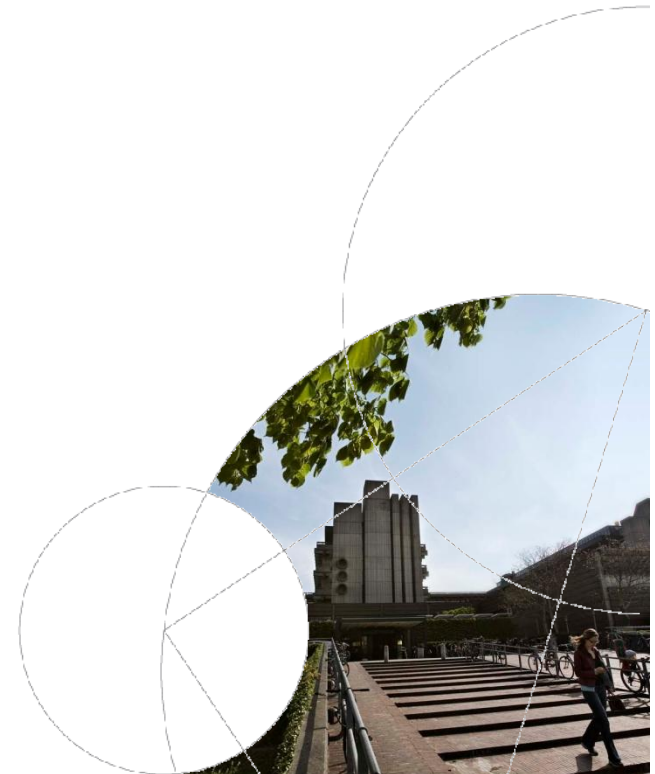




Redesign and implementation of curricula within pharmaceutical sciences in Copenhagen (FARMA-2020)

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Outline

Setting the scene: Changes and developments in DK during the last decade

- In secondary schools
- At university level
- National economy and national strategies
- Employability of graduates (MSc in Pharmacy)

Development of the new curricula within pharmaceutical sciences (FARMA 2020)

- Implementation of 3-year BSc program, starting 2015
- Development of 2-year MSc programs, starting 2018
 - Initiatives within regulatory affairs/regulatory sciences

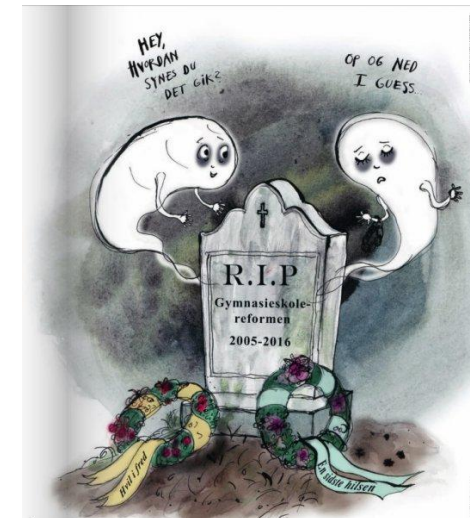


Secondary School changes in DK (2005 – 2017)

- Major reform in 2005, revised in 2017
 - 50 – 80% of all children nowadays graduate from secondary schools.
 - Government intention: More flexibility \rightarrow higher student motivation \rightarrow more interest for science and technology
- More diverse student population entering universities
 - Motivation for study
 - Student's way of learning
 - Insight into discovery of new medicines

