UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Medicinal Chemistry

2122-2-F5401Q039

Aims

This course provides students with the basic principles of pharmaceutical chemistry and rational drug design. Since this academic year (2020-2021) a credit will be taught by Prof. Francesca Magli of Di.SEA.DE, who will provide a series of insights on the economics of drug development and about the innovation in the process of drug development.

The teaching objectives are as follows:

KNOWLEDGE AND UNDERSTANDING ABILITY

At the end of this training activity, the student must demonstrate to be able to read a scientific article dealing with the rational design of new pharmacologically active compounds, the drug development (hit to lead), the pharmacokinetic. To achieve this goal during the course a series of very recent articles are analyzed that explain and exemplify the topics covered. The course provides the student with specific knowledge in the following areas:

1 Structure- and ligand-based drug design

2 hit to lead development

3 pharmacological targets (proteins, nucleic acids)

4 pharmacokinetic

5 Supply chain of drug development (Prof. F. Magli)

6 stories of successful drugs

CAPACITY TO APPLY KNOWLEDGE AND UNDERSTANDING

At the end of this training activity, the student must demonstrate that he is able to:

1 Draw a ligand given a pharmacological target

2 Imagine the development of a new lead

3 Imagine how to expand an existing group of congeneric drugs (with the same action and the same target)

JUDGMENT AUTONOMY

At the end of this training activity, the student must demonstrate to be able to critically read a scientific article, analyze its contents, judge any weaknesses and strengths of the article, foresee possible experimental and application limitations, imagine creatively further developments of the technique presented by the article. The teacher stimulates the critical discussion of the articles presented in class in order to accustom the student to this type of analysis of scientific literature.

Some students will present insights on specific topics that are then discussed together in the classroom.

LEARNING SKILLS

Expected results:

1 Collect and understand the new information needed to rationalize the properties of new drugs

2 Collect and understand information about the development of new targets and new leads

3 Economic and management aspects of the drug development process (F. Magli)

Contents

Rational drug design (structure and ligand-based), drug development (from hit to lead), pharmacokinetic, metabolism of drugs, prodrugs, strategies in drug release, examples of drug development, the drug supply chain, personal work

Detailed program

1) rational drug design: ligand- and structure-based drug design

2) drug development: from hit to lead

3) pharmacokinetic (liberation, adsorption, distribution, metabolism, excretion, toxicity). oxidative, reductive, conjugative metabolism

4) Targets and mechanisms of action of drugs

5) Classes of drugs (pharmacodynamic): anti-inflammatory, antiviral drugs , antibiotics, anti-hypertensive drugs, other drugs

6) biological vs chemical drugs

7) drug carriers: polymers and nanoparticles, the nanomedicine

8) smart drugs: prodrugs, smart polymers

9) The drug supply chain, the contribution of technology innovation in drug development and the drug logistics (F. Magli)

Prerequisites

Background. The course is intended for students who have a solid background in chemistry, with an advanced knowledge of organic chemistry. A good knowledge of the analytical methods in organic chemistry is also needed, in particular NMR spectroscopy.

Teaching form

Registered Lessons (in streaming) uploaded on the site

Online Slides and scientific papers

Personal project on a drug or a class of drugs

Textbook and teaching resource

Slides and scientific papers available at the e-learning platform of the course.

Semester

First semester

Assessment method

IN COVID-19 period oral exams will be done online on the webex platform. Changements will be possible according to the evolution of the epidemic trend. It will be possible to do oral examinations in English.

The verification of the achievement of the objectives is carried out using:

for the assessment of the learning outcomes foreseen in fields D1 and D2: final oral exam;

for the assessment of the learning outcomes provided for in field D3 the critical discussion in the class of scientific articles;

for the assessment of the learning outcomes provided for in field D4, the presentation of a personal report on a new drug

Office hours

Contact: on demand by email to the lecturer.