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The changing face of Pharmacy

François Ledermann[1*], Antoine Geissbühler[2*], Gerrit Borchard[3*], Stefan Mühlebach[4*], Jean-François Locca[5,8], Jacqueline Bezençon[6,8], Nicolas Widmer[7,8]

[*]the 4 lecturers equally contributed to the symposium and to these proceedings.

[1]Institute for the History of Medicine, University of Bern and Schloss-Apotheke, Bern
[2]Service of Cyber Health Care and Telemedicine, Geneva University Hospitals and University of Geneva
[3]School of Pharmaceutical Sciences, University of Geneva and University of Lausanne
[4]Vifor Pharma, Glattbrugg and Department of Pharmaceutical Sciences, University of Basel
[5]Pharmacie de Prilly and University Out-patients' Clinic, Lausanne
[6]PharmaCenter, University of Basel
[7]Division of Clinical Pharmacology, University Hospital Center and University of Lausanne
[8]swissYPG, Bern

Drug professionals have regularly seen during history their activities changing and evolving. The pharmacy profession is currently facing new challenges in a changing world. The Swiss Young Pharmacists Group (swissYPG) has organized in 2011 an educative and reflective symposium on this theme on the occasion of the first Swiss congress of pharmacists in Interlaken [1]**.**

The manufacture of drugs: from apothecary to industry [2, 3]

Driven by the three pillars of traditional pharmacy, which are manufacture, storage and administration of medicines, the pharmacist appeared in Europe in the 12th century under the impulse of mutations due to Arab science. Galenics was then driving expansion of the profession. The apothecary manufactured many preparations, such as electuaries, pills and troches within the practice of polypharmacy. The pharmacist of the Middle Ages, and then of the Renaissance, found a legal and institutional basis supported by multiple regulations. Both the access to the profession and the education of the future apothecary were codified and emphasized two aspects: the book knowledge and the practical knowledge, reflecting the role of pharmacists in the manufacturing of drugs. Despite several paradigm shifts that affect treatment, such as spagyric medication of Paracelsus or new drugs from the Americas, the central place of the apothecary in manufacturing continued until the 19th century. It is also established by the many pharmacopoeia and formularies that appear in Switzerland and elsewhere.

In the early 19th century, when alkaloids appeared[1], the daily work of the pharmacist was altered by these new molecular substances. Since 1850, new drugs arrived, especially the first products of organic chemistry which are initially antipyretic analgesics and sleeping pills. This phenomenon led to many changes: new formulations such as capsules, tablets and injectables, a more pharmacological vision of drug and the take off of pharmaceutical industry. The latter grew

[1] Active ingredients mostly isolated by pharmacists for the first time.

Correspondence address:
Swiss Young Pharmacists Group, Stationsstrasse 12, 3097 Berne-Liebefeld; E-mail: swissYPG@pharmaSuisse.org

rapidly, often from community pharmacists' laboratories. Gradually, and especially during the 20th century, the proprietary drug took over magistral formula, in particular as a result of major change in therapeutic approaches and dosage forms. Antibiotics, psychiatric drugs, hormonal products and many other drugs, developed since the early 20th century, were thus sold as proprietary drugs.

Fig. 1. Prof. François Ledermann

The pharmacist, who was still mostly developing traditional dosage forms such as pills and decoctions from whole extracts in 1900, lost his predominance in the manufacture of drugs. The advent of industrial society has therefore radically transformed the work of the pharmacist as well as his social image.

The new information technologies [4, 5]

Industrial society now seems to give way to a so-called information or knowledge society[2]. What about then of the new professional world in which the pharmacist will evolve? Health systems are undergoing strong demographic, societal, economic and qualitative pressures. The medication circuit represents therefore a major financial and security issue. In this context, the roles of health professionals are clearly destined to evolve. In parallel, patients are increasingly interconnected and want to have a voice. The future seems to be in the regional, national and international networks and expectations are high towards computer tools to improve medicine in the 21st century. These tools tend thus to become the nervous system of public health. We must be able to communicate, understand, decide, manage and develop our health systems in a world where information is becoming a real strategic issue, more and more every day.

In hospitals, for instance, computerization can reduce complications, mortality rates and costs. However, poor adoption or use of computer tools can be dramatic (e-iatrogeny). A prerequisite for optimal benefit is the design of programs that are simple and ergonomic, connected and mobile, context-aware[3] and relying on a robust infrastructure (security, etc.). For outpatients, integrated, personalized and local IT services could also allow a better care of patients at home (e.g. Ambient Assisted Living program; AAL), given the aging population and growing incidence of chronic diseases. Telemedicine is also gaining importance and seems to improve patient comfort and care within regions with few health care providers. Finally, health information networks projects (e.g. e-toile in Geneva) could improve the quality and efficiency of care by efficiently sharing information among all health care providers while actually putting the patient at the center of the process.

[2] Distinction however discussed as this society relies on a solid industrial fabric.

[3] Localization, activity, vital signs, emotional status.

Fig. 2. Prof. Antoine Geissbühler

Thus, like their medicine and nursing confreres, community pharmacists (including those involved in home care), as well as hospital or industry pharmacists, are expected to integrate these new paradigms and tools in their practice, while remaining able to judge their actual usefulness for optimal management of the patient.

Pharmaceutical industry's development strategies [6, 7]

Forced by the high attrition rate of late stage drug candidates, and increasingly empty pipelines, several strategies are being followed by pharmaceutical industries to increase the number of candidates. Among them is the establishment of high throughput screening methods to search large libraries of chemical structures and to identify potential drug candidates. However, big expectations in this approach have not entirely been met, and the human factor may prove to be as efficient[4]. Another approach is the development of biological (proteins and antibodies). They have been the driver of innovation for the last few years, made possible by the advance of studies on their basis of action, stemming from proteomics and genomics. Another buzz word in drug development is "Individualized Medicine", which takes into account the impact of differences between patients on drugs' efficacy (target expression, pharmacokinetics, pharmacogenetics, etc.)[5]. More and more, therapeutics will be accompanied by so-called "companion diagnostics". Last but not least, portfolio management, i.e. the search for additional indications for the same drug (by various approaches such as reverse genetics) or acquisition of biotech companies to obtain access to new drug candidates are other opportunities for "Big Pharma".

However, such novelties must be knowledge-based, which demands a close interaction between academia and industry. This cooperation is yet not easy to manage (different assumptions, conflict of interests, etc.). Academia is interested in creating and diffusing knowledge, although it is also slowly moving to market activities (papers publication to acquire funding, patenting, etc.). Academic scientists are yet often being focused too much on the fundamental side of drug discovery and development, neglecting the translational approach in which their findings should be translated into a real-world product. To the contrary, drug development in the corporate world is designed to create revenue for the company. In an industrial environment, scientific creativity is often suppressed. Industrial organizations are aware of these limitations and strive to either implement "biotech-like" structures in drug discovery and early development, or seek interaction with academic institutions (called a "collaboration bubble"). In addition, multilateral "open innovation" models do exist, in which

[4] E.g. thanks to the Lipinski "Rules of 5" to evaluate druglikeness.

[5] E.g. trastuzumab that is used regarding differences in the expression of the target protein.

knowledge is shared between several partners from academia and industry, often using "Web 2.0" tools[6].

Fig. 3. Prof. Gerrit Borchard

For community and clinical pharmacy, such new developments should have a significant impact (e.g. diagnostic/monitoring kits, etc.).

Round table and discussion

This symposium has tracked past and present evolutions of the pharmacist, by giving us the opportunity to think about the future of this profession. A historical perspective has first allowed following the impressive developments and changes in the pharmacy profession throughout the last centuries. In the new environment of information technologies and of a health system confronted with major demographic changes, the drug is now considered also in terms of costs and risks. Therefore, the pharmacist can, and has to, significantly contribute to teams and networks of care. The situation in the pharmaceutical industry was finally presented from the scientist's viewpoint with experience in both industry and academics. Pharmaceutical companies are seeking new collaborations with universities to bring more drugs in the pipeline.

Fig. 4. Prof. Stefan Mühlebach

The roundtable also allowed addressing the issue of education of pharmacists. Given the employment market, the question arises whether it meets the mutations observed (Fig. 5). Are young pharmacists able to make the right career choice at the end of their studies? Are graduates "fit for use"?

In addition to preparing to federal exam, the fifth year of study is also the crucial period of career orientation. The studies' reform had an "assessment area" much larger and wider in time that is possible in Switzerland today. One should consider the duration of studies of natural and medical sciences in the context of international competition for work. This raises the question whether the strength and excellence of Swiss dual education system (both academic scientific studies and university of applied sciences[7]) can be applied to the pharmacy. Anyway, social and practical skills, poorly transmitted during university studies, should also be provided to a generation that already generates new social interaction via the Internet. These capabilities are often crucial for the job's success and satisfaction.

[6] E.g. the "Open Source Drug Discovery" network, for novel anti-tuberculosis drugs.

[7] Professional practice-oriented.

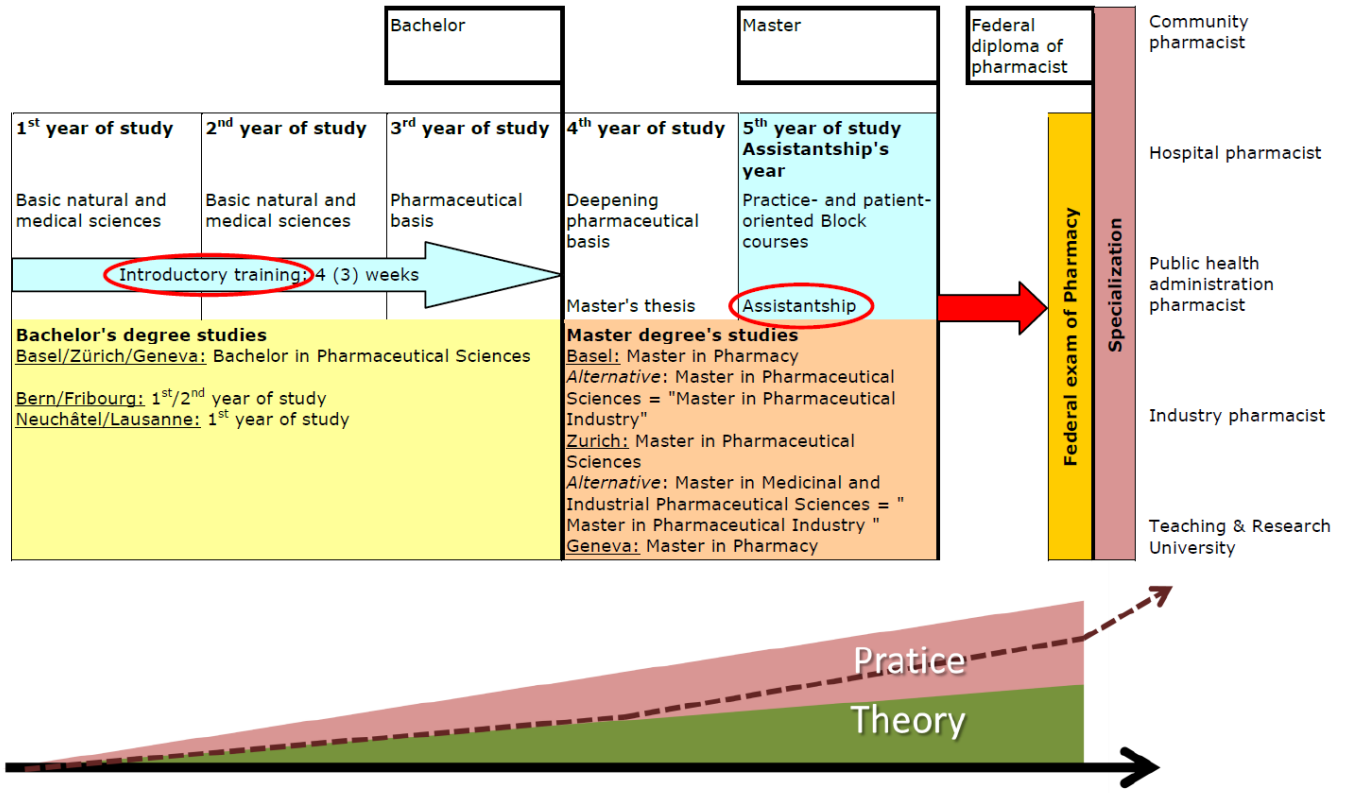

Fig. 5. Undergraduate and continuing education: fit for use? (courtesy of pharmaSuisse)

However, unlike in the past, individual career orientation will often be modified, notably by the influence of the balancing between work and family activities. All this highlights the importance of lifelong learning[8].

Comments from young pharmacists, faced with the crucial period between graduation and first job, are very important. They provide reflection on the effective adaptation of education and training in pharmacy, both in term of content and of their arrangement, as well as in their durability against the evolving needs of the profession [8].

Fig. 6. Round table

[8] I.e. continuing education; one speaker also talked about the need for a professional realignment every 10 years.

This symposium showed in this regard that an important responsibility lies on the swissYPG because of the reflection platform it provides. In concert with other health professionals and peers, it can help to build better pharmaceutical roads and to define the future of pharmacy, ultimately for the benefit of the patient.

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References

[1] Widmer N, Bezençon J, et al. La Pharmacie en mutation. *pharmaJournal* 2011; 149(16): 19.

[2] Chast F. Histoire contemporaine des médicaments. Paris: La Découverte; 2002.

[3] Helmstädter A, Hermann J, et al. Leitfaden der Pharmaziegeschichte. Eschborn: Govi-Verlag; 2001.

[4] Frist WH. Shattuck Lecture: health care in the 21st century. *The New England Journal of Medicine* 2005; 352(3): 267-72.

[5] Medicine goes digital: A special report on health care and technology. *The Economist* 2009: 1-14.

[6] Luessen HL, Borchard G. Protein pharmaceuticals: Recent achievements and trends for formulation and delivery [Editorial]. Injectable drug delivery 2010: Formulations focus: ONdrugDelivery; 2010. p. 4-7.

[7] Kling J. Biotechs follow big pharma lead back into academia. *Nature Biotechnology* 2011; 29(7): 555-6.

[8] Federal Act of 23 June 2006 on University Medical Professions (LPMéd) Section 2 Specific objectives for training, Art. 9 Pharmacy; RS 811.11. http://www.admin.ch/ch/f/rs/c811_11.html [06.02.2012].