutical Use	3	DPOP 803 (3) (SP) <i>Offered every other year (odd years)</i>
Patient Reported Outcomes: Theory, Methods and Applications	3	DPOP 805 (3) (SP) <i>Offered every other year (even years)</i>
Informatics: Use of Large Healthcare Databases	3	DPOP 804 (3) (F) <i>Offered every other year (odd years)</i>
Pharmaceutical Policy	3	DPOP 806 (3) (F) <i>Offered every other year (odd years)</i>
DPOP Seminar	4	DPOP 899 (1) (F and SP) <i>Offered every year</i>
Basic statistics	6	BIOS 600 (3) and BIOS 545 (3), or equivalent
Fundamentals of epidemiology	3	EPID 600 OR EPID 710 (F) <i>To be taken as early as possible in the program. Offered every Fall</i>
Linear regression	3	HPAA 881 (3) or equivalent
Analysis of Categorical Data	3	HPAA 883 (3) (SP) or BIOS 665 (3) or EPID 718 (3) or equivalent
Proposal writing	3	HPAA 872 (3) (SP) or equivalent
Electives	6	
Total	43	

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Required Course Descriptions

- DPOP 801 *Pharmaceutical Economics* (3). This course is focused on the investigation of the economic and health impact of major pharmaceutical policies, regulations, market conditions, prescription drug use, and pharmaceutical care. Students obtain hands-on experience with econometric modeling techniques using original data for empirical analysis of medical technologies and pharmaceutical policy interventions.
- DPOP 803 *Social and Behavioral Aspects of Pharmaceutical Care* (3). This course draws from medical sociology and health psychology to familiarize students with core theories, research, measures, and design issues relevant to conducting social/behavioral research surrounding pharmaceutical use.
- DPOP 804 *Informatics: Use of Large Health Care Databases* (3). This is an interdisciplinary course providing practical training in the analysis of large, secondary databases containing physician, hospital, and pharmaceutical data. Course topics include data preparation, algorithm development, quality control, and dataset limitations. The course will explore the challenges and opportunities of working with large health datasets, including databases created for administrative and clinical purposes. In addition, the course will help prepare students for careers in research and program evaluation.
- DPOP 805 *Patient-Reported Outcomes: Theory, Methods and Applications* (3). This course examines the role of patient-reported outcome measures in studying the impact of illness and the effects of pharmaceutical products and services. The course provides an overview of the theoretical foundations underlying the assessment of patient-reported outcomes, reviews methods used to develop and assess the psychometric properties of patient-reported outcome measures, and examines how these measures are currently used in research and practice.
- DPOP 806 *Pharmaceutical Policy* (3). This course examines policies that influence pharmacy. Structured methods of policy analysis are examined and used to assess theoretic and analytic applications for evaluating pharmaceutical policy.
- DPOP 899 *Seminar in Pharmaceutical Policy and Outcomes Research* (1). This seminar offers presentations and discussions on current pharmaceutical policies, major issues in drug markets, and contemporary outcomes research topics in the field. Students must register every semester.
- EPID 600 *Principles of Epidemiology* (3) Pre- or co-requisite: BIOS 600. Permission required for non-SPH majors. An introductory course that considers the meaning, scope and applications of epidemiology to public health practice and the uses of vital statistics data in the scientific appraisal of community health. One lecture and two lab hours per week.
- EPID 710 *Fundamentals of Epidemiology* (3). An intensive introduction to epidemiological concepts and methods for students intending to engage in, collaborate in, or interpret the results of epidemiologic studies. Some familiarity with biomedical concepts may be needed.
- BIOS 600 *Principles of Statistical Inference* (3). Major topics include elementary probability theory, probability distributions, estimation, and tests of hypotheses, chi-square procedures, regression and correlation.
- BIOS 545 *Principles of Experimental Analysis* (3). Continuation of BIOS 600; the analysis of experimental and observational data, including multiple regression, and analysis of variance and co-variance.
- HPAA 872 *Developing Proposals for Health Services and Policy Research* (3). Integrated study of selected theory and research as it relates to the organization and delivery of health services. Students are required to take HPAA 872 as their proposal writing course. If for some reason HPAA 872 is not available, the student must work with his/her Student Advisory Committee (SAC) to develop an alternative plan. The alternative plan must include the student writing a 10-20 page proposal that is similar to the AHRQ or NIH dissertation grant format which

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- follows the PHS 398 guidelines (specific aims, background, preliminary studies, and methods). (SAC, See section 2.1 Advising).
- HPAA 881 *Linear Regression Models* (3). Prerequisite: HPAA 496 *Math Module* (16) and HPAA 496 *Stats Module* (28) or equivalent. Required for all doctoral students. This course is an introduction to linear regression models. Topics include linear algebra, least squares regression, multicollinearity, heteroscedasticity, autocorrelation, and hypothesis testing.
- HPAA 883 *Analysis of Categorical Data* (3) Prerequisite: HPAA 882 or equivalent. This course is an introduction to the analysis of categorical data using maximum likelihood and specification tests. Topics covered include econometric models in which the dependent variable is not continuous, including logit, probit, tobit, two-part, and duration models.
- ENG 601 *English for International Students* (All international students are encouraged to take this course their first semester at UNC-CH).
- ENG 603 *English Pronunciation*

Elective Courses & Concentration Areas

Students take elective courses for a minimum of 6 credits hours. The choice of electives depends on concentration area and must be approved by the student's advisor. There are three concentration areas for PhD students in DPOP: *Pharmacoeconomics and Drug Policy*, *Pharmacoepidemiology*, and *Social and Behavioral Pharmacy*. Students also can decide to have a more general program of study if they do not want to concentrate in one of these three areas. Listed below are among the highly recommended elective courses in each of the concentration areas.

Pharmacoeconomics and Drug Policy

- | | |
|----------|---|
| ECON 851 | Health Economics in Developing Countries |
| HPAA 652 | Economic Evaluation of Healthcare Technology |
| HPAA 715 | Health Economics for Policy and Administration |
| HPAA 762 | Quality of Care |
| HPAA 815 | Health Economics Seminar |
| HPAA 882 | Advanced Methodology in Health Policy and Administration Research |

Pharmacoepidemiology

- | | |
|----------|--|
| EPID 715 | Theory and Quantitative Methods in Epidemiology |
| EPID 718 | Advanced Methods for Epidemiologic Data Analysis |
| EPID 733 | Clinical Trials Epidemiology |
| EPID 743 | Genetic Epidemiology |
| EPID 750 | Epidemiologic Surveillance in Public Health |
| EPID 765 | Methods and Issues in Pharmacoepidemiology |
| EPID 764 | Hospital Epidemiology |
| EPID 800 | Epidemiology of Medical Care |
| EPID 805 | Clinical Epidemiology |
| EPID 893 | Pharmacoepidemiology Seminar |

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Social and Behavioral Pharmacy

HBHE 750	Applied Research Methods in Health Behavior and Health Education
HBHE 800	Social Psychological Theories of Individual Health Behavior
HBHE 801	Topics in Sociology of Health
HBHE 852	Scale Development Methods
HBHE 853	Advanced Evaluation of Health Intervention Programs
PSYC 842	Test Theory and Analysis
PSYC 851	Multidimensional Scaling
PSYC 864	Topics in Attitude Research
SOCI 802	Social Psychological Theory
SOCI 822	Sociological Theories of Aging and the Adult Life Course
SOCI 836	Social Gerontology
SOCI 862	Health Organizations and Occupations
SOCI 863	Medical Sociology: Health, Illness, and Healing

Students are also strongly encouraged to take advantage of the rich intellectual climate on campus here at UNC-CH by attending seminars provided by other departments, such as those offered by Health Policy and Administration, Epidemiology, the Program on Health Outcomes, and seminars offered by the Cecil G. Sheps Center for Health Services Research.

To acquire or update specific skills, students can take short courses provided on campus. However, these short courses do not count toward academic credits. The Office of Academic Technology & Networks (ATN) and the Institute for Research in the Social Sciences (IRSS) offer regular short courses in various computer programs and software, data management, funding, and other topics.

Advising

Each incoming student is assigned a temporary academic advisor from the Division's graduate faculty. The academic advisor assists the student in developing an initial plan of study and in identifying courses or research areas consistent with their academic and career goals. The students can change academic advisors at any point in time in consultation with the DPOP Director of Graduate studies. A student must establish a student advisory committee (SAC) prior to the end of their second semester of study. The SAC consists of a research advisor as chairman and two other members of the graduate faculty. One of the members must be from outside DPOP

DPOP Graduate Seminar Series

The DPOP Graduate Seminar meets regularly during the fall and spring semesters. This seminar is intended to be a forum for scholarly discussion of policy issues, research ideas and methods, campus and industry research resources, and the presentation of ongoing research among the Division's graduate students and faculty. The Graduate Seminar is coordinated by a Division faculty member or members on a yearly basis, usually with the assistance of a graduate student.

Graduate students are required to register for the DPOP Seminar series during each of their first four semesters of study. The students find them stimulating and enlightening. After a student passes comprehensive exams, the Division expects students to attend seminar even though they are not registered for credit since they are still an active part of the department.

Each student is expected to give a seminar presentation once yearly. Seminar requirements differ each year depending on the seminar topic. Additional information concerning seminar requirements is provided each semester by the faculty Seminar Coordinator(s).

Teaching and Research Practicum

Teaching Practicum

The teaching experience is a requirement for students admitted into the doctoral program. Its purpose is to enhance knowledge and skills in teaching. Optimally, it should be completed during the first two years of the program. It must be completed before taking the comprehensive exams.

To fulfill this requirement, the student must be involved in teaching a two or three credit hour course. Students should work with the DPOP faculty to determine which course they will select to satisfy their practicum requirement. Students must fill out a contract before starting their practicum. The student will be mentored in teaching by a DPOP faculty member and at the end of the practicum, will be evaluated by the supervising faculty member. A satisfactory evaluation is required to fulfill the teaching practicum requirement. The student must assume responsibility for major aspects of the selected practicum course (e.g., planning and teaching). Simply serving as a teaching assistant does not satisfy this requirement. Students must deliver at least four 50 minute lectures and must attend at least one seminar on teaching while doing the practicum. Seminars are offered through the graduate school and through the Center on Teaching and Learning.

Research Practicum

The research practicum is a requirement for students admitted into the doctoral program. Its purpose is to enhance knowledge and skills in research by working on one or more research projects. Optimally, it should be completed during the first two years of the program to develop the skills necessary to complete the dissertation. It must be completed before taking the comprehensive exams. Students must fill out a contract before starting their practicum. At the end of the practicum, students will be evaluated by the faculty member who is supervising their practicum. A satisfactory evaluation is required to fulfill the research practicum requirement. The practicum may involve designing and implementing a research project, conducting data analyses, writing manuscripts, preparing a grant proposal, presenting findings at a meeting, or a combination of these activities. Data entry, photocopying, or interviewing patients alone does not satisfy the practicum requirement. The student must devote the equivalent of 15 hours per week for a regular semester (14 weeks), for a total of 210 hours to satisfy the practicum requirement.

Written Qualifying Exams

PhD students are expected to complete all the required course work, proposal writing, and the research and teaching practica before they can take written qualifying exams.

The objective of the doctoral written qualifying exams is to ensure that students are proficient in three concentration areas before pursuing dissertation research. Although a student may choose to focus his/her studies in one area, fundamental knowledge and skills in all three areas are considered necessary for a qualified PhD candidate in DPOP to pursue dissertation research. The three tested areas are: 1) Pharmacoeconomics; 2) Pharmacoepidemiology; and 3) Health Behavioral Sciences. Exams cover the program's required competencies (see Appendix 2) and have three modules, corresponding to these three areas.

Schedule

Doctoral students are normally expected to take the written qualifying exams at the end of their second academic year. Each year, the exam shall be regularly given on Monday, Wednesday, and Friday during the second week of June. In the event of time conflicts, students shall submit a written request for re-scheduling to the Division Chair and the Director of Graduate Studies.

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Format

Written qualifying exams will be open-book format. Students are encouraged to use MS Word and Excel to complete the exam. For each module, up to 3 published articles will be selected by the faculty and provided to the students on the Friday prior to the exam week. Questions for the exam will focus on critically evaluating and interpreting conceptual issues, research and analytic methods, and results that are either discussed in the papers or that are relevant to the papers. Questions may address student's understanding of the theories involved, analytical frameworks employed; statistical tests conducted; interpretation of the results and policy implications; and the strengths and weakness of study design, data collection or analytical methods employed in the study compared to any alternatives.

Evaluation

Each module of the exam will be evaluated separately, with three grades possible: Pass, Marginal Pass, and Fail. To pass the exam, students must receive a "Pass" on all three modules.

A grade of "Pass" on a module indicates that the student's answers demonstrate an adequate and complete understanding of the competencies being evaluated, with no evidence of weaknesses.

A grade of "Marginal Pass" on a module indicates that the student's answers demonstrate an adequate understanding of the competencies evaluated, but that some answers are weak or deficient in a specific area. Students who receive a "Marginal Pass" on any of the three modules must meet with the faculty member(s) responsible for evaluating the module(s) immediately after receiving their grade. Remedial work will be provided to the student, and the student must develop a plan to complete the remedial work required within six weeks of receiving their grade. If the remedial work is not performed in a satisfactory manner, or within the time prescribed, the grade on this exam module will convert to a "Fail".

