

PHRS 801: Common Core in Pharmaceutical Sciences	1 単位
PHRS 899: Seminars in Chemical Biology	1 単位
PHRS 991: Research in Pharmaceutical Sciences*	1 単位
CHEM 701: Introduction to Lab Safety	1 単位

#### 1 年次 後期

CMBC 804A: Biochemical Foundations of Chemical Biology  
 CMBC 804B: Foundations of Chemical Biology Journal Club  
 Biology Core Course if needed

PHRS 802: Drug Development & Professional Skills

PHRS 899: Seminars in Chemical Biology#

Elective course if needed

#### 2 年次 前期・後期

PHRS 991: Research in Pharmaceutical Sciences

PHRS 899: Seminars in Chemical Biology#

PHRS 994: Research in Pharmaceutical Sciences

Elective Course or Biology Core Course if needed

#### 3-5 年次

PHRS 899: Seminar in Chemical Biology#

PHRS 994: Research in Pharmaceutical Sciences\*¶

\*Students register for the course "section" which corresponds to their adviser. This is section 417 for first year students.

§Students must be registered for a minimum of 9 total credit hours for the semester when enrolled in PHRS 991.

#Students must register for the course "section" which corresponds to the course director for their divisional seminar.

¶Students must be registered for a minimum of 3 credit hours of PHRS 994 after joining a lab doing thesis work.

## ② Pharmaco-engineering and molecular pharmaceutics→Drug delivery

教育プログラム、Course description

<https://pharmacy.unc.edu/education/phd/drug-delivery/phd-program/>

修了するには、

- ・24 単位の習得が必要
- ・毎週のセミナーへの出席。3 年次からは発表をすること。
- ・Lab rotation or dissertation は学期ごとに 3 単位以上
- ・筆記試験及び口述試験 (QE)

- Dissertation and final defense

Drug Delivery 専攻には二つのコースがある。

1. Molecular Pharmaceutics
2. Pharmacoengineering

授業科目 (1. Molecular Pharmaceutics)

Ethical Dilemmas	1.25	PHRS 801	Fall
Nanomedicine	3	DPMP 738	Spring
Advanced Pharmaceutics	1.5 (total 3)	DPMP 862/890	Spring, Fall
Advances in Drug Delivery	3	DPMP 864	Fall
PK Module 1: Pharmacokinetics	1.75	DPET 853	Fall
Biostatistics	3	BIOS 600	Spring
Drug Metabolism Module	1.5	DPMP 815	Spring
Math/Applied Math Elective	3	List below	
Engineering Elective	3	List below	
Seminar*	1	DPMP 899	Fall, Spring
Research	3	DPMP 991	Fall, Spring
Doctoral Dissertation	>3**	DPMP 994	Fall, Spring
Electives	6		

\* *STUDENTS MUST REGISTER FOR SEMINAR EVERY SEMESTER IN WHICH THEY ARE IN RESIDENCE*

\*\* *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*

*STUDENTS ARE ALSO REQUIRED TO TAKE AT LEAST 9 CREDITS OF ELECTIVE COURSES*

**Math Electives 13 科目**

**Engineering Electives 13 科目**

**Suggested Electives 19 科目**

Other courses can fulfill these electives upon petition by the student and approval by the director of graduate studies or the student's Ph.D. advisory committee.

Excluding research and seminar credits but including credits from elective courses, students must take a minimum of 24 credits of course work prior to sitting for the Qualifying Exam. Students who have taken relevant coursework prior to enrollment

in the Division of Pharmacoengineering and Molecular Pharmaceutics Graduate Program may use that coursework to satisfy graduate course requirements provided that the courses were taken within 8 years of entry into the graduate program and that passing scores (H, P, or A, B) were received. Courses taken more than 8 years previously may be waived on a case-by-case basis (particularly if the individual has been using the relevant skills frequently) at the discretion of the research advisor and with the approval of the division faculty. All requests for waivers of required courses should be submitted in writing to the division director of graduate studies for review by the division faculty. Note that while a student may waive a particular required course, he or she must still complete a minimum of 24 credits of course work.

### 授業科目 (2. Pharmacoengineering)

This DPMP Ph.D. in Pharmaceutical Sciences track has an emphasis in pharmacoengineering, an emerging discipline that integrates engineering methods with pharmaceutical sciences. Pharmacoengineers apply the latest experimental approaches from life sciences, chemistry, and physics in conjunction with theoretical and quantitative methods from engineering, mathematics, and computer science to solve problems in medicine and drug therapies.

We believe in the importance of in-depth training of students both in pharmaceutical sciences and modern engineering, mathematics, and computer science, as well as in the conduct of original research leading to the doctoral dissertation. Thus, we have designed the curriculum to offer rigorous and comprehensive training in the key principles of pharmaceutical sciences and engineering yet maintain a high degree of flexibility for students to tailor the coursework to their specific interests suitable to their research projects.

The program is among the first of its kind in the country and is a joint effort between the UNC Eshelman School of Pharmacy's Division of Pharmacoengineering and Molecular Pharmaceutics and the Joint Department of Biomedical Engineering at UNC-Chapel Hill and North Carolina State University.

Students work at the interface of engineering and pharmaceutical sciences to develop safer and more effective medicine and medical technologies. It provides students not only with a strong knowledge base in both pharmaceutical sciences and engineering, but also a highly interdisciplinary research experience. Students have the flexibility to

work with any of more than two dozen outstanding faculty members with expertise in a variety of fields within pharmacy and engineering.

