

## 統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\*

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大和田智彦 Tomohiko OHWADA 東京大学大学院薬学系研究科教授

### 1 はじめに

著者らは研究室での会話を通して、日米の薬学教育の仕組みや内容に大きな違いがあることを知り、アメリカの薬剤師の活躍の場や責任の大きさに驚いた。本稿では、著者の一人がアメリカの大学で実際受けている薬学専門教育、特に化学教育の紹介を通して、日本の薬学教育の今後の方向性についても私見を交えて考察してみたい。

### 2 日米の薬学教育の相違点

日米の薬学教育の決定的な違いが年限と体制にある。日本での薬剤師を養成する薬学教育は6年間の学部教育として行われるのに対して、アメリカでは、学部卒業後(通常4年間)、Pharm. D. プログラムと呼ばれる4年間の専門教育を専門機関(School of Pharmacy)で行う。すなわち、アメリカの薬学教育は学部教育ではなく大学院教育であり、Pharm. D. プログラム修了後、Doctor of Pharmacy(Pharm. D.)の学位が授与される。Pharm. D. は Ph. D.(博士号)とは異なり、専門職の学位であるが、Doctor の名のつく学位取得を薬剤師資格の条件としている。簡単に言えば、薬剤師になるために、アメリカでは高校卒業後8年間(4+4)の教育を受ける必要がある。同様の教育プログラムは医師にもあり、Doctor of Medicine(M. D.)と呼ばれる専門職学位が必要である。

全米には132校の School of Pharmacy があり、そのうち125校が学部卒からの教育である。歴史の長い伝統校の7校が例外的に6年間の一環教育(高校卒業後入学し、学部相当2年間+ Pharm. D. プログラム4年間)が許されている。著者の一人が所属する Rutgers, The State University of New Jersey(以下、Rutgers)は6年間一環の School of Pharmacy である。Rutgers では、最初の2年を Pre-professional Years(4年制の学部教育に相当)と呼び、一般化学、生物学、数学、Writing、人文科学、薬学概論、有機化学、物理学、生理学、統計学、心理学、ミクロ経済学などを学び、講義と並行して生物、化学、物理、有機化学の実習も行う。日本の薬学部で行う有機化学の講義内容はこの2年間に集中して学ぶ。後半の4年を Professional Years と呼び、大学院レベルの専門科目を学ぶ。6年間一環の School of Pharmacy では、Pharm. D. プログラムに進級する際には試験がないが、一般的には Pharm. D. プログラム(School of Pharmacy)に入学するためには、必修科目の単位を取る必要がある。また Pharmacy College Admission Test(PCAT)と呼ばれる試験を受け一定の成績を取らなければならない。多くの学生は学部卒業後、1年かけて単位の取得と PCAT の試験準備を行う。薬剤師になるために、高校卒業後8年以上かかることもよくある。人気の高い6年間一環の School of Pharmacy に入学するには、高校卒業時に明確なキャリアプランを持ち、相当高い SAT Score (センター試験のようなもの)が必要である。

### 3 アメリカにおけるメディシナルケミストリー教育

Rutgers および一般的な4年間の Pharm. D. プログラムの期間(いずれも Professional Years と呼

\* 英文原題: Integration of Medicinal Chemistry in the US Pharmacy School Education

ぶ)では、専門科目として薬化学(pharmaceutical chemistry)、メディシナルケミストリー、薬剤学(pharmaceutics)、薬理学(pharmacology)、薬物治療学(therapeutics)など、病気別に薬の使い方を学ぶ。Rutgersでは、1年目にメディシナルケミストリーの基礎になる薬化学(有機化合物の立体化学、命名法、代謝反応、生体物質の生合成、機器分析・分析化学の原理)<sup>1)</sup>を半年、2年目にメディシナルケミストリーを通年で学ぶ。<sup>2)</sup>メディシナルケミストリーというと日本では医薬品の有機合成化学に重きを置くが、Rutgersでは実際の医薬品の構造活性相関、作用機序、副作用、薬物代謝・排泄(水への溶解性)について化学構造をもとに講義している。すなわち治療に使用される医薬品について、有機化学、薬理学、生化学、薬物動態学、毒性学などを統合して化学構造の視点から有機化学者が教育する。とりわけ化学構造の習得は必須で、膨大な数の医薬品(約1,000化合物)を1年間かけて学習する。講義の後半になると、構造式から水溶性や代謝の部位が予測可能になる。構造活性相関データの集積と解析には、教員にも高い知識力や学問レベルが要求される。日本でも、実際の医薬品を題材にした統合的なメディシナルケミストリーを講義できるように、教員側の組織的なレベルアップが必要であると感じる。

化学構造から、副作用の回避や off-label use(適応外使用)を考える例をあげる。これらの例は実際の治療現場で活用され、Rutgersのメディシナルケミストリーの講義に含まれている。

#### 例1 スルホンアミド・アレルギー(sulfonamide allergy)

スルホンアミド(-SO<sub>2</sub>NH-)は医薬品でよく見られる部分構造である。スルホンアミド・アレルギーは、スルホンアミド基を有する抗生物質でよく目にする。一方、利尿薬はチアジド系、ループ系、炭酸脱水素酵素阻害薬などのグループに分類されるが、ループ系には4種類、フロセמיד、トルセמיד、ブメタニド、エタクリン酸がある(図1)。化学構造を見ると、そのうち3つはスルホンアミドがあり、スルホンアミド・アレルギーの患者には使えない可能性を考える。その場合スルホンアミド構造を持たないエタクリン酸(実際には中毒性難聴のため、あまり使われない)がスルホンアミド・アレルギーの患者に安全に使える唯一の薬ということになる。すなわち、スルホンアミド基を有する抗生物質のスルファメトキサゾールに対してアレルギーを持つ患者に、利尿薬としてフロセמידが使えるかという問題意識を持つべきである

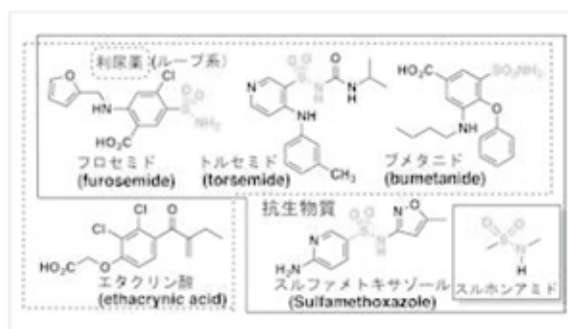


図1 スルホンアミド・アレルギー

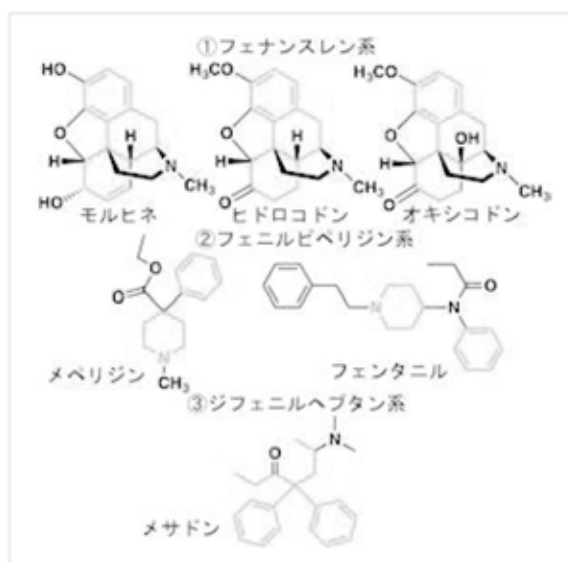


図2 鎮痛薬の分類

(図1). 化学構造の理解によって, どんな薬にもスルホンアミド・アレルギーの概念が適用できる. 医薬品の名前と作用を覚えただけでは, 可能性のある副作用には気がつかない.

例2 構造のクラススイッチ

オピオイド鎮痛薬は①フェナンスレン系(モルヒネ, ヒドロコドン, オキシコドンなど), ②フェニルピペリジン系(メペリジン, フェンタニル), ③ジフェニルヘプタン系(メサドンの)の3つのグループに分類される(図2). あるグループの鎮痛薬に患者がアレルギーや耐性を持って投与を継続できない場合, 薬剤師は薬の変更を考える必要がある. 薬への反応性等で変更する場合, 名前が違ってても構造式が違うとは限らない. 似た構造式には似た反応性を持つ可能性があり(cross sensitivity), 構造の異なるグループの鎮痛薬に変更することが妥当である.

例3 ニューキノロン系やテトラサイクリン系抗菌剤の2価カチオンとの反応

フルオロキノロンの構造式を見ると(図3), 牛乳中のCa<sup>2+</sup>や2価カチオンと錯体を形成する可能性が大きく, 水溶性が減少し吸収が阻害されるため牛乳での服用を避けるべきであることが理解できる. なぜ1価カチオンではなく, 2価カチオンとの反応性を考える必要があるかが構造式から理解できる. 単に添付文書の記載を記憶しているだけではカチオンの種類による反応性の違いは分からない.

例4 副作用を利用した薬物治療(off-label use)

抗生物質のエリスロマイシンの主たる毒性は, 代謝によって生じるケタールによる胃腸けいれん(gastrointestinal cramping)であることが知られている(図4). そのため, ケタール生成を抑えたクラリスロマイシンやアジスロマイシンが使われている. 一方, エリスロマイシンは胃腸けいれん作用を利用して off-label use(適応外使用)として便秘薬に使用されている.

4 薬局や病院でメディシナルケミストリーの知識はどう役に立つのか

RutgersのProfessional Yearsでは, 学生は1年目と2年目の夏休み期間(アメリカでは学年の終わりの時期に対応する)に薬局と病院の実習(rotation)を行う. さらに4年目は5週間ごとに, 薬局, 病院, FDAなどの政府機関や製薬会社などで実習を行う. 薬局, 病院では受け入れ機関の監督下, 実際の薬剤師と同等な立場で活動する. メディシナルケミストリーを習った学生は, 薬局と病院の実習でも, 薬の名前から構造式を想像し, 作用機序やアレルギーを考えることができる. 薬剤師になった後でも類推や判断の根拠としてメディシナルケミストリーが活用でき, また卒業後企業研究者やアカデミックの進路を選んだ際には創薬研究において当然活用できる.

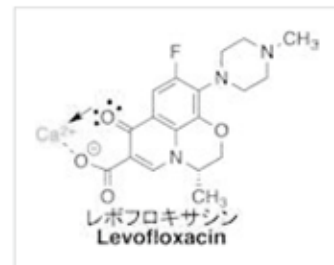


図3

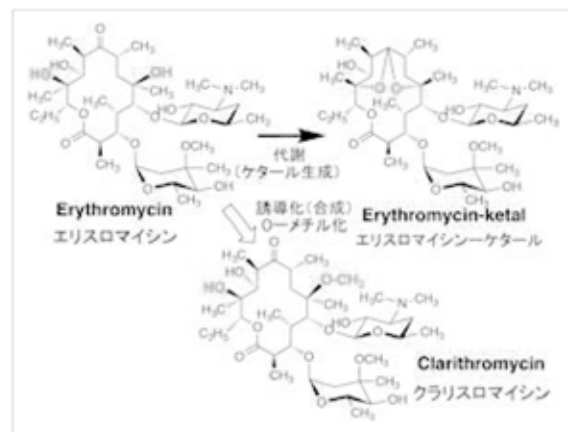


図4 エリスロマイシンの代謝

## 5 日本の化学系薬学教育の強みを生かしたメディシナルケミストリー教育の重要性

Rutgers ではメディシナルケミストリーは最も取得困難な科目の1つで、通年講義、各学期に100を超える医薬品の化学構造式に関する試験が4回ある。学生は必死で覚えることから、次第に構造式に由来する物性や薬理作用の規則性に気がつく。なぜこのような構造活性相関、薬理学、生化学、有効性と副作用、薬物動態などを含めた医薬品の臨床的知識を統合的に勉強する必要があるのだろうか。それは、アメリカの薬剤師が医師の診察に同席し、それぞれの患者に適切な薬を選択する責任を負っているためである。日本でも薬剤師が処方提案し医師と協議しながら薬物治療を行う機会は増えているが、日本の大学における教育の組み立てでは、十分に対応できていないように思う。類推や判断には、医薬品の化学構造とそれに由来する統合された知識やロジックが大いに必要である。ではアメリカのシステムをそのまま真似すれば、よりよい薬学教育が日本にできあがるのだろうか。

日本の化学系薬学の教員は、有機合成化学や詳細な立体化学反応や構造化学などの基礎的な有機化学に強みを発揮できるので、治療に用いられている医薬品の3次元的な化学構造を議論することが可能である。もちろん生体物質と医薬品の相互作用を有機化学の立場でとらえることもできる。薬理学や薬物動態学を有機化学の視点から講義することも重要であり、化学薬学の教員が当該分野の基礎知識を吸収して、治療現場において、あるいは創薬研究の場においても活用できる日本独自のメディシナルケミストリーを、組織的に整理・構築していくことが重要であろう。

また日本の薬学において研究が盛んであったことを再認識し、研究する薬剤師を育成することが可能である。研究する薬剤師を育成する視点は、現在のアメリカの薬学教育に欠けているように思う。医学の発展を願って研究する医師(臨床医)が身近に多数いる状況からも、研究する薬剤師の存在はチーム治療の高度化や波及の根幹をなすと思う。例えばスルホンアミド含有医薬品の中で、なぜアレルギーを起こす物質と起こさない物質があるのか、アレルギーから逃れる化学修飾があるかなど、研究テーマは山積している。薬物治療に関する研究を行うためには、分野にかかわらずPh. D. が不可欠であり、学部レベルから大学院レベルに薬学教育の範囲を拡張する必要がある。6年制学部において大学院レベルの薬学教育は少なくとも化学系では行われていないと思う。現在の学部6年間+4年間(大学院博士課程)の合計10年の区分を再検討して、10年間のPharm. D. + Ph. D. コースを作ることも可能ではないか。アメリカの例を見ても、8年制と言ってよい教育が一般的であり、さらにPharm. D. + Ph. D. プログラムやPharm. D. + M. D. プログラムも既に存在している。アメリカをはじめ海外の薬学教育制度の現状と歴史を研究して発想の転換を議論し、日本の薬学教育の良さを発揮できる独自の教育プログラムの構築を目指して行動し始める必要がある。

最後に、アメリカの薬学教育・薬剤師が目指す理念を紹介しよう。*Pharmacotherapy Optimization* (薬物治療の最適化)。この言葉には創薬研究も含まれ、研究する薬剤師、医薬品の化学構造をもとに患者の治療薬を最適化できる薬剤師が含まれ、日本の薬学教育や薬剤師が目指す方向性とも合致した意味深い言葉だと思う。

### 参考文献

- 1) Rice J. E. "Organic Chemistry Concepts and Applications for Medicinal Chemistry", Academic Press, San Diego, 2014.
- 2) Lemke T. L. *et al.*, "Foye's Principles of Medicinal Chemistry", Seventh Edition, Lippincott Williams & Wilkins, Philadelphia, 2013.

キーワード アメリカ薬学教育, Pharm. D. プログラム, メディシナルケミストリー教育, 化学構造, 臨床的知識

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# 1-1. トロント大薬 教員名簿

Graduate Appointment、55名

	氏名	職位・役職	専門領域（大）
1	Christine Allen	Professor	Drug Development and Disease Diagnostics;
	Ahmed Aman	Assistant Professor-Status 本 籍：Ontario Institute for Cancer Research	ADME/PK
2	Stéphane Angers	Professor	Drug Development and Disease Diagnostics; Molecular basis of drug targets and diseases
3	Zubin Austin	Professor, Academic Director, Centre for Practice Excellence	Health Services Research;
4	Marisa Battistella	Associate Professor-Status, Clinician Scientist	Clinical Pharmacy Research, Drug Safety, Health Services Research;
5	Reina Bendayan	Professor	Drug Development and Disease Diagnostics, Drug Safety, Molecular basis of drug targets and diseases;
6	Rob Bonin	Assistant Prof.	Drug Development and Disease Diagnostics, Molecular basis of drug targets and diseases;
7	Heather Boon	Professor	Clinical Pharmacy Research, Drug Safety, Health Services Research;
8	Lisa Burry	Assistant Professor	Clinical Pharmacy Research, Drug Safety;
9	Suzanne M. Cadarette	Associate Professor	Drug Safety, Health Services Research;
10	Tigran Chalikian	Professor	Molecular basis of drug targets and diseases;
11	Ayman Chit	Assistant Professor - Status	Drug Development and Disease Diagnostics, Health Services Research;
12	Ian Crandall	Assistant Professor	Drug Development and Disease Diagnostics
13	Carolyn Cummins	Associate Professor	Drug Development and Disease Diagnostics, Molecular basis of drug targets and diseases

専門領域 (小)	大学院担当 (?)		
	Pharmacy 薬学	Biomedical Sciences 生物医科学	Clinical Social & Administrative Pharmaceutical Sciences 臨床・社会薬学
Focus on developing advanced drug delivery formulations to treat a wide range of indications, including cancer and osteoarthritis.	<input type="radio"/>	<input type="radio"/>	
Focus on the molecular mechanisms underlying signal transduction events activated by the Wnt and Hedgehog families of secreted growth factors.	<input type="radio"/>	<input type="radio"/>	
Focus on both students and practitioners, and implications for regulators, employers, and educators	<input type="radio"/>		<input type="radio"/>
leads translational studies that address unmet clinical needs across the spectrum of pharmacotherapy care in patients with chronic kidney disease.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
the mechanisms that regulate drug transport at blood-tissue barriers, including the blood-brain barrier, blood-testicular, blood-intestinal and blood-placenta barriers	<input type="radio"/>		
the molecular mechanisms of pathological pain and cognitive disorders, including how neuronal activity maintains and modifies plastic changes in the nervous system.	<input type="radio"/>	<input type="radio"/>	
health services and policies, focusing on the use, regulation, safety and effectiveness of natural health products and traditional/complementary medicine practices	<input type="radio"/>		<input type="radio"/>
symptom management in the intensive care unit, in particular preventing or treating delirium through approaches such as optimizing sedation	<input type="radio"/>		<input type="radio"/>
pharmacoepidemiology, health services research and pharmacy practice, with focus in osteoporosis and fracture prevention	<input type="radio"/>		<input type="radio"/>
the physico-chemical forces that govern inter- and intramolecular interactions of biopolymers, including proteins and nucleic acids	<input type="radio"/>	<input type="radio"/>	
the epidemiology of infectious diseases, effectiveness and cost-effectiveness of health technologies and interventions, and the economics of the health care system	<input type="radio"/>		<input type="radio"/>
evaluates novel classes of chemical compounds for their effectiveness against neglected diseases, with a focus on malaria caused by the parasite Plasmodium falciparum	<input type="radio"/>	<input type="radio"/>	
the role of nuclear receptors in the development of diabetes, obesity and other metabolic diseases to identify therapeutic targets and develop drugs to prevent or treat these conditions	<input type="radio"/>	<input type="radio"/>	

	氏名	職位・役職	専門領域（大）
14	Carlo DeAngelis	<b>Clinician Scientist</b> 本籍：Sunnybrook Health Service Centre	Clinical Pharmacy Research, Drug Safety, Health Services Research
15	Lisa Dolovich	Professor & Dean	Clinical Pharmacy Research, Drug Safety, Health Services Research
16	Lee Dupuis	<b>Clinician Scientist</b> 本籍：The Hospital for Scik Children	Clinical Pharmacy Research
17	Jean Gariepy	Professor - Status 本籍：Ontario Cancer Institute	Drug Development and Disease Diagnostics, Molecular basis of drug targets and diseases
18	Tara Gomes	Assistant Professor	Drug Safety, Health Services Research
19	Paul Grootendorst	Associate Professor	Health Services Research
20	Sara Guilcher	Assistant Professor	Health Services Research
21	David Hampson	Professor	Drug Development and Disease Diagnostics, Molecular basis of drug targets and diseases
22	Brian Hardy	<b>Associate Professor - Status</b>	Clinical Pharmacy Research
23	Heiko Heerklotz	<b>Professor - Status</b>	Drug Development and Disease Diagnostics, Molecular basis of drug targets and diseases
24	Jeffrey Henderson	Associate Professor	Drug Development and Disease Diagnostics, Molecular basis of drug targets and diseases
25	Certina Ho	Assistant Professor - Teaching Stream	Drug Safety
26	Jeffrey Hoch	<b>Associate Professor -Status</b> 本籍：St. Michael'sHospital	Health Services Research
27	Shana Kelley	<b>University Professor</b>	Drug Development and Disease Diagnostics, Molecular basis of drug targets and diseases
28	Jillian Kohler	Professor	Health Services Research