A grade of "Fail" on a module indicates that the student does not appear to have a mastery of the competencies being evaluated. Students who fail one or more of the exam modules will be considered to have failed the exam as a whole. This has very serious consequences for program completion. Such students must meet with the faculty member(s) responsible for evaluating the module(s) immediately after receiving their grade and develop a plan of study focused on remediation of the deficiencies identified. Such students will be allowed to retake the failed module(s) one time. Although the second exam will test the same competencies as those tested in the initial exam, the specific questions included on the exam will differ. (NOTE: Students do not need to retake modules on which they have obtained a grade of "Pass.") Because a grade of "Fail" indicates that the student needs to gain a better mastery of the required competencies, students are required to wait at least three months before retaking the failed module(s). However, in most cases, the exam should be retaken within six months of the initial exam date.

A student who fails one or more modules of the exam for the second time is classified by the University as "Academically Ineligible". As such, they are not allowed to register for classes, hold TA positions, or progress in the program. When special circumstances warrant, The Graduate School may grant a student a third and final opportunity to take the examination. This third opportunity is only available to students if requested by the student's director of graduate studies. However, no student may continue in a program or take an examination a third time without approval by the Administrative Board of The Graduate School.

Dissertation Requirements

After successfully passing the written qualifying exams, students will begin to work on their dissertation proposal. A minimum of six (6) hours of thesis credit must be taken in order to complete the requirements for the PhD degree. There is no limit to the number of dissertation hours that can be taken; however, no more than six (6) hours may be applied to the minimum of 43 hours needed to satisfy graduation requirements. The Division does not have any additional thesis requirements beyond those stated in the *Graduate School Handbook* section on Thesis and Dissertation Preparation and Requirements.

Dissertation Format

Dissertations can follow the traditional monograph or the three paper option format. The three paper option requires three journal-length manuscripts of publishable quality that could be altered slightly for submission to refereed journals, accompanied by additional sections and/or appendices that provide detail normally included in the monograph dissertation format but excluded from articles (e.g. a more detailed literature review, questionnaires, details on data collection, concluding chapter).

Time Limits in the UNC-CH/DPOP Graduate Program

DPOP Dissertation Progression Guidelines

Within 3 months of passing comprehensive exams, students are encouraged to identify a dissertation advisor. Dissertations must include a pharmaceutical component or have implications for pharmaceutical policy or pharmacy practice.

Within 6 months of completing comprehensive exams, students are expected to have submitted a first draft of their dissertation proposal to their advisor.

Within 12 months of completing comprehensive exams, students are expected to defend their dissertation proposal. They are also expected to have their work plan and expected date of completion approved by their committee at the time of the dissertation proposal defense.

Students must update dissertation committee members of their progress quarterly in writing. Also, students are encouraged to have an interim meeting of their dissertation committee approximately 6 months after they have defended their proposal, to update the committee of their progress and to receive feedback.

All students are strongly encouraged to try to complete their dissertation within 12 months of defending their proposal.

<h3>3. FACULTY AND ADJUNCT FACULTY</h3>

A. Tenure Track Faculty

The Division of Pharmaceutical Outcomes and Policy consists of an active and interdisciplinary faculty. In addition to our faculty with primary appointments, we have 9 adjunct faculty who make significant contributions as research collaborators, guest lecturers, or mentors for our PhD students. The faculty is committed to training graduate students in pharmaceutical outcomes and policy to become national and international leaders in our field. The following tables present: (a) a list of our current faculty and ranking, years of service, and areas of research, (b) gender and ethnic trends of faculty, (c) distribution of faculty by rank and age, and (d) a list of our adjunct faculty.

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Table 2: Current Faculty

Name	Ranking	Years of Service	Areas of Research
Michael Murray	Professor (Chair)	4	Developing pharmacy services that can improve drug use in patients with chronic disorders such as high blood pressure and asthma, examining how computers can help physicians avoid errors in prescribing medication, and low-income minority groups' use of health care.
Joel Farley	Assistant Professor	1	Medicaid prescription policies and their impact on health care utilization and expenditures in vulnerable populations.
Matthew Maciejewski	Associate Professor	1	Evaluation of programs for chronic disease management, health economics, research methods, and outcomes research.
Mary Roth	Assistant Professor	3	Developing, implementing, and evaluating medication therapy management services as a means to improve the quality of medication use and health outcomes in older adults.
Susan Blalock	Associate Professor	5	Health outcomes assessment, the psychosocial aspects of chronic illness, patient decision-making, and compliance with therapeutic regimens.
Richard Hansen	Assistant Professor	4	Understanding the relationship of cost-containment strategies, health policy, patient preferences with appropriate use of pharmaceuticals, and understanding the impact of these issues on drug utilization and spending.
Betsy Sleath	Professor	12	Provider-patient communication, literacy and the readability of written drug information, and ethnic and gender differences in physician prescribing.

Table 3: Current Faculty Gender Ethnicity

Current Faculty Gender & Ethnicity		
Rank	Gender	Ethnicity
Professor	Male	Caucasian
Professor	Female	Caucasian
Associate	Female	Caucasian
Associate	Male	Caucasian
Assistant	Male	Caucasian
Assistant	Male	Caucasian

Table 4: Trends in Faculty Rank

Trends in Faculty Rank			
Year	Assistant Professor	Associate Professor	Professor
'01 – '02	1	3	2
'02 – '03	0	4	2
'03 – '04	1	4	2
'04 – '05	1	4	3
'05 – '06	2	4	3
'06 – '07	3	3	2

Table 5: Distribution of Faculty by Rank & Age, August 2007

Number of Faculty	Rank	Age Range
1	Professor, Chair	50-60
1	Professor	45-55
2	Associate Professor	35-55
3	Assistant Professor	30-40

Table 6: Adjunct Faculty

Name	Organization
Patricia J. Bush, PhD, Adjunct Professor	Georgetown University School of Medicine
Andrea K. Biddle, PhD, MPH, Adjunct Associate Professor	UNC-CH School of Public Health, Health Policy and Administration
Mr. Jack W. Campbell, IV (Jay), Adjunct Assistant Professor	NC Board of Pharmacy
Marisa Domino, PhD	UNC-CH School of Public Health, Health Policy and Administration
Alicia Gilsenan, PhD, Adjunct Assistant Professor	Research Triangle Institute
Mr. Steven R. Moore, Adjunct Assistant Professor	UNC-CH Odum Institute
John E. Paul, PhD, Adjunct Associate Professor	UNC-CH School of Public Health, Health Policy and Administration
Joshua Thorpe, PhD, MPH, Adjunct Assistant Professor	Duke University School of Nursing
Morris Weinberger, PhD, Adjunct Professor	UNC-CH School of Public Health, Health Policy and Administration

B. Teaching

The faculty are required to participate in both professional degree and graduate program training. Teaching assignments are made based upon the programmatic teaching needs and each faculty member's expertise. When new faculty are hired, we try to limit the amount of teaching within the first year. In the graduate program, teaching needs have been identified through a process of curricular and competency mapping, spearheaded by Professor Susan Blalock in consultation with the Division faculty. Doing so has provided us with needed information to assure that our graduate program training is consistent with the competencies we have required of our students. Where gaps have been identified, the faculty have sought courses offered by other health profession schools that can fill the void or recommended new curricular content for existing courses within the Division's graduate program. Ultimately each faculty member should serve as course director in one graduate course and either serve as a course coordinator or participate in at least one-third of a course's lectures in the professional program. Decisions on the courses faculty teach in the graduate and professional degree programs are made collaboratively between the chair and faculty member. Philosophically it is important that each faculty member has a sense of enthusiasm for the content of an assigned course. The teaching evaluations conducted for each course are discussed at meetings between each faculty member and the chair, held each semester and at the annual review.

Division faculty are actively involved in mentoring PhD students within the division as well as Master's and PhD students in other departments on campus. The following table presents the mentoring activities of faculty at UNC-CH between 2001 and 2007.

Table 7: Mentoring of Students

Faculty	Advisor (MS)	Advisor (PhD)	Advisory Committee	Total
Susan Blalock	1	2	12	15
Joel Farley	1	2	1	4
Richard Hansen	1	3	5	9
Matthew Maciejewski	0	2	2	4
Michael Murray	0	2	1	3
Mary Roth	0	1	1	2
Betsy Sleath	4	4	10	18

Faculty Teaching Loads

Division faculty are actively involved in training both PharmD and PhD students. Faculty coordinate and lecture in both PharmD and PhD courses. The following table illustrates the course coordination and teaching responsibilities of the division faculty. We present the most recent data available from the 2006-2007 academic year.

Table 8: Faculty Teaching Loads

Faculty	PharmD Courses Coordntd	PharmD Courses Lectured	PhD Courses Coordntd	PhD Course Lectured	PharmD Lectured Hours	PhD Lectured Hours
Susan Blalock	1	1	1	4	22	11
Joel Farley	1	1	0	2	7	13
Richard Hansen	3	5	1	1	46	30
Matthew Maciejewski	0	0	1	3	0	36
Michael Murray	0	1	1	1	15	2
Mary Roth	0	6	1	2	11	4
Betsy Sleath	1	3	2	2	10	32

C. Research

Division faculty have been extremely successful in obtaining extramural funding and in publishing their scientific findings. The following tables present: (a) the financial support received by faculty members between 2001 and 2007 and (b) the average number of yearly peer-reviewed publications per faculty member between 2001 and 2006. Appendix C contains abbreviated Curriculum Vitae's of division faculty members.

Table 9: Financial support

Year	State Funds	Extramural Funds	Total
01-02	\$27,213	\$973,065	\$1,000,278
02-03	\$28,470	\$1,022,415	\$1,050,885
03-04	\$23,960	\$2,000,000 (approx)	\$2,023,960
04-05	\$42,318	\$2,921,782	\$2,964,100
05-06	\$88,000	\$1,347,148	\$1,435,148
06-07	\$101,000	\$2,769,412	\$2,870,412

*Beginning in FY 04-05, the school elected to significantly increase the division budget to cover annual expenses previously paid for by the school's administrative budget.

Table 10: Average Yearly Peer-reviewed Publications per Division Faculty Member

Year	2001	2002	2003	2004	2005	2006
Publications	2.3	4.2	2.4	5.4	5.9	3.8

D. Leadership Activities of Faculty

Faculty have served in numerous leadership roles within the School of Pharmacy as presented in the table below. Dr. Blalock served as the school's faculty delegate to the American Association of Colleges of Pharmacy in 2004-2005.

Table 11: Leadership Activities of Faculty

Faculty	Organizational Leadership
Susan Blalock	School of Pharmacy Faculty Delegate, American Association of Colleges of Pharmacy, 2004-2005
	Divisional Director of Graduate Studies for Pharmaceutical Policy and Evaluative Sciences 2007-present
Richard Hansen	Chair, IT Manager Search Committee, University of North Carolina School of Pharmacy
	Chair, Honors Committee, University of North Carolina School of Pharmacy
	Chair, Web Committee, University of North Carolina School of Pharmacy
Mary Roth	Director, UNC-CH School of Pharmacy Medication Management Program for Seniors
Betsy Sleath	Divisional Director of Graduate Studies for Pharmaceutical Policy and Evaluative Sciences, 2003-2006 and 2000-2001

E. Evaluation of Faculty Performance

Faculty are formally evaluated on an annual basis by the chair with discussions with each faculty member about research, teaching, and service activities. As shown in the Strategic Plan (Appendix A), the faculty have decided to have their achievements measured by the number of grants awards and the dollar award of these grants, the numbers of publications in peer-reviewed journals and the impact of these publications on pharmaceutical policy, the numbers of graduate students, the numbers of honors and awards, and leadership roles in state, national and international organizations. While impact factors of journals have a lag period of one to two years and suffer some inherent insufficiencies, faculty typically strive to get their manuscripts published in appropriately targeted and nationally or internationally prominent pharmacy or medical journals.

F. Evidence of Excellence

Division faculty are nationally recognized through involvement with national organizations and through honors and awards received. The following tables present: (a) highlights of faculty excellence and (b) awards and honors received by faculty.

Table 12: Highlights of Faculty Excellence

Type of Role	Faculty	Organization and Specific Role
Leadership at a National Level	Susan Blalock	California Breast Cancer Research Council, Evaluation and Priority Setting Subcommittee (Chair)
	Michael Murray	Board of Directors, American Society of Clinical Pharmacology & Therapeutics
		Chair, Committee on the Coordination of Scientific Sections, American Society of Clinical Pharmacology & Therapeutics
	Mary Roth	Fellow and Secretary of the Board of Regents, American College of Clinical Pharmacy
	Betsy Sleath	Chair elect of the Social and Administrative Sciences section of the American Association of Colleges of Pharmacy
		Food and Drug Administration Risk Communication advisory committee
Participation on National Expert Panels and Study Sections	Susan Blalock	American College of Rheumatology. REF Study Section
		Association of Rheumatology Health Professionals: Pre-review panel for Arthritis Foundation grant proposals
	Michael Murray	Safe Medication Use Expert Panel, United States Pharmacopeia
		Overcoming barriers to treatment adherence in minorities and persons living in poverty. Study Section Beeson Career Development Awards, Review Panel, National Institute on Aging
	Betsy Sleath	Therapeutic Decision-Making Expert Panel, United States Pharmacopeia
Editorial Board of Major Journals	Susan Blalock	Current Rheumatology Reviews
	Richard Hansen	Research in Social & Administrative Pharmacy
	Betsy Sleath	Patient Education and Counseling

Table 13: Faculty Awards and Honors

Type of Award	Faculty	Specific Award
Investigator Awards	Joel Farley	Pfizer Scholars Grant in Health Policy: The Effect of Medicaid Prescription Restrictions on Mental Health Utilization and Expenditures in Parents with Schizophrenia.
		Anti-osteoporosis Medication Trends and Determinants in the US Ambulatory Population from 1996-2004: Results from the Medical Expenditure Panel Survey (MEPS) American Society of Health-System Pharmacists Foundation – Junior Investigator Research Grant
	Richard Hansen	K12 Mentored Clinical Research Career Development Program; K12RR023248, US Department of Health and Human Services.
	Mary Roth	K23 AG024229 The National Institutes of Aging Mentored Patient-Oriented Research Career Development Award, NIH K23, Improving the Quality of Medication Use in Older Adults
		Gordon H. DeFries Career Development in Aging Research Award 2006
		Provost Junior Faculty Development Award 2007
Other Faculty Awards and Honors	Richard Hansen	Outstanding Peer Reviewer – Journal of Managed Care Pharmacy
	Matthew Maciejewski	Academy Health, Abstract selected as one of Most Outstanding Abstracts
		Society of General Internal Medicine, Milton Hamolsky Award
	Michael Murray	Fellow of the International Society for Pharmacoepidemiology (FISPE)
	Betsy Sleath	Received a Chapel Hill/Carrboro Community Hero Award from Radio Station 1080 for asthma work

4. STUDENTS

A. Enrollment and Demographics

The Division of Pharmaceutical Outcomes and Policy is fortunate to have an outstanding group of students at every level of study. Each year, the division enrolls approximately 3 to 4 graduate students. The following table presents information on applicants.