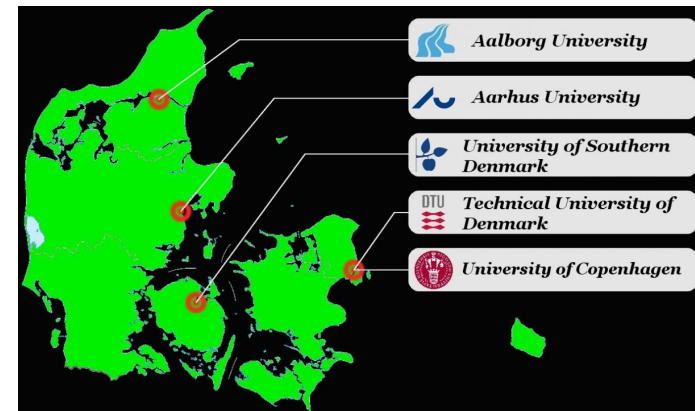


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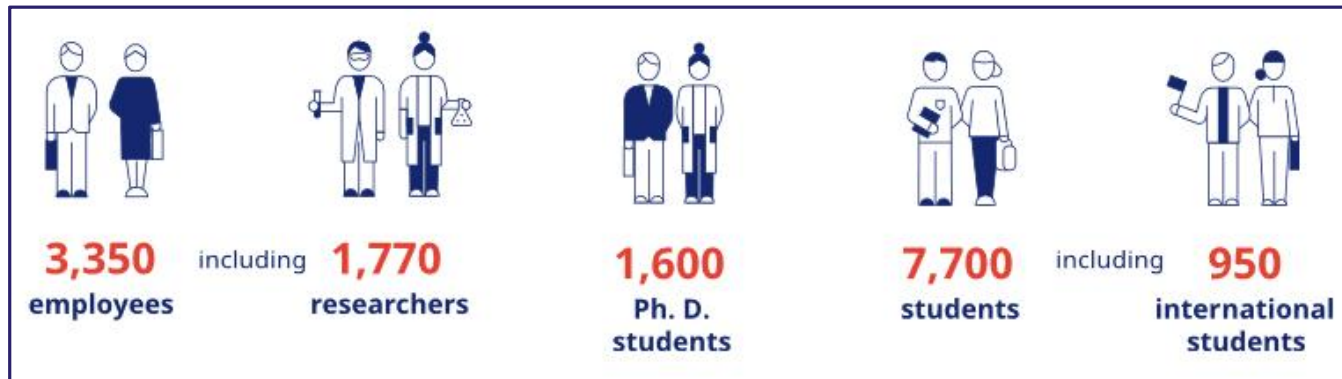


Changes and developments at universities (2005-2017)

- More money for research, less for education.
- Increased competition between universities
 - Economic incentive to enroll more students
 - Great increase in number of university programs
 - Most DK universities offer at least some of the major programs
 - Pharmacy offered at UCPH and at University of Southern Denmark
 - Medicine offered at 4 universities
- University mergers and re-organizations
 - 2007 – Faculty of Pharmaceutical Sciences
 - 2012 – Faculty of Health and Medical Sciences