#### Core Courses

MOPH 864 Pharmacoengineering in Drug Delivery 3 credits  
 BMME 890 Bio Transport 3 credits

#### Pharmaceutical Sciences

DPET 855 Principles of Pharmacokinetics 3 credits  
 MOPH 862 Advanced Pharmaceutics 3 credits

#### Engineering Emphasis

MATH Math/Applied Math Elective (Chose from list below) 3 credits  
 BMME Engineering Elective 1 (Chose from list below) 3 credits

#### Statistics

BIOS 550 Basic Elements of Probability and Statistical Inference 3 credits  
 or  
 DPET 831 Design and Analysis of Clinical Drug Trials 3 credits

#### General Electives

General Elective 1 3 credits  
 General Elective 2 3 credits  
 Arranged with research adviser; to be specific for research area

#### Seminar

BMME 890 BME Graduate Seminar (every semester) 1 credit  
 and

MOPH 899 Molecular Pharmaceutics Seminar 1 credit

#### Ethics

CTRC Responsible Conduct of Research (choose one) 1 credit  
 GRAD 721; Research Ethics  
 PHCY 801: Ethical Dilemmas in Research

#### Dissertation Research

MOPH/BMME Doctoral Dissertation variable

### ③ Pharmacotherapy and experiential therapeutics→Drug optimization

<https://pharmacy.unc.edu/education/phd/drug-optimization/phd-program/>

二つのコースがある。

#### 1. Clinical track

入学資格：PharmD 又は MD

## 2. Non-clinical track

入学資格：BSc、臨床トレーニングの無い学生

Areas of coursework and research

- Drug metabolism and transport
- Pharmacokinetics/pharmacodynamics/pharmacometrics
- Pharmacogenomics
- Clinical research
- Experimental therapeutics
- Mechanisms of drug toxicity

**These are applied to therapeutic areas, including:**

- cardiovascular disease,
- hepatology/gastroenterology/transplant,
- infectious disease/HIV,
- oncology/hematology, and
- pulmonary disease.

Graduates from both tracks have enjoyed an outstanding employment rate in both academia and the pharmaceutical industry.

### カリキュラム

偶数年入学者（例えば 2020 年入学者）

Clinician Track

Non-clinician Track

奇数年入学者（例えば 2019 年入学者）

Clinician Track

Non-clinician Track

### ④ Pharmaceutical outcomes and policy→Patient outcomes

DPOP has 12 faculty members and 37 adjunct faculty members. Several faculty are located on the Asheville campus and are part of the UNC Health Sciences at MAHEC.

3つのコース(Concentration)がある。

1. **Pharmaceutical Policy and Economics Concentration**
2. **Pharmaco-Epidemiology Concentration**
3. **Social and Behavioral Concentration**

#### カリキュラム

<https://pharmacy.unc.edu/education/phd/patient-outcomes/phd-program/>

Our PhD program prepares graduates for leadership positions in academia, industry, and government sectors. Students develop solid research skills, enabling them to conduct high quality research directed at improving the use and cost-effectiveness of pharmaceutical products, technology, and services in society.

We study the effectiveness and costs of medications, how patients take their medications, and the impact of drug policies on health outcomes in diverse populations. Our research focuses on health outcomes and how to support medication taking at the individual, practice, and system level. Key challenges our Division addresses include:

- Ensuring that all people have the knowledge, skills, and resources to use the medications they need
- Personalized medication treatment to ensure optimal effectiveness, safety and value in real world settings.
- Promoting informed and shared decision making so that prescribed medication regimens reflect patients' values, preferences and needs.

Addressing these complex issues requires an interdisciplinary approach with innovative use of a variety of data sources, including administrative records, primary survey data, and community stakeholders.

#### *Our Curriculum*

Students receive two years of didactic training in research methods with closely mentored supervision on research projects throughout the program. The curriculum consists of three concentrations:

#### **1. Pharmaceutical Policy and Economics Concentration**

The Pharmaceutical Policy and Economics concentration prepares students to learn about pharmaceutical policy in the US and abroad and analyze the impact of such policy. Students learn how to select the optimal study design to answer a research question and, through research rotations and practica, gain skills in primary data

collection and secondary data analysis. Students in this concentration can tailor their coursework to develop expertise in the methodologies and content of greatest interest to them.

## **REQUIRED COURSEWORK FOR PHARMACEUTICAL POLICY AND ECONOMICS CONCENTRATION**

(\* denotes that course is required for all DPOP PhD students)

<b>Topic/course</b>	<b>Credit hours</b>
* <u>DPOP 803</u> . Social and Behavioral Aspects of Pharmaceutical Use (Fall Semester Odd Years)	3
* <u>DPOP 806</u> . Pharmaceutical Policy (Fall Semester Even Years)	3
* <u>DPOP 872</u> . Proposal Writing (Fall Semester Even Years)	3
* <u>PHRS 815</u> . Implementation Science (New course! Number to be determined)	1.5
* <u>PHRS 801</u> . Ethics (Fall Semester)	1
* <u>PHRS 899</u> . DPOP Student and Faculty Seminar (Fall and Spring Semesters)	4
* <u>PHRS 994</u> . Doctoral Dissertation	6
* <u>EPID 710</u> . Fundamentals of Epidemiology (Fall Semester Odd Years)	5
<u>EPID 765</u> . Methods and Issues in Pharmacoepidemiology (Spring Semester)	3
Statistics (see notes below)	9
Electives (see notes below)	9
<b>Minimum required total</b>	<b>48.5</b>