Table 14: Graduate School Applicants

Year	Number of Applicants*	Number Attended Recruitment Weekend	Number from Recruitment Weekend Extended Offers	Number from Recruitment Weekend Accepted	Number Accepted	Mean GPA for Students Accepted	Mean GRE for Students Accepted
2001	(PhD program just approved and unofficially started)	N/A	N/A	N/A	1	3.84	1080
2002	22	N/A	N/A	N/A	4	3.72	1240
2003	32	2	2	1	2	4.33*	1320
2004	26	4	1	0	3	3.84	1310
2005	12	1	2	1	1	3.48	1170
2006	19	6	6	4	4	3.50	1125
2007	17	3	2	1	4	3.38	1365

* One admitted student was from an undergraduate school with a grade range of 0 to 5.0 rather than 0 to 4.0.

Minority Enrollment

Our program has been successful in admitting an ethnically and gender diverse group of graduate students as indicated by the table below.

Table 15: Student Enrollment

Name	Year Admitted	Gender	Ethnic group	National Origin
Josuha Thorpe	2001	Male	Caucasian	United States
Johnny Byrd Jr.	2002	Male	Caucasian	United States
Alex Fu	2002	Male	Asian	China
Mark Patterson	2002	Male	Caucasian	United States
Troy Trygstad	2002	Male	Caucasian	United States
Melissa Butler	2003	Female	Black	Bermuda
Shin-Yin (Sharon) Chen	2003	Female	Asian	Taiwan
Hisham Aljadhey	2004	Male	Arabic	Saudi Arabia
Ashley Beard	2004	Female	Caucasian	United States
Aaryn Cohen	2004	Female	Caucasian	United States
Deidre Washington	2005	Female	Black	United States
Stacie Dusetzina	2006	Female	Caucasian	United States
April Susan Herndon Corbett	2006	Female	Caucasian	United States
Brian Leinwand	2006	Male	Caucasian	United States
Amica Simmons Yon	2006	Female	Black	United States
Patrick Ryan	2007	Male	Caucasian	United States
Chi- Chuan (Emma) Wang	2007	Female	Asian	Taiwan
Michele Wilson	2007	Male	Caucasian	United States

Undergraduate Institutions

Appendix D contains a table presenting the undergraduate institutions of our admitted graduate students.

Recruitment Practices

The division has used several different mechanisms for recruiting high quality graduate students over the past several years: (1) a student recruitment dinner every fall where local individuals who have expressed an interest in our program are invited to have dinner with division faculty and current students, (2) a School of Pharmacy's recruitment weekend which occurs every spring, where high quality applicants are invited to UNC-CH for the weekend to interview and meet with division faculty and students, (3) a booth at the Academy of Health meeting showcasing our program, (4) mailings to student chapters of the American Pharmacists Association, (5) making division PhD courses available for PharmD or Master's students or persons employed at Glaxo Smith Kline or contract research organizations in the area who have an interest in our field, and (6) having our downloadable brochure available on the World Wide Web. Table 14 illustrates our "success rate" from recruitment weekend.

B. Funding

The following table presents the current sources of graduate student support.

Table 16: Current Graduate Student Support

Student	Entry	Degree	Advisor	Support
Hisham Aljadhey	August 2004	PhD	Michael Murray	External Support
Ashley Beard	August 2004	PhD	Betsy Sleath	Arthritis Foundation Dissertation Grant
Melissa Butler	August 2003	PhD	Matthew Maciejewski	GSK Fellowship
Shin-Yin (Sharon) Chen	August 2003	PhD	Matthew Maciejewski	RA
April Susan Herndon Corbett	August 2006	PhD	Mary Roth	RA
Stacie Dusetzina	August 2006	PhD	Richard Hansen	TA
Brian Leinwand	August 2006	PhD	Richard Hansen	TA
Aaryn Olesen Cohen	August 2004	PhD	Richard Hansen	External Support
Patrick Ryan	August 2007	PhD	Richard Hansen	External Support
Chi-Chuan (Emma) Wang	August 2007	PhD	Joel Farley	TA
Deidre Washington	August 2005	PhD	Susan Blalock	NHLBI Minority Supplement Grant
Michele Wilson	August 2007	PhD	Matthew Maciejewski	External Support
Amica Simmons Yon	August 2006	PhD	Betsy Sleath	TA

Note: TA- Teaching Assistant, RA- Research Assistant, NHLBI = National Heart, Lung, Blood Institute

Graduate Teaching Assistantships and Responsibilities

Purpose

Teaching assistantships are awarded to graduate students in the pharmaceutical sciences, typically in their first and second years of study, to provide instructional support for courses and laboratory sections. These service awards include a stipend and payment of health insurance fees for the student.

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Requirements

Assistantships begin with the start of classes in August and end the following August 14th. During the summer months, students are expected to assist the faculty in revising previously taught courses and developing new ones. Teaching assistants (TAs) are assigned to one or two undergraduate or graduate level classes at the beginning of each semester. Upon notification, each TA should consult with the faculty member(s) teaching his/her assigned class(es) for instructions. In general, TA duties include assisting with course preparation, grading, and holding office hours for students. TAs are expected to regularly attend the assigned courses and may also be asked to present a limited number of lectures.

Each teaching assistantship (TA) carries a service commitment of 15 to 20 hours per week. Assistantships constitute full employment, so are not consistent with holding concurrent University appointments, either salaried or hourly. While course-related duties may not always require this amount of effort, particularly during summer sessions, the remaining obligated time is reserved for the student's research and professional development. Activities may include literature searches, research projects, manuscript preparation, or other scholarly activities, as agreed upon by the student's advisor and/or Director of Graduate Studies.

Supplemental Employment: Students holding assistantships are discouraged from seeking external employment, as dedicating time to other activities may adversely affect progression. Non-university employment may be undertaken only if disclosed to the advisor and/or Director of Graduate Studies, and with due consideration for both the student's academic progression and his/her responsibilities as a TA.

Students who elect to take advantage of summer internships or other field experiences that provide full-time compensation will not be eligible to hold assistantships concurrently. Such summer opportunities must be selected in consultation with the faculty advisor and Director of Graduate Studies.

Research Assistantships

Research assistantships are only available as outside research funding permits. These will be arranged individually by the faculty member requesting assistance on a particular project or grant. Research assistantships do not provide tuition remission *per se*, but the grant process may allow faculty to obtain sufficient funds to cover those expenses.

Tuition Remission

The University of North Carolina makes a distinction between tuition waivers and tuition remissions. Any graduate TA or RA appointment includes a tuition waiver that waives in-state tuition. Tuition remissions cover the out-of-state portion of the tuition. Each year, the Division has a limited number of tuition remissions available to students as financial aid for fall and spring semesters only. Typically, graduate teaching assistantships are accompanied by tuition remissions, but the Division may also be able to supplement outside sources of financial aid with tuition remissions.

Travel Awards

Students are encouraged to present their work at regional and national meetings. Pending availability of funds, DPOP provides awards supporting thesis-related travel for eligible Graduate students. These awards are not necessarily intended to cover the full cost of travel and may be supplemented by other, non-Division funds. Preference is given to persons presenting papers or posters and to those who have not attended a meeting previously. Any student who is currently enrolled in the PhD program and is in good standing is eligible to submit an award proposal. Good standing implies, at a minimum, that course work is being or has been completed according to schedule, a major advisor and Student Advisory Committee (SAC) have been selected, and comprehensive examinations have been taken (if applicable). Students have presented in the past at the following professional meetings: European Association for Communication in Healthcare (EACH), Academy Health, American Pharmacists Association, International Society for Pharmacoeconomics and Outcomes Research, International Conference on Health Care Communication, American Public Health Association, Southern Pharmacy Administration Conference and the International Society for Pharmacoepidemiology.

C. Environment

The environment at UNC-CH encourages interdisciplinary research and students are encouraged to pursue PhD minors or participate in certificate programs if they desire to do so after talking with their Student Advisory Committee.

PhD Minors

Students may undertake a minor in any program that offers a graduate degree with approval from the Director of Graduate Studies. A minor in a PhD program must comprise at least 15 hours of courses in programs other than that of the major, and cannot also be counted toward the major. The minor must be approved in advance by the Director of Graduate Studies in both the major and the minor programs. After approval by both programs, a copy of the proposed minor course of study should be signed by the Director of Graduate Studies in the major and minor programs and sent to the Graduate School to become a permanent part of the student's record. The minor must also meet all the requirements described in the *Graduate School Handbook*.

Certificate Programs

There are also many certificate programs available in which division students can participate. The programs involve taking a certain number of credits in courses approved in the area of focus. Available certificate programs that are relevant to our students include: (a) health outcomes, (b) aging, (c) health disparities, (d) survey methodology, and (e) health communication.

D. Progression of Students and Success Rate

Our five graduates from the PhD program to date have all completed their PhD degrees in four years. We currently have one PhD student who was admitted in 2003 and has not yet defended their dissertation proposal. Part of this is due to the departure of faculty with expertise in pharmacoeconomics. We now have new faculty with expertise in this area and the student is expected to become a dissertator by the fall of 2008. We have another PhD student admitted in 2004 who failed sections of the comprehensive exams and then took a leave of absence for personal reasons. She plans to return to the program in the spring of 2008. Another PhD student took a leave of absence in the fall of 2007 due to serious health problems. The faculty regularly discuss the progression of students at division meetings and attempt to resolve difficulties students are having with progression.

Current Student Awards

The numerous awards granted to our graduate students as evidence of their excellence are presented in the following table.

Table 17: Current Student Awards

Student	Award(s)
Hisham Aljadhey	Ideal Student Prize, College of Pharmacy, King Saud University, Riyadh, Saudi Arabia
Ashley Beard	Alpha Omicron Pi Doctoral Dissertation Award
	Whitehead Public Health Scholarship
	Rho Chi (Pharmacy Honor Society)
	Delta Omega (Public Health Honor Society)
Melissa Butler	ISPOR Outstanding Service Award
	University Merit Assistantship / University of North Carolina- Chapel Hill
	Best Social Science Poster, 4 th Annual University Research Day, UNC-CH
	GSK/GSO Fellowship
	Fellow Travel Award, American College of Cardiology / American Heart Association Scientific Forum on Quality of Care and Outcomes Research in Cardiovascular Disease and Stroke
Shin-Yin (Sharon) Chen	Finalist, Best Poster Presentation, in ISPOR 11th Annual International Meeting
	Research Assistantship Award, University of North Carolina at Chapel Hill
	Teaching Assistantship Award, University of North Carolina at Chapel Hill
	National Taiwan University Distinctive Student Award
	National Taiwan University President's Award
	Cultural Scholarship, Zhongzheng District, Taipei, Taiwan
	Travel Award: Cairo, Egypt
April Susan Herndon Corbett	GlaxoSmithKline – Phi Lambda Sigma – AFPE First Year Graduate School Scholarship in the Pharmaceutical Sciences American Foundation for Pharmaceutical Education
	Scholarship in the Pharmaceutical Sciences
	Best Poster Reflecting a Connection of UNC-CH Campus with the Community UNC-CH Institute on Aging
	Rho Chi Academic Honor Society, UNC-CH School of Pharmacy
	Hollingsworth Scholarship Academic Scholarship, UNC-CH School of Pharmacy
	Phi Lambda Sigma Member Leadership Society, UNC-CH School of Pharmacy
	Merck Index Award Academic Award, North Carolina State University
	Phi Beta Kappa Member Academic Honor Society, North Carolina State University
	Phi Lambda Upsilon Member National Chemistry Honor Society, North Carolina State University
Stacie Dusetzina	Highest Quality Achievement Award – Rho, Inc.
	Reaching Above and Beyond Award – Rho, Inc.
	Golden Key Honor Society Award
	Eshelman Fellowship
	Dean's List – UNC-CH
Amica Simmons Yon	Pharmaceutical Outcomes and Policy Award
	F.O. Bowman Award
	Pharmacy Foundation/Joe Hollingsworth Scholarship
	Nominated for the Fannie Jackson Andrews Scholarship/Award
	Nominated for Phi Lambda Sigma, National Pharmacy Leadership
	University of North Carolina School of Pharmacy Honors Program, Best Student Honors Project, 2005-2006

Current Student Publications and Presentations

Our current students have been extremely productive at publishing peer-reviewed articles and book chapters and presenting at local and national meetings. Appendix E contains current student publications and Appendix F contains presentations.

Leadership Roles in University Organizations

The following table illustrates the active involvement of our students in leadership roles at our university.