Faculty of Health and Medical Sciences



School of
Medical
Sciences

School of
Oral Health
Sciences

School of the
Pharmaceutical
Sciences

School of
Public Health

School of
Veterinary
Medicine and
Animal Science

BSc and MSc in
Medicine

MSc in Human Biology

BSc and MSc in Health
Informatics

BSc and MSc in
Molecular
Biomedicine

MSc of Immunology and
Inflammation

MSc in Health Science

Master of Headache
Disorders

BSc and MSc in Dental
Surgery

Bachelor of Dental
Hygientisk

Academy Profession
Degree
in Dental Practice

Dental Assistant

BSc and MSc in
Pharmacy

MSc in
Pharmaceutical
Sciences

MSc in Medicinal
Chemistry

Master of Industrial
Drug Development

Master of
Pharmaceutical
Regulatory
Affairs/Medicines
Regulatory Affairs

BSc and MSc in
Health Sciences

BSc and MSc in
Health Informatics

Master of Disaster
Management

Master of Global
Health

Master of Public
Health

BSc and MSc in
Veterinary Medicine

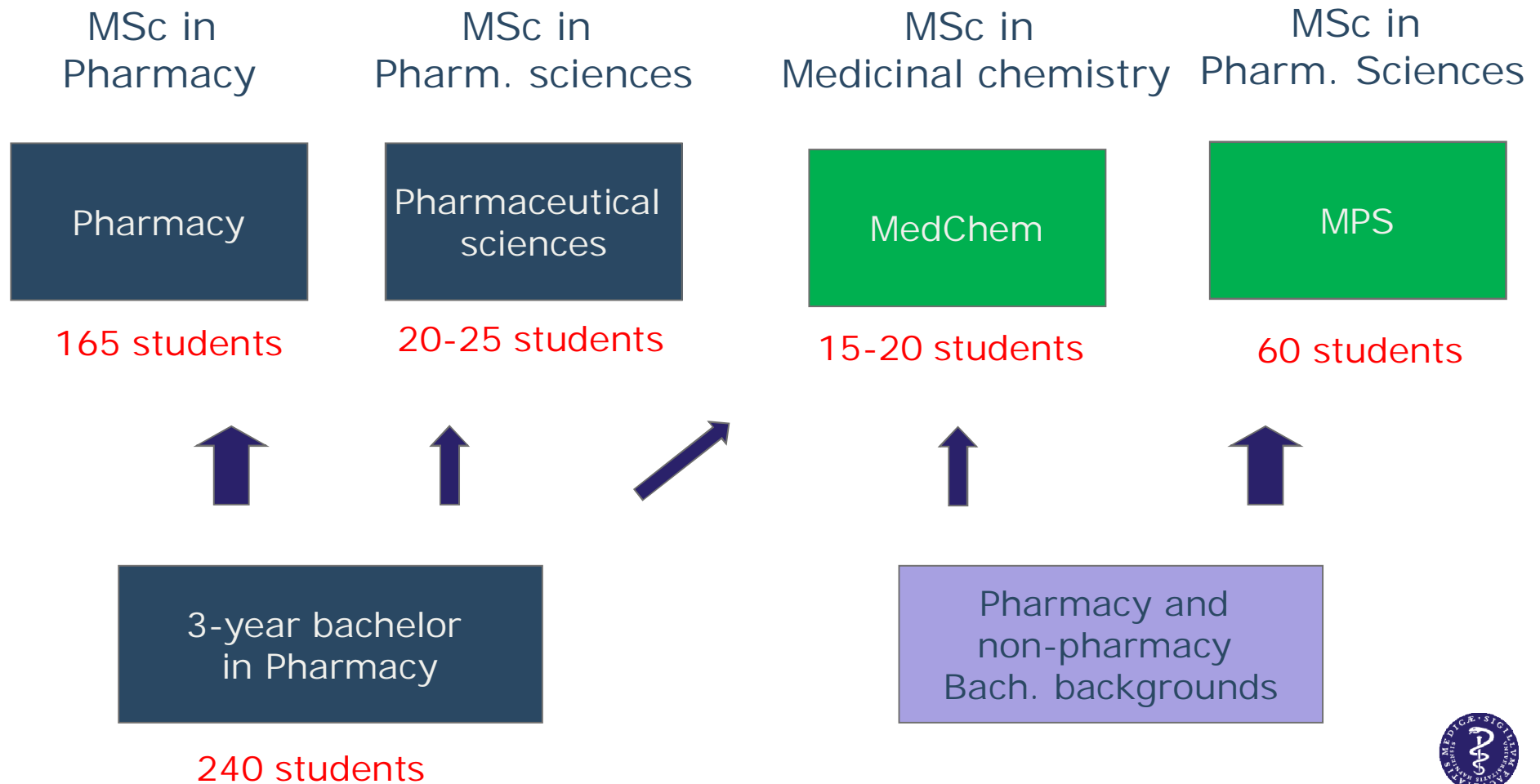
BSc and MSc in
Animal Science

BSc and MSc in
Biology-
Biotechnology

Master of
Companion
Animal Clinical
Science

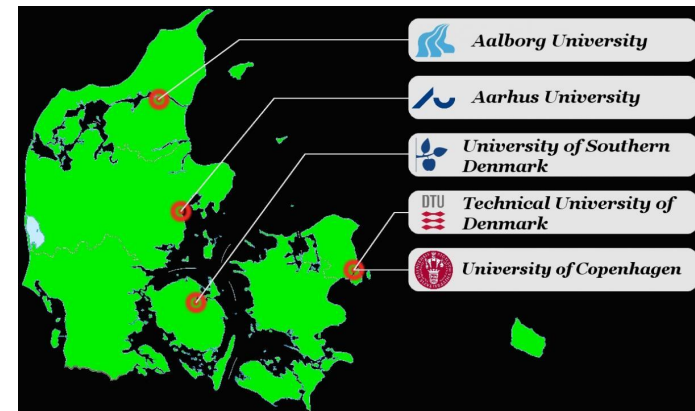


PharmaSchool BSc and MSc programs



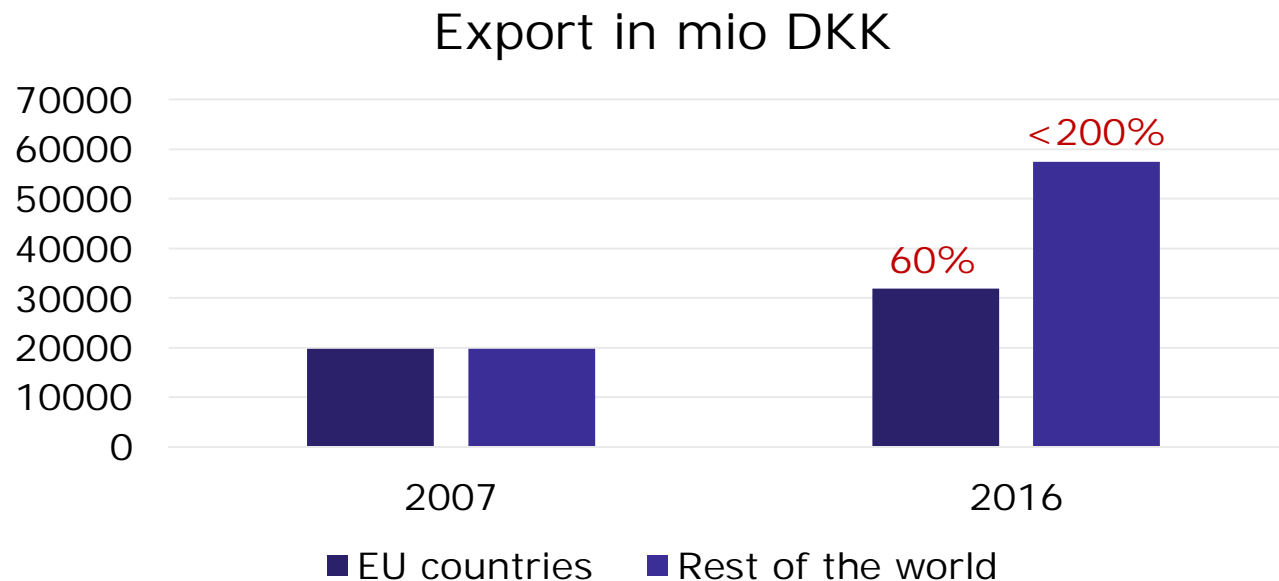
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 - 2007 – Faculty of Pharmaceutical Sciences
 - 2012 – Faculty of Health and Medical Sciences
- National “study progress reform”, ver. 1.0 in 2014 and ver. 2.0 in 2016
 - Reduce number of dropouts
 - Reduce student delays in study



Life science and the economy of Denmark

Pharmaceutical products are the most important Danish export goods.



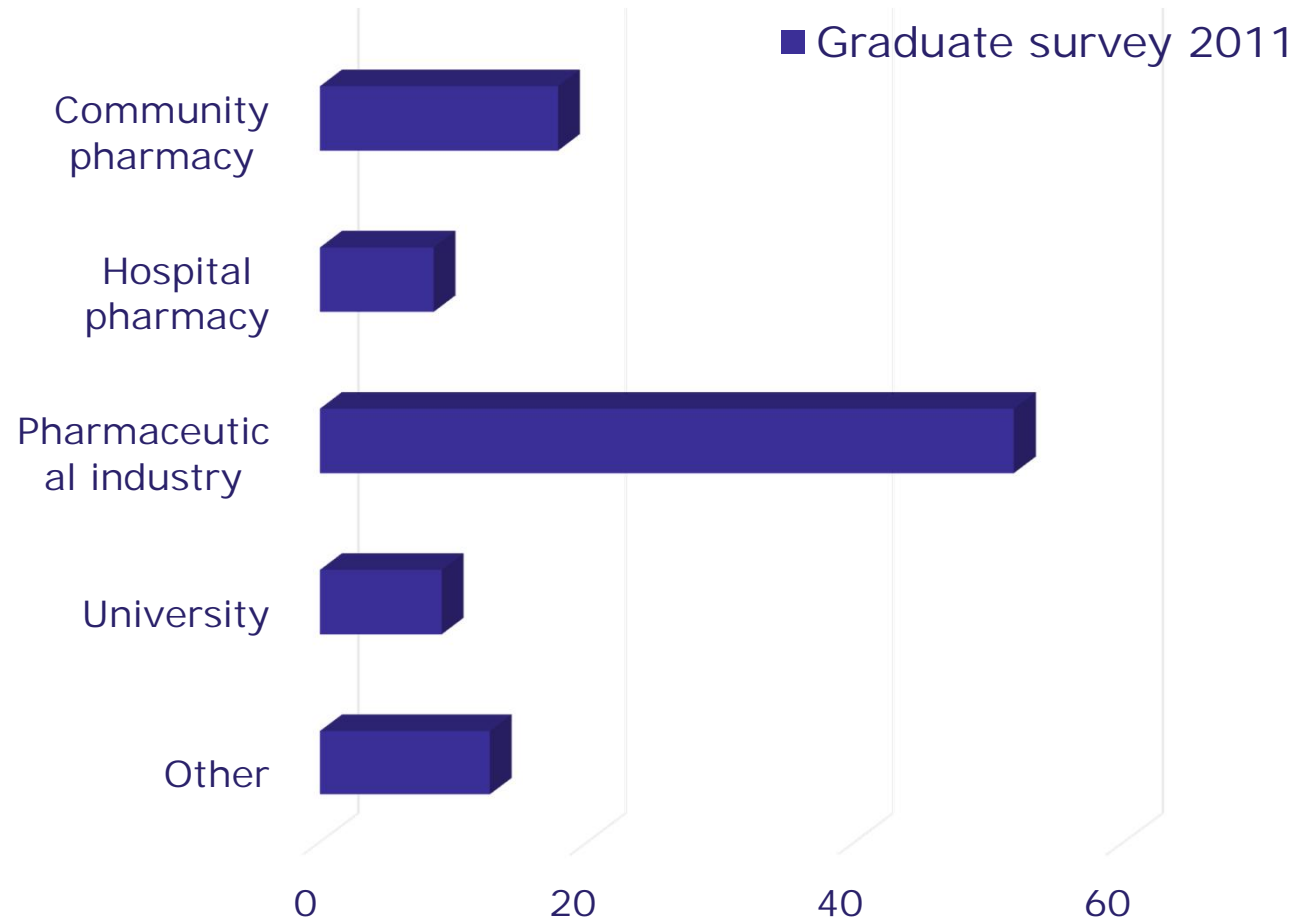
“National growth strategy for Life Science” has recently been presented and has received much political attention

The Danish Association of the Pharmaceutical Industry and Danmarks Statistik

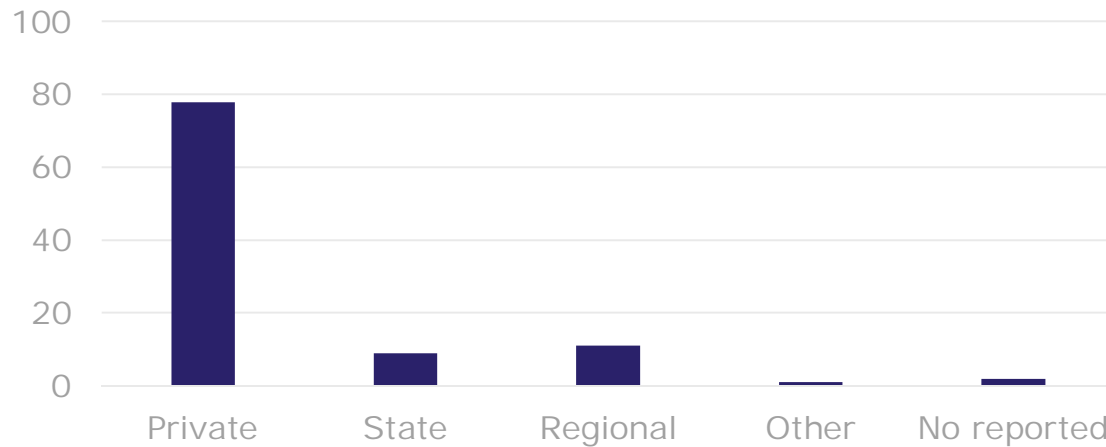
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Employment status MSc pharmacy graduates



Pharmacy graduates employment (in sectors - Survey 2015)



PhD students not included

- Top private workplaces
- Novo Nordisk
 - Community pharmacies
 - H.Lundbeck
 - LeoPharma
 - Biogen
 - Alk Abello

- Top state workplaces
- Københavns Universitet
 - Statens Serums Institut
 - The Danish Medical Agency

- Top regional workplaces
- Region Hovedstadens Apotek
 - Region Sjællands Sygehusapotek
 - Hospitalsapotek Region Midtjylland



Important focus points in the development of the 2015-BSc curriculum

- BSc in pharmacy should be tailored to all three MSc programs
- Covering fundamental natural/biomedical science as well as use of medicines (Advisory board input)
- Constructive alignment, including student motivation
- Experimental elements included in all/relevant courses
 - Balance between following detailed laboratory instructions and independent and more creative thinking (personal reflections and design of experiments)
- Online and blended learning initiatives – implemented and in progress



Bachelor in pharmacy – curriculum 2015

Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6
Drug development - from molecule to man	Organic chemistry II – synthesis of drug molecules	Biopharmaceuticals – bioorganic chemistry	Social Pharmacy - Method and Dissemination	Systems Pharmacology - Signaling Pathways	Elective
Chemical principles	Pharmaceutical Biology	Basic Pharmacology	Organ Pharmacology	Drugs from nature	Elective
Cellular and molecular biology	Pharmaceutical Physical Chemistry I - thermodynamics and equilibrium	Philosophy of Science and Social Pharmacy	Pharmaceutical Analytical Chemistry	Pharmaceutics II – Solid Dosage Forms	Bachelor's project
Organic chemistry I – Physicochemical properties	Evaluation of Pharmaceutical Substances	Pharmaceutical Physical Chemistry II - Kinetics and Transport Phenomena	Pharmaceutics I - Liquid and Semi-Solid Dosage Forms	Pharmacotherapy	

Use of drugs

Development and production of drugs

The pharmacological basis for drugs and drug substances

The chemical basis for drugs and drug substances



Implementation of Bachelor's program

Status:

- Students like the program, the courses and the ambitions
- First year dropout rates and delays still not acceptable

Short term plan:

- Personal and focused feed back is planned during later parts of first semester. To show the less privileged students what it takes to study at university.
- Maybe a reduction in contact hour should be considered and exchanged by other student activities.



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Planned structure of the 2018-Pharmacy curriculum

Sem 1	Sem 2	Sem 3	Sem 4
Advanced Pharmaceutics	Internship (30 ECTS) or elective courses	Internship (30 ECTS) or elective courses	Master's thesis (30 – 60 ECTS)
Pharmaceu- tical Policy, Economics and Ethics			
Toxicology and Drug Safety			
Medicinal and biostructural chemistry			



Overview of MedChem program

	Block 1	Block 2	Block 3	Block 4
Year 1	Reactions and synthesis in Medicinal Chemistry	Reactions and synthesis in Medicinal Chemistry	Heterocyclic chemistry	Biopharmaceuticals chemical design and modifications
	Medicinal and biostructural chemistry	Structural and computational medicinal chemistry	Elective	Elective
	Block 1	Block 2	Block 3	Block 4
Year 2	Flexible (Elective or thesis)	MSc thesis	MSc thesis	MSc thesis
	Flexible (Elective or thesis)	MSc thesis	MSc thesis	MSc thesis

Compulsory	Elective	Flexible (Elective or thesis)	MSc thesis
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The Copenhagen Centre for Regulatory Science (CORS)

Vision:

- aims at being the international partner for academic leadership in regulatory science, research and education. And to participate in building the regulatory framework that will make innovative medicinal products available to patients



Headed by Professor Marieka De Bruin

- developing new tools, standards and approaches to evaluate the efficacy, safety, quality and performance of medical product in order to assess benefit-risk and facilitate a sound and transparent regulatory decision making

Educational involvement:

- MSc programs in pharmacy and pharmaceutical sciences
- Internships (MSc students in companies)
- Professional master's degree (MSc in Medicines Regulatory affairs)



Thank you for your attention



Future elective courses (Open for BSc-students)

Course title (tentative)

Design, synthesis and reactivity in medicinal and biopharmaceutical chemistry

Statistical design and analysis of experiments

Characterization of drug substances and drug delivery systems

Advanced Pharmacotherapy or (Clinical Pharmacy)

Contemporary social pharmacy

Neuropharmacology: from pathophysiology to pharmacotherapy

Drug delivery to the central nervous system (CNS)

Intellectual Property Rights and Innovation

Radiopharmaceutical Chemistry



Future elective courses (MSc-level)

Course title (tentative)
Advanced Medicinal Chemistry
Molecular structure and interactions
Pharmaceutical modelling/multivariate data analysis
Quantitative Pharmacology or Pharmacometrics
Methodologies and Procedures in Clinical Drug Development
Clinial trials/pharmacovigilance
Regulatory Sciences
Clinical Pharmacist
Theories and Research Methods in Social and Clinical Pharmacy
Biopharmaceuticals: Formulation of Peptides and Proteins
Biopharmaceuticals: Protein Production and Analysis
Biopharmaceuticals: Chemical Design and Modification of Biomacromolecules
In vitro techniques in biochemistry and pharmacology
Bioanalysis by Chromatography and Mass Spectrometry
Biopharmaceutical aspects of drug formulation design and delivery
Advanced manufacturing of pharmaceuticals