### ***Strongly Recommended***

DPOP 870. Pharmaceutical Outcomes Research Methods for students in 2nd or 3rd year, focuses on the implementation of advanced methods in pharmaceutical outcomes research (Spring Semester Odd Years)

## **2. Pharmaco-Epidemiology Concentration**

The pharmaco-epidemiology concentration prepares students to interpret and apply state-of-the-art epidemiologic approaches to study utilization and comparative effectiveness/safety of healthcare interventions using a variety of complex data sources (e.g., administrative healthcare claims, electronic health records, and

registries). Students in this concentration can tailor their coursework to develop expertise in the methodologies of greatest interest to them, focused on quantitative methods, including predictive analytics and causal inference.

## **REQUIRED COURSEWORK FOR PHARMACO-EPIDEMIOLOGY CONCENTRATION**

(\* denotes that course is required for all DPOP PhD students)

<b>Topic/course</b>	<b>Credit hours</b>
* <u>DPOP 803</u> . Social and Behavioral Aspects of Pharmaceutical Use	3
* <u>DPOP 806</u> . Pharmaceutical Policy	3
* <u>DPOP 872</u> . Proposal Writing	3
* <u>PHRS 815</u> . Implementation Science (New course! Number to be determined)	1.5
* <u>PHRS 801</u> . Ethics	1
* <u>PHRS 899</u> . DPOP Student and Faculty Seminar	4
* <u>PHRS 994</u> . Doctoral Dissertation	6
* <u>EPID 710</u> . Fundamentals of Epidemiology	5
<u>EPID 705</u> . Introduction to Deductive and Probability Logic in Epidemiology	2
<u>EPID 715</u> . Theory and Quantitative Methods in Epidemiology	4
<u>EPID 716</u> . Epidemiologic Data Analysis	3
* <u>EPID 765</u> . Methods and Issues in Pharmacoepidemiology	3
Biostatistics courses (see below for recommendations and options)	6
Electives (see below for recommendations and options)	9
<b>Minimum required total</b>	<b>54.5</b>

### ***Strongly Recommended***

DPOP 870. Pharmaceutical Outcomes Research Methods for students in 2nd or 3rd year, focuses on the implementation of advanced methods in pharmaceutical outcomes research (Spring Semester Odd Years)

### **3. Social and Behavioral Concentration**

The Social Behavioral concentration prepares students to apply social behavioral theory in the design and evaluation of health interventions as well as in the study of multilevel factors that affect health behaviors and outcomes. Students learn how to ask impactful questions, select optimal study designs and research methods to answer those questions, and disseminate their research findings to diverse audiences.



Through research rotations and practica, students gain skills in primary data collection and secondary data analysis. Students in this concentration can tailor their coursework to develop expertise in the methodologies of greatest interest to them, including quantitative and qualitative methods.

### **REQUIRED COURSEWORK FOR SOCIAL BEHAVIORAL CONCENTRATION**

(\* denotes that course is required for all DPOP PhD students)

<b>Topic/course</b>	<b>Credit hours</b>
* <u>DPOP 803</u> . Social and Behavioral Aspects of Pharmaceutical Use	3
* <u>DPOP 806</u> . Pharmaceutical Policy	3
* <u>DPOP 872</u> . Proposal Writing	3
* <u>PHRS 815</u> . Implementation Science (New course! Number to be determined)	1.5
* <u>PHRS 899</u> . DPOP Student and Faculty Seminar	4
* <u>PHRS 801</u> . Ethics	1
* <u>PHRS 994</u> . Doctoral Dissertation	6
* <u>EPID 710</u> . Fundamentals of Epidemiology	5
* <u>EPID 765</u> . Methods and Issues in Pharmacoepidemiology	3
Scale Development Methods (HBEH 853) OR Patient Reported Outcomes Measurement and Application (HPM 794)	3
Statistics	9
Electives	9
<b>Minimum required total</b>	<b>51.5</b>

#### ***Strongly Recommended***

DPOP 870. Pharmaceutical Outcomes Research Methods for students in 2nd or 3rd year, focuses on the implementation of advanced methods in pharmaceutical outcomes research (Spring Semester Odd Years)

→トロント大学薬学部と同じく、UNC 薬学部の大学院教育は、PharmD 課程修了者に限定されていない。

#### **② MS 課程 (Residency Program)**

教育プログラム、Course description

<https://pharmacy.unc.edu/education/ms/residential-program/>

入学資格：PharmD 学位保持者で、米国の薬剤師免許を有するもの

### 3. Rutgers 大学の大学院教育

4つの専攻（教育プログラム）がある。

#### 1. Medicinal Chemistry

PhD in Medicinal Chemistry

MS in Medicinal Chemistry with thesis

MS in Medicinal Chemistry without thesis

#### 2. Pharmaceutical Sciences

PhD in Pharmaceutical Science 27 単位の座学+45 単位の研究（1 年の residency を含む）

<https://pharmacy.rutgers.edu/wp-content/uploads/phd-program-goals-pharma-10-2017-003.pdf>