専門領域 (小)	Pharmacy 薬学	Biomedical Sciences 生物医科学	Clinical Social & Administrative Pharmaceutical Sciences 臨床・社会薬学
understanding how the immune system is involved in causing the side effects of anti-cancer treatments	○	○	○
interventions and collaborative practices that can improve health care delivery, medication management and pharmacy practice	○		○
the supportive care of children with cancer or undergoing hematopoietic stem cell transplantation	○		○
synthetic, combinatorial and genetic approaches to design peptide-based delivery shuttles or to re-engineer large structural templates such as bacterial toxins in order to generate selective vehicles for cancer cells and other cell targets.	○		
Tara Gomes is an epidemiologist whose research interests include pharmacoepidemiology, drug safety and effectiveness, and drug policy research	○		○
Paul Grootendorst examines economics issues in the pharmaceutical sector, with a particular focus on drug pricing, insurance and the provision of community pharmacy services	○		○
Sara Guilcher's research program optimizes integration of care for whole-person activation among individuals with complex needs.	○		○
David Hampson studies the application of viral vector-mediated gene therapy to the neurodevelopmental disorders Fragile X Syndrome and Dravet Syndrome.	○	○	
Brian Hardy's research focuses on the pharmacokinetics, pharmacodynamics and effectiveness of drugs in the elderly, including drugs used for major depression and bipolar disease.	○		○
understanding the interactions of amphiphilic molecules with membranes	○	○	
the molecular mechanisms regulating programmed cell death in the mammalian central nervous system (CNS), neural connectivity in the CNS, and the development and delivery of small molecule therapeutics targeting these processes.	○	○	
experiential education, educational scholarship and medication safety initiatives related to community pharmacy practice.	○		
Jeffrey Hoch analyzes cost effectiveness of publicly funded drugs and treatments. His research interests include health services research related to cancer, mental health, and health issues affecting poor and vulnerable populations.	○		○
Shana Kelley's research focuses on the development of new technologies for disease diagnosis, drug discovery and life sciences research.	○	○	
Jillian Clare Kohler focuses on global access to essential medicines, specifically issues linked to anti-corruption, transparency and accountability in the pharmaceutical sector, trade issues and intellectual property rights.	○		○

	氏名	職位・役職	専門領域（大）
29	Lakshmi Kotra	Professor	Drug Development and Disease Diagnostics, Drug Safety, Molecular basis of drug targets and diseases
30	Murray Krahn	Professor	Clinical Pharmacy Research, Health Services Research
31	Ping Lee	Professor	Drug Development and Disease Diagnostics
32	Linda Levesque	<b>Assistant Prof. -Status</b>	
33	Rob Macgregor	Professor, Director, <b>Graduate Department of Pharmaceutical Sciences</b>	Drug Development and Disease Diagnostics
34	Muhammad Mamdani	Professor -Status 本籍：St. Michel's Hospital	Muhammad Mamdani Clinical Pharmacy Research, Drug Safety, Health Services Research
35	Lisa McCarthy	<b>Associate Prof. -Status &amp; Clinical Scientist</b> 本籍：Women's College Hospital	Clinical Pharmacy Research, Drug Safety, Health Services Research
36	K. Sandy Pang	Professor	Drug Development and Disease Diagnostics, Drug Safety, Molecular basis of drug targets and diseases
37	Manny Papadimitropoulos	<b>Assistant Professor -Status</b> 本籍：Eli Lilly	Health Services Research
38	Keith Pardee	Assistant Professor	Drug Development and Disease Diagnostics
39	Peter Pennefather	<b>Professor Emeritus</b>	Clinical Pharmacy Research
40	Micheline Piquette-Miller	Professor	Clinical Pharmacy Research, Drug Development and Disease Diagnostics, Drug Safety
41	Raymond Reilly	Professor, Director of the Centre for Pharmaceutical Oncology	Drug Development and Disease Diagnostics, Drug Safety, Molecular basis of drug targets and diseases
42	Winnie Seto	<b>Assistant Professor -Status</b> 本籍：The Children for Sick Children	Clinical Pharmacy Research

専門領域 (小)	Pharmacy 薬学	Biomedical Sciences 生物医科学	Clinical Social & Administrative Pharmaceutical Sciences 臨床・社会薬学
Lakshmi Kotra investigates the intersection of medicinal chemistry, drug action, drug design, preformulations and pre/clinical studies.	○	○	
Murray Krahn evaluates the effectiveness, cost effectiveness and feasibility of integrating new drugs, technologies and services into the health care system, with a primary interest in prostate cancer and viral hepatitis.	○		○
Ping Lee's research focuses on developing new approaches to enhance and regulate the delivery of poorly soluble drugs for oral therapy and nitric oxide for wound healing.	○	○	
	○		
Rob Macgregor studies the non-covalent forces that stabilize biological molecules such as proteins and DNA, specifically the role that water plays in stabilizing these structures.	○	○	
Muhammad Mamdani uses machine learning and analytics to address health care problems, with a focus on improving patient outcomes and health care system efficiency.	○		○
Lisa McCarthy's research focuses on medication management and the continuity of health care, with the aim of reducing medication-related harm and optimizing people's experiences with their medications.	○		○
Sandy Pang's research focuses on the application of pharmacokinetics and pharmacodynamics to study drug transport, metabolism, and the vitamin D receptor.	○	○	
Manny Papadimitropoulos leads health outcomes evaluations to understand which interventions provide good value and aid policymakers in making decisions regarding the funding of new interventions.	○		○
Keith Pardee pioneers the development of in vitro devices to host cell-free synthetic gene networks for broad applications in research and human health.	○	○	
Peter Pennefather is developing a biophysical understanding of how cellular signals carried by neurotransmitters, cell membrane potential and intracellular second messengers modulate transmembrane ion channels in neurons and glia cells.	○		
Micheline Piquette-Miller investigates the influence of disease and environmental factors on the regulation of drug transport proteins in the placenta and on maternal and fetal health.	○	○	
Raymond Reilly focuses on developing novel radiopharmaceuticals to detect and treat cancer, including discovery, preclinical development and clinical translation of these agents.	○	○	
Winnie Seto conducts clinical pharmacy research in pediatric patients, focusing on pharmacokinetics, medication use in critically ill pediatric patients and application of clinical epidemiological principles.	○		○

	氏名	職位・役職	専門領域（大）
43	Michael Spino	<b>Professor -Status</b> 本籍：Apodex	Drug Development and Disease Diagnostics
44	Beth Sproule	Associate Professor & Clinician Scientist 本籍：Centre for Addiction and Mental Health	Clinical Pharmacy Research
45	Anna Taddio	Professor	Clinical Pharmacy Research
46	Mina Tadrous	<b>Assistant Prof. -Status</b>	Drug Safety, Health Services Research
47	Alison Thompson	Associate Prof.	Drug Safety, Health Services Research
48	Jack Uetrecht	Professor	Clinical Pharmacy Research, Drug Safety, Molecular basis of drug targets and diseases
49	Scott Walker	<b>Professor -Status</b>	Clinical Pharmacy Research
50	Sandra Walker	<b>Associate Prof. -Status</b> 本籍：Sunnybrook & Women's College Health Sciences Centre	Clinical Pharmacy Research
51	Donald Weaver	<b>Professor -Status</b> 本籍：University Health Network Reserch	Drug Development and Disease Diagnostics
52	James W. Wells	Professor	Molecular basis of drug targets and diseases
53	Peter Wells	Professor	Drug Development and Disease Diagnostics, Drug Safety, Molecular basis of drug targets and diseases
54	Shirley X.Y. Wu	Professor	Drug Development and Disease Diagnostics, Drug Safety, Molecular basis of drug targets and diseases
55	Gang Zheng	<b>Professor -Status</b> 本籍：University Health Network Reserch	Drug Development and Disease Diagnostics, Drug Safety, Molecular basis of drug targets and diseases

専門領域 (小)	Pharmacy 薬学	Biomedical Sciences 生物医科学	Clinical Social & Administrative Pharmaceutical Sciences 臨床・社会薬学
Michael Spino's research is focused on the pharmacokinetics and pharmacodynamics of iron chelators and their potential use in preventing neurological damage.	○	○	
Beth Sproule's research focuses on medications used in the treatment of mental health and substance use disorders, as well as on the addiction-related harms of therapeutic medications.	○		○
Anna Taddio's research aims to improve pain mitigation during medical procedures, particularly for children, in order to optimize health outcomes.	○		○
Mina Tadrous focuses on evaluating drug policies and post-marketing surveillance of medications to answer questions about medication safety and effectiveness and improve the optimal use of medications.	○		○
Alison Thompson's research focuses on ethical issues that arise from public health policies, particularly in the intersection of public health and the general public.	○		
Jack Utrecht's research focuses on mechanistic studies of idiosyncratic drug reactions with a view to preventing these serious reactions.	○	○	
Scott Walker leads therapeutic, pharmacokinetic and pharmacodynamic studies.	○		
Sandra Walker focuses on antimicrobial therapy, specifically antimicrobial use and dose optimization, patient outcomes, infection screening tools, antibiotic resistance and antimicrobial stewardship.	○		
Donald Weaver's research interests include computer-aided design and synthesis of novel molecules to treat chronic neurodegenerative disorders, with a focus on Alzheimer's disease.	○	○	
James Wells focuses on developing a mechanistic understanding of the molecular processes that underlie G protein signalling.	○	○	
Peter Wells' research focuses on the body's adverse reactions to drugs, environmental chemicals and reactive oxygen species.	○	○	
Shirley Wu focuses on developing advanced pharmaceuticals and drug delivery technologies for unmet medical needs.	○	○	
Gang Zheng's research focuses on developing technology to diagnose and treat cancer more effectively. His research interests include nanomedicine, molecular imaging and phototherapy.	○	○	

氏名	職位・役職	専門領域（大）
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Teaching Stream, 10 名

56	Vnita Arora	<b>Associate Professor</b>	Practice
57	Andrea Cameron	Associate Professor	Experiential Education
58	David Dubins	Associate Professor	
59	Jamie Kellar	Associate Professor	
60	Peter Torios	Associate Professor	
61	Emily Musing	Associate Professor 本籍 UHN	
62	Marie Rocchi	Associate Professor	
63	Sandra Bjelajac Mejia	Assistant Professor Interim Director, Professional Programs	
64	Natalie Crown	Assistant Professor	
65	Kathy Vu	Assistant Professor	

<p style="text-align: center;">専門領域 (小)</p>	<p style="text-align: center;">Pharmacy 薬学</p>	<p style="text-align: center;">Biomedical Sciences 生物医科学</p>	<p style="text-align: center;">Clinical Social &amp; Administrative Pharmaceutical Sciences 臨床・社会薬学</p>
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<p>Vinita Arora is Course Coordinator for a broad range of pharmacy practice courses and a Faculty Course Coordinator in Experiential Education.</p>
<p>Andrea Cameron is a Course Coordinator within the Experiential Education program and Coordinator of the Industrial Pharmacy Residency Program.</p>
<p>David Dubins teaches in three programs: the Graduate Department of Pharmaceutical Sciences, the Specialist Program in Pharmaceutical Chemistry, and the Doctor of Pharmacy program.</p>
<p>Jamie Kellar teaches in the neuropsychiatry and health systems courses at the Faculty. Her research is in the field of health professions education, with a specific focus on professional identity formation.</p>
<p>Emily Musing is Vice President, Quality and Safety and Chief Patient Safety Officer at the University Health Network in Toronto, leading both inpatient and outpatient pharmacy services across UHN's many sites.</p>
<p><b>Academic Director, International Pharmacy Graduate Program (IPG)</b></p>
<p><b>Interim Director, Professional Programs</b></p>
<p>Natalie Crown completed her BSc.(Pharm) at Dalhousie University, a pharmacy practice residency program at the Queen Elizabeth II Health Sciences Centre in conjunction with Dalhousie University, and her post-baccalaureate PharmD at the University of Toronto.</p>
<p>Kathy's clinical expertise is in oncology and health systems approach to delivering safe and high quality care to cancer patients, and her research interests are in pharmacy practice and quality improvement in oncology.</p>

氏名	職位・役職	専門領域（大）
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その他 1, 11 名

66	Maria Zhang	Clinical Educator	
67	Debra Sibbald	Senior Lecturer	
68	Jauher Ahmad	Lecturer	
69	Karen Cameron	Lecturer	
70	Della Croteau	Lecturer	
71	Mary Erclik	Lecturer	
72	Debbie Kwan	Lecturer	
73	Jennifer Lake	Lecturer	
74	Tanya Sklierenko	Lecturer	
75	Naomi Steenhof	Lecturer	
76	Kenny Tan	Lecturer	



<p style="text-align: center;">專門領域 (小)</p>	<p style="text-align: center;">Pharmacy 薬学</p>	<p style="text-align: center;">Biomedical Sciences 生物医科学</p>	<p style="text-align: center;">Clinical Social &amp; Administrative Pharmaceutical Sciences 臨床・社会薬学</p>
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<p>Maria Zhang focuses her research and teaching on substance use disorders, with a specialization in problematic prescription drug use.</p>
<p>Debra Sibbald's expertise in curriculum includes curriculum designs, small and large classroom strategies research methodologies, and online computer-assisted learning for teaching, assessment and research.</p>
<p>Jauher Ahmad is responsible for the design, coordination and delivery of Medication Therapy Management I and Community Pharmacy Management courses.</p>
<p>Karen Cameron coordinates PHM619H (Physical Findings and Assessment) and PHM251H (Early practice experience 2). Her research interests include preceptor models and use of virtual interactive cases.</p>
<p>Della Croteau is the Interprofessional Education Faculty Lead. She has also taught the health systems course to first year PharmD students.</p>
<p></p>
<p>As Preceptor Education and Engagement Coordinator, Debbie is the academic lead for curriculum design and delivery of faculty development initiatives for preceptors involved in experiential education.</p>
<p>ennifer Lake's teaching responsibilities are pharmacotherapy in primary care (PHM652). Her educational interests are collaborative learning, applied learning, pharmacy practice and primary care.</p>
<p>Tanya Sklierenko focuses on patient care programs and expanding the role of the community pharmacist. She holds a Faculty position at the Leslie Dan Faculty of Pharmacy in Experiential Education.</p>
<p>Naomi's clinical expertise is in chronic pain and geriatrics, with focus on medication management, tapering opioid medications and the use of buprenorphine-naloxone therapy for patients with chronic pain.</p>
<p>Kenny Tan is a community pharmacist and teaches in the Medication Therapy Management and Early Practice Experience programs.</p>

氏名	職位・役職	専門領域（大）
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その他2, 115名

Professors-Status		10人
Associate Professors - Status		10人
Assistant Professors -Status		37人
Adjunct Professors		8人
Adjunct Lecturers		39人
Sessiona Lecturer		1人

<p style="text-align: center;">専門領域 (小)</p>	<p style="text-align: center;">Pharmacy 薬学</p>	<p style="text-align: center;">Biomedical Sciences 生物医科学</p>	<p style="text-align: center;">Clinical Social &amp; Administrative Pharmaceutical Sciences 臨床・社会薬学</p>
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<p>Oravo Ferdandes, Jack Seki を含む</p>

## **1-2. トロント大学薬学部**

### **PharmD Course Descriptions**

#### **Year 1 Course Descriptions 14 科目**

Students in Year 1 of the PharmD program at the Leslie Dan Faculty of Pharmacy, University of Toronto's complete several foundational courses which are important in preparing them to become medication therapy experts. Courses are taught in a variety of formats which include large class discussions, small group discussions, laboratory-based simulation, seminar discussions, and online learning.

#### **PHM101H1 Pharmacotherapy 1: Foundations and General Medicine**

This is the first of a series of courses taught over three years of the program which will provide the required knowledge and skills to effectively manage patients' drug therapy. In addition to covering selected therapeutic topics, the course will integrate relevant pathophysiology, pharmacology, clinical pharmacokinetics, selected pharmaceuticals and principles of evidence-based pharmacotherapy. Principles of drug therapy in geriatrics, pediatrics and other special populations will be addressed. Various learning and teaching methodologies will be used including didactic teaching, small group case discussions, and in-depth discussions of cases in small case study seminar groups. This course will help students prepare for the Medication Therapy Management Course and the other Pharmacotherapy courses.

*Prerequisite:* PHM113H1; PHM142H1; PHM144H1; PHM145H1; PHM146H1

*Co-requisite:* PHM105H1; PHM141H1; PHM143H1

#### **PKM105H1 Medication Therapy Management 1**

Medication Therapy Management (MTM) involves a partnership between the patient, pharmacist, and other healthcare providers to promote safe and effective medication use so that desirable patient outcomes are attained. It is founded on the philosophy of Pharmaceutical Care, and may encompass an array of services, whereby the pharmacist employs a systematic patient-centred approach to define and achieve goals related to optimal pharmacotherapy. The MTM series of courses will be delivered longitudinally over three years of the undergraduate program, with MTM 1 being the first of the four-part course series. MTM 1 will allow students to begin to apply knowledge and develop skills needed to undertake MTM, with content drawn from co-requisite and pre-requisite courses. Lecture and laboratory sessions will be designed to facilitate guided, independent, and collaborative learning. A key element of MTM 1 is that students will have the opportunity to undertake the role of a pharmacist in a simulated community practice and will be responsible for various tasks such as

conducting patient interviews, assessing the appropriateness of pharmacotherapy, providing medication-related patient education, actively participating in the medication-dispensing process, responding to drug information queries from patients and health care providers, documenting pharmacotherapeutic recommendations, and interpreting the pharmacist's ethical and legal obligations within provincial and federal regulatory frameworks. This course will introduce and develop fundamental knowledge, skills, and attitudes intrinsic to the pharmacy student's professional identity development; these attributes will be transferable to diverse practice settings, and prepare students for their first year early experiential rotation.

*Prerequisite:* PHM110H1; PHM113H1

*Co-requisite:* PHM101H1; PHM114H1; PHM141H1

### **PHM110H1 Health Systems**

This course introduces pharmacy students to Canada's healthcare system including structures, functions and the policies that underpin healthcare services. Students will learn about the roles and responsibilities of key healthcare providers including pharmacists in a variety of healthcare settings. Students will gain insight into how and where pharmacy and medication fit within the larger system of care. Historical context will be used to explain why the healthcare system exists and critical reflection will be encouraged to explore how and why the system may be evolving, especially with respect to the roles that pharmacists play within the system. The course provides an introduction to essential management, communication and leadership skills that will be required by healthcare professionals to flourish within the evolving health system.

### **PHM113H1 Pharmacy Informatics**

Pharmacy informatics introduces students to two core types of information: 1) patient-specific information created in the care of patients and 2) knowledge-based information, which includes the scientific literature of health care. Informatics also implies the use of technology in managing information and knowledge. Students will develop the introductory knowledge and skills to assume responsibility for identifying, accessing, retrieving, creating and exchanging relevant information to ensure safe and effective patient care throughout the medication use process. This course will utilize an innovative e-Resource and ample opportunity to develop skills in this emerging area.

### **PHM114H1 Social and Behavioral Health**

This course is composed of three components: 1) introduction to sociological theories and concepts that impact health and health care; 2) introduction to professionalism and ethics and 3) introduction to the ways in which individual psychology shapes and

affects health and health care. Topics such as the social determinants of health and related ethical issues; the social construction of disease; and the exploration of when and why people seek health care services will be used to stimulate discussion about how social forces impact pharmacy practice. Codes of ethics and other ethical principles for guiding professional practice in pharmacy will be discussed through the analysis of ethics cases. Behaviouralist, cognitivist, developmentalist, and psychoanalytic theories will be used to help students understand the range of responses and behaviours individuals may demonstrate when dealing with health-related issues. Students will apply these theories to discussion of different patient education (counselling) approaches designed to optimize personal and health-related outcomes.

### **PHM130H1 Pharmaceutical Calculations**

As pharmacists, you are expected to integrate your knowledge and skills gained throughout the pharmacy curriculum to provide direct patient care. Pharmacy practice is calculations intensive and accuracy is critically important to safe and effective patient care. As medication therapy experts, patients and other health care providers value and depend on pharmacists' expertise and accuracy in pharmaceutical calculations. Throughout the course, students will be required to complete pharmaceutical calculations with a focus on accuracy. A case based approach will be taken to familiarize students with real life examples of common calculations required to practice in community and hospital settings. The objective of this course is to prepare the student to apply knowledge and skills gained to other courses in the program, such as the early practice experience (EPE 1).

### **PHM140H1 Molecular Pharmacology**

Many drugs act via the receptors and other proteins that mediate cellular signalling. Such proteins can be grouped into several families on the basis of their structural and functional similarities. Examples from each family are examined at the molecular level from a pharmacological, biochemical and biophysical point of view for insight into their structure, their mechanism of action, their modulation by drugs and the underlying dysfunctions toward which the drugs are directed. Basic principles of molecular pharmacology are introduced as a tool for decoding the relationship between dose and response across all families, with an emphasis on the explicit nature of concepts such as potency and efficacy.

*Prerequisite:* PHM142H1

### **PHM141H1 Pharmaceutics**

Achieving effective treatment of a disease while minimizing adverse effects of a drug requires rational selection, formulation and administration of an appropriate dosage form. This course teaches the scientific background and technical aspects important in dosage form design and their therapeutic applications. This course will focus on the biopharmaceutical considerations and physiochemical foundation of various dosage forms. Discussion will include preformulation factors (melting point, solubility, viscosity, dissolution, particle and solid state properties), rheology, pharmaceutical solutions, pharmaceutical powders, colloids and dispersions, complexation chelation, and protein binding.

### **PHM142H1 Metabolic Biochemistry and Immunology**

This course examines aspects of mammalian biochemistry, metabolism and molecular immunology pertinent to pharmacologically significant drug actions in vivo. Where appropriate the biochemical basis, mechanism, and effect of specific drugs on human physiology are also discussed. In addition this course examines the biochemical basis of pharmacogenetics and metabolomics differences seen in different human populations.

### **PHM143H1 Pathobiology and Pathology**

This course is designed to introduce pharmacy students to the physiological and biochemical mechanisms which lead to pathological states and includes the laboratory investigation and follow-up associated with specific diseases.

*Prerequisite:* PHM145H1

### **PHM144H1 Pharmacokinetics**

This course will examine how physiologic and biochemical processes influence the fate of drugs in the body. The interrelationship between the physiochemical properties of the drug and the rate/extent of absorption will be explored. Mathematical modeling of the plasma concentration time curves following drug administration will constitute a major part of the course. Fundamental pharmacokinetic principles and quantitative relationships will be used to determine approaches in designing dosage regimens, evaluating pharmacologic response and explaining mechanisms of drug-drug interactions. The resulting theory will form the basis for selecting a particular route of drug administration, determining the frequency of administration and identifying patient factors which require a modification of normal drug dosing regimen.