Table 18: Student Leadership Roles in University Organizations

Student	Organization(s)	Student Role(s)
Ashley Beard	Graduate Student Organization, UNC-CH School of Pharmacy	President
	Minority Student Caucus, UNC-CH School of Public Health	Treasurer
	Graduate & Professional Student Federation (GPSF)	Senator
	Interdisciplinary Journal Club – Public Health/Pharmacy	Division Representative
Melissa Butler	UNC-CH Graduate Professional Student Federation (GPSF) Senate	Treasurer
	UNC-CH ISPOR Student Chapter	Founder & President
	UNC-CH Student Fee Advisory Subcommittee of the Tuition & Fee Advisory Taskforce	Voting Member
	UNC-CH Student Fee Audit Committee	Voting Member
April Susan Herndon Corbett	Pharmacy Student Geriatric Interest Group UNC School of Pharmacy	Founder and Chair
	Prescription Assistance Counseling Program UNC-CH School of Pharmacy in partnership with UNC Hospitals	Coordinator
Stacie Dusetzina	Interdisciplinary Journal Club – Public Health/Pharmacy	Planning Committee member
	Graduate Student Organization	Division Representative
Deidre Washington	School of Pharmacy Graduate Student Organization	Secretary
Amica Simmons Yon	Student National Pharmaceutical Association (SNPhA)	Vice President (2004-2005) and Historian/Service Committee Chair (2003-2004)

Dissertation Titles of Current Students and Alumni

Appendix G presents the dissertation titles of current students who are dissertators and alumni.

Placement and Performance of Graduate Students

Appendix H lists the first jobs of the graduates from our program. Appendix I presents the publications of our alumni.

5. LEADERSHIP, ADMINISTRATIVE SUPPORT, FACILITIES AND EQUIPMENT

Leadership

The Division is led by Professor Michael Murray, PharmD, MPH who serves as chair of the division of pharmaceutical outcomes and policy. He reports directly to Dean Blouin. With the reasonably small number of faculty in the Division, the Chair often chooses to reach key decisions based on discussions and recommendations of the DPOP faculty at monthly meetings. The Chair is relied upon by the faculty to provide leadership towards faculty recruitment and retention, and student affairs. The Chair is also responsible for providing structure and supervision towards the Divisional support staff. Susan Blalock, PhD serves as the divisional director of graduate studies and reports to Professor Murray.

Administrative Support: Roles and Responsibilities

Gwen Ricks, (Administrative Assistant I), serves as the Graduate Program Coordinator. She coordinates and processes all graduate student applications, admissions, comprehensive exams, and progression paperwork. In addition, she assists with scheduling graduate student interviews, comprehensive exams, proposal defenses and planning the graduate student orientation day and recruitment weekend as well as maintaining the current student and alumni files. She provides direct support to Division Faculty, maintains the Division website, processes financial and travel documents, and directly supervises three work-study students.

Charlotte O'Brien, (Administrative Assistant II), is responsible for overseeing the Division's administrative functions, including finances, human resources, facilities, IT, scientific publication and reporting processes. She directly supervises the Administrative Assistant I and works very closely with the School of Pharmacy Divisions of Finance, Human Resources, Facilities, IT, and the Office of Research and Graduate Education. In addition, she provides direct support to the Chair and acts as a liaison for the Chair of the Division to keep faculty, staff and other Divisions within the School of Pharmacy and outside of the School abreast of the Division's activities.

Wendy Mann, Administrative Officer, is responsible for coordinating all sponsored programs activities for the division including proposal development and grants management. She serves as liaison for the Division with the Office of Research and Graduate Education as well as other divisions within the School of Pharmacy and outside of the School. She provides support to the Chair, faculty, students and staff for sponsored program activities which include research, training, and other sponsored activities. She works with Charlotte O'Brien in the management of the division budget and finances.

Work Study Students; assist Charlotte O'Brien, Gwen Ricks and Wendy Mann in supporting the faculty and graduate students.

How Staff Support Academic Programs

Division Staff provide both direct and indirect support to the academic programs. The Administrative Assistant I provides support to Professor Blalock, the division director of graduate studies as well as the other division faculty. She coordinates admission of graduate students and maintains paper and electronic files for student information. She also helps coordinate graduate seminar and comprehensive exams. She assigns space to graduate students and informs them of division policies and procedures. She works with the graduate students to process all required forms documenting progress to the graduate school. In addition, she maintains the alumni database, updates the website and listservs that are used for student communications. Administrative support is provided to faculty and students copying, preparing class materials, obtaining items from the library, arranging travel for visiting lecturers, arranging travel for presentations at meetings, and ordering educational supplies and materials.

The Administrative Assistant II and Administrative Officer also support the academic programs especially in the areas of payroll, financial management, human resources, purchasing and grants management. In these roles, they ensure that adequate funds are available to pay teaching assistants and other graduate students, purchase educational supplies and pay graduate student travel. They are responsible for making sure the appropriate paperwork is submitted to human resources for graduate teaching and research assistants. They provide support to graduate students regarding financial and administrative questions and make sure that the faculty and graduate students adhere to the appropriate policies and procedures for human resources, financial, and sponsored research activities. In addition, they assist the faculty and students with grant proposal development and submission. Work study students assist with providing academic support to faculty and students. As our faculty continues to grow, more administrative support will be needed.

Financial Support of Administrative Staff

The annual cost for support staff salaries and fringes benefits is currently \$178,172. The support staff salaries are currently funded by the School of Pharmacy permanent allocation of state funds. The work study students are funded by the office of scholarship and student aid with no cost to the School of Pharmacy.

Facilities and Equipment

The division has space in both Beard and Kerr Hall. In Kerr Hall, the faculty has a suite of offices, which is in close proximity to the School of Public Health. Many division faculty hold adjunct appointments in public health, serve on public health student committees, and collaborate with public health faculty on research. The division has research project space and graduate student space in Beard Hall. In addition, the division houses the Center for Pharmaceutical Outcomes and Policy (CPOP) research, which has a suite of offices in Beard Hall. CPOP also has a server which division faculty can use to store research data with protected health information. As our faculty and number of graduate students continue to grow, more space will be needed to accommodate this growth.

6. FUTURE

Our division has made great strides in the development, implementation, and growth of our PhD program in Pharmaceutical Outcomes Research that was started in 2001. Prior to the creation of this program, we only offered only a Master's degree and faculty were involved with collaborative PhD programs with the Departments of Epidemiology and Health Policy and Administration in the School of Public Health. When our PhD program was started, we decided to focus our efforts on the PhD program and no longer offer a Master's degree. We have been extremely successful in recruiting high quality graduate students. Our graduates have been successful in obtaining competitive jobs. As evidenced by the publication and presentation records of our faculty, alumni, and students as well as both faculty and student leadership and involvement in professional organizations, we have become nationally and internationally recognized as a leading program in Pharmaceutical Outcomes Research. Our division plans to continue to grow, both in terms of faculty and graduate students. Two new faculty joined us in the 2007- 2008 academic year, Lynn Dressler, PhD, who has expertise in ethics and pharmacogenomics, and Jaya Rao, MD, who has expertise in communication and epidemiology. Our plan is to become one of the world's top three graduate training programs in pharmaceutical outcomes research.

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PROGRAM OVERVIEW

Vision

The Vision of the Division of Pharmacotherapy and Experimental Therapeutics is to advance clinical practice by leading the nation's pharmacy schools in innovative translational research, and in the education and training of clinical scientists, future pharmacists and current practitioners.

This vision is achieved through faculty who, collectively, engage in innovative teaching and research that develop new professional and scientific leaders and create new knowledge; identify and engage in innovative practice models to serve as role models for our students and identify translational research opportunities; and guide PharmD students into post-PharmD training programs.

Mission

The Mission of the Division of Pharmacotherapy and Experimental Therapeutics is to optimize drug therapy through the generation, integration, and translation of scientific information between the bench and the bedside, the patient and the population.

We accomplish this by initiating and conducting research and scholarly activities and developing clinician scientists that generate, integrate and disseminate new knowledge to optimize drug therapy and improve health outcomes for the benefit of patients and society; educating students and practitioners in the optimal use of drugs to provide pharmaceutical care to individuals and communities; partnering in the development and maintenance of innovative practice that strengthens education and translational research; sharing ideas, new scientific information and expertise throughout the profession of pharmacy, the School of Pharmacy and the University through participation and leadership in local, state, national and international organizations, communities and programs.

PhD Program

The Division offers a concentration area in Experimental Therapeutics within the School of Pharmacy's graduate program leading to the degree of Doctor of Philosophy in Pharmaceutical Sciences. A primary goal of this concentration area is to develop clinician-scientists who are capable of conducting translational research that integrates the biomedical and pharmaceutical sciences, while maintaining expertise as clinicians. The focus of this program is the development of research skills in the broad interdisciplinary area of pharmacotherapy and experimental therapeutics. Although priority in admissions is given to clinically-trained individuals, students with a strong interest in developing clinical research skills also are considered for enrollment in the program.

Divisional Organization

The Division of Pharmacotherapy and Experimental Therapeutics is led by the Chair (Dr. Kim Brouwer), the Vice Chair for Graduate Education and Research (Dr. Herb Patterson), and the Vice Chair for Professional Education and Practice (Dr. Ralph Raasch). The Institute for Pharmacogenomics and Individualized Therapy (IPIT) and the Center for Experimental Therapeutics reside within the Division. The Division includes 20 full-time and one part-time faculty and three administrative personnel.

The Degree Program

The Division offers a concentration area in Experimental Therapeutics in the PhD degree program in Pharmaceutical Sciences. This concentration is subdivided into two tracks (clinician and non-clinician). Both tracks prepare graduates for leadership in academic, industrial and regulatory settings. PhD students conduct original research, culminating in a dissertation intended to expand the boundaries of pharmacotherapeutic knowledge, theory, and/or methodology. A complete description of this program is provided in the form of a program handbook. This is updated annually and is provided to all entering

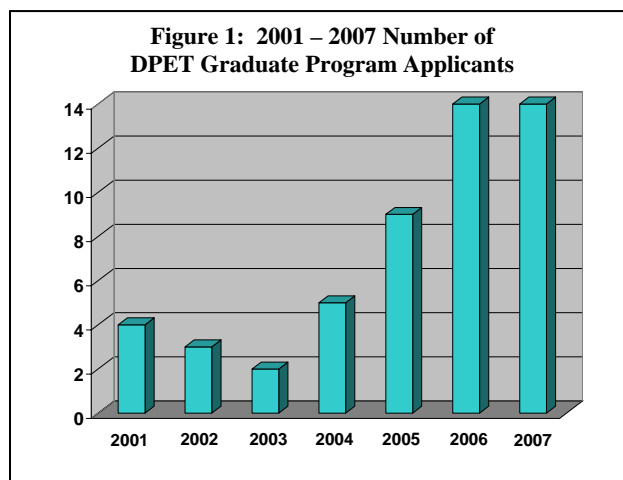
students as part of their orientation materials. It is also available on the Division website. The handbook is included in **Appendix A**.

The primary emphasis of the Division's graduate program concentration area has been, and will continue to be, to recruit and train clinicians (principally PharmDs) to conduct translational research in the pharmaceutical sciences (Clinician Track). Having a clinical background is vital to achieving this goal. The clinical training that these individuals have completed provides them with insight into the importance of conducting translational research that can be applied to optimize patient care. A separate curricular track (Non-Clinician) was developed for applicants who lacked extensive clinical training but desired to conduct translational research. The Non-Clinician curricular track provides additional coursework in pharmacology and therapeutics modules to provide an appropriate clinical background for these students.

Need and Demand for Training in Experimental Therapeutics

The hypothesis-testing skills acquired through graduate education represent an important foundation for basic and applied pharmaceutical scientists. Research experience with contemporary methods (including analytical, cellular, molecular, preclinical and clinical) is critical to the ability of an individual to conduct mechanistic-based research that can be applied to important therapeutic problems. It is clear that the skills required for a Clinician-Scientist to conduct an independent research program in the future cannot be met with the current availability of post-PharmD fellowships. The greatest need for graduates of these programs is anticipated to be in tenure-track Pharmacotherapy faculty positions. However, graduates of similar programs are highly sought by the pharmaceutical industry, federal agencies, and research institutes/cooperative research groups.

The demand for this program can be estimated, in part, by the relatively large number of students seeking post-PharmD fellowships. There are currently 83 fellowship programs listed on the American College of Clinical Pharmacy website. The UNC-CH Division of Pharmacotherapy and Experimental Therapeutics has one of the most highly regarded fellowship programs in the country, with ~6-8 academic and industry-sponsored fellows completing the 2-year fellowship program each year. Although the applicant pool for the PhD program was small initially, there has been a slow but steady increase since the inception of the program (**Figure 1**).



Interdisciplinary Activities and Collaborative Partnerships

The discipline of pharmacotherapy is closely aligned with other health affairs programs at UNC-CH. Several faculty members in the Division have joint appointments in other departments, as listed in **Table 1**.