MS in Pharmaceutical Science 24 単位の座学+6 単位の研究

<https://pharmacy.rutgers.edu/wp-content/uploads/Peutcs-grad-program-goals-pharm-05-2015.pdf>

#### 3. Toxicology

MS/PhD in Toxicology

Department of Pharmacology and Toxicology が主宰するが、17 の他の Departments の教員が指導教員となる共同大学院プログラムである。

#### 4. Health Outcomes, Policy and Economics

MS in Health Outcomes, Policy and Economics

「1. Medicinal Chemistry」のカリキュラム

Med Chem – Curriculum

<https://pharmacy.rutgers.edu/med-chem-curriculum/>

**Graduate Program in Medicinal Chemistry**

**Curriculum**

**Ph.D. in Medicinal Chemistry**

Core courses – 23 credits; Elective courses – 15 credits; Research in Medicinal Chemistry (16:663:701,702) – 34 credits

#### *Core Courses*

- Medicinal Chemistry: Research Techniques and Principles (16:663:501)
- Principles of Drug Design (16:663:502)
- Heterocycles in Medicinal Chemistry (16:663:506)
- Interpretation of Organic Spectra (16:160:515)
- Modern Synthetic Organic Chemistry (16:160:503)
- Molecular Biology and Biochemistry I (16:115:511)
- Independent Research Proposal (16:663:540)
- Seminar in Medicinal Chemistry (16:663:601,602)

**PharmD/PhD dual degree in Medicinal Chemistry** – For highly motivated students already enrolled in the PharmD program at Rutgers Ernest Mario School of Pharmacy

The program enables qualified students to complete requirements for both degrees in a shortened time frame by beginning their PhD coursework and research while still enrolled in the PharmD program. In addition to their PharmD curriculum, qualified students need to complete a PhD curriculum that includes: Core courses – 20 credits; Elective courses – 12 credits; Research in Medicinal Chemistry (16:663:701,702) – 40 credits.

#### *Core Courses*

- Medicinal Chemistry: Research Techniques and Principles (16:663:501)
- Principles of Drug Design (16:663:502)
- Heterocycles in Medicinal Chemistry (16:663:506)
- Interpretation of Organic Spectra (16:160:515)
- Modern Synthetic Organic Chemistry (16:160:503)
- Independent Research Proposal (16:663:540)
- Seminar in Medicinal Chemistry (16:663:601 or 602)

#### **M.S. in Medicinal Chemistry – Thesis Option (Full-Time Students)**

Core courses – 16 credits; Elective courses – 9 credits; Research in Medicinal Chemistry (16:663:701,702) – 6 credits

#### *Core Courses*

- Medicinal Chemistry: Research Techniques and Principles (16:663:501)
- Principles of Drug Design (16:663:502)
- Heterocycles in Medicinal Chemistry (16:663:506)
- Interpretation of Organic Spectra (16:160:515)
- Modern Synthetic Organic Chemistry (16:160:503)
- Seminar in Medicinal Chemistry (16:663:601 or 602)

### **M.S. in Medicinal Chemistry – Non-Thesis Option (Full-Time and Part-Time Students)**

The curriculum and requirements are the same as for the Thesis M.S. with the exception that *students must take two additional 3-credit courses in place of the research requirement*. The Non-Thesis M.S. students must enroll in the 3-credit *Non-Thesis Masters Programmatic Study in Medicinal Chemistry* (16:663:620) during their last semester in the program. In the *Non-Thesis Masters Programmatic Study in Medicinal Chemistry* (16:663:620), students are required to write a literature review or conduct a small research project culminating with a final written critical essay. The literature review or the critical essay must be submitted to a committee of three members for review.

### ラトガーズ大学薬学部には5つの Departments (教員組織) がある

- (1) Chemical Biology
- (2) Medicinal Chemistry
- (3) Pharmacology and Toxicology
- (4) Pharmaceutics
- (5) Pharmacy Practice and Administration

(1)~(4)の教員は、ほぼ全員、PhD で PharmD はほとんどいない。

一方、(5)の教員はほとんどが PharmD で、かつ Residency を経験しており、PhD を持つ人はほとんどいない。下記の、Associate Professor Gerhard は PhD で珍しい例。

### **# Associate Professor Tobias Gerhard, BSPHarm, PhD (Pharmacy Practice & Administration)**

学歴

PhD - Pharmacoepidemiology - University of Florida

BS - Pharmacy - Albert-Ludwigs University, Freiburg, Germany

#### **Research Interests**

Comparative safety and effectiveness of antipsychotic medications, Pharmacological treatments of dementia, Pharmacoepidemiological methods, and more generally research on use and management of therapeutics in Medicaid, Medicare, and privately insured populations.

### **# Professor Lauren Aleksunes, PharmD, PhD (Pharmacology & Toxicology)**

学歴

PhD - Pharmacology and Toxicology - University of Connecticut, Storrs, CT

PharmD - University of Connecticut, Storrs, CT

BS - Pharmacy Studies - University of Connecticut, Storrs, CT

## Research Interests

The ATP-binding cassette transporters (ABC) are members of a superfamily of transporters found in the plasma membrane. ABC transporters function as efflux pumps that remove chemicals from the cell. As a result, transporters limit the cellular accumulation of drugs and toxicants. These transporters are important in removing chemicals from the liver and kidneys and can protect against target organ toxicity. Similarly, these efflux pumps are expressed in the placenta and participate in maternal-fetal xenobiotic disposition, thereby protecting the developing fetus from toxicant exposure. 論文発表は、Toxicology 関係のものが多い。

ラトガーズ大学薬学部では、いわゆるダブルディグリー（PharmD ともう一つの学位）の仕組みがある。次の4つのプログラムがある。

**Dual PharmD/MD（医師） Program**

**Dual PharmD/MPH（公衆衛生学修士） Program**

**Dual PharmD/MBA（経営学修士） Program**

**Dual PharmD/PhD Program**

このうち、4つ目のプログラムは、PharmD コースに在籍しているうちに、PhD コースの履修も行うものである。PharmD コースを修了して大学院に進学すると、高校卒業から PhD 取得まで通常は最短でも11年程度を要するが、このダブルディグリーコースを選ぶと9年で可能になるという。（米国では、学士課程の優秀な学生が大学院の授業を聴講することは多い。この Dual Degree システムはそれを公式に認定したものと言えるかもしれない。）

日本の薬学部と大学院にこれに類似のダブルディグリープログラムを導入して、薬学部学生の博士（薬学）の学位取得が、通常は10年（6+4）を要するところ、9年以下で可能になれば大学院進学者が増加するのではないだろうか。優秀な学生がこのプログラムを履修するようになれば、薬学部教員の養成や、創薬研究者の養成に貢献できると思われる。

さらに二つの大学薬学部の教員構成を調べてみた。

#### 4. University of Southern California 薬学部 教員構成

Departments:

- (1) Pharmacology and Pharmaceutical Sciences (17名)
- (2) Clinical Pharmacy (36名) (ほぼ全員 PharmD)
- (3) Pharmaceutical and Health Economics (13名)
- (4) Regulatory and Quality Sciences (6名)

(2) 以外の Departments に所属する教員は、ほとんど全員 PhD である。

(2) の教員数とその他の教員数はそれぞれ 36 名で、同数である。

## 5. Thomas Jefferson 大学薬学部 教員構成

Departments:

(1). Pharmaceutical Sciences (10 名) ほぼ全員 PhD

(2). Pharmacy Practice (20 名) ほぼ全員 PharmD

教員数は(1) : (2) = 1 : 2 である。

## 6. ユニバーシティ・カレッジ・ロンドンの大学院教育

<https://www.ucl.ac.uk/pharmacy/study/mphilphd-study>

・ MPhil/PhD

まず修士課程に入学し、その後、PhD 課程に進む。

院生は、次の専攻のいずれかに属する。

- (5) Research Department of Pharmaceutical and Biological Chemistry
- (6) Research Department of Pharmaceutics
- (7) Research Department of Pharmacology
- (8) Research Department of Practice and Policy

そして、次の 6 つの研究クラスターで研究活動を行う。

- Age-related Medicines Development and Use
- Drug Discovery and Therapeutic Target Identification
- Fabrication and Synthetic Technologies for Advanced Drug Delivery
- Medicines Use and Optimisation
- Pharmacoepidemiology and Medication Safety
- Translational Neuroscience

教員 (Academic Staff) は 64 名で、Department 次の 4 つ。

- Pharmaceutical & Biological Chemistry 18 人 (28%)
- Pharmaceutics 16 人 (25%)
- Pharmacology 13 人 (20%)
- Practice and Policy 17 人 (27%)

このほかに、37 人の Research Staff (Research Fellow, Research Associate 等) がいる。

入学資格 : 生化学、化学、微生物学の薬局、薬理学、またはその他の関連科目で修士号、または最低 2 級の英国学士号、または同等の基準の海外での資格があれば応募可。

<https://www.ucl.ac.uk/prospective-students/graduate/research-degrees/pharmacy-mphil-phd>

・ UCL の規則では、フルタイムの研究生は、最初の登録から 9 か月以上 MPhil の学位に登録する必要があり、その後、PhD 課程にアップグレードするための学術要件を満たす必要がある。一方、パートタイムの研究学位の学生は、最初の登録から最低 15 か月間 MPhil の学位に登録する必要があり、その後、PhD 課程にアップグレードするための学術要件を満たす必要がある。ただし、アップグレードを完了したからといって、MPhil が授与されたわけではない。PhD 課程へのプロセスとして存在しているシステムである。

・ 通常、4 つの研究部門 1) 薬学・生化学研究科、2) 薬剤学研究科、3) 薬理学研究科、4) 実践政策研究部のうちの 1 つの研究科、さらに 6 つ①加齢に伴う医薬品の開発と使用②創薬と治療標的の同定③高度なドラッグデリバリーのための製造および合成技術④医薬品の使用と最適化⑤薬理疫学と医薬品の安全性⑥トランスレーショナル神経科学、の専門のどれかを専攻する。

・ 博士課程トレーニングプログラムには、学生のニーズに合わせて特別に設計された短期コースが含まれる。このプログラムには、一般的なスキルに関する講義とワークショップに加えて、基本および高度な実験技術を教える薬科大学の専門家による講義が含まれている。

・ 博士課程の学生は、年に 2 回（4 月と 9 月）開催される博士課程研究デーに出席する必要があり、学生の学力向上をさらに促進するために、会議、国際協力、その他の研究活動の費用を支援できる追加の教員資金を提供している。

