Pharmacology at the University of Lund

We were appointed by the Medical Faculty of the University of Lund to evaluate the Pharmacology discipline in Lund and to give recommendations. To assist in this, we have been given substantial background material, which we believe is known by the faculty and which we therefore do not replicate in this report. Besides, we have had a site visit on 1 June 2011 where we met key representatives from the faculty as well as of the discipline. Based on the background material, the site visit and our deliberations, we hereby present a number of recommendations.

The Medical Faculty of the University of Lund has decided that time is ripe for a major overhaul of the area of pharmacology. It has traditionally been very strong in Lund with notable scientists such as Overton, Thesleff, Håkansson, Andersson and Melander. For various reasons, it has not been possible to fully maintain this strong position. Indeed, the sometimes excellent research in pharmacology at present is fragmented into subdisciplines with little common pharmacological identity, and there is no focus and no clear leadership. The teaching of pharmacology may also have suffered - partly because there are fewer pharmacologists as teachers and partly because pharmacology is a discipline that integrates knowledge of all organ systems and is not well taught in its entirety with an organ-based approach. Finally, the part of clinical pharmacology that involves direct interaction with patients and clinicians has not been well maintained.

In 2012, a Master’s programme in pharmacy will start in Lund. Even though the present staff may give several aspects of the proposed curriculum, this is not true for much of the pharmacology. It is a particular challenge that two of the profile areas of the programme will be Drug Discovery and Clinical Pharmacy. Neither area is very strong at present.

Thus, pharmacology in the broadest sense needs to be strengthened in Lund for several independent reasons. There are new challenges that need to be met. We think the present
situation offers a unique opportunity, and we hope the faculty will have the audacity to take the chance by bold action.

**Pharmacology**

Pharmacology is the area of medicine, pharmacy and biology that is concerned with the study of drug action (1). More specifically, it is the study of the actions of drugs on living organisms. Basic pharmacology, sometimes referred to as molecular pharmacology or in French-speaking countries as fundamental pharmacology, is the part of pharmacology specifically concerned with the molecular aspects of pharmacology. Animal pharmacology is sometimes referred to as experimental pharmacology, and this is the area of pharmacology that deals with the study of drug actions on living animals.

Until 25 years ago, drugs were used to discover drug targets, drug transporters and drug metabolizing enzymes, and the same structures were functionally characterized and hence classified by drugs. Clearly, the pharmacologists were the scientists who used drugs as experimental tools, especially in live animals. The revolution in molecular biology, the mapping of the human genome, proteomics and imaging techniques has changed this picture completely. Basic biomedical research has become a melting pot and the distinction between the classical disciplines including anatomy, physiology, pharmacology etc. has become somewhat arbitrary.

All basic biomedical researchers aim at understanding molecular mechanism of disease with the ultimate goal of discovering or designing new chemical entities for unmet medical needs. In this regard, they have all become pharmacologists but only a minority has a genuine interest in drugs. In 1964, the famous British pharmacologist John Gaddum wrote: “The Pharmacologist has been a 'jack of all trades,' borrowing from physiology, biochemistry, pathology, microbiology and statistics, but he has developed one technique of his own and that is the technique of bioassay”. Thus, in modern times, other basic scientists, clinicians, faculty managements and more importantly funding offices increasingly have a difficulty in seeing the beauty of pharmacology which somehow is seen as a superficial discipline that borrows from others without having an identity of its
own. This is totally wrong and even a modern pharmacologist may be defined as “a physiologist who knows the right dose”. With the many challenges that drug discovery, drug development and drug use pose on society, it is increasingly important that pharmacologists take a leading role in basic as well as clinical and more society-oriented biomedical research.

**Clinical pharmacology and clinical pharmacy**

Clinical pharmacology is the scientific discipline that in principle involves all aspects of the relationship between drugs and humans. Its breadth includes the development of new drugs, the application of drugs as therapeutic agents, the beneficial and adverse effects of drugs in individuals and society, and the deliberate misuse of drugs. Clinical pharmacology is a science that may be of significant importance to a variety of professions including physicians, pharmacists, nurses and scientists in many different disciplines.

The term ‘clinical pharmacologist’ is also used in the professional sense to refer to those physicians who are specialists in clinical pharmacology. They have usually undertaken several years of postgraduate training focusing on important aspects of clinical pharmacology including clinical trials theory, drug evaluations, pharmacoepidemiology, pharmacoepidemiology, pharmacogenetics, pharmacovigilance and clinical drug toxicology. Such clinical pharmacologists have as their primary goal, that of improving patient care, directly or indirectly by promoting the safer and more effective use of drugs. For further reading, we refer to a recent comprehensive review (2).