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Table 1: Joint Faculty Appointments

Faculty Member	Joint Appointment Rank	Primary Appointment	Department of Joint Appointment
Kim L.R. Brouwer	Professor	School of Pharmacy	Curriculum in Toxicology, School of Medicine
Amanda H. Corbett	Clinical Assistant Professor	School of Pharmacy	Division of Infectious Diseases, School of Medicine
Celeste M. Lindley	Clinical Associate Professor	School of Pharmacy	Division of Hematology & Oncology, School of Medicine
Howard L. McLeod	Professor	School of Pharmacy	Division of Hematology & Oncology, School of Medicine
J. Herbert Patterson	Professor	School of Pharmacy	Division of Cardiology, School of Medicine
A. Wayne Pittman	Clinical Associate Professor	School of Pharmacy	Division of Nephrology & Hypertension, School of Medicine
Gary M. Pollack	Professor	School of Pharmacy	Curriculum in Toxicology, School of Medicine
Kirkwood F. Adams, Jr.	Research Associate Professor	School of Medicine	Division of Pharmacotherapy & Experimental Therapeutics, School of Pharmacy
Paul B. Watkins	Professor	School of Medicine	Division of Pharmacotherapy & Experimental Therapeutics, School of Pharmacy

Divisional faculty and students are involved in numerous interdisciplinary research centers at Carolina, as listed below, and detailed in **Appendix B**:

UNC-Chapel Hill

Centers

- The Center for Infectious Diseases (CFID)
- The Center for AIDS Research (CFAR)
- The Lineberger Comprehensive Cancer Center (LCCC)
- Carolina Cardiovascular Biology Center (CCBC)
- Center for Gastrointestinal Biology and Disease (CGIBD)
- The Carolina Center for Genome Science (CCGS)

Programs, Curricula

- UNC-CH Heart Failure Program
- The Curriculum in Toxicology
- North Carolina Collaborative Pediatric Pharmacology Research Unit (PPRU)
- General Clinical Research Center (GCRC)
- The Institute for Pharmacogenomics and Individualized Therapy (IPIT)

School of Pharmacy

- The Center for Experimental Therapeutics (CET)

Divisional faculty are also involved in numerous collaborative relationships with partners external to the University, many of which involve graduate students. For example, the Division has well-established and ongoing collaborative relationships with intramural scientists at the National Institute of Environmental Health Sciences (NIEHS), located approximately 10-miles from campus in Research Triangle Park, NC. One doctoral student (C. Lee) completed dissertation research resulting from collaboration between Dr. Herb Patterson (Professor, DPET) and Dr. Darryl Zeldin (Head, Environmental Cardiopulmonary Disease Section, NIEHS; Adjunct Professor, DPET). In addition, numerous partnerships with pharmaceutical companies have been established in an effort to increase the supply of well-trained scientists in the field of pharmacokinetics, pharmacodynamics, and drug disposition. For example, the Eli Lilly & Co.– UNC-CH Predoctoral Fellowship in Pharmacokinetics, Pharmacodynamics, and Drug Disposition fosters communication and collaboration between UNC-CH and Lilly scientists. This fellowship provides four years of support at \$25,000 per year, and funds two senior graduate students specializing in the broad area of drug disposition for a period of two years each. One DPET predoctoral student (B. Swift) currently is funded by this fellowship. The first Lilly Fellow, [M. Zamek-Gliszczynski (2004-2005)], completed his doctoral dissertation on the hepatic transport of drugs and derived metabolites (Major Adviser: K. Brouwer) and the second Lilly Fellow, [C. Kalvass (2005-2006)] completed his doctoral dissertation on blood-brain barrier distribution and the ultimate influence on CNS pharmacokinetics/pharmacodynamics (Major Adviser: G. Pollack). In addition, scientists from pharmaceutical companies within Research Triangle Park contribute to the graduate education program in the Division by lecturing in their respective areas of expertise. A complete listing of these partners is provided below in **Table 2**:

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Table 2: Collaborative Research Relationships

Academic Institutions	Institutes	Industrial Partners	
Duke University	Hamner Institute	Abbott	Boehringer Ingelheim
Fox Chase Cancer Center	National Institute of Environmental Health Sciences	Bristol-Myers Squibb	Cato Research
Long Island University	National Institutes of Health	Clinsys Clinical Research, Inc.	Eli Lilly and Co.
North Carolina State University	Research Triangle Institute	EMD (Merck)	Gilead
St. Jude's Children's Research Hospital		GlaxoSmithKline	Hoffmann-La Roche, Inc. (Roche)
University of Cape Town		Icon, Inc.	King Pharmaceuticals
University of Kwa-Zulu Natal		Pfizer, Inc.	Pharmaceutical Product Development, Inc.
Wake Forest University		Pharsight	POZEN
		Quintiles, Inc.	SAS
		Statistical Research, Inc.	United Therapeutics

Examples of translational student research activities are presented in **Table 3**. Faculty in the Division are currently involved in approximately 15 interdisciplinary research collaborations within the School, 40 interdisciplinary collaborations outside of the School, and 25 co-funded projects.

Table 3: Translational Student Research Activities

Mary Peace McRae's doctoral dissertation research project investigated the impairment of hepatic bile acid transport as a mechanism of antiretroviral-associated hepatotoxicity. This was accomplished by: 1) determining the relative potency of bile acid transport inhibition by protease inhibitors and nonnucleoside reverse transcriptase inhibitors in sandwich cultured human hepatocytes, 2) determining the role of BSEP inhibition in the alteration of taurocholate transport by protease inhibitors and nonnucleoside reverse transcriptase inhibitors in transfected Sf9 cells, 3) determining whether susceptibility to hepatotoxicity can be identified based on early plasma bile acid levels following acute and chronic antiretroviral exposure in HIV-infected subjects, and 4) determining if there are polymorphisms in the BSEP gene which predispose patients to the hepatotoxic effects of ARVs.

Craig Lee's doctoral dissertation research project evaluated the role of the cytochrome P450 epoxigenase pathway in the development of cardiovascular disease in order to determine if this pathway represents a therapeutic target of potential clinical utility. This was accomplished by 1) evaluating the association between variation in key genes which regulate this pathway (EPHX2, CYP2J2, CYP2C8) and the risk of developing coronary heart disease clinical events in humans at the population level, and 2) developing novel transgenic mice which overexpress the human cytochrome P450 epoxigenases CYP2J2 and CYP2C8 in vascular endothelial cells to characterize the in vivo mechanisms underlying these associations in preclinical models.

Patrick Roberts' doctoral dissertation research project targeted Ras and Rho Family GTPases for the treatment of cancer through inhibition of CAAX-signaled modifications and the ERK MAPK Pathway. This was accomplished by: 1) evaluating the requirement of post-translational modification of Rho family members for proper subcellular localization and function, 2) determining whether Icm-catalyzed methylation was required for K-Ras mediated NSCLC, 3) determining whether K-Ras positive NSCLCs preferentially activate the ERK MAPK signaling cascade using a tissue microarray comprised of 150 NSCLC patient samples.

Rong Zhao's dissertation research project evaluated several aspects (rate, extent and regional distribution) of central nervous system pharmacokinetics using in vitro, in situ and in vivo experimental approaches. Passive permeability, drug brain tissue binding, efflux transport and drug metabolizing enzymatic activity are important determinants of blood-brain barrier penetration. In addition, drug regional distribution is also influenced by local cerebral blood flow, capillary density and P-glycoprotein-mediated efflux.

Emily Olson's doctoral dissertation research project utilizes hysteresis loop area as a quantitative measure of pharmacokinetic/pharmacodynamic (PK/PD) dissociation and variability. Alterations in PK, such as those resulting from differential CYP metabolic activity, drive apparent PD variability and hysteresis area may be a useful metric for characterizing patient and population drug exposure. Hysteresis behavior is influenced by specific PK/PD processes, population variability, and time-point selection. The utility of quantitating hysteresis loop area will be addressed by 1) developing a method of quantitating the area bounded by the hysteresis that is accurate, reproducible and sensitive to changes in PK/PD parameter values, 2) differentiating hysteresis loops of sufficient size to be pharmacologically

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meaningful from non-hysteresis behavior in the presence of typical experimental variability, and 3) utilizing hysteresis behavior to optimize sparse sampling schedules for recovering estimates of specific PK/PD parameters.

Jin Kyung Lee's doctoral dissertation research project will be focused on to assess the effect of breast cancer resistance protein (BCRP) modulation on drug hepatobiliary disposition and elucidate therapeutic and toxic implications. This research project will elucidate the mechanism(s) of sex-related differences in the hepatobiliary disposition of BCRP substrates, using acetaminophen and generated metabolites [glucuronide and sulfate] and metabolically stable rosuvastatin. In addition, the likelihood that GF120918, which recently underwent a phase I clinical study to be utilized as a BCRP inhibitor, may also inhibit hepatic basolateral transport proteins such as MRP3 and/or MRP4, resulting in an unexpected hepatic accumulation of BCRP substrates. Finally, the effect of sulindac, a nonsteroidal anti-inflammatory drug which potentially inhibits the expression of estrogen receptor, on Bcrp expression will be determined.

The Inter-institutional Perspectives

Currently, there are an insufficient number of programs in Schools/Colleges of Pharmacy that provide training in clinical pharmacology/translational research to allow meaningful inter-institutional comparisons. Because our concentration area was recently established, we have just started collecting information relevant to judge our position to similar programs. Such metrics include external reviews, quantity and quality of student applicants, measures of student productivity (e.g., scholarships, manuscripts, presentations, time to degree, honors and awards), impact of graduate program alumni, and research funding base.

Previous Evaluations

This concentration area was developed subsequent to the last self-study and external review of the School of Pharmacy's external graduate program.

CURRICULUM

Educational Goals and Skills Acquisition

Doctoral training in translational pharmacy is based on the philosophy that all doctoral students should be familiar with the broad spectrum of areas that comprise pharmaceutical sciences and should also have in-depth training in a single therapeutic area or specialization. Students are required to demonstrate competency in pharmacology, drug metabolism, pharmacokinetics, pharmacogenomics, clinical trial design, and statistics. Courses, seminars, and research experiences prepare students for positions in universities, government and industry research laboratories or research centers.

To accomplish these goals, this concentration area was developed with two curricular tracks based on previous experience of the student: clinician or non-clinician. It is our belief that the clinical track for this program provides the optimal training for students who seek an academic career. However, we also recognize the need to educate highly motivated, exceptionally qualified students lacking previous clinical training. The non-clinician curricular track was proposed to meet this need.

Degree Requirements

Doctoral degree requirements include core School of Pharmacy Courses and Division-specific courses. The comprehensive examination for all doctoral students is based on core competencies. Ordinarily, students take core courses to gain competency. However, for students with prior course work or experience, some core courses may be exempted based on criteria established by the doctoral committee and the instructor of the core course, pending approval of the faculty in the Division. Core courses for PhD students with a Clinical Degree (e.g., PharmD, MD) entering the program in the Fall of 2007 include:

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Two-Year Course Schedule for Clinical Graduate Students

FALL 2007		SPRING 2008	
Course	Hrs	Course	Hrs
DPET 855, Pharmacokinetic Theory and Applications	3	DPET 856, Advanced Pharmacokinetics and Pharmacodynamics	4
PHCY 801, Ethical Dilemmas in Research	1	DPET 832, Introduction to Applied Pharmacogenomics	2
MOPH 810, Drug Metabolism	3	MOPH 850, Pharmaceutical Analysis	2
DPET 899, Seminar	1	DPET 899, Seminar	1
DPET 991, Research	3	DPET 991, Research	3
		Clinical Experience (May or June)	
FALL 2008		SPRING 2009	
Course	Hrs	Course	Hrs
DPET 840, Advanced Pharmacotherapy	3	DPET 822, Advanced Clinical Pharmacy	3
BIOS 600, Principles of Statistical Inference	3		
DPET 833, Experimental Design Considerations in Clinical Research	2	DPET 831, Quantitative Methods in Clinical Research	3
DPET 899, Seminar	1	DPET 899, Seminar	1
DPET 991, Research	3	DPET 991, Research	3
		Clinical Experience (May or June)	

Core courses for PhD students without a Clinical Degree (e.g., BA, BS or MS) entering the program in the Fall of 2007 include:

Two-Year Course Schedule for Non-Clinical Graduate Students

FALL 2007		SPRING 2008	
Course	Hrs	Course	Hrs
PHCO 155, General Pharmacology (ENDO, AUTO, CARDIO)	2.5	PHCO 156, General Pharmacology (CNS, ID, ONC)	1.5
DPET 855, Pharmacokinetic Theory and Applications	3	DPET 856, Advanced Pharmacokinetics and Pharmacodynamics	4
PHCY 801, Ethical Dilemmas in Research	1	DPET 832, Introduction to Applied Pharmacogenomics	2
MOPH 810, Drug Metabolism	3	MOPH 850, Pharmaceutical Analysis	2
DPET 899, Seminar	1	DPET 899, Seminar	1
DPET 991, Research	3	DPET 991, Research	3
FALL 2008		SPRING 2009	
Course	Hrs	Course	Hrs
<i>One of the following modules:</i>		<i>One of the following modules:</i>	
PHCY 443 (PY2 Module - Dermatology/ Endocrinology)	2	PHCY 444 (PY2 Module - Cardiology/ Nephrology)	3
PHCY 445 (PY2 Module - Pulmonary/ Gastroenterology)	2	PHCY 446 (PY2 Module - Neurology/ Psychology)	2
PHCY 447 (PY3 Module - Hematology/ Oncology)	3		
PHCY 449 (PY3 Module - Infectious Diseases)	3		
BIOS 600, Principles of Statistical Inference	3		
DPET 833, Experimental Design Considerations in Clinical Research	2	DPET 831, Quantitative Methods in Clinical Research	3
DPET 899, Seminar	1	DPET 899, Seminar	1
DPET 991, Research	3	DPET 991, Research	3

Course descriptions for required and elective courses offered within and outside of the School of Pharmacy can be found in **Appendix C**.

In addition to coursework, students develop competency in research methods through laboratory rotations, individual mentoring, and hands-on experience as they conduct their own research. Students are required to register for formal credit in supervised research related to the dissertation project (DPET 991) and in dissertation writing (DPET 994). Students are expected to demonstrate the following research core competencies:

1. Formulate an original research question.
2. Understand alternate research designs and methods, including sample selection and measurement strategies.
3. Conduct a research project, including learning the appropriate skills for the collection of data and/or the use of secondary data.
4. Develop statistical and analytical skills needed to test hypotheses and interpret results.