### **PHM145H1 Human Histology and Anatomy**

This course introduces the student to the structure of the human body and its relationship to function. Following an introduction to basic human histology, the course will use a systemic approach to the study of human anatomy.

### **PHM146H1 Fundamentals of Pharmacology**

This course will introduce students to fundamental principles of pharmacology. The principles of drug-receptor interactions will be examined and various examples of protein targets of drug action shall be presented. The pharmacology of drugs that modify fundamental physiological processes such as the autonomic nervous system and endocrine and autocrine pathways will also be examined to serve as a background for future pharmacotherapy modules.

*Co-requisite:* PHM145H1

### **PHM151H1 Early Practice Experience (EPE)**

*(Pending approval of the Committee on Curriculum and Assessment.)*

This course is the first of two early experiential rotations. Students will undertake this first EPE-1 during the summer following Year 1 (sometime between May and August). Each student will actively participate in day-to-day services within a community pharmacy practice setting, thus enabling application of knowledge, skills and values introduced in faculty-based courses and simulated practice environments (laboratories). Required activities include prescription/medication order processing, patient education, drug information provision, medication history taking, and observation of/participation in patient safety processes in the practice setting. Students also need to demonstrate effective communication skills, professionalism and teamwork during the rotation.

*Pre-requisite:* PHM101H1; PHM105H1; PHM110H1; PHM113H1; PHM114H1

## **Year 2 Course Descriptions, 14 科目**

In Year 2 of the PharmD program, students undertake additional foundational courses as well as several courses related to patient care practice. At the end of their course work, students will undertake 160 hours of experiential education in a patient care setting during the summer.

### **PHM201H1 Pharmacotherapy 2: Self-Care Perspectives and Pharmacotherapy**

Self-care perspectives and pharmacotherapy is the second in a series of Pharmacotherapy courses taught over three years. In addition to covering selected therapeutic topics relating to self-care, (primarily dermatology and EENT) the course



will address principles of drug therapy in the practice context of self-care in which pharmacists work unsupervised as the primary health professional contact. It will build and enhance students' knowledge and skills in the management of minor, self-limiting and self-diagnosed ailments, which is within the scope of practice for pharmacists. Special contextual issues relating to the pharmacist's role in self-care, particularly communicating with patients; and the pharmacist's responsibility in accurately assessing and triaging patients, developing care plans and monitoring for this patient population, including special populations of concern. Issues of preventing drug therapy problems related to patient self-selection will be part of patient safety concerns. This course will build on content and skills from PHM101H1 and PHM105H1. The course will be aligned to the other Pharmacotherapy modules and will provide the required knowledge, skills, attitudes and behaviours to effectively manage patients' drug therapy in incorporating relevant schema recognition, pathophysiology, pharmacology, clinical pharmacokinetics, pharmaceuticals and evidence-based authoritative sources of best practice pharmacotherapy.

*Prerequisite:* PHM101H1; PHM105H1; PHM113H1; PHM140H1; PHM141H1; PHM145H1; PHM146H1; PSL205H1

*Co-requisite:* PHM205H1; PHM242H1

### **PHM202H1 Pharmacotherapy 3: Endocrinology, Nephrology and Urology**

This course is designed for pharmacy students to develop a broad understanding of pathophysiology, pharmacology, clinical pharmacokinetic and pharmacotherapy in major areas of endocrinology, nephrology and urology. The course will use a problem-based approach with emphasis on the integration and application of fundamental principles to specific clinical situations.

*Prerequisite:* PHM101H1; PHM105H1; PHM113H1; PHM140H1; PHM141H1; PHM142H1; PHM143H1; PHM144H1; PHM145H1; PHM146H1; PSL205H1

*Co-requisite:* PHM205H1

### **PHM203H1 Pharmacotherapy 4: Infectious Diseases**

This course is designed to provide students with the knowledge in pathobiology, pharmacology, pharmacotherapy, clinical pharmacokinetics and relevant pharmaceuticals required to be a practitioner in infectious diseases therapeutics. The course will be taught using a variety of techniques including on-line lectures, case-based learning and small interactive group learning.

*Prerequisite:* PHM101H1; PHM105H1; PHM113H1; PHM140H1; PHM141H1; PHM142H1; PHM143H1; PHM144H1; PHM145H1; PHM146H1; PHM205H1;

PHM212H1; PHM242H1; PSL205H1

*Co-requisite:* PHM206H1; PHM230H1

### **PHM204H1 Pharmacotherapy 5: Cardiovascular Diseases**

This course is designed to provide students with the knowledge in pathobiology, pharmacology, pharmacotherapy, and clinical pharmacokinetics required to be a practitioner in cardiovascular therapeutics. The course will be taught using a variety of techniques including lecture and team-based learning.

*Prerequisite:* PHM101H1; PHM140H1; PHM141H1; PHM142H1; PHM143H;  
PHM144H1; PHM146H1; PSL205H1

*Co-requisite:* PHM206H1

### **PHM205H1 Medication therapy Management 2**

This Medication Therapy Management (MTM) course is the second of the four-part series of simulated pharmacy practice courses. MTM 2 will enable a student to continue to apply knowledge and develop skills needed by a pharmacist to provide patient care, using a systematic patient-care process to define and achieve the goals of optimizing safe, effective pharmacotherapy. MTM 2 course content is drawn from relevant co- and pre-requisite courses. Lectures and simulated practice sessions are designed to facilitate independent and collaborative learning that will be transferrable to diverse practice settings and prepare a student for early experiential learning. Students will be responsible to perform and document a comprehensive patient assessment to identify, resolve and prevent drug therapy problems, and educate patients on the appropriate use of medications. Students will be required to assess a patient's health status; integrate relevant information to recommend appropriate therapy, determine efficacy and safety endpoints for monitoring therapy, document a care plan, and follow-up parameters with patients to evaluate their response to therapy, in a simulated practice environment. Students will also actively participate in the medication dispensing process, prepare extemporaneously compounded pharmaceutical products, and interpret the pharmacist's professional, ethical and legal obligation within provincial and federal frameworks.

*Prerequisite:* PHM101H1; PHM105H1; PHM114H1

*Co-requisite:* PHM201H1; PHM202H1

### **MPH206H1 Medication Therapy Management 3**

Medication Therapy Management 3 (MTM 3) is the third of a four-part series of simulated pharmacy practice courses that is delivered longitudinally over three years of the undergraduate program. MTM 3 builds on the skills developed in MTM 1 and MTM

2, focusing on more comprehensive, integrated patient centred care. MTM is founded on the philosophy of Pharmaceutical Care and involves a partnership between the patient, pharmacist, and other health care providers to promote safe and effective medication use to achieve desirable patient outcomes. MTM 3 provides students learning opportunities to apply and integrate materials learned through all courses in the curriculum to date, using simulated practice-based interactions to enhance their patient-care skills. Lectures will provide foundational material and skills which will be applied in the simulated interactions. Simulated interactions will focus on developing effective patient-centered management of multidimensional drug-therapy anchored in a professional context, in preparation for the student's second year practice experiential course.

*Prerequisite:* PHM101H1; PHM201H1; PHM202H1; PHM205H1

*Co-requisite:* PHM203H1; PHM204H1

### **PHM212H1 Research Methods for Pharmacy**

Pharmacists are required to apply research evidence in practice. As health care providers, pharmacists discern and translate both the quality and relevance of health information with the goal of optimizing patient outcomes. This course introduces students to clinical trial designs typically used in health care. The course will explore core principles in experimental and non-experimental research designs. The focus will be on randomized controlled trials as they are the primary method of generating evidence for therapeutic interventions. Students will learn how various research approaches are selected, designed, executed, analyzed, published and applied (including critical appraisal). The course covers a broad range of research topics at the introductory to intermediate level. Students will develop foundational knowledge and skills in research methods, statistics and ethics that will be applied in pharmacotherapy modules.

### **PHM213H1 Health Economics and Pharmacoeconomics**

This course surveys the economic aspects of the pharmaceutical sector. The course will use the methods of economic analysis to investigate how markets allocate resources, when they work well and the role for government when they do not work well. Specific topics include the economics of the development of new drugs; economic aspects of drug insurance, economic appraisal of new drugs ("pharmacoeconomics"), and economic models of the pharmacist labour market.

### **PHM215H1 Management: Skills, Communication and Collaboration**

Management skills and related communication and collaboration skills are essential for success in any field of pharmacy practice. This course will provide students with an introduction to basic concepts in management, communication and collaboration with other health and business professionals, and will culminate with the development of a business plan that enables students to apply knowledge and skills. This course is also designed to give students a broad overview in collaborative leadership theory so that they are better prepared to work effectively in their chosen field. Students will learn how pharmacy practice in different settings has evolved from 1985 to 2000 to 2015 as well as how practice may evolve in the future. In doing so students will develop a greater appreciation of the skills required to deliver effective patient care-focused services. Overall, the aim of this course is to equip students with the ability to apply their clinical, pharmaceutical and management skills to provide high quality services that are patient focused and demonstrate value for money.

*Prerequisite:* PHM110H1

### **PHM230H1 Physical Assessment and Injection Techniques**

This course will provide an introduction to the physical assessment of patients. Students will engage in lectures, on-line activities and skills practice in a laboratory setting. This course includes modules pertaining to immunizations and the administration of substances by injection that will allow students to meet the competencies required by the Ontario College of Pharmacists.

*Prerequisite:* PHM143H1; PHM145H1; PHM201H1; PHM202H1, PHM205H1; PSL205H1

*Co-requisite:* PHM203H1; PHM204H1; PHM206H1

### **PHM240H1 The Science of Pharmacotherapy**

This course will build upon basic pharmacology and medicinal chemistry to make links between the basic sciences and demonstrate how basic principles can be used to improve clinical therapy. It will also include critical evaluation of evidence for specific mechanisms and therapies. The format of the course to address these issues will be online questions that are designed to illustrate these points. The questions will be either multiple choice or short answer. Online feedback will be provided.

*Prerequisite:* PHM140H1; PHM142H1; PHM144H1; PHM212H1

### **PHM241H1 Topics in Pharmaceutical Quality and Clinical Laboratory Medicine**

This course will provide an introduction to pharmaceutical analysis and discuss the importance of assuring the pharmaceutical quality of medicinal products with an emphasis on establishment of quality control assays and specifications, bioequivalence

testing of generic drugs, special considerations for biopharmaceutical products, and the regulatory process in Canada. In addition, the course will discuss the application of analytic techniques in clinical laboratory medicine with a focus on commonly used tests to monitor patient health and the therapeutic use of drugs, including tests for personalized drug therapy. The course includes a laboratory component which will present drug formulation and related quality control issues.

*Prerequisite:* PHM141H1; PHM144H1

### **PHM242H1 Microbiology of Infectious Diseases**

The course provides a brief introduction to the general biology of organisms, and an overview of the host response to infection. Attention is then focused on common bacterial, fungal, viral and parasitic infections of man, and their epidemiology, prevention and treatment. Other topics include sterilization, disinfection, and a survey of antibiotics and chemotherapeutic agents.

*Prerequisite:* PHM142H1

*Co-requisite:* PHM201H1

### **PHM251H1 Early Practice Experience 2 (EPE2)**

This course is the second of two early experiential rotations, each consisting of 160 hours of experiential education. Students will undertake EPE-2 during the summer following Year 2 within predetermined blocks between May and August. Each student will actively participate in primarily clinical, with some operational, activities under the guidance of a pharmacist preceptor, within a direct patient care pharmacy practice setting. The purpose is to enable students to apply previously learned content and skills from faculty-based lecture courses and simulated practice environments (laboratories), and to gain new knowledge, skills and values while immersed in a pharmacy practice setting.

*Prerequisite:* PHM151H1; PHM201H1; PHM202H1; PHM203H1; PHM204H1; PHM205H1; PHM206H1

## **Year 3 Course Descriptions**

### **Fall term required courses**

#### **PHM301H1 Pharmacotherapy 6: Hematology, Oncology and Immunotherapies**

This course is designed to provide pharmacy students with the pathobiology, pharmacology, pharmacotherapy and clinical pharmacokinetics required to be a practitioner in oncology, hematology and immunology therapeutics. The course will be

taught using a variety of techniques including on-line lectures, case-based learning and small interactive group learning.

*Prerequisite:* PHM101H1; PHM105H1; PHM113H1; PHM140H1; PHM141H1; PHM142H1; PHM143H1; PHM144H1; PHM145H1; PHM146H1; PHM201H1; PHM202H1; PHM203H1; PHM204H1; PHM205H1; PHM206H1; PSL205H1

*Co-requisite:* PHM302H1; PHM305H1

### **PHM302H1 Pharmacotherapy 7: Neuropsychiatry**

This course is designed to provide pharmacy students with the knowledge in pathobiology, pharmacology, pharmacotherapy and clinical pharmacokinetics required to be a practitioner in neuropsychiatric therapeutics. The course may be taught using a variety of techniques including on-line lectures, case-based learning and small interactive group learning.

*Prerequisite:* PHM101H1; PHM113H1; PHM140H1; PHM141H1; PHM142H1; PHM143H1; PHM144H1; PHM145H1; PHM146H1; PHM212H1; PSL205H1

### **PHM305H1 Medication Therapy Management 4**

Medication Therapy Management 4 (MTM 4) is the final course in a four-part course series that is delivered longitudinally over three years of the pharmacy undergraduate program. MTM 4 builds on the skills developed in previous MTM courses, offering students opportunities to apply and integrate materials learned through many courses in the curriculum to date. This course focuses on developing and enhancing skills needed to optimize the pharmacist's scope of practice in providing effective patient care in Ontario. Lectures and simulations emphasize the pharmacist's roles (CanMEDS, 2015; AFPC, 2010) as a communicator, care provider, scholar, professional, manager, collaborator, and advocate, to prepare students for their Advanced Pharmacy Practice Experience (APPE) rotations.

*Prerequisite:* PHM101H1; PHM202H1; PHM203H1; PHM204H1; PHM206H1; PHM251H1

*Co-requisite:* PHM301H1; PHM302H1; PHM310H1

### **PHM310H1 Pharmacy in the Modern Health Care System**

This course will take an issues-oriented, critical-thinking approach to the healthcare system, with a particular emphasis on pharmacy practice. The course will build on the material from PHM110H1, PHM114H1 and PHM215H1, and will allow a deeper look into areas such as quality and patient safety, e-health technology and the health care needs of diverse populations. Students will also have an opportunity to explore the role of interprofessional collaboration in health care delivery. By following week by week the members of a virtual Canadian family as they navigate the healthcare system, students will examine issues with drug supply and access, pharmacy practice reform, expanded services, collaborative care and reimbursement models, and the interconnectivity of the disparate parts of the health care system. In addition to looking at health systems issues related to pharmacy practice in Canada, this course will include international comparisons between the Canadian system and the systems of the United Kingdom, United States and Australia. By participating in class discussions, reading course reference materials and completing assignments, students will learn to identify and analyze current and emerging health system issues from key stakeholder perspectives. In the course of doing so, they will also become aware of, understand and appreciate:

- factors internal and external to pharmacy and medication use that drive change in practice current strategies for evaluating and improving health care and pharmacy practice
- the role of interprofessional collaboration in the delivery of healthcare
- emerging roles and opportunities in pharmacy.

*Prerequisite:* PHM110H1; PHM114H1; PHM213H1; PHM215H1

### **PHM330H1 Preparation for Advanced Pharmacy Practice Experience**

The Preparation for Advanced Pharmacy Practice Experience (APPE) course is designed to strengthen and integrate students' knowledge, skills, and attitudes in preparation for, and make the transition to, APPE rotations. This course, via lectures, workshops, case-based role play activities and related assignments and assessments, will enable students to review, build on, consolidate and apply previous knowledge, skills and behaviours acquired throughout the curriculum in academic courses and in earlier experiential rotations in the areas of patient care provision, communication, collaboration, management, advocacy, scholarship, and professionalism. (CanMEDS, 2005, AFPC, 2010). The goal of this course is to engender students' practical skills and strategies to help prepare them for the role of advanced pharmacy practice students.

### **PHM340H1 Introductory Toxicology**

Concerned primarily with drug-induced diseases, this lecture course provides students with a conceptual framework for understanding the broad spectrum of toxicological problems encountered in clinical practice, in drug development and regulation, and in medical research. Central biochemical mechanisms and the relevance of clinical factors to toxicological expression will be integrated and applied to illustrative models of drug-related diseases in humans.

*Prerequisite:* PHM140H1, PHM142H1, PHM143H1, PHM144H1, PHM145H1, PSL205H1

### **Fall Term Elective Courses**

Students enroll in one of the following elective courses:

#### **PHM320H1 Global Pharmaceutical Policy**

This course is designed for students who are curious to learn about pharmaceutical public policy at the global level and also to explore the interrelationship between global and domestic health public policy issues, particularly those related to political economy and the governance of the pharmaceutical system. There are no prerequisites required but students are strongly recommended to have taken at least one social science or public health course given the ample reading and research requirements. Particular emphasis will be placed on how governments in different jurisdictions manage their public health responsibilities, particularly in terms of providing access to essential medicines and human development objectives, the tension between economic and



health objectives, global trade obligations and their impact on access to medicines, and how pressure from special interest groups are relevant to pharmaceutical policy. Corruption issues will also be addressed. This course encourages a large amount of student participation through group work, discussion, presentations, and debate. Accordingly, students will need to keep up with the weekly readings in order to ensure that they are prepared for the class.

#### PHM321H1 Selected Topics in the Pharmaceutical Industry

This course is designed to expose students to the pharmaceutical and biopharmaceutical industries, its environment, inner workings, and approach to engaging customers and stakeholders. The course outlines the business model of the industry and covers both drug development and commercialization, from international and Canadian perspectives. The course is intended to broaden the students' understanding of the industry, introduce critical concepts and terminology, build confidence and prepare students who may seek a career in the industry.

#### PHM323H1 Molecular Mechanisms of Drug Action

The proteins and nucleic acids that are the targets of most prescribed drugs can be classified according to their structure and mechanism of action at the molecular level. In this course, basic concepts of enzyme action such as the mechanisms of enzyme catalysis, the Michaelis-Menten and pre-equilibrium equations, steady-state approximations, allostery and cooperativity will first be covered. Major classes of therapeutic targets will then be discussed with an emphasis on their normal biochemical roles that are exploited for therapeutic intervention. The mechanisms of action of drugs acting on enzymes (antiviral and antimicrobial agents) on nucleic acids and on the cytoskeleton (anti-cancer agents) will be of special interest. The concept of rational cancer therapy will also be covered with examples of drugs targeting growth factors signalling pathways that are dysregulated in cancers.

#### PHM325H1 Aboriginal Issues in Health and Healing

This course examines the many issues surrounding the health of aboriginal people living in Canada. During the 13 weeks of class, students will come to understand the present day health issues of aboriginal peoples from the perspective of their historical and political context and the effects of health care policy. The many highly qualified speakers from the Aboriginal community and its focus on health and healing process make this course unique in the university. Optional, but strongly recommended, field trips include a "medicine walk" on the Six Nations reserve in which students will be able to see firsthand the source of some of the herbal preparations that are used in healing,

and a purification (sweat) lodge ceremony outside the city. The course is enriched by its association between students of the Leslie Dan Faculty of Pharmacy and the Aboriginal Studies program in the Faculty of Arts and Science, many of whom are of Aboriginal origin.

#### PHM383H1 Antimicrobial Stewardship

Antimicrobial Stewardship is an inter-disciplinary, multi-faceted approach to optimize antimicrobial use. While the ultimate goal of Antimicrobial Stewardship is to improve patient outcome, appropriate and effective use of antimicrobials is an important component to control antimicrobial resistance, minimize unintended consequences such as *C. difficile* infections, and to contain health care costs. As of 2013, presence of an active Antimicrobial Stewardship Program has been made a Required Operating Practice for acute care hospitals and long-term care facilities by Accreditation Canada. This course expands and deepens knowledge gained from the Year 2 Infectious Diseases Pharmacotherapy and Microbiology courses, with an emphasis on clinical application within the antimicrobial stewardship context. It will introduce students to the principles of antimicrobial stewardship to facilitate rational selection of antimicrobial regimens; stewardship interventions; quality improvement methods; as well as program development, implementation and evaluation. The course culminates to a team proposal presentation for an antimicrobial stewardship program based on a fictitious institution's profile. Each team is tasked with convincing a panel of judges, who in practice are antimicrobial stewardship clinicians or program executives, to support their proposed program.

#### PHM389H1 Research Project 1

This elective course is designed to introduce students to the philosophy, methodology and performance of research in scientific fields offered by faculty members who hold graduate appointments in the Department of Pharmaceutical Sciences. The research will involve the review of pertinent scientific literature and the generation of new information. Depending upon the project and the supervisor, the research may be conducted in a number of settings, e.g., in a laboratory at the Faculty, in a hospital, community pharmacy, pharmaceutical company, or in an office. Fields of study are wide ranging and include drug delivery, drug metabolism, medicinal chemistry, pharmaceuticals, pharmacokinetics, pharmacoepidemiology, pharmacy administration and

pharmacoeconomics, radiopharmacy, receptor biology, therapeutics, and toxicology. The course includes working in the laboratory (or other relevant setting), reading, searching for literature, performance of research and writing of the research report. Often times, the research may result in a joint publication with the supervisor. Students are expected to spend a minimum of 78 hours on the course, and are required to obtain prior written consent of the supervisor and course coordinator.