Clinical pharmacy is an area within the pharmaceutical sciences that specifically focuses on the optimal and rational use of drugs for the benefit of the patient as well as society. Clinical pharmacists cover the same aspects in clinical pharmacology as the clinical pharmacologists but with the focus on the *product* rather than the patient and the medical treatment. Clinical pharmacists should work fully integrated with clinical pharmacologists, physicians and other health care professionals as well as the patient him-/herself.
How to organize pharmacology in Lund

Basic pharmacology may be viewed as the classical pharmacological discipline and it is usually organized within a pharmacological institute or as a separate pharmacological department within a faculty of health, pharmaceutical or sometimes veterinarian sciences. The main tasks are research and undergraduate teaching of medical, biomedical, pharmacy and veterinarian students. Clinical pharmacology, on the other hand, is a medical specialty in Sweden as well as in the other Nordic countries, and it should therefore be organized in a separate department or section within a Centre of Laboratory Sciences in a University Hospital. Clinical pharmacology also does research and undergraduate teaching but in addition it has commitments to the health care system including drug information, therapeutic drug monitoring, drug committee and pharmacovigilance, just to mention a few possibilities.

The separation of basic and clinical pharmacology has a historical origin and it has been and still is a cause of much conflict and controversy within the subject, which is counterproductive for both parts as well as for pharmacology as a whole. Time has come to bring both ends together in one united organization. Modern basic pharmacology is difficult to distinguish from other basic sciences, and it needs clinical pharmacology to strengthen its drug profile. On the other hand, what distinguishes clinical pharmacology from other medical specialties is that the well-educated clinical pharmacologist has a very solid theoretical training in basic and clinical pharmacology.

The distinction between clinical pharmacology and clinical pharmacy is more clear-cut yet another cause of much controversy and conflicts in many places. A clinical pharmacist has an authorization as a pharmacist, and in Sweden a clinical pharmacologist is a physician and hence not a pharmacist. Both disciplines aim at promoting rational drug use, and there is a considerable overlap in what they claim they do. In practice, there is a great difference in how the two disciplines achieve their goals because clinical pharmacy has the drug as a product as its focus whereas clinical pharmacology has the patient as its focus. If well organized and coordinated in an environment characterized by mutual trust and respect, the two disciplines together provide a very powerful instrument
towards the rational use of drugs, and it is a matter of management to see to it that this happens.

Trends in the discovery process of New Chemical Entities (NCE)

Globally, the pharmaceutical industry brings about 25-30 new drugs to the market annually, which is more or less the same number as 60 years ago (3), but the costs for developing each new drug nowadays are approximately 1 billion USD. The development of new pharmaceutical products is handled within the pharmaceutical industry based on findings in different disciplines of basic research. A pronounced modern trend is that academic institutions and small and specialized commercial companies manage early phases of this process. Modern drug discovery is often based on techniques and strategies that favour the development of very lipophilic, hence poorly soluble small molecules, so-called non-Lipinski drugs, and also the increasing number of new drugs of peptide nature. Both the non-Lipinski and the peptide drugs have low bioavailability posing new challenges in the area of drug delivery.

The research focus and the educational contents of a pharmacy programme including pharmacology should consider this situation, i.e. to teach students in all steps of the pharmacological actions that are involved at different stages of product development. This includes basic mechanistic laboratory trials, animal experimental work, and safety assessment before human exposure, design and conduct of phase 1 in volunteers and the design of the final clinical programme before marketing authorization. The regulatory quality demands as defined by national authorities (FDA, EMA and more) – i.e. Good Laboratory Practice (GLP), Good Clinical Practice (GCP) and more, are vital parts in pharmacological education and research.

Furthermore, knowledge of the impact on health economy and post-marketing surveillance for reporting and handling of adverse events are essential parts of the pharmacological education.
The qualifications of the teaching staff in pharmacology should reflect the above given subjects for education, either by its own capacity or by organizing networks of experts.

**The present and future role for pharmacists**

The pharmacological education of pharmacists shall fulfill the needs for the present and future occupations in pharmacies, the pharmaceutical industry and drug regulatory authorities as well as for different public councils in communities, hospitals and purchasing groups. Furthermore, pharmacists also have a professional responsibility for the education in pharmacology for other professionals in health care, i.e. nurses, nursing assistants, pharmacy assistants, etc.