・ 博士課程の Handbook

- Doctoral School Handbook



### 第3章「Accreditation（認証評価）」

本文書で取り上げた国には、日本のモデル・コアカリキュラムのようなものはない。

強いてあげれば、イギリスの認証評価機関である、General Pharmaceutical Council (GPhC)による Indicative Syllabus が日本のモデル・コアカリキュラムと対比できるかもしれない。

また、イギリスの GPhC による Standards for Pharmacy Professionals は、日本のモデル・コアカリキュラムの「薬剤師に求められる 10 の基本的資質」と比較考察の対象になる。

各大学薬学部は、薬学教育の認証評価機関（Accreditation Organization）が定めた評価基準等に沿って教育プログラム（カリキュラム）を作成している。従って、各国の Accreditation Organization の評価基準やガイドライン等と日本のモデル・コアカリキュラム、或いは、薬学教育評価機構の評価基準を比較検討することは意味があるように思われる。

そこで、各国の認証評価機関のホームページから、いくつかの文書をダウンロードした。

#### 1. カナダ Canadian Council for Accreditation of Pharmacy Program (CCAPP)

評価基準：Accreditation standards for Canadian first professional degree in pharmacy programs（2020 版）

<https://ccapp-accredit.ca/wp-content/uploads/2020/07/July7-CCAPP-Professional-Standards-ENG.pdf>

- ・ 30 項目の基準がある。日本の薬学教育評価機構の評価基準の中項目に対応する？
- ・ トロント大学薬学部は CCAPP の評価を最近受けて、最高の評価（有効期間が 6 年）を得た（2020 年 6 月）。カナダでは、個々の大学の評価報告書は公開されていないので、見るができない。

#### 2. 米国 Accreditation Council for Pharmacy Education (ACPE)

<https://www.acpe-accredit.org/>

ACPE の standards（2016 年版）。23 項目の基準

<https://www.acpe-accredit.org/pdf/Standards2016FINAL.pdf>

University of North Carolina, Eshelman School of Pharmacy は 2019-2020 年に認証評価を受け適合 (accredited) 評価を得た。8 年間有効。

<https://www.acpe-accredit.org/faq-item/University-of-North-Carolina-Eshelman-School-of-Pharmacy-2/>

個々の大学の判定結果のみ公表されていて、評価報告書は公表されていないようだ。



### 3. イギリス General Pharmaceutical Council (GPhC)

<https://www.pharmacyregulation.org/>

#### A) Standards for Pharmacy Professionals

・ Pharmacy professionals must:

S1 provide person-centred care

S2 work in partnership with others

S3 communicate effectively

S4 maintain, develop and use their professional knowledge and skills

S5 use professional judgement

S6 behave in a professional manner

S7 respect and maintain the person's confidentiality and privacy

S8 speak up when they have concerns or when things go wrong

S9 demonstrate leadership

#### B) (日本) 薬剤師に求められる 10 の基本的資質(2013 年策定)

1. 薬剤師としての心構え
2. 患者・生活者主体の視点
3. コミュニケーション能力
4. チーム医療への参画
5. 基礎的な科学力
6. 薬物能力における実践能力
7. 地域医療における実践能力
8. 研究能力
9. 自己研鑽
10. 教育能力

A)とB)の比較は、「世界薬学探訪記」において、以下のようになされている。(位置 No. 9239/15786-9278/15786)

9つの standards (S1-S9) は、日本の薬学教育モデル・コアカリキュラムの改訂において策定された「薬剤師に求められる 10 の基本的資質 (6 年制薬学部卒業時に身につけておくべき資質)」と極めて近い関係にあると思われるが、両者を突き合わせて比較してみると興味深いことがわかる。

イギリスの「9つのスタンダード」で最も重要とされるのは「S1. 人間中心医療 (person-centered-care)」であり、日本の「10の資質」においても「患者・生活者本位の視点」として2番目に位置づけられている。また今回の改訂で、新たに「S8. 過ちや不正行為に対する誠実義

務 (Speaking up about concerns : duty of candour) 」が「9つのスタンダード」に付け加わったが、日本の「10の資質」には同様な項目は取り上げられていない。医療安全や社会正義を重要視するイギリスの特徴と言えるだろう。また、「S7. 守秘義務とプライバシーの尊重」は、「10の資質」では前面に取り上げられていないが、重要な項目である。

改訂版「9つのスタンダード」には解説パンフレットがあり、各スタンダードに対していくつかの項目を設けた説明がされている。「S9. 指導力の発揮」は、その説明をよく読んでみると日本の「10の資質」にも含まれる「教育能力」と密接な関係にあることがわかるが、言葉の使い方が日英で異なることは興味深い。

このように、大学における薬学教育と医療現場における薬剤師の職能を同時に監督する GPhC は、薬学生と薬剤師の双方に対して改訂版「9つのスタンダード」を通じて一貫したメッセージを送っている。これに対して、「薬学部卒業時に身につけておくべき資質」とされている日本の「10の資質」は、これが医療現場に出た薬剤師の出発点であるとは、必ずしも医療現場で充分認識されていないことが残念である。

・ General Pharmaceutical Council による評価報告書 (Accreditation Report) が公開されている。

<https://www.pharmacyregulation.org/documents-subject/accreditation-and-recognition>

University College London は 2019 年に評価を受け、その評価報告書は次の URL にある。最高評価 (6 年間有効) を得ている。

UCL MPharm reaccreditation report, June 2019 final

UCL MPharm reaccreditation REPORT June 2019 final.pdf

この報告書の「**Appendix 2 – Standards**」に評価基準が記載されている。これと、日本の薬学教育評価機構の評価基準を比較検討するとよいように思われる。

