UCL Université catholique de Louvain

# LCHM2244

*2010-2011*

# Medicinal chemistry

| 3.0 credits | 22.5 h + 7.5 h |
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| Teacher(s) : | Marko Istvan (coordinator) ; Schneider Yves-Jacques ; |
| Language : | Anglais |
| Place of the course | Louvain-la-Neuve |
| Main themes : | 1. The pharmaceutical industry and its current social and economical environment.<br>2. The strategies of "lead discovery".<br>3. The optimalisation of ADMET properties.<br>4. The structure-activity relationships.<br>5. The methods of screening.<br>6. Selected examples of "structure-based" drug design. |
| Aims : | The course objective is to introduce to the master student (in chemistry or biochemistry) the different problems treated in pharmaceutical industry, from the discovery of an active substance ("lead" molecule), till the production of a commercializable drug. It is a general teaching that integrates concepts of physical chemistry, organic chemistry, spectroscopy and biochemistry (previously pointed out during the BAC cursus) into the multidisciplinary context of drug research and development. Particular attention will be focused on the knowledge integration and the multidisciplinary thinking, as it is nowadays the custom in pharmaceutical industry.<br><br>*The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".* |
| Content : | First, a general overview will be given on the pharmaceutical industry, with the main steps of drug research and development, from the conception to the commercialization. This particular industry will be placed in its social and economical context. Then, the available strategies of lead discovery will be explained, starting from serendipity to conclude with rational design: the unexpected discovery, utilization of synthetic chemistry, utilization of natural products from vegetal, animal or human origin (hormones, neurotransmitters,<br>). Each approach will be illustrated by examples: chlorodiazepoxide, sildenafil, dihydropyridines, non steroidal anti-inflammatory compounds, cannabinoid analogues, taxanes, epibatidine, squalamine, dolastatine, peptides and peptidomimetics, beta-blockers,<br><br>The choice, sometimes delicate, between racemate or pure enantiomer will be discussed (thalidomide, levoceterizine). "Lead" optimalization will be explained on the basis of ADMET properties (adsorption, distribution, metabolism, excretion, toxicity) which have to be addressed. In this context, the concepts of pro-drugs and drug delivery systems will be presented. The QSAR (quantitative structure-activity relationship) methods will be approached (bioisosterism, drug-likeness, molecular modelling, in silico methods). Modern methods of rapid screening for activity (HTS, high throughput screening) and related spectroscopic tools (NMR, Mass spectrometry) will be briefly presented. Finally, the rational design (structure-based design) will be illustrated with ACE (angiotensin converting enzyme) inhibitors, statines (HMG-CoA-reductase inhibitors), thrombin inhibitors, delta-opioid agonists,<br><br>Teaching method<br>o Oral presentation with transparencies, slides (or powerpoint).<br>o Interaction with the students (discussions, questions,<br>).<br>o Complementary documents given for personal information (recent articles). |

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| Other infos : | Background:<br>- Courses of chemistry and biochemistry of BAC (BAC CHIM with minor BIOL, and BAC BIOL with minor CHIM).<br>- Relation with other teachings: the course is constructed in such a way that the knowledge of a minimum of pharmacological terms is required.<br>However, introduction to basic pharmacology should be helpful for chemists (definition of the pharmacological targets and their functioning, agonists and antagonists, biodistribution, elimination processes,<br>). Students in chemistry interested in medicinal chemistry are invited to include in their program the courses BIOL 2226 (cellular pharmacology) and AGRO 2750 (human and animal toxicology). The protection of innovation in drugs' industry is also an important aspect, non covered in this course CHM 2244, because this matter makes part of the course SC 3001 (research, innovation and intellectual property: application to the domains of chemistry of life sciences).<br><br>Evaluation:<br>- Presentation of a personal work (written and oral presentation in a seminar) based on articles from the recent literature. The subject will be chosen by the student, in agreement with the professor, on the basis of personal interests in the field.<br><br>Supports:<br>Notes of the professor.<br>Review articles.<br>Books form the CHIM library.<br><br>The course could be partly or totally delivered by an invited lecturer. |
| Cycle and year of study : | > Master [120] in Chemistry |
| Faculty or entity in charge: | CHIM |