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5. Master written communication skills needed to report the research findings in an original dissertation, in abstracts for presentation at scientific meetings, and manuscripts submitted to scholarly journals.

Other Divisional Requirements

Certain aspects of the Division's concentration area are common to other Divisions in the School of Pharmacy. As such, a description of the student advising and mentoring philosophy, practicum and research opportunities, doctoral comprehensive examinations, the dissertation committee, and the dissertation proposal can be found in the first section of the School of Pharmacy Self-Study document.

Teaching Experience. In the Division, students gain teaching experience through a variety of opportunities and assignments. All students participate in one or more journal clubs, where assignments are made for detailed journal article reviews and presentation. As teaching assistants, graduate students have the opportunity to teach by formal presentation to students, including clinical topics within professional elective courses, pharmacotherapy modules that are required for all professional students, and selected topics in graduate courses.

Seminar Series. Students are required to attend, and present yearly in, the Division Seminar series that meets weekly during each Fall and Spring semester. A sample seminar schedule can be found in **Appendix D**. Presentations are given by School and Division faculty, as well as faculty from the larger University community and invited nationally recognized speakers. Topics include current research progress and special topics, particularly those that focus on translational research and are relevant to the educational and research mission of the Division and enhance the graduate student's training. Graduate students are evaluated and given feedback on presentation techniques and use of audiovisuals, ability to analyze, interpret and present data and literature in a logical, understandable and scientific manner, and are graded on their presentations. Feedback is tabulated according to faculty and student assessments, and a summary along with specific comments is reviewed by the student and faculty mentor; a copy is placed in the student's file. A sample evaluation form can be found in **Appendix E**.

Written Qualifying Exam. This exam is intended to: assess the extent and currency of the candidate's knowledge in as comprehensive and searching an examination as the best practice of that field requires; test the candidate's knowledge of all transferred courses; discover any weaknesses in the candidate's knowledge that need to be remedied by additional course work or other instruction; and determine the candidate's fitness to continue work toward the doctorate. The Preliminary Doctoral Written Examination is a comprehensive examination taken upon completion of required graduate course work, and must be taken and passed. This usually will be at the end of the second year (end of the 4th semester) of graduate school. Written qualifying examinations are offered once per year beginning the first Monday in June. Typically, this week-long examination is divided into closed book and open book sections; more details regarding the format and structure of the written qualifying examination will be provided to students taking the examination during the Spring semester. Questions will be solicited from the faculty in the Division, as well as from members of each student's Dissertation Advisory Committee (DAC). Participation in the Preliminary Doctoral Written Examination is a responsibility of all members of the Divisional faculty. DAC members are invited and encouraged to participate, but the faculty make the final decision regarding whether or not the student passes or fails this examination. A student judged to have failed the examination, either in its entirety or a significant portion thereof, will be required to retake the relevant portion(s) of the examination. At the discretion of the Divisional faculty, the student may be required to complete other assignments in lieu of retaking a portion of the examination. These examinations will be graded and the results conveyed to the student within one month of the written examination. A student who fails the examination for the second time becomes ineligible for further doctoral work. No student may continue in the program, or take the examination a third time, without approval by the Administrative Board of the Graduate School.

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Oral Qualifying Exam. The student's first oral examination consists of construction (in NIH or NSF format), presentation, and defense of the dissertation proposal. The proposal should be in a format suitable for submission as an F32 (clinical) or F31 (non-clinical) NIH grant. The proposal should include a statement of the problem, the significance and specific objectives of the project, a review of the literature pertinent to the problem, and a description of the methods to be used. Extensive preliminary data are not required, but available preliminary data should be included. This examination must be scheduled by the last day of October following successful completion of the written examination (generally within the 5th semester of the graduate program). All Divisional faculty will be invited to participate in the examination and to provide advice to the DAC which makes the final decision regarding whether or not the student passes or fails this examination. This first oral examination serves several purposes. It evaluates the student's ability to: formulate hypotheses, supported by relevant literature and/or preliminary data generated by the student; review the relevant literature, and place the proposed experimentation within the context of that literature; develop a persuasive rationale for performing the dissertation project; construct a logical research plan that would address the central hypotheses developed by the student. Students also may expect questions pertaining to material from their written examination, as well as questions regarding basic scientific knowledge. In addition, this examination provides a forum for the DAC to assist in the overall direction of the dissertation project. It is important to note that the focus of this requirement is on issues of process (proposal construction; the ability of the student to present cogent arguments and respond to questions) rather than documentation in detail of the feasibility, and therefore the likelihood of a successful outcome, of the dissertation research. Thus, extensive preliminary data are not required.

Other Aspects of Professional Preparation

Students have the opportunity to attend a wide range of seminars, workshops, and other educational opportunities within and outside the Division. These include research presentations by faculty from UNC-CH, by distinguished faculty invited from outside of the University, as well as seminars and workshops related to the responsible conduct of research.

Evaluation of Student Progress

Student progress is evaluated by student self-assessment, his/her adviser, the Division faculty, and the doctoral committee. Students are provided with a checklist of formal requirements for the doctorate which is reviewed with faculty annually to identify major milestones (completed coursework, examinations, teaching requirements). Other indicators of progress are less formal and require a more qualitative assessment. This is accomplished by a formal annual review of each student by the faculty at the Divisional summer retreat.

Course Curriculum Review and Innovation

Review and innovation responsibilities have been led by the Chair, the Vice Chairs and the Director of Graduate Studies. Given several of the core competencies in research listed above (in particular, #2-4), targeted coursework was developed. The Division offers courses in experimental and study design, clinical trials methodologies, analysis of clinical research data, and other important statistical concepts in clinical research (DPET 831 and DPET 833). In addition, plans are underway to expand coursework (DPET 832) and research opportunities in pharmacogenomics, an important and emerging area of pharmacotherapy. Finally, an enhanced course sequence in advanced pharmacotherapy, presented by content experts within the Division and by colleagues in health affairs, was developed (DPET 822 and DPET 840).

FACULTY AND ADJUNCT FACULTY

Faculty Appointments and Demographics

The Division currently consists of 12 tenure-track (9 males, 3 females) and 9 fixed-term (5 males, 4 females) faculty who are fully committed to graduate education as one means of preparing the next generation of leaders in the field of pharmacotherapy and experimental therapeutics. A complete list of faculty, by translational research focus and type of appointment, is presented in **Tables 4 and 5**.

Biosketches for each faculty member are presented in **Appendix G**.

Table 4: Division Faculty

Faculty Name	Faculty Rank	Area of Expertise
Clinical Research Methods		
J. Heyward Hull	Clinical Professor	Experimental Design, Applied Biostatistics, Drug Development
A. Naser L. Rezk	Research Assistant Professor	Clinical Analytical Chemistry; Development of multiplex analytical methods in complex biological matrices
Cardiovascular Pharmacotherapy		
Craig R. Lee	Assistant Professor	Role of genomics in the development, progression and treatment of cardiovascular disease; Eicosanoid metabolism; Endothelial dysfunction
J. Herbert Patterson	Professor and Vice Chair	Clinical research of drugs used in heart failure; Assessment of biomarkers and genotypes in Heart Failure; Use of registries to characterize Heart Failure populations
A. Wayne Pittman	Associate Professor	Clinical research of drugs used in hypertension
Jo E. Rodgers	Clinical Assistant Professor	Clinical research of drugs used in heart failure and cardiac transplant
Hepatology/Gastroenterology Pharmacotherapy		
Robert E. Dupuis	Clinical Associate Professor	Transplant pharmacotherapy; Clinical pharmacokinetics
Roy L. Hawke	Assistant Professor	The influence of liver disease pathobiology on drug disposition pathways and the genetic and immunologic basis for drug-induced hepatotoxicity; The association of liver disease progression and treatment response with serum biomarkers of inflammation, oxidative stress, apoptosis, fibrosis/cirrhosis
HIV Pharmacotherapy/Infectious Disease		
Amanda H. Corbett	Clinical Assistant Professor	Clinical pharmacology of antiretroviral agents used in the treatment of HIV infection
Angela D.M. Kashuba	Associate Professor	Clinical pharmacology of antiretroviral agents used in the treatment of HIV infection; Preventing transmission of HIV, Understanding and predicting drug-drug interactions and AEs; Role of sex and ethnicity in drug disposition
Ralph H. Raasch	Associate Professor and Vice Chair	Infectious disease pharmacotherapy
Oncology Pharmacotherapy		
Celeste M. Lindley	Associate Professor	Clinical pharmacology of anticancer drugs; Translational and Phase I oncology trials; Drug metabolism
Christine M. Walko	Clinical Assistant Professor	Clinical pharmacology of anticancer drugs; Translational and Phase I oncology trials; Clinical pharmacokinetics of anticancer drugs; Cancer pharmacogenomics
William C. Zamboni	Associate Professor	Nanotechnology; Pharmacokinetics/ pharmacodynamics
Pharmacogenomics and Individualized Therapy		
Howard L. McLeod	Fred N. Eshelman Distinguished Professor	Colorectal cancer; Molecular markers of therapy; Cancer pharmacogenomics; Translational pharmacology clinical pharmacology of anticancer drugs
Timothy J. Wiltshire	Associate Professor	Mouse genetics; CNS therapy; Cancer therapy
Pharmacokinetics/Pharmacodynamics - Drug Metabolism/Drug Transport		
Kim L.R. Brouwer	George H. Cocolas Distinguished Professor and Chair	Mechanisms of hepatic uptake, translocation and biliary excretion of drugs/metabolites; Development/refinement of in vitro model systems to predict in vivo hepatobiliary drug disposition, drug interactions, and hepatotoxicity; Pharmacokinetics
Mary F. Paine	Research Assistant Professor	Pharmacokinetic mechanisms underlying drug-drug and drug-diet interactions; Drug metabolism and transport; Pharmacogenetics
Adam M. Persky	Clinical Assistant Professor	Pharmacy education; Pharmacokinetics & pharmacodynamics of dietary supplements; Interaction of exercise and/or nutrition on drug disposition and action; Skeletal muscle physiology/ pathophysiology and agents that influence form/function
Gary M. Pollack	Executive Associate Dean and Professor	Pharmacokinetics and pharmacodynamics; Protein binding influences; Drug delivery to the CNS; Drug transporters
Pulmonary Pharmacotherapy		
Dennis M. Williams	Associate Professor	Pulmonary disease; Asthma

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Table 5: Division Adjunct Faculty

Name	Rank	Organization
Allen E. Cato	Clinical Professor	Cato Research
David M. Cocchetto	Adjunct Associate Professor	GlaxoSmithKline
Giulia Ghibellini	Adjunct Assistant Professor	GlaxoSmithKline
Alison A. Motsinger	Adjunct Assistant Professor	Dept. of Statistics, North Carolina State University
William T. Sawyer	Adjunct Associate Professor	Quintiles, Inc.
Darryl C. Zeldin	Adjunct Professor	National Institute of Environmental Health Sciences (NIEHS)

In reviewing the composition of faculty ranks over the last seven years (**Table 6**), nearly half of tenure-track faculty are at the rank of Associate Professor (8) with few Full Professors (4) (**Figure 2**). It is anticipated that this distribution will become more balanced over the next several years as several faculty come up for consideration for promotion to Full Professor. Recent adoption of revised Promotion and Tenure Guidelines are likely to facilitate this process as these new guidelines highlight collaborative research efforts undertaken by many Division faculty.

Table 6: 2001 – 2007 Trends in School-Based Faculty Rank

Year*	Clinical Assistant Professor	Clinical Associate Professor	Clinical Professor	Research Assistant Professor	Research Associate Professor	Research Professor	Assistant Professor	Associate Professor	Professor	Total
2001	2	1	0	0	0	0	2	7	1	13
2002	2	1	0	0	0	0	2	7	1	13
2003	3	1	0	0	0	0	2	7	0	13
2004	3	1	0	0	0	0	2	7	1	14
2005	4	1	0	0	0	0	1	7	2	15
2006	5	1	1**	1	0	0	1	7	3	19
2007	4	1	1**	2	0	0	2	7	4	21

* Academic year beginning with fall semester.

** Includes one part-time faculty member.

Figure 2: 2007 Faculty Rank Distribution (Excluding Adjunct and Visiting Faculty)

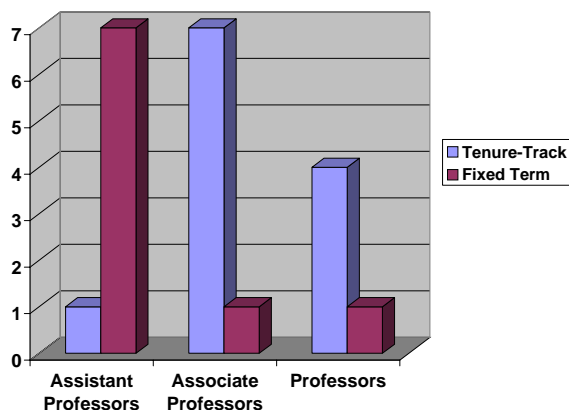
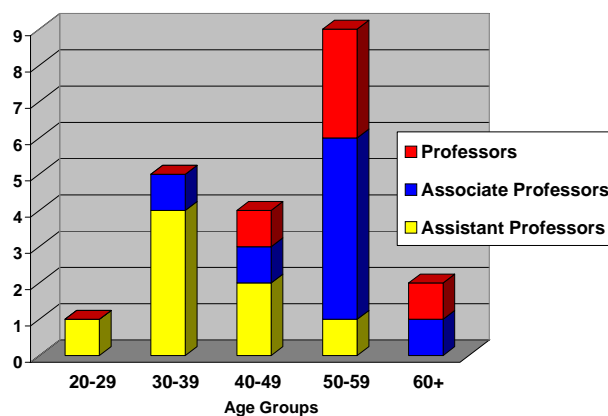


Figure 3: 2007 Faculty Age Distribution (Excluding Adjunct and Visiting Faculty)



Faculty Age, Racial, Ethnic, and Sex Diversity

Figure 3 shows the age distribution of the faculty. Of the 20 full-time faculty in DPET, 35% are women. At the rank of Full Professor, 25% are women, and at the rank of Associate Professor, 29% are women. None of the full-time faculty represents an ethnic minority. As faculty searches are conducted, care is always taken to identify and encourage qualified minority applicants to apply.