(Please download the Research Project Information document)

APPLICATION AND ENROLMENT PROCEDURES If the professor agrees to supervise your research project, the Research Project - Supervisor Form (which is part of this document), must be completed. The Course Coordinator for PHM389H1 must also sign this form. The completed and signed Research Project - Supervisor Form must be returned to Linda Chung (in Room 424) by the appropriate deadline (see below). Submission of this form does not in itself complete your registration in the course. You must also complete a course add form with Linda by the appropriate deadline:

Fall Term: Wednesday, September 18, 2019

Winter Term: Friday, January 17, 2020

Course Coordinator: Professor Suzanne Cadarette

E-mail: [s.cadarette@utoronto.ca](mailto:s.cadarette@utoronto.ca)

Telephone: 416-978-2993

Room: PB 602

### **Winter Term Selective Courses**

Students enroll in one of the following selective courses:

#### **PHM350H1 Pharmacotherapy in Ambulatory Care**

Ambulatory care pharmacists are accountable for addressing drug therapy needs and developing sustained partnerships with patients in an outpatient environment. They practice in primary care, family health teams, community pharmacies and specialty clinics. This practice can be independent or in a collaboration with other health care providers. Ambulatory care pharmacists require the knowledge and skills to triage, prescribe, administer and monitor medication therapies. They provide pharmaceutical care to patients with a variety of medical conditions and levels of acuity. This course will provide students with the knowledge, skills, and values to be a contemporary

ambulatory care practitioner with an emphasis on ambulatory care sensitive conditions, preventative care, minor ailments and natural health products.

#### PHM351H1 Pharmacotherapy in Institutional Care

Institutional pharmacists are accountable for addressing drug therapy needs with patients in an in-patient environment. Students will learn to apply therapeutics that are commonly seen when caring for a hospitalized patient. Some of the topics included are: IV therapeutics (fluid and electrolytes), acute pain management, VTE prophylaxis, diabetic ketoacidosis and in-hospital management of diabetes, postoperative medication management. Topics may include a brief introduction to critical care and some aspects of emergency medicine. Aspects of patient and medication safety will be integrated into the course.

*Prerequisite:* PHM101H1; PHM113H1; PHM140H1; PHM141H1; PHM142H1; PHM144H1; PHM146H1; PHM305H1; PHM340H1

#### PHM353H1 Pharmacotherapy in Critical Care

This course is designed to expose students to hospital-based clinical pharmacy practice, with a focus on the Intensive Care Unit (ICU). Various topics that encompass commonly encountered clinical conditions of patients in the ICU will be discussed, with an emphasis on the role of pharmacotherapy. Students will also be introduced to the role of multidisciplinary team members integral to the ICU including the respiratory therapist, nurse, ethicist and intensivist (pending availability). The course will be taught using traditional classroom lectures, case-based discussions, small-group learning projects, and self-directed learning. Student participation both within the classroom and online, and in group work assignments is expected.

Students enroll in one of the following selective courses:

PHM352H1 Pharmacotherapy in Older Adults

Growth in the proportion of the population over age 65 is expected to place significant demands on the health care system. Pharmacists must be prepared to effectively manage the pharmacotherapy in older patients in order to achieve optimal individual and health system outcomes. This 26-hour selective course will prepare students for their future roles in geriatric practice through the development of specific competencies in the knowledge and application of pharmaceutical care for older adults. This course will cover demographics, biology of aging, socioeconomics, ethical issues, informed consent, elder abuse, and beliefs and barriers regarding health care and medication use in older individuals. Communication issues, unique needs of caring for seniors, and barriers to medication taking will also be addressed. Specific pharmacotherapy of conditions prevalent in the elderly, including movement disorders, dementia, urinary incontinence, and specific drug-induced illnesses will be covered. This course will rely on case-based discussions to enable students to develop skills integral to patient assessment and optimizing drug therapy in the older adult with complicated disease and medication history.

*Prerequisite:* PHM101H1; PHM143H1; PHM144H1; PHM145H1; PHM146H1; PHM202H1; PHM203H1; PHM204H1; PHM205H1; PHM301H1; PHM302H1

PHM354H1 Pharmacotherapy in Pediatrics

This course builds on general knowledge and skills gained in the first three years of pharmacotherapy courses. It allows students to gain the fundamental pharmacotherapeutic knowledge and practice skills to care for patients from the neonatal period to the adolescent years. In addition to covering evidence based pharmacotherapy of several pediatric conditions, the course integrates

relevant normal development and physiology (fetal, neonatal, infant, child and adolescent), pathophysiology, clinical pharmacokinetics, medication safety, poison prevention, and patient (through the ages) and caregiver education. Each week the course will consist of two hours of didactic lectures and group case discussions primarily presented by clinical pharmacy staff from Sickkids Hospital. The course allows students to effectively manage pediatric patients' medication therapy in selected pediatric conditions, prepares the student for pediatric direct patient care (DPC) and non-direct patient care (NDPC) rotations, and encourages a career in pediatric pharmacy practice.

*Prerequisite:* PHM101H1; PHM113H1; PHM144H1; PHM146H1; PHM202H1; PHM203H1; PHM204H1

#### PHM355H1 Pharmacotherapy in Women's Health

Medications used in the care of Canadian women are amongst the most commonly prescribed pharmaceuticals. This course is designed to allow the student to obtain fundamental pharmacotherapeutic knowledge of medications used from menarche to menopause. This course will encourage students to develop a practice that provides quality care to women.

Students enroll in one of the following selective courses:

#### PHM360H1 Personalized Medicine

This course builds upon fundamental pharmacokinetic concepts taught in the first and second years in order to understand, describe and predict the sources of intra- and inter-individual variability in drug disposition and response in different patient population groups. The course is designed for students to understand the underlying basic principles used to individualize drug and dosage regimens for patients based on genetic, physiological and environmental factors. Critical evaluation of evidence and review of current guidelines or recommendations for dose or drug adjustments based on genetic

factors and the potential for drug-diet, drug-drug or drug-disease interactions will be covered. The format of the course to address these issues will be student presentations and in-class discussion of specific questions that are designed to illustrate these points.

*Prerequisite:* PHM140H1; PHM144H1

#### PHM361H1 Latest Developments in Drugs and Biologics

This course will cover all aspects of new drugs and biologics approved in the preceding 12 month period, together with those that entered phase III clinical trials during the same period. This is a unique course in the curriculum that will discuss the latest on new drugs and biologics. Approximately 50% of the lectures will be delivered using traditional methods, covering new drugs and for the remainder of the classes, pre selected pharmacy student groups will present their projects in new drugs and biologics. Instruction materials and reference materials will be drawn from Health Canada, FDA, scientific literature and drug information files.

#### PHM362H1 Assessing the Bioavailability and Bioequivalence of Medical Drug Products

This course introduces regulatory, clinical, statistical and logistical considerations in assessing the relative bioavailabilities of formulations. A heavy emphasis is placed on clinical trial design, and biostatistics involved in second entry drug applications to regulatory bodies. Students will learn about the methods, regulations, techniques, pharmacokinetics, and biostatistics involved in creating bioequivalence studies, at an introductory level. The course has a heavy mathematical bias with a component dedicated to mathematical modeling and basic programming in R-project, an open source statistical package. After taking this course, students will understand the steps required to set up single-dose or steady-state pilot and pivotal bioequivalence trials using parallel, crossover and replicate designs. Students will be able to take a data set of plasma concentrations and be able to process and interpret

the results of the trial. Students will gain a deeper understanding and context of the regulatory differences involved in generic drug testing between Canada, the United States and Europe.

*Prerequisite:* PHM141H1; PHM144H1; PHM241H1

Students enroll in one of the following selective courses:

PHM370H1 Community Pharmacy Management

A comprehensive program outlining the issues and topics which are critical in the successful operation of a community pharmacy practice including: selection of organizational structures, demographic review, financial analysis, business plan development, purchasing and financing a community pharmacy, operational workflow, financial management, risk management and insurance, inventory purchasing procedures and inventory management, pricing decisions, marketing strategy, advertising, sales promotion and salesmanship, ethics, security and general business policies. Building on the basic principles taught in PHM215H1, this course expands into a case based learning application of business administration which offer students exposure to Finance, Operations, Organizational Behaviour, Innovation and General Management as applied to the field of Pharmacy and Healthcare. The cases will provide students with the opportunity to develop skills for effective analysis, evaluation and problem-solving. To do this, students will learn about basic analytical tools (e.g., projections, break-evens, communication, organization theory) and will then be required to apply these tools using case methodology. Students will be given the opportunity to practice decision-making with imperfect information under time constraints and develop business writing skills. Preparation of a detailed business plan will also be a mandatory component for this course.

*Prerequisite:* PHM215H1



### PHM371H1 Institutional Pharmacy Practice Management

This course builds on the administrative, managerial and human resource principles presented in the prerequisite course, PHM215H1, with specific application to managing a pharmacy practice in an institutional setting. By means of lectures, case studies and assigned readings, students will explore institutional responses to health system changes and the “managed care environment”, the re-engineering of pharmacy practice, strategies for outcome and process improvement, workload management systems and professional accountability. Other topics will include the role of Pharmacy within the larger hospital environment including the interdisciplinary team and the importance of Family and Patient Centered Care.

*Prerequisite:* PHM215H1

### **Winter Term Elective Courses**

Students enroll in two of the following elective courses:

#### **PHM322H1 Patient/Medication Safety**

This course will look at patient safety and the potential for medication incidents from two aspects: (1) the medication-use system (e.g., prescribing, order entry, dispensing, administration, and monitoring of drug therapy); and (2) professional practice (e.g. preventable adverse drug events). It will build on topics previously covered in the curriculum, as well as additional materials related to the Institute for Safe Medication Practices Canada, the Canadian Patient Safety Institute, and the concept of continuous quality improvement in pharmacy practice.

### PHM381H1 Medical Imaging for Pharmacists

This course will discuss the principles and applications of medical imaging in patient care. There will be an emphasis on radiopharmaceuticals and nuclear medicine imaging (SPECT and PET) but other imaging technologies will be discussed including MRI, ultrasound, X ray, mammography and CT. These technologies are applied in diagnosing infectious disease, cancer,

cardiovascular disease, hepatobiliary and renal dysfunction, and neurological disorders. The emerging role of molecular imaging using PET and SPECT in selecting patients for personalized medicines for cancer as well as monitoring response to these new therapies will be introduced.

*Prerequisite:* PHM202H1; PHM204H1; PHM241H1; PHM301H1

#### PHM382H1 Nanomedicines in Oncology

This course covers a range of topics that pertain to the development and application of nanomedicines in oncology. Students will gain an understanding of the biological barriers to drug delivery in oncology as well as the tremendous heterogeneity in cancer and the challenges this presents for treatment. The concepts of passive and active targeting of nanomedicines will be covered with critical assessment of the enhanced permeability and retention effect. A detailed overview of the most advanced nanotechnology-platforms for drug delivery (i.e., liposomes, block copolymer micelles and polymer-drug conjugates) will be provided with additional discussion of new emerging platforms. The integration of imaging in drug development and development of theranostics and therapeutic-diagnostic pairs will also be discussed. Special emphasis on critical evaluation of scientific literature and pre-clinical/clinical studies will be made throughout the course.

#### **PHM384H1 Teaching and Learning**

The educator role for pharmacists is broad and involves diverse roles, including teaching patients, designing and delivering continuing education, mentoring/precepting students, and educating other care professionals in small and large group settings. In order to provide students with the knowledge, skills, and abilities necessary to fulfill this mandate, a course in educational theories and methods is important. Material from this course will be applied in a practical sense to pharmacy practice courses and experiential learning activities. Specific topics to be covered in the course will include: development of behavioural learning objectives, learning theories, teaching techniques for various audiences, assessment tools, methods, and techniques and educational practice as a profession

#### **PHM385H1 Diabetes Care**

This course provides many of the theoretical and practical aspects of diabetes management needed in providing comprehensive diabetes care. The goals and objectives of the course are modeled on the requirements for the Certified Diabetes Educator Exam and will provide much of background needed in preparation for writing this exam. Topics covered in the course include (but are not limited to): review of the diabetes disease processes, nutrition and exercise management of diabetes, self-care strategies and strategies to reduce the risk of complications due to diabetes, management of hypo- and hyperglycemia, appropriate blood glucose monitoring, management of diabetes in special situations such as diabetes in pregnancy, in children, adolescents and the elderly, and management of complex patients.

*Prerequisite:* PHM101H1; PHM105H1; PHM201H1; PHM202H1; PHM203H1; PHM204H1; PHM205H1; PHM206H1; PHM301H1; PHM302H1; PHM305H1

PHM386H1 Mental Health and Addiction

This course is designed to provide students interested in mental health and addictions with a broader knowledge base in the field. It will introduce students to the mental health and addiction system in Canada, the role of stigma in accessing and providing care, the role of psychotherapy and the evidence base for specific modalities, including cognitive behaviour therapy (CBT), interpersonal psychotherapy (IPT), mindfulness therapy, and motivational interviewing. The course will also address issues such as medication adherence and mental health first aid. Students will also be taught how to use validated scales to assess for psychotropic-induced movement disorders. The course will introduce additional mental health disorders/issues, not covered in PHM302H1 including psychotropic medication use in pregnancy and lactation and child and adolescent psychiatry. It will also cover key substance use disorders/issues in

more depth than was possible in PHM302H1, including harm reduction principles, cannabis use (recreational and medicinal), recreational drugs and anabolic steroids. The course will be taught using a variety of techniques including didactic lectures, observed patient interviews (video-simulation), case-based learning and interactive group learning.

*Prerequisite:* PHM302H1

### **PHM387H1 Global Health**

Global Health is defined as an area for study, research, and practice that places a priority on improving health and achieving equity in health for all people worldwide by reducing avoidable diseases, disabilities, and deaths. This elective will introduce students to selected foundational competencies in global health education such as the global burden of disease, social and economic determinants of health, the globalization of health and healthcare, global health governance, human rights and equity. Students will discuss practical and ethical challenges in delivering care in low-resource settings, describe tools and strategies to address the needs of specific vulnerable populations and examine cultural awareness and its importance in caring for diverse vulnerable populations.

### **PHM388H1 Self-Care Perspectives and Pharmacotherapy for Minor Ailments**

The management of minor, self-limiting and self-diagnosed ailments such as rashes, cold sores and hay fever is within the scope of practice for pharmacists. This course is designed to build and enhance students' knowledge and skills necessary for contemporary and future pharmacy practice in the area of self-care and minor ailments. This course will cover the management of conditions not covered in other courses and will provide the students' with a comprehensive understanding of non-prescription and prescription therapeutics as they relate to patient self-medication and minor ailments. Emphasis will be placed on the role and responsibility of the pharmacist in accurately assessing and triaging patients, determining the appropriate use of non-prescription and prescription drugs, by determining when to follow-up, refer, and how to document the patient's care. The student will be equipped with the clinical skills, confidence, and tools needed to gather and convey reliable minor ailment information to patients and healthcare providers in an effort to effectively and confidently assess and treat patients. With this knowledge and a structured framework

for conducting a minor ailments assessment, students will be able to help patients make appropriate decisions and achieve optimal outcomes from their selected, evidence-based therapy. The main course material will be presented as case-based didactic lectures; student participation in class discussions and interactive classroom activities will be expected. *Prerequisite:* PHM105H1, PHM205H1, PHM206H1, PHM305H1

### **PHM389H1 Research Project I**

This elective course is designed to introduce students to the philosophy, methodology and performance of research in scientific fields offered by faculty members who hold graduate appointments in the Department of Pharmaceutical Sciences. The research will involve the review of pertinent scientific literature and the generation of new information. Depending upon the project and the supervisor, the research may be conducted in a number of settings, e.g., in a laboratory at the Faculty, in a hospital, community pharmacy, pharmaceutical company, or in an office. Fields of study are wide ranging and include drug delivery, drug metabolism, medicinal chemistry, pharmaceuticals, pharmacokinetics, pharmacoepidemiology, pharmacy administration and pharmacoconomics, radiopharmacy, receptor biology, therapeutics, and toxicology. The course includes working in the laboratory (or other relevant setting), reading, searching for literature, performance of research and writing of the research report. Often times, the research may result in a joint publication with the supervisor. Students are expected to spend a minimum of 78 hours on the course, and are required to obtain prior written consent of the supervisor and course coordinator.

Please download the [Research Project Information](#) document

### **PHM391H1 Current Compounding Topics and Practice Issues**

Pharmacists are expected to understand and comply with Health Canada's directives (policies) regarding the distinction between manufacturing and compounding of medications, and with relevant federal and provincial/territorial legislation. Pharmacy graduates should be able to interpret literature, comply with current compounding guidelines and regulations, assess formulation risks, and make appropriate decisions on how to safely compound, label, and choose the correct administration route for compounded products. This course builds upon knowledge and skills gained in PHM141H1 Pharmaceutics, PHM212H1 Research Methods in Pharmacy and PHM241H1 Topics in Pharmaceutical Quality and Clinical Laboratory Medicine, and will explore core principles of sterile and non-sterile compounding in pharmacy. The course will cover a broad range of hazardous and non-hazardous parenteral and oral products with respect to compounding and safety aspects whenever such preparations and products are intended for human use. Students will develop foundational knowledge in compounding methods, safe use of parenteral and oral compounded products, parenteral routes of administration, stability and solubility, and managing product shortages.

*Prerequisite:* PHM141H1; PHM212H1; PHM241H1

#### **Year 4 Course Descriptions**

Students in Year 4 spend the entire academic year on Advanced Pharmacy Practice Experience (APPE) rotations. These rotations begin in May following Year 3 and take place over a 52 week period. Students are required to complete the following rotations:

- 2 x 5-week APPE Institutional Required rotations (PHM401H1 and PHM402H1)
- 1 x 10-week APPE Community Required rotation (PHM414Y1)

- 1 x 5-week APPE Selective (direct patient care) rotation (PHM424H1)
- 2 x 5-week APPE Elective rotations (PHM451H1, PHM452H1, PHM461H1, or PHM462H1)
- 3 x 5-week rotation blocks are considered study blocks, where students do not have rotations assigned. The dates of these study blocks vary for each student and students may have no more than 2 consecutive study blocks.

All experiential education courses for students in our PharmD and PharmD for Pharmacists programs are overseen by the Office of Experiential Education.

### **LEARN MORE**

Our patients are the heart of why we study and work. Leslie Dan Faculty of Pharmacy's experiential education opportunities ensure that as you progress throughout your studies, you gain real-world knowledge through the application of your academic and theoretical teachings. Under the supervision and guidance of highly trained professional pharmacists and preceptors, these experiences will give you the confidence and compassion needed to succeed in this challenging and rewarding field.

All experiential education courses for students in our PharmD and PharmD for Pharmacists programs are overseen by the Office of Experiential Education (OEE). The office works closely with pharmacist preceptors and others in a variety of practice sites across the province and beyond.

The University has a formal partnership with all teaching hospitals who are members of the Toronto Academic Health Sciences Network (TAHSN) as well as TAHSN associate members:

- Baycrest Health Sciences

- Holland Bloorview Kids Rehabilitation Hospital
- Centre for Addiction and Mental Health
- Sinai Health System
- Unity Health Toronto
- Sunnybrook Health Sciences Centre
- The Hospital for Sick Children
- University Health Network
- Women's College Hospital
- The University of Toronto
- North York General Hospital
- Trillium Health Partners
- Michael Garron Hospital (formerly the Toronto East General Hospital)

Please see the specific programs for a list of experiential courses offered through the Office of Experiential Education.

**For more information, please contact**

oee.phm@utoronto.ca.

### **PharmD Experiential Rotations**

The PharmD (Doctor of Pharmacy) program provides students with 44 weeks of hands-on clinical training over the course of their studies. The experiential learning component of this program means our students graduate with an extensive knowledge of pharmacotherapy and medication therapy



management, based on the treatment of real patients. We want to emphasize the importance of pharmacy science facilitated by knowledge and research, and delivered with professionalism and compassion. Our graduates will deliver the enhanced scope of practice called for by the Canadian healthcare system.

## **Early Practice Experience (Required Courses)**

PharmD students generally undertake experiential education at the end of their first and second years and for the entirety of their final year of the program.

### **Year 1 - Early Practice Experience (EPE-1) (May - August)**

This course is the first of two early experiential rotations, each consisting of 160 hours of experiential education.

During the summer (May-August) of their first year, students begin engaging with and treating patients. Students will learn to apply their practical knowledge by actively participating in day-to-day services within a direct patient care pharmacy practice setting. This immersive application of knowledge, skills, and values learned in faculty-based courses and simulated practice environments (laboratories) allows students to build confidence early on in their studies.

## **Year 2 - Early Practice Experience (EPE-2) (PHM 251) (May - August)**

This course is the second of two early experiential rotations, each consisting of 160 hours of experiential education in the summer after year 2.

Building on their experience from the previous summer in EPE-1, students will complete this second rotation of direct patient care in a community or institutional setting. This rotation is typically accomplished within a 4-week time-frame. The additional experience gained during this rotation will help prepare students for their final Year 3 courses at the Faculty, and for their Advanced Pharmacy Practice Experience (APPE) rotation during Year 4.

## **Advanced Pharmacy Practice Experience (Required Courses)**

### **Year 4 - Advanced Pharmacy Practice Experience (APPE)**

Prior to commencing APPE rotations, students in the PharmD program will have completed three years of undergraduate pharmacy education, including a Preparation for APPE course.

The APPE rotation occurs over 12 months starting in May of each year, and encompasses students' final year of both the entry-to-practice PharmD program

and the PharmD for Pharmacists (PFP) program. **Students will be expected to travel to placement sites across Ontario.**

PharmD students will complete 35 weeks of APPE rotations, as well as an additional 15 weeks of independent study over the course of their 4th academic year.