また、評価報告書の「**Appendix 3 – Indicative Syllabus**」(本文書内の **Indicative Syllabus** に転記) は、各大学薬学部で教育プログラムを作成する上の参考資料である。従って、これと日本の薬学教育モデル・コアカリキュラム (の項目) を比較検討するとよいと思われる。

(参考) イギリスでは、薬剤師が研修を受けて、独立処方権を持つ (Independent Prescriber, IP) ことが可能である。

そのための教育プログラムを提供している Aston 大学薬学部の評価報告書が次の URL にある。

Aston IP reaccreditation REPORT, July 2020 final

Aston IP reaccreditation REPORT, July 2020 final.pdf

## **2a. イギリス Royal Pharmaceutical Society**

### **Prescribing Competency Framework**

<https://www.rpharms.com/resources/frameworks/prescribers-competency-framework>

### **Development for Students**

<https://www.rpharms.com/development/students>

### **Professional Guidance on the Administration of Medicines in Healthcare Settings**

<https://www.rpharms.com/Portals/0/RPS%20document%20library/Open%20access/Professional%20standards/SSHM%20and%20Admin/Admin%20of%20Meds%20prof%20guidance.pdf?ver=2019-01-23-145026-567>

### **Professional guidance on the safe and secure handling of medicines**

<https://www.rpharms.com/recognition/setting-professional-standards/safe-and-secure-handling-of-medicines/professional-guidance-on-the-safe-and-secure-handling-of-medicines>

### **8 core Principles of Safe and Appropriate Handling of Medicines**

<https://activesocialcare.com/handbook/safe-handling-medication/8-core-principles-of-safe-and-appropriate-handling-of-medicines>

## **4. オーストラリア Australian Pharmacy Council**

<https://www.pharmacycouncil.org.au/>

### Accreditation

<https://www.pharmacycouncil.org.au/resources/pharmacy-program-standards/>

### Standards

<https://apcwebsite.blob.core.windows.net/webfiles/16ee2b4a2eb0ea11a812000d3a6aa9f7/ACCR%20EDITATION%20STANDARDS%20FOR%20PHARMACY%20PROGRAMS-2020-web-071119.pdf?sv=2015-07-08&sr=b&sig=rBvyt4CvPu6if43pRKGg3aYXPI2upgEs%2BikPXSRaRQ0%3D&se=2020-10-03T16%3A57%3A00Z&sp=r>

Performance Outcomes Framework

[https://apcwebsite.blob.core.windows.net/webfiles/9bdc62822eb0ea11a812000d3a6aa9f7/181291\\_APC-Performance-Outcomes\\_WEB.pdf?sv=2015-07-08&sr=b&sig=B6cqOG09rFBmYV1Yvw0TRXMHNxQ6EZrseffwGHkGUtk%3D&se=2020-10-03T17%3A00%3A08Z&sp=r](https://apcwebsite.blob.core.windows.net/webfiles/9bdc62822eb0ea11a812000d3a6aa9f7/181291_APC-Performance-Outcomes_WEB.pdf?sv=2015-07-08&sr=b&sig=B6cqOG09rFBmYV1Yvw0TRXMHNxQ6EZrseffwGHkGUtk%3D&se=2020-10-03T17%3A00%3A08Z&sp=r)

## 資 料

### 表 1. カナダの各州の薬剤師の権限

<https://www.pharmacists.ca/pharmacy-in-canada/scope-of-practice-canada/>

アルバータ州では薬剤師の権限が最も大きく拡大されている。薬剤師は臨床検査のオーダーができ、データの解釈もできる。また、研修を受けた薬剤師は、注射ができるし、医療用医薬品 (Schedule 1 drug) の独立処方権を得ることができる。(英国の薬剤師と同様)。

論文 : Chan & 大和田智彦 「総合的なメディシナルケミストリーを採り入れたアメリカの薬学教育」  
ファルマシア Vol. 53 324頁

:

#### 1-1. トロント大薬学部 教員名簿

<https://www.pharmacy.utoronto.ca/faculty>

#### 1-2. トロント大学薬学部 PharmD Course Descriptions

#### 1-3. トロント大学薬学部 時間割

#### 2-1. ラトガーズ大学薬学部 教員名簿

Ernest Mario School of Pharmacy – Rutgers University

<https://pharmacy.rutgers.edu/directory/>

### Five Departments:

- (1) Chemical Biology
- (2) Medicinal Chemistry
- (3) Pharmacology and Toxicology
- (4) Pharmaceutics
- (5) Pharmacy Practice and Administration

(1)~(4)の教員は、ほぼ全員、PhD で PharmD はほとんどいない。一方、(5)の教員はほとんどが PharmD で、かつ Residency を経験している。PhD を持つ人はほとんどいない。

幾つかの研究室の中を覗いてみると :

Associate Professor Tobias Gerhard, BSPHarm, PhD

学歴

PhD - Pharmacoepidemiology - University of Florida

BS - Pharmacy - Albert-Ludwigs University, Freiburg, Germany

**Research Interests**

Comparative safety and effectiveness of antipsychotic medications, Pharmacological treatments of dementia, Pharmacoepidemiological methods, and more generally research on use and management of therapeutics in Medicaid, Medicare, and privately insured populations