Goals for Research, Teaching, Mentoring/Advising and Professional Activities and Service

All faculty are expected to be active participants in teaching, research, professional activities and service to the Division, School, University, and the broader community of scholars. Expectations for each faculty member are communicated in writing by the Chair as an outcome of the annual review process. While such expectations are, by necessity, individualized to a large extent, some general comments regarding these important faculty responsibilities are worthwhile.

Teaching

Teaching activities of the faculty are critically important to our professional and graduate programs. A quantification of professional teaching responsibilities is summarized in **Table 7** below, and in detail in *Appendices H and I*. Teaching graduate students in our clinical, research and professional environments is not only pursued in the classroom, but in the laboratory, in small group discussion sessions (including one-on-one mentoring), in laboratory meetings, in patient care sites as well. All faculty teach in one or more of these environments. Evaluation of the impact of these teaching responsibilities, including the extent, quality, and location of those activities, is an important agenda item for the annual faculty review process, which is led by the Division Chair with the assistance of one of the Vice Chairs.

The School has a course and instructor evaluation process to capture student opinions of instructional quality. Student assessments of teaching and course administration are provided as part of the faculty annual review process. Each faculty member also is expected to conduct a self-evaluation of teaching as part of the teaching portfolio required of all faculty by the University of North Carolina. The process of continued self-evaluation is an important component of the promotion, tenure, and post-tenure evaluation of faculty. Finally, a peer review process of teaching is available. These evaluations usually are conducted by senior faculty, at the request of those wishing to be reviewed. A candid, peer review document is completed as part of this process.

Table 7: Description of Annual Teaching Activities

Professional Courses	
<ul style="list-style-type: none"> • 20 DPET professional courses, on average, offered per year • Estimated 10 – 150 students per course • 1,000 professional course contact hours, on average, per year • Many of the courses are team-taught (i.e., structured by a course coordinator with several faculty who assume teaching responsibilities for parts of a course) • Faculty from all ranks (i.e., professors, associate professors, assistant professors, and fixed-term faculty) involved in the coordination and/or teaching of professional courses • 25 professional students trained, on average, through clerkships per year 	
Graduate Courses	
<ul style="list-style-type: none"> • 12 DPET graduate courses, on average, offered per year • Estimated 5 – 50 students per course • 140 graduate course contact hours, on average, per year • Many of the courses are team-taught (i.e., structured with a course coordinator and several faculty who assume teaching responsibilities for parts of a course) • Faculty from all ranks (i.e., professors, associate professors, assistant professors, and fixed-term faculty) involved in the coordination and/or teaching of graduate courses • 6 graduate students trained, on average, through clerkships per year 	

Mentoring

Graduate students are mentored by the Divisional Director of Graduate Studies, their Major Adviser and Committee Chair, and their doctoral dissertation committee members. Research Assistant Professors, senior fellows and senior graduate students often serve as informal mentors to junior students. Consistent with the philosophy of the University of North Carolina as a “university without walls”, the divisional culture is one that encourages and supports inter-laboratory communication and collegiality, especially as it relates to the mentoring of junior colleagues.

DIVISION OF PHARMACOTHERAPY AND EXPERIMENTAL THERAPEUTICS

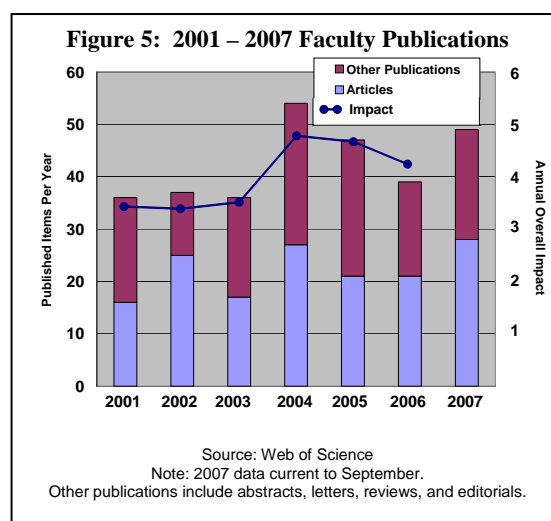
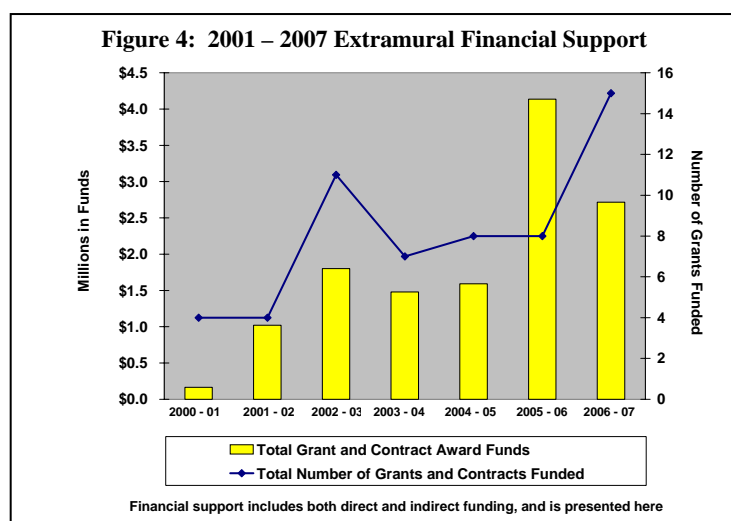
The Chair and Vice Chairs serve as advisers and often informal mentors for faculty. These discussions may be held on a regular basis with a set schedule or, more often than not, as ad hoc sessions. With regard to formal faculty mentoring, the School has established a process in which mentors both inside and outside of the School are assigned to meet with junior faculty to review and assist with their progress as young scholars. In addition, other Division faculty have been a part of a mentoring program available within health affairs, the K30 Clinical Research Curriculum program supported by NIH, that has led to successful and funded NIH grant submissions. One of the Division's Vice Chairs, Ralph Raasch, also serves as one of the co-directors of the UNC-CH K30 program.

Research

All faculty are expected to be actively engaged in scholarship. The Division's research portfolio is very diverse, with translational research in genetics, molecular biology, drug metabolism and transport, pharmacokinetics, pharmacodynamics, and clinical therapeutics. Divisional faculty have been awarded numerous federal, state, private foundation, and industry grants. A list of faculty grants over the past five years is presented in **Appendix F**. **Figure 4** illustrates that extramural investigator-initiated grants have increased over 200% over the past six years, and total [direct + indirect] extramural grant and contract funding has increased by approximately 600%. Due to the clinical nature of many research projects, most indirect rates range from 0 to 23%. Over the past six years, DPET faculty have received 14 intramural grants totaling \$118,855.

Another metric of success in research is represented in peer reviewed publications. Division faculty have published in highly rated journals (impact factor) including: *Clinical Pharmacology and Therapeutics* (8.1), *Journal of Pharmacology and Experimental Therapeutics* (4.0), *AIDS* (5.6), *Pharmacogenetics and Genomics* (5.4), *Cancer Research* (7.7), *Circulation* (10.9), *Hepatology* (10.4), *American Journal of Transplantation* (6.8), *Journal of Clinical Oncology* (13.6), *Pharmacotherapy* (1.9), and *Drug Metabolism and Disposition* (3.6).

In 2006, 41 peer-reviewed manuscripts were published by Division faculty. The average number of publications per faculty member was 4, with a range of up to 15. Selected publications over the past five years are shown in the faculty abbreviated curriculum vitae in **Appendix G**. **Figure 5** summarizes the manuscripts published since 2001, and the average impact factor of the journals in which the articles were published.



Service and Professional Activities

Service is a consistent expectation of all faculty. Division faculty serve on virtually all standing and ad hoc committees within the School, as well as on numerous committees within the University national/international professional organizations.

Evaluation of Faculty Performance

Faculty are evaluated on an annual basis. The evaluation process consists of faculty self-reporting performance in the areas of scholarship (publications; grant funding), teaching (didactic; laboratory-based; experiential), and service (school; university; profession). Each faculty member meets with the Chair and Vice Chair to discuss performance over the preceding year, and most importantly, to discuss goals and objectives, and agree on plans, including percentage effort in each area of emphasis, for the coming year. Faculty involvement with graduate students (*e.g.*, major adviser, committee chair, committee member) is reviewed during this annual evaluation process as well. These annual meetings are captured in writing, and in the aggregate, form the foundation for considerations of reappointment, promotion, and tenure. In addition, the performance of each faculty member is considered annually by the School's Executive Committee, providing additional opportunity for feedback.

Faculty Excellence

Examples of faculty excellence, awards, and honors are listed in *Appendices M and N*. The interactions and activities described above and in these appendices facilitate strong research collaborations, and provide an excellent framework for graduate student training

STUDENTS

Enrollment and Demographics

The Division has an outstanding group of students at every level of study. At this stage of its development, the Division intends to enroll ~3-4 doctoral students each year. The quality of applicants has increased substantially over the past five years. This trend is not entirely reflected in the summary statistics on standardized test scores and grade point averages, but is apparent from the work and research experience of our applicants.

Table 8 shows standardized test scores of applicants and students who enrolled in our concentration area, in addition to race and sex distribution. **Table 9** lists the undergraduate or professional institutions of our graduate students, and **Table 10** lists numbers of applicants and mean GPA and GRE for students accepted into our program. **Table 13** lists our current graduate students and their advisers, subspecialty, and financial support.

Table 8: 2001 – 2007 Demographic Profile of Graduate Students

	2001	2002	2003	2004	2005	2006	2007
Entering Students	0	2	1	2	3	5	4
Mean GRE Score*	N/A	1185	1340	1250	1207	1270	1158
Mean Entering GPA	N/A	3.5	3.6	3.3	3.3	3.6	3.7
Racial distribution**	N/A	2 White 0 AA 0 Other	0 White 0 AA 1 Other	1 White 0 AA 1 Other	1 White 2 AA 0 Other	1 White 1 AA 3 Other	1 White 0 AA 3 Other
Sex distribution	N/A	2 M; 0 F	0 M; 1 F	0 M; 2 F	2 M; 1 F	0 M; 5 F	1 M; 3 F
Graduating Students	0	0	0	0	1	1	2
Number/Degree Awarded	0	0	0	0	1 PhD	1 PhD	2 PhD
Mean length of time-to-degree for master's graduates	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mean length of time-to-degree for doctoral graduates	N/A	N/A	N/A	N/A	5 years	4 years	4.75 years
Details on employment placement or advanced study of graduates upon completion	N/A	N/A	N/A	N/A	Tenure-track faculty	Tenure-track faculty	Postdoc, Industry Scientist

* GRE Score includes Quantitative and Verbal

** AA = African-American; Other = American Indian, Asian, Hispanic and Pacific Islander

DIVISION OF PHARMACOTHERAPY AND EXPERIMENTAL THERAPEUTICS

Table 9: Undergraduate/ Professional Institutions for Divisional Graduate Students

Institution	Number of Students
North Carolina Institutions	
Fayetteville State University (Fayetteville, NC)	1
North Carolina State University (Raleigh, NC)	1
University of North Carolina at Chapel Hill (Chapel Hill, NC)	2*
Wake Forest University (Winston-Salem, NC)	1
Southeast Institutions	
University of Kentucky (Lexington, KY)	1*
Virginia Commonwealth University (Richmond, NC)	1*
Other U.S. Institutions	
Kalamazoo College (Kalamazoo, Michigan)	1
Long Island University (Brooklyn, NY)	1*
St. Louis College of Pharmacy (St. Louis, MO)	1*
Temple University (Philadelphia, PA)	1*
University of Pittsburgh (Pittsburgh, PA)	1*
Wayne State University (Detroit, Michigan)	1
International Institutions	
China Pharmaceutical University (Nanjing, China)	2
Handong Global University (Kyungbuk, South Korea)	2
Luis Razetti Medical School (Caracas, Venezuela)	1*
Nankai University (Tianjin, China)	1

Note: Table includes a total of 18 students (some received both undergraduate and professional degrees). One of those students left program before earning PhD.

* Indicates institution where student earned professional degree

Table 10: 2001 – 2007 Graduate Applicants

Year	Number of Applicants*	Number Attended Recruitment Weekend	Number from Recruitment Weekend Extended Offers	Number from Recruitment Weekend Accepted	Number Accepted	Mean GPA for Students Accepted	Mean GRE for Students Accepted
2001	4	4	2	0	0	N/A	N/A
2002	3	3	2	2	2	3.5	1185
2003	2	2	1	1	1	3.6	1340
2004	4	4	2	2	2	3.3	1250
2005	9	5	3	3	3	3.3	1207
2006	14	7	5	5	5	3.6	1270
2007	14	7	4	4	4	3.7	1158

* Please note that the number of applicants and those accepted include those graduate students who applied and entered the UNC-CH School of Pharmacy graduate program with another division and later transferred to DPET. The year such transfer students entered the School's graduate program under a former division is listed here as the entry date rather than the date the student transferred to DPET. Also, one of the students admitted in 2007 has deferred for the 2007 – 08 academic year.