The PharmD APPE year consists of three components:

#### Direct Patient Care Rotations (25 Weeks)

The Direct Patient Care rotations provide experience in a variety of practice settings such as institutional, community and ambulatory care.

- Community Pharmacy Rotation (10 Weeks)
- Institutional Rotation 1 (5 Weeks)
- Institutional Rotation 2 (5 Weeks)
- Selective Rotation (5 Weeks) \*Direct Patient Care in any approved setting

#### Elective Rotations (10 Weeks)

The elective rotations can be Direct Patient Care (DPC) and/or Non-Direct Patient Care (NDPC) placements.

- Elective Rotation 1 (5 Weeks)
- Elective Rotation 2 (5 Weeks)

#### Independent Study (15 Weeks)

Students will have the remaining three 5-week blocks defined as study blocks scheduled throughout their final year.

- Independent Study 1 (5 Weeks)
- Independent Study 2 (5 Weeks)
- Independent Study 3 (5 Weeks)

In each rotation, students are guided, supervised, and assessed on a day to day basis by a preceptor.

Students are supported by a team of Experiential Course Coordinators, Office of Experiential Education (OEE) staff, the Director of the OEE, and related Program Directors. This team provides academic oversight on all aspects related to experiential course delivery, and monitoring and assessment of students during rotations.

## **Assessments**

Students in APPE rotations are assessed according to the educational outcomes of the Association of Faculties of Pharmacy of Canada (AFPC) for First Professional Degree Programs in Pharmacy. These educational outcomes are care provider, communicator, collaborator, leader-manager, health advocate, scholar and professional. Please visit the AFPC website for more information.

Students are encouraged to have preceptors review the student's resume to maximize learning opportunities based on their past experiences.

# 1-3. トロント大薬 時間割

1 年生 前期 (秋学期)

出典：トロント大学薬学部提供の資料を桐野が編集  
同一科目名には同じ色のハイライト

	月	火	水	木	金	備考
9:00-10:00		145 Lecture Human Histology & Anatomy	145 Lecture Human Histology & Anatomy	145 Lecture Human Histology & Anatomy	144 Optional Tutorial Pharmacokinetics	
10:00-11:00		142 Lecture Mtabolic Biochemistry & Immunology	110 Lecture Health Systems	142 Lecture Mtabolic Biochemistry & Immunology	144 Lecture Pharmacokinetics	
11:00-12:00		144 Lecture Pharmacokinetics	Other Mandatory Course/Program Requirements	Cocurricular Activities	113 Lecture Pharmacy Informatics	
12:00-13:00	PHM144H1 Lecture Pharmacokinetics					
13:00-14:00	130 Lecture Pharamaceutical Calculations → EPE 1					
14:00-15:00	146 Lecture Fundamantals of Pharmacology					
1500:1600						
16:00-17:00						
17:00-18:00						
18:00-19:00						

# 1 年生 後期 (冬学期)

	月	火	水	木	金	備考
9:00-10:00		140 Optional Tutorial Molecular Pharmacology	101 Workshop Pharmacotherapy 1: Foundations and General Medicine	105 Lab Medication Therapy Mngement 1	141 Optional Tutorial Pharmaceutics	
10:00-11:00		140 Lecture Molecular Pharmacology			141 Lecture Pharmaceutics	
11:00-12:00		105 Lecture Medication Therapy Mngement 1	143 Lecture Pathobiology and Pathology		101 Lecture Pharmacotherapy 1: Foundations and General Medicine	
12:00-13:00		141 Lecture Pharmaceutics	140 Lecture Molecular Pharmacology		Co-curricular Activities	
13:00-14:00	140 Lecture Molecular Pharmacology		101 Workshop Pharmacotherapy 1: Foundations and General Medicine			
14:00-15:00	141 Lecture Pharmaceutics	114 Lecture Social and Behavioral Health				
15:00-16:00	143 Lecture Pathobiology and Pathology					
16:00-17:00						
17:00-18:00						
18:00-19:00						

## 2 年生 前期 (秋学期)

	月	火	水	木	金	備考
9:00-10:00			205 Lab Medication Management 2		241 Lab 隔週 8:30-12:30 or 13:00-17:00 Topics in Pharmaceutical Quality and Clinical Laboratory Medicine	
10:00-11:00		201 Lecture/ Panel Pharmacology 2: Self-Care Perspectives and Pharmacotherapy		202 Workshop Pharmacotherapy 3: Endocrinology, Nephrology and Urology		
11:00-12:00						
12:00-13:00	202 Lcture Pharmacotherapy 3: Endocrinology, Nephrology and Urology			Co-curricular Activities		
13:00-14:00		212 Lecture Research Method for Pharmacy				
14:00-15:00	205 Lecture Medication Therapy Management 2			202 Workshop Pharmacotherapy 3: Endocrinology, Nephrology and Urology		241 Lab 隔週 8:30-12:30 or 13:00-17:00 Topics in Pharmaceutical Quality and Clinical Laboratory Medicine
15:00:1600	242 Lecture Microbiology of Infectious Diseases	241 Lecture Topics in Pharmaceutical Quality and Clinical Laboratory Medicine				
16:00-17:00		242 Lecture Microbiology of Infectious Diseases				
17:00-18:00						
18:00-19:00						

## 2年生 後期 (冬学期)

	月	火	水	木	金	備考	
9:00-10:00		203 Lecture Pharmacotherapy 4: Infectious Diseases					
10:00-11:00		215 Lecture Management: Skills, Communication & Collaboration					
11:00-12:00		240 Lecture The Science of Pharmacotherapy					
12:00-13:00				206 Lab 9:00-16:30 Medication Therapy Management 3		213 Lecture Health Economics & Pharmacoeconomics	
13:00-14:00	206 Lecture Medication Therapy Management 3			230 Lab 9:00-16:30 Physical Assessment & Injection Techniques	203 Workshop 13:00-15:00 or 15:00-17:00 Pharmacotherapy 4: Infectious Diseases/	Co-curricular Activities	
14:00-15:00	204 Lecture Pharmacotherapy 5: Cardiovascular Diseases				204 Workshop 12:00-14:30 or 14:30-17:00 Pharmacotherapy 5: Cardiovascular Diseases		
15:00-16:00	230 Lecture Physical Assessment & Injection Techniques					203 Lecture Pharmacotherapy 4: Infectious Diseases/ 204 Lecture Pharmacotherapy 5: Cardiovascular Diseases	
16:00-17:00							
17:00-18:00							
18:00-19:00							



### 3年生 前期 (秋学期)

	月	火	水	木	金	備考
9:00-10:00		305 Lab Medication Therapy Management 4	310 Lecture Pharmacy in the Modern Health Care System		301 Workshop Pharmacotherapy 6: Hematology, Oncology & Immunotherapies	
10:00-11:00						
11:00-12:00				305 Lecture Medication Therapy Management 4		
12:00-13:00		ランチ	301 Lecture Pharmacotherapy 6: Hematology, Oncology & Immunotherapies	Co-curricular Activities		
13:00-14:00	Electives 320 Global Pharmaceutical Policy, 321 Selected Topics in the Pharmaceutical Industry 13:00-15:00	305 Lab Medication Therapy Management 4			340 Lecture Introductory Toxicology	
14:00-15:00	323 Molecular Mechanisms of Drug Action 14:00-15:00			Electives 323 Molecular Mechanisms of Drug Action 325 Aboriginal Issues in Health & Healing 383 Antimicrobial Stewardship		
15:00-16:00	302 Lecture Pharmacotherapy 7: Neuropsychiatry		340 Lecture Introductory Toxicology			
16:00-17:00						
17:00-18:00						
18:00-19:00						

### 3年生後期（冬学期）

	月	火	水	木	金	備考
9:00-10:00		Elctive <b>385</b> Lecture Diabetes Care	<b>330</b> Lecture Preparation for Advanced Pharmacy Practice Experience		Selective Group 1 <b>351</b> Lecture Pharmacotherapy in Institutional Care	
10:00-11:00				Elective <b>384</b>		
11:00-12:00		Selective Group 3 <b>360</b> Personalized Medicine <b>361</b> Latest Develop-ments in Drugs and Biologics <b>362</b> Assessing the Bioavailabity and Bioequivalence of Medical Drug Products	Elective <b>388</b> Lecture Self-Care Perspectives and Pharmaco- therapy for Minor Ailments	Teaching and Learning	Selective Group 2 <b>352</b> Lecture Pharmacotherapy in Critical Care	
12:00-13:00						
13:00-14:00	Selective Group 2 <b>355</b> Lecture Pharmacotherapy in Women's Health		Selective Group 2 <b>354</b> Lecture	Elective <b>386</b> Lecture Mental Health and Addiction	Co-curricular Activities	
14:00-15:00		Selective Group 4 <b>370</b> Community Pharmacy Management <b>371</b> Institutional Pharmacy Practice Management				
15:00-16:00	Elective <b>387</b> Lecture Global Health	Elective <b>322</b> Lecture Patient/ Medication Safety	Elective <b>381</b> Lecture Medical Imaging for Pharmacists	Selective Group 1 <b>350</b> Lecture Pharmacotherapy in Ambulatory Care		
16:00-17:00						
17:00-18:00	Selective Group 1 <b>353</b> Lecture Pharmacotherapy in Pediatrics					
18:00-19:00						

ハイライトは Selective（専門選択科目 グループ別）

## 2-1. ラトガーズ大学教員名簿

		Departments ( 学科 / 大講座 / 専攻 )						
	教員・職員氏名	職位	Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration	
1	Emily R. Aboujaoude, PharmD, Residency	Clinical Assistant Prof.					○ 1	Experiential Education
2	Elena Abramova	Research Associate					○ 2	Continuous Education
3	Chritopher D. Adams, PhramD, Residency	Clinical Assistant Prof.					○ 3	Simulation Technology Program
4	Lauren Aleksunes, PharmD, PhD	Prof., Graduate Director			○ 1			Dean
5	Janice Allunario, BS Pharm, RPh	Adjunct Clinical Professor						Dean for Planning & Assessment
6	Liza Barbarello Andrews, PharmD, BS	Clinical Associate Professor					○ 4	Experiential Education
7	Joseph A. Barone, PharmD, BS	Prof., Dean						Dean
8	M. Thomas Bateman Jr., PharmD Residency	Clinical Assistant Professor					○ 5	
9	Kristin Bohnenberger, PharmD, Residency	Clinical Assistant Professor					○ 6	
10	Mary M. Bridgeman, PharmD, Residency (1 year)	Clinical Professor					○ 7	
11	Patrick Bridgeman, PharmD, Residency	Clinical Assistant Professor					○ 8	
12	Luigi Brunetti, MPH, PharmD, Residency	Associate Professor					○ 9	
13	Lindsay Brust-Sisti, PharmD, Residency	Clinical Assistant Professor					○ 10	
14	Gregory Cabanas, PharmD, Residency	Clinical Assistant Professor					○ 11	
15	Maria Cardinale, PharmD, Residency	Clinical Assistant Professor					○ 12	

Departments ( 学科 / 大講座 / 専攻 )

	教員・職員氏名	職位	Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration
16	Luca Cartegni, PhD, MS, BS	Associate Professor		○ 1			
17	Samuel Chackalamannil, PhD	Adjunct Professor & Lecturer	○ 1				
18	Yoke-Chen Chang, PhD, MS, BS	Assistant Research Professor			○ 2		
19	Suzie Chen, PhD, MS, BS	Professor, Department Chair		○ 2			
20	Seohyun (Claudia) Choi, PharmD, Residency, BS	Clinical Assistant Professor					○ 13
21	Angelo J. Cifaldi, JD, BS-Pharmacy	Adjunct Professor					○ 14
22	John L. Colaizzi, PhD, MS, BS-Pharmacy	University Professor					○ 15
23	Vi Dan	Administrative Assistant					○ 16
24	Chintan Dave, PhD, PharmD	Assistant Professor					○ 17
25	Alexandra Della Pia, PharmD	Clinical Assistant Professor					○ 18
26	Christine Dimaculangan, PharmD, Residency	Clinical Assistant Professor					○ 19
27	Deepali Dixit, PharmD, Residency	Clinical Associate Professor					○ 20
28	Muhammad Effendi, PharmD, Residency	Clinical Assistant Professor					○ 21
29	Linda Everett	Department Administrator/Supervisor			○ 3		
30	Germin Fahim, PharmD, Residency	Clinical Assistant Professor					○ 22
31	Lesley Fierro, PharmD, MS-Drug Information, BS-Pharmacy	Rutgers Pharmaceutical Industry Fellowship Executive Director					○ 23
32	Joel S. Freundlich, PhD, ME, BS-Chemical Engineering	Associate Professor	○ 2				

Experiential Education

Pharmacy Law & Bioethics

Pharmacology, Physiology and Neuroscience

## Departments ( 学科 / 大講座 / 専攻 )

	教員・職員氏名	職位	Departments ( 学科 / 大講座 / 専攻 )				
			Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration
33	Philip Furmanski, Phd, BA	Distinguished Professor		○ 3 Dis. Prof.			
34	Dayuan Gao, PhD	Assistant Research Professor				○ 1	
35	Olga Garbuzenko, PhD	Assistant Research Professor				○ 2	
36	Carol Gardner, PhD-Radiation Biology, MS-Biological Sciences, BA-Biology	Associate Research Professor			○ 4		
37	Donald R. Gerecke, PhD, MS, BS	Associate Professor			○ 5		
38	Tobias Gerhard, PhD-Pharmacology, BS-Pharmacy	Associate Professor					○ 24
39	Andrew Giaquinto, PharmD, Residency	Clinical Associate Professor					○ 25
40	Elissa Glinn	Administrative Coordinator	○ 3				
41	Jimmy Gonzalez, PharmD, Residency	Clinical Associate Professor					○ 26
42	Marion Gordon, PhD-Biochemistry, BA-Chemistry	Associate Professor			○ 6		
43	Andrew Gow, PhD, MEd, BS	Professor			○ 7		
44	Daniel J. Greer, PharmD, BS, Residency	Clinical Assistant Professor					○ 27
45	Changjiang (C.J.) Guo, MD-Endocrinology, MB-Medicine	Assistant Research Professor			○ 8		
46	Grace Guo, PhD, MS, MBBS	Assistant Professor			○ 9		
47	Jessie Yanxiang Guo, PhD, MS, BS	Assistant Professor		○ 4			
48	Rita Hahn, MS, BS	Research Associate			○ 10		
49	Fei Han	Business Manager				○ 3	
50	Arash Hatefi, PhD	Associate Professor				○ 4	

Experiential Education

		Departments ( 学科 / 大講座 / 専攻 )				
教員・職員氏名	職位	Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration
51	Longqin Hu, PhD- Medicinal Chemistry, MS & BS-Pharmacy Professor, Department Chair; Graduate Director	○ 4				
52	Humberto R. Jimenez, PharmD, BS, Residency Clinical Assistant Professor					○ 28
53	Jackie Johnston, PharmD, BS, Residency Clinical Assistant Professor					○ 29
54	Allen N. Jones, PhD, BS Lecturer	○ 5				
55	Laurie Joseph, PhD, MS, BS Associate Research Professor			○ 11		
56	Joseph Jude Assistant Research Professor			○ 12		
57	Leonid Kagan, PhD, MSc Clinical Pharmacy, BPharm Associate Professor				○ 5	
58	Gee Youn (Geeny) Kim, PharmD, Residency Clinical Assistant Professor					○ 30
59	S. David Kimball, PhD - Organic Chemistry/ Chemical Biology, BA-Exprimental Psychology Research Professor	○ 6				
60	Ah-Ng Tony Kong, PhD, BS-Pharmacy Distinguished Professor, Graduate Director 冠教授				○ 6 Dis. Prof. 冠	
61	Bo Kong, PhD, MS, BS Assistant Research Professor			○ 13		
62	Caitlin E. Kulig, PharmD, BS, Residency Clinical Assistant Professor					○ 31
63	Ahmed Lasfar, PhD, MS Assistant Research Professor			○ 14		
64	Debra Laskin, PhD, MA-Biopsychology, BA-Psychology Distinguished Professor, Department Chair 冠教授			○ 15 Dis. Prof. 冠		
65	Edmond J. LaVoie, PhD, BS Professor	○ 7				
66	Shike Li Laboratory Researcher				○ 7	

## Departments ( 学科 / 大講座 / 専攻 )

	教員・職員氏名	職位	Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration
67	Eva Link	Principal Accounting Clerk			○ 16		
68	Fang Liu, PhD, BS	Associate Professor		○ 5			
69	Mei T. Liu, PharmD, Residency	Clinical Assistant Professor					○ 32
70	Amy Loughman	Program Coordinator		○ 6			
71	Yao-Ping Lu, PhD, MD, MS	Adjunct Associate Professor		○ 7			
72	Janet Lupo	Fellowship Program Coordinator					○ 33
73	Rama Malaviya, PhD, MS & BS-Chemistry	Associate Research Professor					○ 34
74	Rupal Mansukhani, PharmD, Residency	Clinical Associate Professor					○ 35
75	Megan E. Maroney, PharmD, Residency	Clinical Associate Professor					○ 36
76	Michael T. Mauri, PharmD, Residency	Clinical Assistant Professor					○ 37
77	Caitlin McCarthy, , PharmD, Residency	Clinical Assistant Professor					○ 38
78	James McCracken, PharmD	Clinical Assistant Professor					○ 39
79	Rachel S. Meyers, PharmD, Residency	Clinical Assistant Professor					○ 40
80	Bozena B. Michniak-Kohn, PhD, BS-Pharmacy	Professor				○ 8	
81	Audrey Minden, PhD, BA	Associate Professor		○ 8			
82	Tamara Minko, PhD-Psychology, MS-Biochemistry	Distinguished Professor, Chair				○ 9 Dis. Prof.	
84	Valdimir Mishin, PhD, MD	Research Associate			○ 17		
85	Christopher J. Molloy, PhD-Toxicology, BS-Pharmacy	Chancellor, Distinguished Professor			○ 18 Dis. Prof.		
86	Enid Morales, PharmD	Clinical Associate Professor					○ 41

Experiential Education

		Departments ( 学科 / 大講座 / 専攻 )				
教員・職員氏名	職位	Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration
87	Matthew J. Moschitto, PhD, MS & BS-Chemistry	Assistant Professor	○ 8			
88	Alejandra Murillo	Program Coordinator, Health Outcomes, Policy & Economics (HOPE)				○ 42
89	Navaneeth Narayanan, PharmD, Residency	Clinical Associate Professor				○ 43
90	Steven F. Nerenberg, PharmD	Clinical Assistant Professor				○ 44
91	May Nguyen, PharmD, Residency	Clinical Assistant Professor				○ 45
92	Yekaterina Opsha, 以下、経歴省略	Clinical Assistant Professor				○ 46
93	Jiyeon Joy Park	Clinical Assistant Professor				○ 47
94	Ammie J. Patel	Clinical Assistant Professor				○ 48
95	Mark D. Peters II	Adjunct Clinical Associate Professor				○ 49
96	Ashmi Philips	Clinical Assistant Professor				○ 50
97	Laura T. Pizzi	Professor, HOPE Director				○ 51
98	Natalia Pogrebnyak	Laboratory Researcher			○ 10	
99	Hui Pung	Senior Program Coordinator			○ 11	
100	Raymond C Rancourt	Assistant Rearch Professor		○ 19		
101	Kenneth Reuhl	Professor		○ 20		
102	Christine Robinson	Clinical Associate Professor				○ 52
103	Elizabeth Rossi	Program Coordinator		○ 21		
104	Nicole Rudawsky	Clinical Assistant Professor				○ 53
105	Julie Saleh	Clinical Associate Professor, Vice Chair				○ 54
106	Bailey Savoy	LaboratoryAssistant		○ 22		

Experiential Education



		Departments ( 学科 / 大講座 / 専攻 )				
教員・職員氏名	職位	Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration
107	Carolyn Seyss	Professor, Fellowship Program Director				
108	Pooja Shah	Clinical Assistant Professor				○ 55
109	Jianliang (Julia) Shen	Laboratory Technician	○ 9			
110	Patrick J. Sinko	Distinguished Professor			○ 12	Dis. Prof.
111	Anita Siu	Clinical Professor				○ 56
112	Molly Siver	Clinical Assistant Professor				○ 57
113	Deborah Stalling	Business Manager	○ 10			
114	Phoebe Stapleton	Assistant Professor		○ 23		
115	Marc Sturgill	Associate Professor, Chair				○ 58
116	Nanjoo Suh	Professor	○ 11			
117	Vasanthi R. Sunil	Associate Research Professor		○ 24		
118	Siddharth Swamy	Clinical Assistant Professor				○ 59
119	Sharana Taylor	Administrative Assistant				○ 60
120	Danielle Tompkins	Clinical Assistant Professor				○ 61
121	Michael Toscani	Research Professor				○ 62
122	Michael J. Totleben	Lecturer	○ 9			
123	Kinal Vayas	Laboratory Technician		○ 25		
124	Lucio Volino	Clinical Associate Professor, Director of Assessment				○ 63
125	Mary L. Wagner	Associate Professor				○ 64
126	Joseph Walter	Clinical Assistant Professor				○ 65
127	Hong Wang	Senior Research Analyst		○ 12		
128	Janice Weinstein	Administrative Coordinator				○ 66
129	Sara Weinstein	Clinical Assistant Professor				○ 67