The pharmacological expertise in society is presently widening its focus related to health economy, drug safety, rational use of drugs and quality and equity in drug use. The global perspective is the lack of access to new drugs in resource-poor settings. The cost of drugs as entities in treatments is dramatically increased and must be scrutinized and challenged. Sales promotion actions are increasingly brought directly to patients. This must be handled in an ethical fashion by professionals in the industry and managed by pharmacists and clinical pharmacologists (and all other professionals in health care!) in their positions in hospitals, pharmacies and all kinds of public and private patient care.

An evident trend in pharmacotherapy is the development of individualized selection and dosing of drugs (ie. individualized therapy), which calls for capabilities by the prescribers for correct patient assessments and access to laboratory facilities supporting rapid genotyping and the subsequent need for care and information in hospitals and pharmacies.

The role for the pharmacist with a solid pharmacological expertise will be contained in the professional position as “clinical pharmacist”. As outlined above, this category of pharmacists will have important supportive missions for inpatient care and will offer a key capability in community pharmacies.
Recommendation

The new pharmacy Master’s programme, which will be launched in 2012 at the University of Lund, has self-evidently a strong focus on drugs and this will prime a revival of pharmacology that on the other hand is mandatory for the programme. In order to achieve the desired rejuvenation of the pharmacological disciplines in Lund, it is necessary to establish a Pharmacology Centre ideally at a Laboratory Centre at the University Hospital of Lund. This involves recruitment of new competence to the Faculty of Health Sciences as well as to the health care system (“Landstinget”). It is recommended that the efforts of the Faculty should be coordinated by the efforts of the health care system (Landstinget) to build up and define the tasks and roles of clinical pharmacology and clinical pharmacy in the southern part of Sweden. Further detailing of this analysis lies outside the scope of the present expert statement. However, it must take place as soon as possible to ensure that the new recruits can give their creative input to the new structure, including the Master’s programme in pharmacy school.

We believe it is necessary to recruit at least three persons at a senior level; one focusing on preclinical or basic pharmacology, one on clinical pharmacology and one on clinical pharmacy. The clinical pharmacology position should be combined with a position as chief physician at the University Hospital of Lund, and the professor of clinical pharmacy should also have a part-time consultant position at the Hospital Pharmacy. One of the three candidates must have clear leadership qualifications and should become the new chairman of pharmacology whose role is to rally all the pharmacologists in Lund towards common goals. The chairman must continue to be an active researcher and should as a minimum have some international reputation, but he or she does not necessarily have to be a frontline researcher any longer. Further, it is possibly an advantage if a scientist, who has training as a pharmacist, occupies the preclinical position. The clinical pharmacologist should be prepared to take responsibility for the increased contacts with the clinical disciplines including primary care, hence the requirement that he or she is also a chief of the discipline. The clinical pharmacist should ideally have experience from teaching the area within the framework of a modern pharmacy school programme.
Even though at least one or two local candidates may fill one of the positions, we anticipate that the recruitment base is not sufficient to find suitable candidates for all positions within Sweden. It is the opinion of the expert committee that it is not possible to recruit strong candidates from abroad unless both the Faculty and the Landstinget together will guarantee an attractive package covering the first 7-10 years in the form of research assistant positions, funds to cover running costs, access to laboratory facilities and laboratory technicians as well as access to clinical trial unit facilities including GCP. Faculty and hospital leadership may change or change their minds and must be prepared to draft and sign a contract with the new chairman of the pharmacology centre in Lund where the specific contents of the package are detailed.

In addition to these senior positions, we think that recruitment of more junior candidates with complementary research/teaching profiles is desirable. The new chairman could initiate this.

Whereas research should be part of the obligations of all the positions, its weighting relative to teaching and administration may vary between the positions, and possibly also over time of employment as a result of internal and external evaluations.

We believe that the Faculty should make an effort to achieve as much synergy between the new recruits and the strong scientists already present at the faculty as possible. We have not been able to penetrate all the ramifications of such a physical co-localization, but tentatively suggest that localization within the Department of Laboratory Medicine in Lund close to Högestätt-Zygmunt and the Clinical Trials unit could offer advantages. Obviously, some of the scientists may wish to have their laboratories elsewhere and also have teaching in multiple locations.

Some years ago, a network activity, Läkemedel in Lund (LiL) that spans several faculties, was initiated. With its relatively limited budget, some activities including seminars and the development of a home page have been developed. This activity should be incorporated into a planned new Pharmacology Centre and could provide a basis for close
contacts with pharmacology-interested scientists from other faculties. The activity was recently evaluated and some recommendations for future activities of LiL were briefly described in the report. A new leadership of a Pharmacology Centre should seriously consider these.

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References:

