

From Pharmacy to Pharmaceutical Sciences – The New Curriculum

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Abstract: Looking at the statistics of Pharmacy graduates, the picture has changed considerably over the last 25 years. In the 1980s at least 80% of the diploma students chose an occupation in a community pharmacy. Today graduates are employed in hospitals, industry, government, and in public health positions beside the traditional community pharmacy that still accounts for about 50%. This reflects the strategy of the Institute to develop 'Pharmacy' into 'Pharmaceutical Sciences', which has been pursued by the nomination of several professors in fields beyond classical pharmacy in the 1990s, while keeping the classical pharmacy chairs strong. This trend is ongoing with a recent nomination of a chair in Pharmacogenomics. As a consequence, a new concept for the training of pharmacists has been designed resulting in the Curriculum in Pharmaceutical Sciences that began in the year 2000.

Keywords: Bachelor's/Master's studies · Federal diploma for pharmacists · Pharmaceutical sciences

1. Introduction

The pharmaceutical sciences are concerned with the different aspects of drugs (Fig. 1). New therapeutics and diagnostics are established, characterized and brought into an adequate galenic form for safe use. New drug targets are identified which help to design specific therapies. New diagnostic tools are being developed. Furthermore health care is a central issue in our society and offers many attractive career opportunities. With the new curriculum a commitment has been made to offer the students a broad-based education at university level for the different facets of pharmaceutical sciences. The optional courses during the Master's studies allow for the students to develop a personal focus; however, specialization in a particular field of pharmacy is postponed until the postgraduate level.

2. Organization of the Curriculum

The federal diploma for pharmacists ('Eidg. Apothekerdiplom') requires studies of five years at university level, which is compatible with the EU guidelines. The new curriculum has been designed in the format of the Bachelor's/Master's (BSc/MSc) studies presently being implemented at the ETH (Fig. 2). The number of semesters required for the two levels are: 6 semesters (three years) for the BSc and 3 semesters (1½ years) for the MSc. For the federal diploma an additional half-year has to be spent as an intern focusing on practical aspects of the profession. The BSc ETH in Pharmaceutical Sciences is *not* a federal degree and does not qualify for work as a health-care professional.

3. Basics in Natural Sciences

The first two years of the curriculum are dedicated to the basics in natural sciences: mathematics, computer science, physics, statistics, fundamentals in biology, general and organic chemistry. The program is identical with that for biology students. Special lectures for pharmacists are offered in anatomy and physiology. In addition, an introductory course on Pharmaceutical Sciences has been established, comprising milestones in pharmacy, biology, chemistry, and medicine. At the same time, students are introduced to the teaching and re-

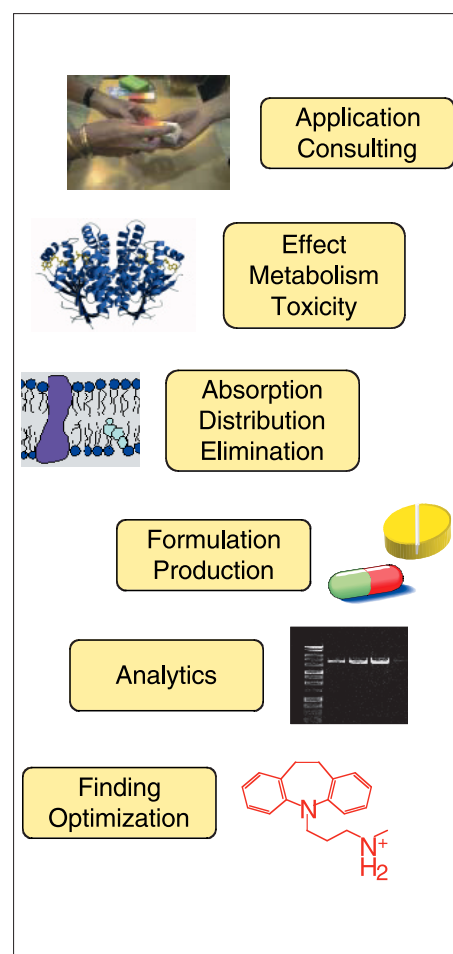


Fig. 1. From drug finding to consulting – spectrum of topics in Pharmaceutical Sciences

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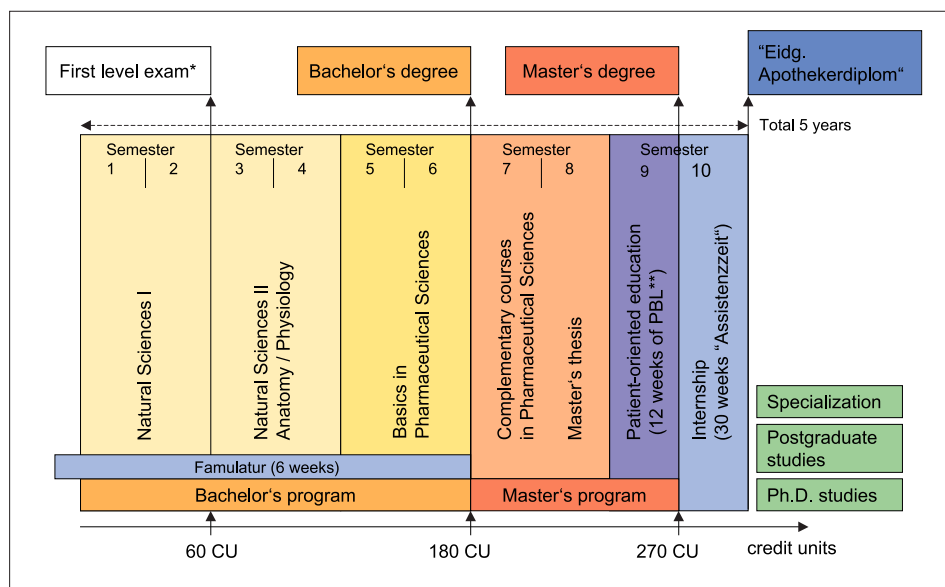


Fig. 2. Curriculum in Pharmaceutical Sciences at ETH. * 'Basisprüfung', i.e. first exam for benchmarking; ** problem-based learning. For more information see <http://www.pharma.ethz.ch>.

search programs of the different professors at the Institute of Pharmaceutical Sciences (IPW) and information is provided on job opportunities and the situation in the health-care sector. After the first year, students take a first exam ('Basisprüfung') to benchmark their performance. From the second year on, credit units (CU) for every subject have to be achieved that contribute to the final balance of the BSc (total 180 CU).

4. Education in Pharmaceutical Sciences

The focus in the third year is on drug-related aspects. Basics from the discovery of active substances to their application are covered. The subjects comprise: Pharmaceutical Chemistry, Pharmaceutical Analytics, Biopharmacy, Galenical Pharmacy/Quality Control, Pharmaceutical Biology, Pharma-

cology/Toxicology, Radiopharmacy, Genetic engineering, Nutrition/Dietetics, Social and Preventive Medicine, Evidence-based Medicine, Pathobiology, Medical Microbiology, Business Administration. Lectures are accompanied by practical courses that account for more than 50% of the time. Much emphasis is put on the retrieval and digestion of information.

From the fourth year on, optional courses are offered that permit in-depth studies on selected topics of the basic courses, but also open new fields such as ethno-pharmacy, environmental aspects of drugs, and the history of pharmacy. An interdisciplinary approach is taken with the series 'Arzneimittelseminare' in which students concentrate on different aspects of a general theme such as 'Insulin Therapy', 'Vaccines: Trends in Development and Application', 'The Development of Specific Radiotherapeutics' and 'Phytopharmaca – the Kava-Kava Controversy'. These projects are pursued in small

teams of students accompanied by a tutor. Results are presented in the presence of experts in the field and a written summary is deposited. In the frame of the Master's thesis, students get a chance to work on their own scientific project. They are integrated in the research groups of the IPW or alternatively go to research groups in the university hospital or in industry. In all cases, the projects are supervised by one of the IPW's professors. With a total of 270 CU (including 180 CU of the BSc) the MSc ETH in Pharmaceutical Sciences can be obtained.

5. Advancing to the 'Medizinalperson' with Federal Diploma

Students who opt for the federal diploma in Pharmacy ('Eidg. Apothekerdiplom') have to follow a structured fifth year with theory blocks (total of 12 weeks, equivalent to 30 CU) and an internship with a focus on practical aspects (total of 30 weeks; 20 weeks in a community pharmacy and 10 weeks in a community pharmacy or a hospital). The two parts are interconnected to foster problem-based learning. The concept of this newly designed 'Assistenzjahr' resulted from a joint effort of the Swiss Pharmacy Schools (University of Lausanne/Genf, University of Basel and ETH Zürich). Lecturers are recruited among practitioners in community pharmacies, hospitals and the health-care sector. Topics comprise pharmaceutical technology for community pharmacies, patient-oriented pharmacy in the hospital, practical aspects of drug therapies, pharmaceutical care and health care, legal issues and economic aspects in pharmacy. In an integrating effort, emphasis is put on the development of communication skills, social competence and the sensibilization for ethical concerns. The final exam, which leads to the diploma 'eidg. dipl. Apotheker/Apothekerin', is under the auspices of the federal government.

6. Job Opportunities

Job opportunities for pharmacy graduates have expanded considerably within the last decade (Fig. 3). Based on their educational background, pharmacists are all-rounders. Besides their expertise in the pharmaceutical sciences, they have fundamental knowledge in the natural sciences and also a basic understanding of medical issues. The federal diploma is attractive as it opens the door to all fields regulated by government legislation including production and quality control. This provides a competitive advantage as compared to the other studies in the life sciences field.

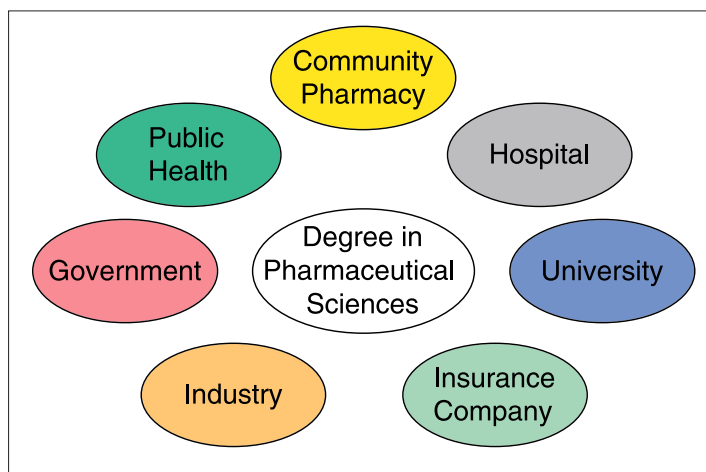


Fig. 3. Job opportunities for graduates in the pharmaceutical sciences