Experiential Education

		Departments ( 学科 / 大講座 / 専攻 )					
	教員・職員氏名	職位	Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration
130	Xia Wen	Research Associate			○ 26		
131	Jessica Wilczynski	Clinical Assistant Professor					○ 68
132	Michael A. Wynd	Clinical Associate Professor					○ 69
133	Shuo Xiao	Assistant Professor			○ 27		
134	Chung S. Yang	Distinguished Professor		○ 13 Dis. Prof.			
135	Christine Yohn	Laboratory Researcher				○ 13	
136	Guofeng You	Distinguished Professor				○ 14 Dis. Prof.	
137	X. F. Steven Zheng	Adjunct Professor		○ 14			
138	Xi Zheng	Research Professor, 冠教授		○ 15 冠			
139	Peihong Zhou	Assistant Research Professor			○ 28		
140	Renping Zhou	Associate Dean for Research		○ 16			
141	Wei-Xing Zong	Professor 冠教授		○ 17 冠			

Experiential Education

教員・職員氏名	職位	Departments ( 学科／大講座／専攻 )				
		Medicinal Chemistry	Chemical Biology	Pharmacology & Toxicology	Pharmaceutics	Pharmacy Practice & Administration

Experiential Education

上記大講座以外の所属 (学部長室、学生部等)

142	Les Barta	Director, Simulation Technology Program
143	Yolanda Carden	Development Specialist
144	Betty Vega Cash	Business Specialist
145	Jessica Cervelli	Laboratory Manager
146	Nancy Cintron	Associate Dean for Student Support Services
147	Melissa Vargas Columna	Senior EOF Counselor
148	Joyce Da Silva	Senior Program Coordinator, Experiential Education
149	Debra Diller	Coordinator, Continuing Education
150	Donna Feudo	Assistant Dean for Experiential Education
151	Carol Goldin	Sr. Associate Dean for Planning and Assessment
152	Henry Hennessy	Unit Computing Manager, IT Department
153	Daniel LaVoie	Senior Stock Manager, Mail Service
154	Kerryn Loesner	Director of Development
155	Lisa A. Mulé	Senior Executive Associate for Administration
156	Geraldine Murphy	Business Specialist
157	Cindy Olexsa	Department Administrator
158	Mallelyne Peralta	Program Development Specialist
159	Monica Peram	Administrative Assistant, Experiential Education
160	Laura Sclafani	Assistant Dean
161	Marianne Shen	Business Manager
162	Geri Urbanski	Administrative Assistant
163	Diana Wilson-Bell	Administrative Coordinator
164	Donald K. Woodward	Seniro Associate Dean for Academic Services

**Program Description**  
**PHARMD/PHD DUAL DEGREE**  
**PROGRAM**

**Ernest Mario School of Pharmacy**  
**Rutgers, The State University of New Jersey**

*Note: Interested PharmD students should contact Associate Professor Andrew Gow ([gow@rci.rutgers.edu](mailto:gow@rci.rutgers.edu)) to learn more and to discuss their academic goals.*

The Ernest Mario School of Pharmacy has established a dual PharmD/PhD program to meet the needs of interests of exceptionally bright and highly motivated students. The program enables students to complete both degrees in approximately nine years by beginning their PhD coursework and research while still enrolled in the PharmD program. Qualified students are able to matriculate into the Graduate Program in Pharmaceutical Science, the Joint Graduate Program in Toxicology, or the Graduate Program in Medicinal Chemistry at the end of their 2<sup>nd</sup> professional year in the PharmD program.

Given the high cost of tuition and the many years of study required for the graduate degrees, we believe a dual degree program that reduces the total time in university will be attractive to high achieving students with strong research interests. We wish to incentivize enrollments in this experimental curriculum further by providing robust scholarship support. We expect to provide tuition remission plus a stipend for dual degree candidates in the 3<sup>rd</sup> and 4<sup>th</sup> professional years of the PharmD program. In the subsequent years, students will be supported by a mix of teaching assistantship and external grant-funded graduate fellowship positions.

Key elements of the program are described below:

1. PharmD students complete two years of pre-pharmacy courses (PP1 and PP2) and enter the professional program in their third year at the university. The PharmD program requires four years of study (P1-P4). Students will enter the dual degree program upon completion of their P2 year, i.e., their fourth year at the university. By the end of the P2 year, these students will have earned approximately 69 undergraduate credits (including general education requirements) in the pre-professional program and another 75 credits in the first two years of the professional program. Therefore, they will be applying to the PhD program at the end of their fourth year at the university, and will have completed approximately 144 credits.
2. Applicants to the dual degree program must meet the entry criteria, including academic performance standards and GRE scores as set by the Graduate Program and an interview by a member of the Dual Degree faculty committee (see #3 below). Students will be admitted into the dual degree program and into either the Graduate Program in Pharmaceutical Sciences, the Joint Graduate Program in Toxicology, or the Graduate Program in Medicinal Chemistry.
3. Because these students are beginning their PhD work while still completing their professional doctorates, they will need special advising. A Dual Degree faculty committee, with representatives of the two graduate programs, will oversee advising and support for these students.

4. A special curriculum will be coordinated within the PharmD program for students interested in research. This will consist of two elective courses designed specifically for this program (which will be offered in the slot of Professional Electives 1 & 2 in the current PharmD curriculum). The third Professional Elective will be a laboratory research experience, similar to a research rotation.
5. At this point in the curriculum (completion of 2nd professional year) students wishing to enter the PharmD/PhD program will have completed the preparatory research curriculum. They will then spend their summer in course work that is appropriate to the two programs and in doing a research rotation (~8 to 12 credits for the summer). **8-12 grad cr**
6. In the 3rd professional year dual degree students will take the same classes as PharmD students but the two professional electives would ideally be ones that are appropriate to one of the PhD curricula. While PharmD professional electives are typically 2 credits, these graduate courses will be 3 graduate credits each. **6 grad cr**
7. PharmD students begin their eight required advanced pharmacy practice rotations immediately after completing the third professional year. During their final year in the professional program (P4 year), dual degree PharmD/PhD students will conduct further research rotations (earning about 3-6 graduate credits) while they complete the rotations. They will also take up to 10 additional credits of graduate course work in their final year in the PharmD program. Most of the courses that would be appropriate for students at this level are offered late in the date or in the evening (in order to allow working students to take part) and therefore scheduling should not be too difficult. **up to 16 grad cr**
8. Dual degree students will target their course work to meet the requirements of the PhD program into which they have been admitted. However, each program should offer courses that can be transferred between programs, as students may wish to transfer from one graduate program to another. The Dual Degree committee will play a key role in helping students during this early phase of their PhD work. By the end of the 4th professional year, students will have earned about 30 credits that may be applied towards the PhD program requirements.
9. Students will complete the PharmD and graduate with their classmates at the end of the P4 year. They will then remain in graduate school for approximately three years, while engaged predominantly in research with a mentor and advisory committee. Over this time the students will complete required coursework and conduct research in their chosen laboratory in accordance with the curriculum of their respective program. Therefore, students can fulfill the requirements of both degrees in six plus three years.

**Please refer to the website of the graduate program of your choice for specific information about requirements:**

[Graduate Program in Pharmaceutical Science](#)  
[Joint Graduate Program in Toxicology](#)  
[Medicinal Chemistry Graduate Program](#)

Revised 3/20/15

**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)  
以下の同大学 HP をご覧ください。  
<https://pharmacy.rutgers.edu/info-for/current-students/schedule-classes-final-exams/>

### 3. University of Southern California (USC) School of Pharmacy

Departments:

(1) Pharmacology and Pharmaceutical Sciences (17 名)

*Professors of Pharmacology and Pharmaceutical Sciences:*

1. Enrique Cadenas, MD, PhD
2. Julio A. Camarero, PhD
3. Sarah F. Hamm-Alvarez, PhD
4. Vassilios Papadopoulos, DPharm, PhD
5. Wei-Chiang Shen, PhD
6. Jean C. Shih, PhD
7. Bangyan Stiles, PhD
8. Clay C.C. Wang, PhD

*Associate Professors of Pharmacology and Pharmaceutical Sciences:*

9. James D. Adams, Jr., PhD
10. Martine Culty, PhD
11. Roger F. Duncan, PhD
12. Ian S. Haworth, PhD
13. Curtis T. Okamoto, PhD

*Assistant Professors of Pharmacology and Pharmaceutical Sciences:*

14. Houda Alachkar, PharmD, PhD
15. Jianming Xie, PhD
16. Yong (Tiger) Zhang, PhD
17. Zhipeng Lu, PhD

(2) Clinical Pharmacy (36 名)

*Professors of Clinical Pharmacy:*

1. Melvin F. Baron, PharmD, MPA (Master of Public Administration, 公共経営学修士)
2. Paul M. Beringer, PharmD
3. Daryl Davies, PhD
4. Julie A. Dopheide, PharmD
5. Stanley G. Louie, PharmD
6. Glen L. Stimmel, PharmD
7. Annie Wong-Beringer, PharmD

*Associate Professors of Clinical Pharmacy:*

8. Steven Chen, PharmD
9. Melissa Durham, PharmD
10. Kevin L. Forrester, PharmD
11. Lisa W. Goldstone, PharmD
12. William C. Gong, PharmD
13. Cynthia L.L. Lieu, PharmD
14. Edith Mirzaian, PharmD
15. Tien M. H. Ng, PharmD
16. Susie H. Park, PharmD
17. Irving Steinberg, PharmD

18. Fred G. Weissman, PharmD, JD (Juris Doctor, 法務博士)

*Assistant Professors of Clinical Pharmacy:*

19. Betty Chan, PharmD
20. Michelle Chu, PharmD
21. Jennifer H. Cupo-Abbott, PharmD
22. Richard Dang, PharmD
23. Tatyana Gurvich, PharmD
24. Emily Han, PharmD
25. Kum Ja K. Lee, PharmD
26. May C. Mak, PharmD
27. Emi Minejima, PharmD
28. Scott Mosley, PharmD
29. Rory O'Callaghan-Kim, PharmD
30. Patrick Tabon, PharmD
31. Paul J. Wong, PharmD
32. Florence H. Wong-Yu, PharmD
33. Maryann Wu, EdD (教育博士)

*Research Assistant Professor of Clinical Pharmacy:*

34. Liana Asatryan, PhD

*Lecturers:*

35. Rebecca Romero, PhD
36. Angel Tabancay, PhD

(3) Pharmaceutical and Health Economics (13 名)

*Professors of Pharmaceutical and Health Economics:*

1. Dana Goldman, PhD
2. Joel W. Hay, PhD
3. Darius N. Lakdawalla, PhD

*Associate Professors of Pharmaceutical and Health Economics:*

4. Geoffrey Joyce, PhD
5. Grant D. Lawless, MD, RPh
6. Jeffrey S. McCombs, PhD
7. John Romley, PhD
8. Seth Seabury, PhD

*Assistant Professors of Pharmaceutical and Health Economics:*

9. Rebecca Myerson, PhD
10. William V. Padula, PhD
11. Erin Trish, PhD

*Research Assistant Professors of Pharmaceutical and Health Economics:*

12. Bo Zhou, PhD
13. Steven Fox, MD, PhD



(4) Regulatory and Quality Sciences (6 名)

*Professor, Department of Regulatory and Quality Sciences:*

1. Frances J. Richmond, PhD

*Associate Professor, Department of Regulatory and Quality Sciences:*

2. Eunjoo Pacifici, PharmD, PhD

*Assistant Professors, Department of Regulatory and Quality Sciences:*

3. Terry David Church, DRSc

4. C. Benson Kuo, PhD

5. Nancy Pire-Smerkanich, DRSc

6. Susan Bain, DRSc

## 4. Thomas Jefferson University, College of Pharmacy

氏名	学位	職位
1 Armen, Roger	PhD-Medicinal Chemistry, BA-Chemistry	Assistant Professor
2 Belani, Jitedra	PhD from Medical School , UCI	Assistant Professor
3 Bellottie, Gina	PharmD from Rutgers, Residency 1 & 2,	Associate Professor
4 Bhardwaj, Vikas	PhD-Pharmaceutical Sciences, Idaho State Univ, B. Pharmacy, Jamia Hamdard Univ	Assistant Professor
5 Bhushan, Alok	PhD, MS, BS-Chemistry	Professor & Chair
6 Brailoiu, Gabriela	MD from Univ. of Medicine & Pharmacy, Iasi, Rom	Associate Professor
7 Cater, Kimberly	PharmD, BS-Neurobiology & Physiology, Residency	Assistant Professor
8 Egras, Amy	PharmD	Associate Professor
9 Finley, Rebecca	PharmD, MS-Institutional Pharmacy	Dean, Professor
10 Hajjar, Emily	PharmD, Residency	Associate Professor
11 Hess, Mary	PharmD, BS-Pharmacy, Residency	Professor
12 Joseph, Andrea	MS, BS-Pharmacy	Clinical Assistant Professor
13 Kaushal, Gagan	PhD	Associate Professor
14 King, Amber	PharmD, BS-Biology, Residency	Associate Professor
15 Lakshmikuttyamma, Ashakumary	PhD-Biochemistry, MS-Biochemistry	Assistant Professor
16 Leon, Nicholas	PharmD, Residency	Associate Professor
17 Mayer, Daniella	PharmD-2015, BS-Pharmaceutical Science-2013, Residency	Assistant Professor
18 Nace, Angela	PharmD, BS-Pharmacy, Residency	Clinical Instructor
19 Nightingale, Ginah	PharmD from Rutgers	Associate Professor
20 Patel, Roshini	PharmD from Univ. Pittsburgh, Residency	Assistant Professor
21 Ronner, Peter	PhD from ETH, Switzerland	Professor
22 Sanoski, Cynthia	PharmD, BS-Pharmacy, PDF-Cardiovascular Pharmacotherapy	Associate Professor
23 Schafer, Jason	PharmD, Residency	Associate Professor
24 Scopelliti, Emily	PharmD, BA-Spanish, Residency 1 year	Associate Professor
25 Scott, Charles	情報なし	Assistant Professor
26 Shah, Bhavik	PharmD from Rutgers, Residency 1 & 2	Associate Professor
27 Shoyele, Sunday	PhD-Pharmaceutics, BS-Pharmacy	Associate Professor
28 Swift, Brian	BS & PharmD, MBA	Clinical Professor
29 Umland, Elena	PharmD, BS-Pharmacy, Residency 2 years	Professor

Deartment		Research/Clinical Interest
Pharmaceutical Sciences	1	
Pharmacy Practice		1
Pharmacy Practice		2 Ambulatory Care
Pharmaceutical Sciences	2	
Pharmaceutical Sciences	3	Cancer Pharmacology focused on Treatment & Provention
Pharmaceutical Sciences	4	
Pharmacy Practice		3
Pharmacy Practice		4
Pharmacy Practice		5
Pharmacy Practice		6
Pharmacy Practice		7
Pharmacy Practice		8
Pharmaceutical Sciences	5	
Pharmacy Practice		9
Pharmaceutical Sciences	6	
Pharmacy Practice		10
Pharmacy Practice		11
Pharmacy Practice		12 Authorization to Administer Injectables
Pharmacy Practice		13
Pharmacy Practice		14
Pharmaceutical Sciences	7	Medical SchoolのDept Biochem & Molec BiolのProfessorでもある
Pharmacy Practice		15
Pharmacy Practice		16
Pharmacy Practice		17
Pharmacy Practice		18
Pharmacy Practice		19
Pharmaceutical Sciences	8	
Pharmacy Practice		20
Pharmaceutical Sciences	9	

# 5. UCL 薬 Academic Staff

教員・職員氏名	職位	専門分野(?)	Department (学科/大講座/専攻)			
			Pharmaceutic al & Biological Chemistry	Pharmaceutics	Pharmacology	Practice and Policy
1 Duncan Browne	1 Associate Professor	Drug Discovery	1			
2 Rachael Dickman	2 Lecturer	Drug Discovery	2			
3 Shozeb Haider	3 Professor	Computational Biophysics	3			
4 Michael Heinrich	4 Professor	Ethnopharmacology & Pharmacognosy	4			
5 Stephen Hilton	5 Senior Lecturer		5			
6 Frank Kozielski	6 Professor	Pharmaceutical Chemical Biology	6			
7 John Malkinson	7 Senior Lecturer		7			
8 Maria Jose Martinez Bravo	8 Associate Lecturer (Teaching)		8			
9 Michael Munday	9 Professor		9			
10 Gary Parkinson	10 Senior Lecturer		10			
11 Andreas Schatzlein	11 Professor		11			
12 Rosemary Smyth	12		12			
13 Paul Stapleton	13 Lecturer (Teaching)		13			
14 Matthew Todd	14 Professor	Drug Discovery	14			
15 Zoë Waller	15 Associate Professor	Drug Discovery	15			
16 Geoff Wells	16 Senior Lecturer		16			
17 Andy Wilderspin	17 Senior Lecturer		17			
18 Esther Woon	18 Associate Professor	Drug Discovery	18			
19 Abdul Basit	19 Professor	Pharmaceutics		1		
20 Steve Brochini	20 Professor	Chemical Pharmaceutics		2		
21 Asma Buanz	21 Lecturer	Pharmaceutical Engineering		3		
22 Dario Carugo	22 Lecturer			4		
23 Duncan Craig	23 Professor, Director	Drug Discovery		5		
24 Simon Gaisford	24 Professor	Pharmaceutics		6		
25 Majella Lane	25 Senior Lecturer			7		
26 Sudax Murdan	26 Reader	Pharmaceutics		8		
27 Mine Orlu	27 Associate Professor			9		
28 Maryam Parhizkar	28 Lecturer	Pharmaceutical Engineering		10		
29 Khalid Sheikh	29 Lecturer (Teaching)			11		
30 Satyanarayana Somavarapu	30 Senior Lecturer			12		
31 Kevin Taylor	31 Professor	Clinical Pharmaceutics		13		
32 Catherine Tuleu	32 Professor	Pediatric Pharmaceutics		14		
33 Ijeoma Uchebgu	33 Professor	Pharmaceutical Nanoscience		15		
34 Gareth Williams	34 Professor	Pharmaceutical Materials Science		16		
35 Afia Ali	35 Associate Professor					1
36 Andrew Constanti	36 Reader					2
37 Oscar Della Pasqua	37 Professor	Clinical Pharmacology & Therapeutics				3
38 Kirsten Harvey	38 Professor	Molecular Neuroscience & Cell Biology				4
39 Jasmina Jovanovic	39 Professor	Neuroscience				5
40 Rebecca Lever	40 Senior Lecturer					6
41 Claudia Manzoni	41 Lecturer	Translational Neuroscience				7
42 Audrey Mercer	42 Associate Professor					8
43 James Phillips	43 Professor	Regenerative Medicine				9
44 Ahad Rahim	44 Professor	Translational Neuroscience				10
45 Arnaud Ruiz	45 Senior Reader					11
46 Stephanie Schorge	46 Professor	Translational Neuroscience				12
47 Mala Shah	47 Professor	Neuroscience				13
48 Ian Bates	48 Professor	Pharmacy Education				1
49 Jennifer Boyd	49 Associate Lecturer (Teaching)					2
50 Louise Brown	50 Associate Professor (Teaching)					3
51 Nadia Bukhari	51 Associate Professor (Teaching)					4
52 Navila Chaudhry	52 Lecturer (Teaching)					5
53 Bryony Dean Franklin	53 Professor	Medication Safety				6
54 Josephine Falade	54 Lecturer (Teaching)					7
55 Alexander Ghanouni	55 Research Associate					8
56 Robert Horne	56 Professor	Behavioral Medicine				9
57 Lizzie Mills	57 Associate Professor					10
58 Terry Ng	58 Lecturer (Teaching)					11
59 Oksana Pyzik	59 Lecturer (Teaching)					12
60 Amira Shaikh	60 Lecturer (Teaching)					13
61 Felicity Smith	61 Professor	Pharmacy Practice				14
62 Li Wei	62 Professor	Pharmacoepidemiology and Drug Safety Research				15

教員・職員氏名		職位	専門分野(?)	Pharmaceutic al & Biological Chemistry	Pharmaceutics	Pharmacology	Practice and Policy
63 Cate Whittlesea	63	Professor	Pharmacy Practice				16
64 Ian Wong	64	Professor	Pharmacy Practice/Medicines Use				17

以上64名のAcademic Staffの外に、37名のResearch Staffがいる。  
後者を構成するのは、Research Fellow, Research Associateが  
主で、Lecturer, Honorary Lecturer等も少数いる。



# 資料 7

「大学における医療人養成の在り方に関する調査研究」

## 薬学研究科 4 年制大学院の在り方に関する調査研究

- 「4 年制大学院の在り方」 検討小委員会の検討結果
- 4 年制大学院博士課程アンケート解析結果（報告）

## 「4年制大学院の在り方」検討小委員会の検討結果

薬学6年制教育を発展・充実させていくためには、卒前教育と卒後教育の切れ目のない連携が必要である。4年制大学院博士課程は、この連携の形態の一つと捉えられ、その充実は高度医療人の養成は云うまでもなく、広く薬学分野の研究者、教育者の育成にも極めて重要と考えられる。学部教育だけでなく大学院教育の成果が社会に問われていると言っても過言ではない。

6年制学部教育に続く4年制博士課程は平成24(2012)年に設置されて以来ほぼ10年が経過し、この間に900名を超える博士(薬学)を世に出している。4年制博士課程については、すでに文部科学省<sup>1)</sup>、日本学術会議<sup>2)</sup>、日本薬学会<sup>3)</sup>、国公立薬学部長会議などのアンケート調査があるが、これらは博士課程の設置時から一期生輩出時までの調査、あるいは一部の大学院のみを対象とした調査等であり、全国の大学院の最新の状況の包括的な調査ではなかった。そこで、本検討小委員会は、現時点での4年制博士課程の実態を調査・分析した。