Professor Lauren Aleksunes - , PharmD, PhD

学歴

PhD - Pharmacology and Toxicology - University of Connecticut, Storrs, CT

PharmD - University of Connecticut, Storrs, CT

BS - Pharmacy Studies - University of Connecticut, Storrs, CT

### **Research Interests**

The ATP-binding cassette transporters (ABC) are members of a superfamily of transporters found in the plasma membrane. ABC transporters function as efflux pumps that remove chemicals from the cell. As a result, transporters limit the cellular accumulation of drugs and toxicants. These transporters are important in removing chemicals from the liver and kidneys and can protect against target organ toxicity. Similarly, these efflux pumps are expressed in the placenta and participate in maternal-fetal xenobiotic disposition, thereby protecting the developing fetus from toxicant exposure. 論文発表は、Toxicology 関係のものが多い。

2-2. ラトガーズ大学薬学部カリキュラム (授業科目説明)

<https://pharmacy.rutgers.edu/programs/curriculum/>

2-3. ラトガーズ大学薬学部 時間割 (3-5 年生 ; 専門課程の 1-3 年次)

<https://pharmacy.rutgers.edu/info-for/current-students/schedule-classes-final-exams/>

3. Univ. of Southern California 薬学部 教員リスト

4. Thomas Jefferson Univ. 薬学部 教員名簿

5. University College London 薬学部 教員名簿

# 表 1

## Pharmacists' Scope of Practice in Canada

 Implemented in jurisdiction
  Pending legislation, regulation or policy for implementation
  Not implemented

		BC	AB	SK	MB	ON	QC	NB	NS	PEI	NL	NWT	YT	NU	
<b>Prescriptive Authority (Schedule 1 Drugs)<sup>1</sup></b>	Independently, for any Schedule 1 drug	X	✓ <sup>5</sup>	X	X	X	X	X	X	X	X	X	X	X	
	In a collaborative practice setting/agreement	X	✓ <sup>5</sup>	✓ <sup>5</sup>	✓ <sup>5</sup>	X	X	✓	✓	X	X	X	X	X	
	Initiate <sup>2</sup>	For minor ailments/conditions	X	✓	✓	✓ <sup>5</sup>	P	✓	✓	✓	✓ <sup>5</sup>	✓	X	X	X
		For smoking/tobacco cessation	X	✓	✓	✓ <sup>5</sup>	✓	✓	✓	✓	✓ <sup>5</sup>	✓	X	X	X
		In an emergency	✓ <sup>7</sup>	✓	✓ <sup>7</sup>	✓ <sup>8</sup>	✓	✓	✓	✓	✓	✓ <sup>7</sup>	X	X	X
<b>Adapt<sup>3</sup>/Manage</b>	Independently, for any Schedule 1 drug <sup>4</sup>	X	✓ <sup>5</sup>	X	X	X	X	X	X	X	X	X	X	X	
	Independently, in a collaborative practice <sup>4</sup>	X	✓ <sup>5</sup>	✓ <sup>5</sup>	✓ <sup>5</sup>	X	X	✓	✓	X	X	X	X	X	
	Make therapeutic substitution	✓	✓	✓ <sup>9</sup>	X	X	✓ <sup>10</sup>	✓	✓	✓	✓	X	✓	X	
	Change drug dosage, formulation, regimen, etc.	✓	✓	✓ <sup>9</sup>	✓	✓	✓	✓	✓	✓	✓	X	✓	X	
	Renew/extend prescription for continuity of care	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	
<b>Injection Authority (SC or IM)<sup>1,5</sup></b>	Any drug or vaccine	P	✓	✓	✓	X <sup>11</sup>	✓	✓	✓	✓	✓	X	✓	X	
	Vaccines <sup>6</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	X	
	Influenza vaccine	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	X	
<b>Labs</b>	Order and interpret lab tests	X	✓	P <sup>12</sup>	✓ <sup>13</sup>	X	✓	P	P <sup>12</sup>	✓ <sup>14</sup>	X	X	X	X	
<b>Techs</b>	Regulated pharmacy technicians	✓	✓	✓	✓ <sup>15</sup>	✓	X	✓	✓	✓	✓	X	X	X	

1. Scope of activities, regulations, training requirements and/or limitations differ between jurisdictions. Please refer to the pharmacy regulatory authorities for details.
2. Initiate new prescription drug therapy, not including drugs covered under the *Controlled Drugs and Substances Act*.
3. Alter another prescriber's original/existing/current prescription for drug therapy.
4. Pharmacists independently manage Schedule 1 drug therapy under their own authority, unrestricted by existing/initial prescription(s), drug type, condition, etc.
5. Applies only to pharmacists with additional training, certification and/or authorisation through their regulatory authority.
6. Authority to inject may not be inclusive of all vaccines in this category. Please refer to the jurisdictional regulations.
7. Applies only to existing prescriptions, i.e., to provide continuity of care.
8. Pursuant to a Ministerial Order during a public health emergency.
9. Applies only to pharmacists working under collaborative practice agreements.
10. Only in the case of a drug shortage.
11. For education/demonstration purposes only.
12. Pending health system regulations for pharmacist requisitions to labs.
13. Authority is limited to ordering lab tests.
14. Authority limited to ordering blood tests. No authority to interpret tests.
15. Pharmacy technician registration available through the regulatory authority (no official licensing).