Student Success

The success of our young graduate program is apparent in the excellent post-graduation placements, awards, grants, publications, and leadership positions. From 1999 to 2002, all students who entered the program have graduated. Since 2002, only one student has withdrawn for personal/family reasons. Our PhD graduates currently hold faculty positions, work in industry, or are pursuing post-doctoral training (Table 11).

The titles of doctoral dissertations of our graduate students are listed in **Appendix J**. Our students are also successful in publishing their research in high quality peer reviewed journals. Representative publications from our graduate students are listed in **Appendix K**. Students also are encouraged to submit their research for presentation at national and international scientific meetings. A selection of these abstracts is presented in **Appendix L**.

Finally, students are highly competitive for local, national, and international awards. A listing of awards can be found in **Table 12**. Since 2002, at least one of our students has received a competitive award each year.

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Table 11: 2001 – 2007 Graduates of PhD Program

Student	Year	Degree	Primary Advisers	Specialization	Papers	Abstracts	First Post-Graduate Position
McRae, Mary P.	2005	PhD	Dr. Angela Kashuba, Dr. Kim Brouwer	HIV Pharmacotherapy	3	2	Assistant Professor of Pharmacology, Kansas City University of Medicine & Biosciences
Lee, Craig R.	2006	PhD	Dr. J. Herbert Patterson, Dr. Darryl Zeldin	Cardiovascular Pharmacotherapy	8	6	Assistant Professor of Pharmacy, School of Pharmacy, UNC-CH
Roberts, Patrick J.	2007	PhD	Dr. Celeste Lindley, Dr. Chenning Der	Oncology Pharmacotherapy	0*	0	Postdoctoral Research Associate, Lineberger Comprehensive Cancer Center, UNC-CH
Zhao, Rong	2008	PhD	Dr. Gary Pollack	Pharmacokinetics	1**	3	Pharmacokineticist, Roche, Shanghai (China)

*Several papers have either been submitted or in press but none published at this time.

** Four additional papers have been submitted for publication

Table 12: 2001 – 2007 Graduate Student Honors and Awards

Student	Honor/Award (Year)
Griffin, Latoya	Minority Presence Scholarship (2006 – 2007), NIH predoctoral fellowship (2007-present)
Lee, Craig	Ruth L. Kirschstein Individual National Research Service Award, NIH (2003 – 2006); UNC-CH Postdoctoral Award for Research Excellence (2005 – 2006); Elizabeth Barrett-Connor Research Award in Epidemiology for Young Investigators, American Heart Association (2005)
McRae, Mary	AFPE Pre-Doctoral Fellowship, American Foundation for Pharmaceutical Education (2002 – 2005)
Olson, Emily	GlaxoSmithKline Fellowship (2006), International Narcotics Research Conference Travel Award (2006), American Association of Pharmaceutical Scientists Travel Award (2005)
Roberts, Patrick	Lineberger Cancer Center Clinical/ Translational Research Award (2006 – 2007)
Swift, Brandon	Eli Lilly Predoctoral Fellowship (2006 – 2008)
Theken, Katherine	UNC-CH Graduate School Merit Assistantship (2006 – 2007), Schering-Plough Rho Chi AFPE First-Year Graduate Student Scholarship (2006 – 2007)
Watson, Roshawn	The Caroline H. and Thomas S. Royster, Jr. Fellowship in the Royster Society of Fellows (2005 – present)
Won, Christina	Graduate Merit Assistantship (2007)
Zhao, Rong	Graduate Merit Assistantship (2003)

Table 13: Current Graduate Students (continued on next page)

Student	Entry	Degree	Adviser	Subspecialty	Support	Projected Completion Date
Lee, Jin	8/04	PhD	Dr. Kim Brouwer	Pharmacokinetics & Drug Transport	RA	2009
Olson, Emily	8/04	PhD	Dr. Gary Pollack	Pharmacokinetics & Pharmacodynamics	RA	2009
Swift, Brandon	8/05	PhD	Dr. Kim Brouwer	Pharmacokinetics & Drug Transport	Fellowship, TA	N/A**
Watson, Roshawn	8/05	PhD	Dr. Howard McLeod, Dr. Chris Walko	Pharmacogenetics	Roysters Scholarship	N/A**
Griffin, Latoya	8/06	PhD	Dr. Kim Brouwer, Dr. Bob Dupuis	Drug Transport	NIH	N/A**
Kim, Tae Eun	8/06	PhD	Dr. J. Herbert Patterson*	Pharmacokinetics	TA	N/A**
Santos, Cristina	8/06	PhD	Dr. J. Herbert Patterson*	Psychiatry & Behavioral Neuroscience	TA	N/A**

* Until a formal adviser declaration is made, first and second year graduate students are assigned to the director of the divisional graduate program.

** N/A indicates those students who have not yet completed written and/or oral qualifying examinations.

DIVISION OF PHARMACOTHERAPY AND EXPERIMENTAL THERAPEUTICS

Table 13: Current Graduate Students (continued from previous page)

Student	Entry	Degree	Adviser	Subspecialty	Support	Projected Completion Date
Theken, Katherine	8/06	PhD	Dr. Craig Lee, Dr. Jo E. Rodgers	Cardiovascular Pharmacotherapy	TA	N/A**
Yan, Zhixia (Grace)	8/06	PhD	Dr. J. Herbert Patterson*	Pharmacokinetics & Drug Transport/ Metabolism	TA	N/A**
Cohen-Wolkowicz, Michael	8/07	PhD	Dr. Ralph Raasch	Pediatric Infectious Disease	External Support	N/A**
Won, Christina	8/07	PhD	Dr. J. Herbert Patterson*	—	Merit Assistantship	N/A**
Wu, Huali	8/07	PhD	Dr. J. Herbert Patterson*	—	External Support	N/A**

* Until a formal adviser declaration is made, first and second year graduate students are assigned to the director of the divisional graduate program.

** N/A indicates those students who have not yet completed written and/or oral qualifying examinations.

LEADERSHIP, ADMINISTRATIVE SUPPORT, FACILITIES, AND EQUIPMENT

Leadership

The Chair provides overall direction and leadership for all divisional activities, including those related to the graduate program. Day-to-day management of, and direct leadership for, the graduate program is delegated to the Vice Chair for Graduate Education and Research, who also serves currently as the divisional Director of Graduate Studies. The Chair meets with the Vice Chairs monthly, in advance of the monthly faculty division meeting, and on an as-needed basis to discuss emerging issues and pending administrative actions. Issues related to the graduate program represent a standing agenda item in the Division's monthly faculty meeting.

Administrative Support

One full-time administrative assistant is responsible for providing administrative support for all aspects of the Division's graduate program. It should be noted that these activities represent only a fraction (~30%) of the work plan for this particular staff member, who also provides administrative support for the fellowship programs, the Vice Chair for Graduate Education and Research, the Director of Graduate Studies, and the Director of the Fellowship programs, in addition to other responsibilities including website maintenance and records management. Given the recent growth of the graduate program, and continued development of fellowship programs, one concern is whether this level of administrative support provides adequate management for these important programs. The two additional full-time administrative staff have no room in their work plans to accept responsibilities associated with the graduate program. Financial support of divisional administrative staff is provided by State funds allocated by the Dean.

Facilities and Equipment

Collectively, DPET faculty have approximately 7,400 square feet of laboratory space housing approximately 450 linear feet of bench space. These spaces contain standard wet lab equipment including sinks, refrigerators, freezers (-20°C and -80°C), fume hoods, and standard laboratory equipment such as pH meters, analytical balances, orbital water baths/shakers, CO₂ incubators, microcentrifuges, temperature controlled centrifuges, nitrogen evaporators, and vacuum pumps. Individual faculty members have specialized equipment for cell culture, organ perfusion, bioanalytical chemistry, protein quantification, and genetic sequencing. Detailed descriptions of space and equipment for individual faculty members can be found in *Appendix O*. Division faculty also have access to research resources through a number of Cores housed in the School of Pharmacy: The Cellular Metabolism and Transport Core, the Mass Spectroscopy Core, and the UNC-CH General Clinical Research Center Analytical Chemistry Laboratory.

Institutional Relationships

As outlined in **Table 2**, DPET faculty have developed many inter-institutional collaborative relationships that assist in graduate student training and translational research efforts.

SELF ASSESSMENT AND FUTURE STEPS

Self Assessment Process

As our PhD program is relatively young, DPET continuously reviews its performance. The Divisional Director of Graduate Studies reports to the Vice Chair for Research and Graduate Education who reports to the Chair. Two Vice Chairs and the Chair meet monthly to discuss any issues related to graduate studies. The DGS or the Vice Chair for Research and Graduate Education provide a report to the Divisional Faculty at each monthly Division meeting. Ad hoc meetings are conducted throughout the year as circumstances dictate. More extensive review and discussion occurs each June at the Divisional retreat, and invites current graduate students to present their progress and any difficulties they are currently facing. Finally, anonymous student surveys are sent by the Graduate Student Organization to all active students and alumni to better understand areas for improvement.

Results from Self Assessment Process

One recent example of the self assessment process is a change in the structure of student mentoring. In 2005, one area of deficiency identified was the lack of a comprehensive advising structure for students. To correct this, DPET adopted a dual mentoring program. This allows students to choose one research adviser and one clinical adviser, based on their area of interest. These advisers meet with the student at least quarterly to offer guidance on elective coursework, clinical rotations or experiences, and research rotations. Generally, these advisers become part of the Student Advisory Committee, and the Dissertation Committee.

Faculty-Identified Program Strengths and Weaknesses

Recent faculty assessment meetings have noted the following strengths of DPET's PhD program: faculty with diverse expertise in pharmacotherapy, the translational focus of the research, the ability to attract strong graduate students (past and present), faculty residing in modern laboratory and office space, the School of Pharmacy being part of a full service health science campus, the proximity to Research Triangle Park for pharmaceutical industry and institute collaborations, and the established cross-disciplinary faculty relationships for training in translational research. Additionally, a dual PharmD-PhD program is being developed and will be offered in 2009 to entering PharmD students.

Weaknesses are outlined in DPET's recent strategic planning document (please see **Appendix P**). Two major issues that must be addressed are: 1) achieving national prominence in translational research and clinical scientist training (i.e. by identifying adequate resources to sustain individual faculty research programs, improve recruitment tactics, improve the visibility of current student and faculty success), and 2) growing the translational research effort (i.e. by forming translational research teams, providing multiple opportunities for interaction between scientists and trainees).

Student-Identified Program Strengths and Weaknesses

As part of ongoing efforts to evaluate the DPET graduate program, an anonymous survey was conducted in October 2007 asking current graduate students to identify program strengths and areas for improvement. Thirteen current DPET graduate students responded. The summary of responses can be seen in **Appendix Q**. The majority of students were very satisfied with recruitment weekend and with their current training activities. The majority of students were somewhat satisfied with coursework scheduling and networking opportunities both within and outside of the School of Pharmacy. Students were dissatisfied with networking opportunities outside of UNC-CH.

DIVISION OF PHARMACOTHERAPY AND EXPERIMENTAL THERAPEUTICS

When asked to provide written comments, students highlighted the following strengths of DPET's graduate program: advanced, relevant coursework, high quality research environment, approachable and helpful faculty, and many good opportunities for independent research. Areas for improvement included: providing more networking opportunities, additional training in giving scientific presentations, more advanced scheduling of courses with teaching assistantship activities, better communication of pending changes to curricula or activities, and providing a more useful website.

Subsequent to faculty review of the survey results, students were asked to attend a follow-up meeting to provide additional recommendations regarding how the graduate program could be improved, and provide more details regarding survey recommendations. Members of the faculty who had not served as advisers conducted the discussion. To ensure that feedback remained anonymous, comments from the meeting were summarized without identifying the source or which students had attended the meeting.

Eight students attended this meeting. Some students felt that better coordination of the graduate student curriculum and activities (e.g., class scheduling, laboratory and clinical rotations, and research activities) within the DPET graduate program was needed. Despite the current DPET early-program assignment of clinic-based and laboratory-based faculty mentor pairs, improvement was needed in this process. In particular, students felt more attention was needed during the period before selection of the major adviser, to address their individual educational needs, to help avoid schedule conflicts, and to identify research opportunities. Also, communication to students, while generally good, was not always consistent, and could be improved. A specific example was a request for earlier notification of planned changes in the DPET program, including class requirements.

For students with several years in their program, more advice/guidance regarding career decisions and where feasible, faculty networking, was requested to help identify opportunities for the students once the PhD program was completed. Also, despite the current graduate student requirement for seminar presentations to colleagues and faculty, additional (earlier) training was suggested, to better prepare the students for the seminars, as well as oral or poster presentations at meetings.

It should be noted that some of the recommendations will require changes and/or commitments at the School rather than Division level. One of the strongest recommendations from the students was that graduate class schedules (DPET and others) and TA assignments be established earlier before the semester begins, to avoid scheduling conflicts (although some scheduling conflicts may be unavoidable, as they occasionally involve departments outside of the School of Pharmacy). There was also a request for more opportunity for interactions with students and faculty from other Divisions and more opportunity for research rotations and collaborative research. Finally, a suggestion also was made to upgrade the School of pharmacy website to both improve the ease in locating specific information and to broaden the information provided.

Future of the Degree Program

The DPET Graduate Program is young but strong, and has already attained a national reputation. Four students have completed their training and taken prominent roles in academia (2), postdoctoral research (1), and industry (1). As the quality of the applicant pool continues to improve, this program's success and reputation will increase. Immediately, faculty will address the areas of improvement highlighted by the current graduate students. In the future, emphasis will be on identifying, recruiting and training more students with a clinical background, improving the visibility of the program, and garnering more financial resources for training. The leadership and faculty of the Division are very enthusiastic about this program and its potential to be a national role model.