- 1) 薬学系人材養成の在り方検討会 「大学院4年制博士課程」における研究・教育などの状況に関する自己点検・評価(平成24～29年度)
- 2) 日本学術会議 薬学委員会 医療系薬学分科会報告書「社会に貢献する医療系薬学研究の推進」(平成29年9月)
- 3) 大学における医療人養成の在り方に関する調査研究委託事業(平成28年度 文部科学省) 報告書「薬学教育の改善・充実に関する調査研究」(平成29年3月)

### 記

大学院薬学研究科4年制博士課程に関するアンケート調査から、大学院進学希望者が国公立並びに私立大学大学院いずれにおいても定員を大幅に満たさない状況が続いており、医療や教育現場において指導的立場に立つべき人材が大幅に不足する事態が懸念される。特に、薬学6年制教育を向上させていく上で、6年制学部教育課程を経た教員の一定数以上の確保が必須であるにもかかわらず、6年制学部卒業生の4年制博士課程への志願者が少ない状況は深刻である。大学院進学者の質および数を確保するためには、大学院薬学研究科4年制博士



課程が目指す魅力ある方向性を明確に示し、薬学 6 年制教育課程を修了して博士号を取得した者に対する社会の評価、理解を高める必要がある。今後の検討が必須と思われる課題を、以下に列挙する。

#### 1) 臨床研究を意識づける学部教育

薬学 6 年制学部教育において、問題発見能力および問題解決能力の醸成を目指した内容を充実させる必要がある。また、薬学部の教員は臨床との連携を意識した研究を行うことを通して、医療における問題を発見・解決する姿勢を学生に示すことも必要である。したがって、(改訂が進められている) 薬学教育モデル・コアカリキュラムでは、薬学専門領域における問題発見能力および問題解決能力の醸成に向けた深く学び考える学習、さらに薬学研究、特に臨床研究における学習の充実が重要である。

#### 2) 大学院生への就学支援

大学院学費無償化や奨学金による就学支援等を通して、大学院生の待遇を改善する必要がある。

#### 3) 大学院生のキャリア形成支援

全国規模で「薬学研究科 4 年制博士課程学生リスト」を作成し、大学や医療機関への就職支援に活用することが有用と考えられる。また、大学教員のやりがいや学生に示し、大学教員としてのキャリア形成を支援することで、薬学 6 年制学部卒・4 年制博士課程修了生の大学教員志向を高める必要がある。

#### 4) 教員の研究環境整備

若手教員の研究環境(研究専念時間や研究費など)を改善して、4 年制博士課程学生の大学教員志向を高める必要がある。

#### 5) 今後の検討課題

- ・医療提供施設に勤務する薬剤師への学位授与状況(社会人大大学院生、論文博士)

- ・大学院で習得した資質が社会でどの程度役立っているかの可視化
- ・博士（薬学）取得者の給与・社会的地位等を基にした費用対効果の明示

以上

令和4年3月18日

一般社団法人 日本私立薬科大学協会

6年制薬学教育制度調査検討委員会

薬学研究科4年制大学院の在り方検討小委員会

伊藤智夫、奥 直人、後藤直正、平田收正、政田幹夫

## 4年制大学院博士課程アンケート解析結果（報告）

一般社団法人 日本私立薬科大学協会では、文部科学省委託費に採択された「大学における医療人養成の在り方に関する調査研究」（令和元年度～令和3年度事業）の検討テーマの一つとして、「薬学研究科4年制大学院の在り方に関する調査研究」を行うこととし、その一環として、大学院薬学研究科4年制博士課程に関するアンケート調査を実施しました。別紙（10ページ以降に添付）の内容でアンケートを依頼し、令和3（2021）年9月末までにアンケート調査に賛同して戴いた国公私立64大学・学部（63大学院）から回答を得ました。以下に、その解析結果を記載します。

### 1. 解析対象大学について

- 1) 国公私立67大学・学部へアンケート回答を依頼した結果、国公私立64大学・学部（63大学院）から回答を得た（徳島文理と徳島文理香川は1大学院である）。
- 2) 公立1大学、私立2大学からは回答がなかった。
- 3) 公立2大学（和歌県立医科、山口東京理科）、私立10大学（青森、医療創生、奥羽、武蔵野、湘南医療、北陸、岐阜医療科学、金城学院、姫路獨協、国際医療福祉福岡）は、4年制博士課程未設置のため調査対象としなかった。
- 4) 以上の通り、本調査結果は国公私立64大学・学部（63大学院）の状況を反映しており、公立3大学と私立12大学の状況は含まれておらず、全国79大学・学部の81%の状況を示している。
- 5) 過去5年間の学位授与数については、6年制学部教育を受けた2期生～6期生の大学院博士課程進学状況を反映しており、修了生を輩出していない私立4校（日本薬科、横浜薬科、大阪大谷、第一薬科）を除いた59大学院の集計結果である。
- 6) 入学定員については、薬学研究科としての入学定員設定が無い国立3大学（千葉、岡山、長崎）の入学定員はゼロとした。広島大学は収容定員が12人と回答があったので、入学定員を3人とした。
- 7) 今回の調査対象大学は全て2016（平成28）年度までに6年制学部が完成しており、教員採用については6年制学部が完成した以降の教員採用状況を反映している（新設校が多数の教員を採用する状況は含まれていない）。

2. 薬学研究科4年制博士課程修了者数（学位授与数）について

2016（平成28）～2020（令和2）年度の5年間における4年制博士課程修了者数（学位授与数）を、以下の表に示した。下線を付した数値は、各項目の5年間の最大値である。

		国公立	私立(1)	私立(2)	国公私立計
2016(平成 28) 年度修了生	【推薦・一般選抜】	<u>59</u>	62	62	121 (121)
	【社会人】	<u>15</u>	25	25	40 (40)
2017(平成 29)年度修了生	【推薦・一般選抜】	53	75	73	128 (126)
	【社会人】	11	27	24	38 (35)
2018(平成 30)年度修了生	【推薦・一般選抜】	58	74	70	132 (128)
	【社会人】	13	42	39	55 (52)
2019(令和元)年度修了生	【推薦・一般選抜】	56	<u>88</u>	<u>82</u>	<u>144 (138)</u>
	【社会人】	12	40	38	52 (50)
2020(令和 2)年度修了生	【推薦・一般選抜】	41	75	71	116 (112)
	【社会人】	14	<u>46</u>	<u>45</u>	<u>60 (59)</u>
5年間の合計	【推薦・一般選抜】	267	374	358	641 (625)
	【社会人】	65	180	171	245 (236)
年平均	【推薦・一般選抜】	53	75	72	128 (125)
	【社会人】	13	36	34	49 (47)

※上記調査期間において、2017年度に私立4大学が4年制博士課程完成年度を迎えたため、私立(1)と私立(2)の2種の集計結果を記載した。

私立(1)：2016～2020年度の5年間に博士課程修了者を輩出した大学の学位授与数

私立(2)：2017年度以降に博士課程修了者を輩出した4大学を除いた学位授与数

国公私立計：数値は私立(1)を用いた集計、()内の数値は私立(2)を用いた集計

- 1) 国公立の学位授与数の最大値は【推薦・一般選抜】、【社会人】ともに2016年度であり、国公立の学位授与数は横ばいか低下傾向にある。
- 2) 私立大学の学位授与数の最大値は、【推薦・一般選抜】は2019年度、【社会人】は2020年度であり、私立大学の学位授与数は増加傾向にある。しかしながら、2017年度以降に博士課程修了者を輩出した4大学を除くと（私立大学(2)）、学位授与数は【推薦・一般選抜】で横ばい、【社会人】で増加傾向にあると思われる、新設大学院による学位授与と社会人大学院生の増加が、学位授与数増加の要因と考えられる。
- 3) 国公私立全体としては、学位授与数は【推薦・一般選抜】、【社会人】ともに増加傾向にあるが、その要因は私立大学の新設大学院の授与数が加算されたためである。

- 4) 【推薦・一般選抜】の学位授与数は、過去5年間の平均で128人/年である。この人数が新規の6年制薬学部・4年制大学院修了生である。一方、【推薦・一般選抜】と【社会人】を合わせた学位授与数は、過去5年間の平均で177人/年である。
- 5) 国公立では、80%が【推薦・一般選抜】、20%が【社会人】である。一方、私立では、68%が【推薦・一般選抜】、32%が【社会人】であり、【社会人】の割合が高い。国公立全体としては、72%が【推薦・一般選抜】、28%が【社会人】である。

※参考

- 1) 入学定員は、国公立 88人（千葉、岡山、長崎を含まず）、私立 181人（2019年度以降開設の4大学を除く）であるので、学位授与数から算出される定員充足率は国公立 64%、私立 61%であった。ただし、私立大学のうち4大学の4年制博士課程は2014年度開設（2017年度に1期生輩出）であった。

3. 薬学研究科4年制博士課程修了者の研究テーマについて

博士課程修了者の研究テーマから、基礎研究と臨床研究の数の比較を試みた。ここで、基礎研究とは「研究テーマにおいて臨床との関連が明確でないもの」、臨床研究とは「研究テーマにおいて特定の疾患や患者集団が読み取れるもの」や「レギュラトリーサイエンスに関する研究」とした。

1-1) 2016～2020年度の4年制博士課程修了者数（学位授与数）のうち基礎研究の割合（％）

	国公立	私立	国公立計
【推薦・一般選抜】	26.6%	25.4%	25.9%
【社会人】	6.2%	7.2%	6.9%

- (1) 【推薦・一般選抜】における基礎研究の割合は、国公立、私立ともに約25%である。
- (2) 【社会人】における基礎研究の割合は、国公立、私立ともに6～7%である。

1-2) 2016～2020年度の4年制博士課程修了（学位授与）者における基礎研究の割合（％）

		国公立計
2016(平成28)年度修了生	【推薦・一般選抜】	23.1%
	【社会人】	2.5%
2017(平成29)年度修了生	【推薦・一般選抜】	24.2%
	【社会人】	5.3%
2018(平成30)年度修了生	【推薦・一般選抜】	29.5%
	【社会人】	7.3%
2019(令和元)年度修了生	【推薦・一般選抜】	25.7%
	【社会人】	7.7%
2020(令和2)年度修了生	【推薦・一般選抜】	26.7%
	【社会人】	10.0%

- (1) 基礎研究の割合は、【推薦・一般選抜】で約25%、【社会人】で10%以下である。
- (2) 2015年度(平成27年度)修了生を対象とした日本学術会議調査によれば、基礎研究の割合は、【推薦・一般選抜】で81%、【社会人】で35%と報告されている。今回の調査結果では、基礎研究の割合は【推薦・一般選抜】、【社会人】ともに大幅に低下しているが、基礎研究の定義が極めて曖昧なため、数値を比較して結論付けることはできない。今回の調査から、4年制博士課程修了生を輩出し始めて6年が経過した時点でも、基礎研究の割合は【推薦・一般選抜】、【社会人】ともに変わらないと言える。

2-1) 2016～2020 年度の 4 年制博士課程修了者数（学位授与数）のうち臨床研究の割合（％）

	国公立	私立	国公立計
【推薦・一般選抜】	13.9%	10.4%	11.9%
【社会人】	58.5%	52.8%	54.3%

- (1) 【推薦・一般選抜】における臨床研究の割合は、国公立、私立ともに約 10%である。  
 (2) 【社会人】における臨床研究の割合は、国公立、私立ともに約 50%である。

2-2) 2016～2020 年度の 4 年制博士課程修了（学位授与）者における臨床研究の割合（％）

		国公立計
2016(平成 28) 年度 修了生	【推薦・一般選抜】	7.4%
	【社会人】	42.5%
2017(平成 29)年度修 了生	【推薦・一般選抜】	18.8%
	【社会人】	52.6%
2018(平成 30)年度修 了生	【推薦・一般選抜】	9.1%
	【社会人】	58.2%
2019(令和元)年度修 了生	【推薦・一般選抜】	12.5%
	【社会人】	63.5%
2020(令和 2)年度修了 生	【推薦・一般選抜】	11.2%
	【社会人】	51.7%

- (1) 【推薦・一般選抜】において、基礎研究は約 25%、臨床研究は約 10%、残り約 65%は基礎・臨床横断型研究である。主流は、基礎・臨床横断型研究である。  
 (2) 【社会人】において、基礎研究は約 10%、臨床研究は 50～60%、残り約 30～40%は基礎・臨床横断型研究である。主流は、臨床研究である。  
 (3) 2015 年度(平成 27 年度) 修了生を対象とした日本学術会議の調査によれば、臨床研究の割合は、【推薦・一般選抜】で 10%、【社会人】で 48%と報告されており、今回の調査結果と同様である。従って、4 年制博士課程修了生を輩出し始めて 6 年が経過した時点でも、臨床研究が劇的に増加した状況にはない。

#### 4. 収容定員と在籍者数について

令和3（2021）年5月1日時点における、国公立63大学院の薬学研究科4年制博士課程の収容定員と在籍者数を以下の表に示した。表の値は、主に6年制学部卒業7期生～10期生と社会人の4年制博士課程進学状況を反映している。

	国公立	私立（1）	私立（2）	国公立計
収容定員	352人	768人	680人	1,120人
在籍者数	246人	688人	630人	934人
充足率	69.9%	89.6%	92.6%	83.4%

※未回答・調査対象外大学に加えて、入学定員設定が無い国立3大学を除いて解析

私立（1）：2021.05.01時点で認可されている全49大学院博士課程の収容定員と在籍者数

私立大学（2）：2016年度（平成28年度）までに博士課程修了者を輩出した41大学院博士課程の収容定員と在籍者数

国公立計：数値は私立（1）を用いた集計

- 1) 全国平均の定員充足率は約83%である。私立の定員充足率（89.6%）が国公立の定員充足率（69.9%）より高いのは、私立において社会人大学院生が多いためと考えられる。
- 2) 2021～2024年度の4年間は、毎年平均234人の4年制博士課程修了生の輩出が予想される。この数は、2016～2020年度の平均（177人/年）に比べて大幅に増加している。
- 3) 国公立においては、2021～2024年度の4年間に、毎年平均62人の4年制博士課程修了生の輩出が予想される。この数は、2016～2020年度の平均（66人/年）に比べて低下している。
- 4) 私立大学（2）の数値によれば、2016年度までに修了者を輩出した41大学院博士課程から、2021～2024年度の4年間には毎年平均158人の博士課程修了生の輩出が予想される。この数は、該当する41大学院の2016～2020年度の平均（106人/年）に比べて大幅に増加している。従って、4年制博士課程在籍者の増加には、2014年度以降に開設（2017年度以降に修了生を輩出）した大学院の学生数に加えて、個々の大学院の学生数の増加が寄与していると思われる。一方、個々の大学院の学生数の増加において、【推薦・一般選抜】あるいは【社会人】のどちらの寄与が大きいかについては、更なる調査が必要である。



## 5. 教員採用数について

国公立 64 大学・学部（63 大学院）における、2016（平成 28）～2020（令和 2）年度の 5 年間の教員採用数を以下に示した。本調査への回答大学は全て、2016 年度までに 6 年制学部が完成年度を迎えている。

		新規教員 採用者数 (過去5年)	うち 6年制学部 のみ卒業	うち 6年制学部・ 4年制博士 修了	うち 左記以外の 薬学部・大 学院修了	うち 薬学以外の 学部・大学 院修了
国公立	助手・助教	176 人	2 人	18 人	107 人	49 人
	講師以上	100 人	1 人	0 人	65 人	34 人
私立	助手・助教	500 人	105 人	142 人	168 人	85 人
	講師以上	494 人	5 人	6 人	348 人	135 人
計	助手・助教	676 人	107 人	160 人	275 人	134 人
	講師以上	594 人	6 人	6 人	413 人	169 人
1年あたりの 採用者数	助手・助教	135 人	21 人	32 人	55 人	27 人
	講師以上	119 人	1 人	1 人	83 人	34 人

※ 1 年あたりの採用者数に基づいて以下の考察を行う。

- 1) 助手・助教・講師以上の採用者中、6 年制教育を受けた者（21+32+1+1= 55 人）は、全採用者数（135+119= 254 人）の 21.6%である。この状況が将来も続くと、6 年制薬学教育を実施する教員の約 8 割が、6 年制薬学教育を受けていない者になる。
- 2) 助手・助教採用者中、6 年制教育を受けた者（21+32= 53 人）は、助手・助教採用者数（135 人）の 39.3%である。国公立では、この採用者数が極端に少ない。
- 3) 過去 5 年間で毎年平均 128 人の 6 年制薬学部・4 年制博士課程修了生が輩出された。一方、6 年制薬学部・4 年制博士課程修了生のうち助手・助教としての採用は毎年平均 32 人であり、6 年制薬学部・4 年制博士課程修了生の 25%である。
- 4) 「薬学以外の学部・大学院修了者」の採用（27 人と 34 人）は、薬学以外の研究分野からの採用が必要と考えられるため、今後もこの数は変わらないと思われる。
- 5) 講師以上の「左記以外の薬学部・大学院修了者」は、主に実務家教員と思われる。10 年後には、6 年制薬学部・4 年制博士課程修了生で実務経験を有する者に置き替わって行くと考えられる。
- 6) 助手・助教の「左記以外の薬学部・大学院修了者」の採用は、薬学部 4 年制学科・大学院修了生が主であると考えられる。このうちの少なくとも半分（28 人）は、6 年制薬学部・4 年制博士課程修了生に置き替わるべきである。
- 7) 助手・助教の採用者中 6 年制教育を受けた者（21+32= 53 人）に、上記の 6 年制薬学部・4 年制博士課程院修了生に置き替わるべき数（28 人）を加えると 81 人となり、全助手・助教の採用者（135 人）の 60%となる。

- 8) 助手・助教の採用者において、6年制薬学部・4年制博士課程修了生（32人）に加えて、「6年制薬学部のみを卒業した者」（21人）と、上述した「左記以外の薬学部・大学院修了者」の半分（28人）が6年制薬学部・4年制博士課程修了生に置き替わると、毎年81人の新規6年制薬学部・4年制博士課程修了生を助手・助教として採用する必要がある。
- 9) 2020年度修了生の66%が【推薦・一般選抜】であり、今後4年間は、毎年平均159人（963人÷4×0.66）の新規6年制薬学部・4年制博士課程修了生が輩出されると考えられる。
- 10) これまでの状況が続くと、2021～2024年度の4年間は、毎年平均40人（159人×0.25）が新規6年制薬学部・4年制博士課程修了教員となることが予測される。上記の新規6年制薬学部・4年制博士課程修了教員の必要数（毎年81人）の約1/2であり、新規の助手・助教の採用を6年制薬学部・4年制博士課程修了生で充足するには、6年制薬学部・4年制博士課程修了生が大幅に不足している。（調査回答大学が67大学、未回答・調査対象外大学が15大学であるため、必要となる6年制薬学部・4年制博士課程修了生の数はさらに多い。）

## 6. 特色ある大学院の取組みについて

アンケート回答から、学位授与数（過去5年間）が多い12大学、収容定員を充足している11大学、臨床薬学研究数が多い10大学を抽出した。一部の大学が重複して抽出されたため、最終的に21大学についてアンケート項目1～3および6の回答を解析し、他大学の回答と比較した。その結果、以下の特徴が明らかとなった。

- 1) 大学院生が多い大学の特徴（社会人大学院生が主である大学を除く）
  - ・臨床研究者のみならず、高度医療人、創薬研究者、レギュラトリーサイエンス研究者など、幅広い人材の育成を目的としている。
  - ・学部学生に対して博士取得の意義、将来のキャリア形成を様々な方法で周知している。保護者への説明会を実施している大学もある。
  - ・TA（ティーチング・アシスタント）、RA（リサーチ・アシスタント）、大学独自の奨学金等で、入学金や学費分の給付に加えて、生活費の一部も補助している。
  - ・派遣医療機関での臨時レジデント、教員採用前提の奨学金給付、アルバイト先の紹介などで生活費を支援している。ただし、レジデント等の就業時間が長く、研究時間の確保が懸念される例もある。
  - ・大学院生に対する研究費の支給や、国内・海外学会発表に際して参加費・旅費・宿泊費等の支援を行っている。
  - ・海外交流（海外派遣1か月）などを実施している。
- 2) 臨床研究が多い大学の中には、社会人大学院生が多く、【推薦・一般選抜】の大学院生が少ない大学も見られる。また、大学院4年制博士課程において、主に専門薬剤師等の高度医療人の養成を目的とし、研究者や教育者の育成を主たる目的としていないと思われる大学も見られる。
- 3) 全ての大学が何らかの形で医療機関との連携を図っている。その中でも、4年制博士課程の学生が、提携施設において6ヶ月間の臨床実地研修を必修科目として履修することや、地域の医療提供施設に勤務する卒業生の勉強会に参加することで、臨床現場からの視点・議論に触れる機会を

提供している大学がある。

- 4) サテライトキャンパスでの夜間・休日の開講、オンライン講義、インテンシブ授業などを活用することで、社会人大学院生が学びやすい環境を提供している大学がある。

## 7. まとめ

本調査結果から、薬学研究科4年制博士課程は多くの大学で定員未充足となっており、国公立大学の4年制博士課程全体としては、大学院生数が低下傾向にあることが明らかとなった。私立大学の4年制博士課程では大学院生数が増加傾向にあるが、その主な要因は新設の大学院と社会人大学院生の増加にあると考えられた。医療提供施設に勤務する薬剤師への学位授与状況については、社会人大学院生の数に加えて論文博士の授与状況を調査することが今後の検討課題である。

学位論文テーマから判断されることは、【推薦・一般選抜】の大学院生では基礎・臨床横断型の研究が多く、臨床研究が主たるテーマとはなっていないことである。【社会人】の大学院生では、臨床研究が50%以上であるが、基礎研究も一定程度認められる。薬学研究科4年制博士課程における人材養成の目的を再度、確認する必要があると思われる。

大学院生が多い大学の特徴として、臨床研究者の養成に加えて、高度医療人、創薬研究者、レギュラトリーサイエンス研究者など、幅広い人材の育成を目的としていることや、学部学生に対して学位（博士）取得の意義、キャリア形成を周知していることが挙げられる。また、大学院進学を促進するために、学費免除に加えて、TA、RA、大学独自の奨学金等で、経済的な支援も行っている。

教員採用の状況から、6年制薬学教育を受けた大学教員が大幅に不足しており、過去5年間の採用教員の約80%は6年制薬学教育を受けていない者となっていることが明らかとなった。この状態を放置すると、将来は、6年制薬学教育を担う教員の多くが、6年制薬学教育を受けていない者となることが常態化する。モデル・コアカリキュラムが改訂されて6年制薬学教育内容が深化しても、それを教授できる人材が不足する状況が続くことになる。

薬学研究科4年制博士課程における6年制学部新卒学生数の不足に伴い、薬学6年制教育を受けて臨床研究や薬学教育を遂行する若手人材の養成が大きく低下している。薬学研究科4年制博士課程では、薬学における臨床研究や教育を担う人材の養成を主たる目的としており、その目的を達成しているとは言い難い状況である。

以上

(別紙：大学院薬学研究科 4 年制博士課程に関するアンケート)

令和 3 (2021) 年 7 月 28 日

国公立大学 (薬学部・薬科大学)  
学長・学部長 殿

一般社団法人 日本私立薬科大学協会  
6 年制薬学教育制度調査検討委員会  
委員長 井上圭三  
「薬学研究科 4 年制大学院の在り方  
検討小委員会」  
委員長 伊藤智夫

#### 薬学研究科大学院 4 年制博士課程に関するアンケート調査のご協力について

一般社団法人 日本私立薬科大学協会では、文部科学省委託費「大学における医療人養成の在り方に関する調査研究」(令和元年度～令和 3 年度事業)に採択され、現在調査研究を進めているところであります。

本事業は、①6 年制薬学教育のモデル・コアカリキュラム改訂に向けた調査研究及び②薬学研究科 4 年制大学院の在り方に関して調査研究を行うものであり、その一環として今回アンケート調査を実施するものです。

この度の 6 年制薬学教育のモデル・コアカリキュラム改訂に向けた調査研究では、薬学部 6 年制学士課程と 4 年制大学院という人材養成課程を一体として考えていく必要があるとの考え方に立ち、大学院薬学研究科 4 年制博士課程に関するアンケート調査を実施することといたしました。

次ページ以降の項目 1. ～ 8. について、ご回答頂きますようお願い申し上げます。

回答は、本様式に記載したものを Word ファイルおよび PDF ファイルの 2 種の形式として、2021 年 9 月 7 日 (火) 17:00 までに、日本私立薬科大学協会までご送付下さい。

(下記の問い合わせ先参照)

薬学研究科大学院 4 年制博士課程の今後の発展のために、ご協力の程、宜しくお願い致します。

(本件問い合わせ先)

一般社団法人 日本私立薬科大学協会  
下 林 正 実

E-mail: shimobayashi@yakudaikyo.or.jp

T E L: 03-3237-0499

アンケート調査 様式

大学名： \_\_\_\_\_

研究科・専攻名： \_\_\_\_\_

1. 6年制学部を基盤とする大学院4年制博士課程の特色をどのようにとらえているか、貴学の考えをお聞かせください。また、4年制博士課程の特色を打ち出すための貴学の対応をお聞かせください。

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2. 4年制博士課程の収容定員と現在の在籍者数（2021年5月1日現在）

収容定員	在籍者数
人	人

3. 6年制学部から4年制博士課程への進学者が少ないため、全国的に入学定員不足となっていることについて、貴学ではどのようにお考えですか。また、4年制博士課程への入学者数を維持または増やすために、貴学ではどのような対策をとられていますか。

4. 貴学における、4年制博士課程学生に対する経済的支援制度（TA制度、RA制度など）、そのような支援額の学費に対する割合、また、経済的支援策として、何が有効なのか具体的にお聞かせください。

5. 4年制博士課程修了生の博士論文タイトル（推薦・一般選抜と社会人別に 過去5年）

※枠が不足する場合は、行を増やして回答してください。

2016年度修了生 (2017年3月修了)	推薦・一般選抜	(博士論文タイトル)
	①	
	②	
	③	
	社会人	(博士論文タイトル)
	①	
	②	
2017年度修了生 (2018年3月修了)	推薦・一般選抜	(博士論文タイトル)
	①	
	②	
	③	
	社会人	(博士論文タイトル)
	①	
	②	
2018年度修了生 (2019年3月修了)	推薦・一般選抜	(博士論文タイトル)
	①	
	②	
	③	
	社会人	(博士論文タイトル)
	①	
	②	
2019年度修了生 (2020年3月修了)	推薦・一般選抜	(博士論文タイトル)
	①	
	②	
	③	
	社会人	(博士論文タイトル)
	①	
	②	

2020年度修了生 (2021年3月修了)	推薦・一般選抜	(博士論文タイトル)
	①	
	②	
	③	
	社会人	(博士論文タイトル)
	①	
	②	

6. 貴学における、4年制博士課程学生の教育・研究における医療提供施設との連携体制について

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7. 新規教員採用者数（過去5年 助手・助教と講師以上に別けて）とその内訳（6年制学部のみ  
の卒業生、6年制学部・4年制博士課程修了者等）

区 分	助手・助教	講師以上
新規教員採用者数（過去5年）	人	人
うち6年制学部のみ卒業	人	人
うち6年制学部・4年制博士課程修了	人	人
うち上記以外の薬学部・大学院修了	人	人
うち薬学以外の学部・大学院修了	人	人



8. 大学名、回答担当者名および連絡先（メールアドレス）

大学名：\_\_\_\_\_

回答担当者：\_\_\_\_\_

回答担当者のメールアドレス：\_\_\_\_\_

ご協力有難うございました。

以上

## 三つの小委員会 委員名簿

ア 大項目検討小委員会（委員会構成：B～F、情報科学技術）

(ア)大項目検討小委員会（委員会：B～F）委員名簿

（◎印：班長 ○印：副班長）

### ① 「B 社会と薬学」

- ◎中村 明弘（日本薬学教育学会 副理事長）
- 白幡 晶（城西大学 学事顧問）
- 有田 悦子（北里大学 薬学部 教授）
- 大川 恭子（武庫川女子大学 薬学部 教授）
- 恩田 光子（大阪医科薬科大学 薬学部 教授）
- 亀井 美和子（帝京平成大学 薬学部長）
- 岸本 桂子（昭和大学 薬学部 教授）
- 近藤 悠希（熊本大学 薬学部 准教授）
- 田島 敬一（熊谷市薬剤師会 会営薬局）
- 益山 光一（東京薬科大学 薬学部 教授）

### ② 「C 基礎薬学」

- ◎後藤 直正（全国薬科大学長・薬学部長会議 会長）
  - 本間 浩（薬学教育協議会 代表理事）
  - 唐沢 浩二（昭和大学 薬学部 講師）
  - 小暮 健太郎（徳島大学 薬学部 教授）
  - 洲崎 悦子（就実大学 薬学部 教授）
  - 高須 清誠（京都大学 薬学部 教授）
  - 高橋 秀依（東京理科大学 薬学部 教授）
  - 長澤 一樹（京都薬科大学 教授）
  - 毛利 順一（北里大学病院薬剤部 講師）
- <相談役>
- 赤路 健一（京都薬科大学 副学長）
  - 宮田 興子（神戸薬科大学 学長）

③ 「D 医療薬学」

- ◎小佐野 博史 (帝京大学 薬学部 教授)
- 伊藤 智夫 (薬学共用試験センター 理事)
- 伊藤 晃成 (千葉大学 薬学部 教授)
- 大津 史子 (名城大学 薬学部 教授)
- 坂本 謙司 (帝京大学 薬学部 教授)
- 田村 豊 (福山大学 薬学部 教授)
- 永田 泰造 (東京都薬剤師会 会長)
- 細谷 治 (日本赤十字社医療センター 薬剤部長)

④ 「E 衛生薬学・公衆衛生薬学」

- ◎平田 收正 (和歌山県立医科大学 薬学部 教授)
- 平井 みどり (兵庫県立赤十字血液センター 所長)
- 武田 香陽子 (北海道科学大学 薬学部 准教授)
- 荒田 洋一郎 (帝京大学 薬学部 教授)
- 小野 敦 (岡山大学 薬学部 教授)
- 古武 弥一郎 (広島大学 薬学部 教授)
- 鈴木 亮 (金沢大学 医薬保健研究域薬学系 教授)
- 原 俊太郎 (昭和大学 薬学部 教授)
- 松野 純男 (近畿大学 薬学部 教授)

⑤ 「F 臨床薬学」

- ◎鈴木 匡 (名古屋市立大学 大学院薬学研究科 教授)
- 政田 幹夫 (大阪医科薬科大学 薬学部 招聘教授)
- 石井 伊都子 (千葉大学 医学部附属病院 薬剤部長)
- 上塚 朋子 (福井県済生会病院 薬剤部主任)
- 奥田 真弘 (大阪大学 医学部附属病院 薬剤部長)
- 角山 香織 (大阪医科薬科大学 薬学部 准教授)
- 真野 泰成 (東京理科大学 薬学部 准教授)
- 三宅 圭一 (兵庫県薬剤師会 副会長)

(イ)「情報科学技術」検討グループ

- 小佐野 博史 (帝京大学 薬学部 教授)
- 木下 淳 (兵庫医療大学 薬学部 准教授)
- 宮崎 智 (東京理科大学 薬学部長)

○印：班長

イ 大学院の在り方検討小委員会

- 伊藤 智夫 (薬学共用試験センター 理事)
- 奥 直人 (薬学共用試験センター 理事長)
- 後藤 直正 (全国薬科大学長・薬学部長会議 会長)
- 平田 收正 (和歌山県立医科大学 薬学部 教授)
- 政田 幹夫 (大阪医科薬科大学 薬学部 招聘教授)

○印：班長

ウ 海外の薬学教育調査研究小委員会

- 桐野 豊 (徳島文理大学 名誉学長・名誉教授)
- 小澤 孝一郎 (広島大学 副学長)
- 武田 香陽子 (北海道科学大学 薬学部 准教授)
- 平田 收正 (和歌山県立医科大学 薬学部 教授)

○印：班長

# 資料 9

## 令和3年度「大学における医療人養成の在り方に関する調査研究」における 「6年制薬学教育制度調査検討委員会」幹事会及び全体会議の主な開催概要（時系列）

幹事会等会議	主 な 検 討 概 要	備 考
(令和元年度～令和2年度)	第1回幹事会～第14回幹事会及び第1回全体会議等を開催した。	令和元年度及び令和2年度実績報告書に添付済
(令和3年度)	幹事会(第15回～第29回)及び全体会議(第2回～第4回)を開催した。	
・第15回幹事会 (4月12日開催)	<ul style="list-style-type: none"> <li>・文科省から、次期コアカリ改訂に向けた医学・歯学・薬学共通項目(案)について、報告があった。</li> <li>・大項目A～G担当の「各大項目検討小委員会」の委員が確定した。(名簿提出)</li> <li>・厚労省から、「薬剤師の養成及び資質向上等に関する検討会」に関する状況報告があった。</li> <li>・大項目「薬学研究」について、意見交換を行った。</li> </ul>	
・第2回全体会議 (4月30日開催)	<ul style="list-style-type: none"> <li>・文科省から、次期コアカリ改訂に向けた本委託事業のスケジュール確認及び文科省内に設置される検討会の、今後の状況について報告があった。</li> <li>・「薬剤師及び医師・歯科医師・看護師向け」アンケート調査については、アンケート方式による聞き取り調査を行った結果の「中間まとめ」が報告された。</li> <li>・次期コアカリ改訂に向けた医学・歯学・薬学共通の項目(案)の中で、薬学の大型目について検討を行った。</li> <li>・薬学教育協議会「有機化学系教科担当教員会議」から、井上委員長あてに提出された「提言」について紹介があった。</li> <li>・カナダ・米国・イギリスにおける海外薬学教育調査に関する報告があった。</li> <li>・厚労省より、「薬剤師の養成及び資質向上等に関する検討会」の中で、「薬剤師の需給推計」に関し報告があり、本年夏ごろを目途にまとめる旨報告があった。</li> </ul>	「カナダ・米国・イギリスの薬学教育調査」の最終報告
・第16回幹事会 (6月7日開催)	<ul style="list-style-type: none"> <li>・「薬剤師として求められる基本的な資質・能力」等について、大学関係者への状況説明が必要なことから、本協会理事会・総会等で報告した旨紹介があった。 私立大学対応：当協会第1回通常総会で報告(6月1日) 国公立大学対応：国公立大学薬学部長(科長・学長)で文科省が報告(6月4日)</li> <li>・薬学研究科4年制大学院の在り方について、意見交換を行った。</li> <li>・厚労省より「薬剤師の養成及び資質向上等に関する検討会」の「議論のまとめ」として報告があった。</li> </ul>	

(令和3年度)

幹事会等会議	主 な 検 討 概 要	備 考
<ul style="list-style-type: none"> <li>・第17回幹事会(7月12日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・「コアカリ大項目検討小委員会」の検討状況について、報告及び意見交換を行った。</li> <li>・大項目「G. 薬学研究」に関する報告があった。</li> <li>・薬学研究科4年制大学院の在り方について、「4年制大学院の在り方検討小委員会」から報告があり、本日の幹事会の意見等を踏まえ、7月26日開催の同検討委員会において、アンケート調査の内容等を検討することとなった。</li> </ul>	
<ul style="list-style-type: none"> <li>・第18回幹事会(8月20日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・「コアカリ大項目検討小委員会」の検討状況について、報告及び意見交換を行った。</li> <li>・「医学/歯学教育コアカリ改訂に関する連絡調整委員会」(第1回)が、8月18日に文科省で開催された旨報告があった。</li> </ul>	
<ul style="list-style-type: none"> <li>・第19回幹事会(9月29日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・文科省主催の医・歯・薬3領域の打ち合わせ状況について、報告があった。</li> <li>・文科省から、「令和4年度改訂版のキャッチフレーズ(案)」について説明があり、今回「医・歯・薬」のコアカリが同時に改訂されることを踏まえ、共通のキャッチフレーズ(案)として提案する旨説明があった。</li> <li>・「薬剤師として求められる基本的な資質・能力」の案文について、たたき台として作成したものが示された。</li> </ul>	
<ul style="list-style-type: none"> <li>・第20回幹事会(10月18日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・文科省主催の第2回医・歯・薬3領域打ち合わせ状況について、報告があった。</li> <li>・文科省から、「令和4年度改訂版の医師として求められる基本的な資質・能力変更(案)」について説明があった。</li> <li>・薬学におけるコアカリ改訂に向けた基本方針(案)について、薬学関係者に対し本委員会の検討内容を報告する機会が必要と考え、本年12月開催の全国会議総会において、現状説明等を行うこととなった。</li> </ul>	
<ul style="list-style-type: none"> <li>・第21回幹事会(10月25日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・10月21日開催の文科省における「医学・歯学連絡調整委員会」に関する報告があった。</li> <li>・コアカリ改訂に向けた基本方針(案)に関する修正部分について、説明及び意見交換を行った。</li> <li>・「薬剤師として求められる基本的な資質・能力(文科省案)」について、報告及び意見交換を行った。</li> </ul>	
<ul style="list-style-type: none"> <li>・第3回全体会議(10月29日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・コアカリ改訂に関するスケジュール等について説明があり、文科省に設置される「薬学系人材養成の在り方に関する検討会」が次期コアカリ改訂の発議機関として位置付けられること等、今後のスケジュールについて説明があった。</li> <li>・文科省主催の「医学・歯学の連絡調整委員会」について、状況報告があった。</li> </ul>	

(令和3年度)

幹事会等会議	主 な 検 討 概 要	備 考
・第3回全体会議 (10月29日開催)	・基本方針(案)及び基本的な資質・能力(文科省案)について、報告及び意見交換を行った。	
・第22回幹事会 (11月8日開催)	・文科省主催の「医学・歯学の連絡調整委員会」に関する状況報告があった。 ・基本方針(案)及び基本的な資質・能力(文科省案)について、報告及び意見交換を行った。	
・第23回幹事会 (11月16日開催)	・文科省から、「医師・歯科医師として求められる資質・能力(案)」について、一部加筆・修正の報告があった。 ・薬学の「キャッチフレーズ(案)」について、一部修正の報告があった。 ・薬学の「基本方針(案)」について、一部修正及び意見交換が行われ、修正後の「基本方針(案)」を、12月開催の全国会議総会へ報告する、また、「薬学系人材養成の在り方に関する検討会」に提案することとなった。 ・文科省提案の「薬学/資質能力(文科省案)」の各項目の説明文について、意見交換を行い、本案を最終案とする旨確認した。	
・第24回幹事会 (12月21日開催)	・12月24日開催の「薬学系人材養成の在り方に関する検討会」への、本検討委員会の対応等について協議した。 ・令和2年度に実施した「紙上インタビュー調査のまとめ」(薬剤師・医師・歯科医師・看護師向けアンケート調査)について、一部修正及び意見交換を行った。 ・大項目「薬学研究」について、12月開催の全国会議総会での意見等を踏まえ、意見交換等を行った。 ・「基本的な資質・能力」における「情報・科学技術を活かす能力(仮)」について、医・歯・薬3領域の合同会議が開催された状況報告及び次回開催の幹事会(12月27日開催)に原案を提出することとなった。	
・第25回幹事会 (12月27日開催)	・文科省から、第2回「薬学系人材養成の在り方に関する検討会」(12月24日開催)の報告があった。 ・「情報・科学技術を活かす能力(仮)」について、原案報告を基に意見交換を行った。 ・本委託研究の最終報告に向けて、提案内容の意見交換を行い、令和4年1月14日開催の幹事会で、改めて検討することとなった。	

(令和3年度)

幹事会等会議	主 な 検 討 概 要	備 考
<ul style="list-style-type: none"> <li>・第26回幹事会 (令和4年1月14日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・文科省から省内における今後のスケジュールとして、「専門研究委員会」を第1回が2月7日、第2回が3月7日開催することとし、本検討委員会によるコアカリ改訂原案を2月8日に提出する旨依頼があった。</li> <li>・コアカリ「大項目」の素案について意見交換を行い、今後、文科省が示すチェックを基に、本委員会でレビューを行い、2月8日に文科省へ提出することとなった。</li> <li>・「社会と薬学」の中項目の新案について、報告及び意見交換を行った。</li> </ul>	
<ul style="list-style-type: none"> <li>・第27回幹事会 (1月28日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・「情報・科学技術を活かす能力(仮)」の薬学教育の説明文について、報告及び意見交換を行い、本案で了承された。</li> <li>・「各大項目の改訂原案」について意見交換を行い、文科省が示すスケジュールに沿って、2月22日には素案最終案として提出する旨依頼があった。</li> <li>・「紙上インタビュー調査のまとめ」(薬剤師・医師・歯科医師・看護師向けアンケート)について、標題を一部追記し、最終版とすることとなった。</li> </ul>	<p>「紙上インタビュー調査」の最終報告</p>
<ul style="list-style-type: none"> <li>・第28回幹事会 (2月18日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・薬学研究科4年制大学院の在り方検討小委員会の検討結果が報告された。</li> <li>・薬学教育コアカリ改訂原案の一部修正について報告があった。</li> <li>・文科省主催のコアカリ改訂専門研究委員会(第1回)の報告があった。</li> </ul>	<p>「4年制大学院博士課程アンケート解析結果」報告</p> <p>2月7日開催</p>
<ul style="list-style-type: none"> <li>・第29回幹事会 (3月18日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・3月7日開催の「薬学教育モデル・コアカリキュラム改訂に関する専門研究委員会」(第2回)に関する報告があった。</li> <li>・本委託費の最終報告に向けて、確認等を行った。</li> </ul>	
<ul style="list-style-type: none"> <li>・第4回全体会議 (3月30日開催)</li> </ul>	<ul style="list-style-type: none"> <li>・本委託費の「最終報告書」(案)について協議し、「6年制薬学教育制度調査検討委員会・全体会議として承認した。</li> </ul>	



#### 4. 謝 辞

以上ご報告のとおり、本委託事業は概ね3か年（令和元年度～令和3年度）の調査研究事業として実施したものである。

この間、事業実施の主体となる「6年制薬学教育制度調査検討委員会」の全体会議及び幹事会の各委員のほか、以下の方々に深く感謝の意を表す。

本事業の遂行に当たり、様々な形でご指導いただいた文部科学省高等教育局医学教育課に心より感謝申し上げます。

また、本調査研究を実施する中で、アンケート調査の解析等にご協力いただいた昭和薬科大学薬学部の岸本成史教授、帝京大学薬学部の長谷川仁美講師、長田洋一助教に厚く御礼申し上げます。

最後に、日本私立薬科大学協会事務局の小池啓三郎事務局長以下、下林正実氏、中嶋恒夫氏、小島彩綾子氏にはお世話になり御礼申し上げます。

令和4年3月

6年制薬学教育制度調査検討委員会 委員長 井上 圭三  
(一般社団法人 日本私立薬科大学協会 会長)