7.15 Medicinal Chemistry

Module Name: Medicinal Chemistry  
Module Code: CO-420  
Level (type): Year 2 (CORE)  
CP: 5

Module Components

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<th>Number</th>
<th>Name</th>
<th>Type</th>
<th>CP</th>
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<tbody>
<tr>
<td>CO-420-A</td>
<td>Medicinal Chemistry</td>
<td>Lecture</td>
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Module Coordinator: Detlef Gabel

Program Affiliation:
- Medicinal Chemistry and Chemical Biology (MCCB)

Mandatory Status:
Mandatory for MCCB
Mandatory elective for Chemistry

Entry Requirements

Pre-requisites:
- Knowledge, Abilities, or Skills
  - General
  - Biochemistry
  - General
  - Organic Chemistry

Frequency: Annually

Forms of Learning and Teaching:
- Lecture (35 hours)
- Tutorial Lecture (10 hours)
- Private Study Lecture (80 hours)

Duration: 1 semester

Workload: 125 hours

Recommendations for Preparation:
Early reading, extensive note taking and self-testing, work through practice problems, fully understand the material before entering class, attend voluntary tutorials

Content and Educational Aims
This module provides an insight into the design of drugs, their interactions with targets, the role of selected targets in selected diseases. It will introduce the concepts of isosteres and biosoosteres. The physical basis of interactions between drugs and targets will be explained. Methods for determining site and strength of binding of drugs to targets will be presented. The optimization of a lead compound to a drug will be detailed. Assay systems for drug optimizations will be presented. The path of drugs from the design to clinical use will be followed. The concept of pharmacophor will be presented. Stereochemical aspects of drug design will be discussed. Rules for drug design and fragment-based drug design will be explained. The ADME concept will be introduced. LD50 and ED50, as well as dose-response curves, will be presented. Structure-activity relationships will be discussed.

Intended Learning Outcomes
By the end of the module, the student will be able to

1. propose a series of isosteres and biosoosteres for common functional groups;
2. understand the principles of testing affinities of drugs to targets;
3. analyze the interaction potential of drugs with their targets;
4. sketch the path of a drug from lead structure to clinical trial;
5. differentiate between conventional and fragment-based drug design;
6. propose ways to identify targets on which specific molecules act
7. estimate the changes in structure and its effect on ADME;
8. extract information about structure-activity relationships from a given research paper on drug design;
9. explain the testing methods employed in the paper;
10. explain changes in interaction potentials for given modifications of a compound;
11. explain the role of the drug in the disease and identify the role of the target.

Usability and Relationship to other Modules

49
7.5 Microbiology

<table>
<thead>
<tr>
<th>Module Name</th>
<th>Module Code</th>
<th>Level (type)</th>
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<tbody>
<tr>
<td>Microbiology</td>
<td>CO-400</td>
<td>Year 2 (CORE)</td>
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**Module Components**

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<td>CO-400-A</td>
<td>Microbiology</td>
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<td>CO-400-B</td>
<td>Microbiology Lab</td>
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**Module Coordinator**

Matthias Ullrich

**Program Affiliation**

- Biochemistry and Cell Biology (BCCB)

**Mandatory Status**

Mandatory elective for BCCB

**Entry Requirements**

**Pre-requisites**

- General Biochemistry and General Cell Biology

**Co-requisites**

- None

**Knowledge, Abilities, or Skills**

- Basic knowledge in biochemistry and cell biology
- Basic laboratory skills in biochemistry and cell biology
- S1 safety instructions

**Frequency**

- annually

**Forms of Learning and Teaching**

- Lecture (35 hours)
- Tutorials (15 hours)
- Private Study (75 hours)
- Safety instructions (1 hour)
- Reading lab manuals (6 hours)
- MSDS preparation (4 hours)
- Experimental work in the laboratory, including seminars (27.5 hours)
- Lab report writing (24 hours)

**Duration**

- 1 semester

**Workload**

- 187.5 hours

**Recommendations for Preparation**

Students should have a sound background in biochemistry and cell biology that they acquired by attending the respective CHOICE modules. They should have understood the basic structure and function of biomolecules, and general principles by which cells multiply and interact with each other. Furthermore, students should have acquired basic skills in experimental molecular biology techniques from the respective CHOICE laboratory courses.

**Content and Educational Aims**

This Microbiology CORE module consists of two module components, one lecture and one laboratory course:

There is no higher life form without microbes, but there are plenty of microbes without higher life forms. Microorganisms are present wherever life is possible. Microbes are conducting the most diverse biochemical processes and are found anywhere in our natural and manmade surroundings. The lecture introduces principles of the world of microorganisms, discussing their diversity and analyzing how microbes act in the environment or on human health. Bacteria, archaea, fungi, protozoa, and viruses are dealt with in the context of human health, environmental processes, or food manufacturing. Taxonomy will be analyzed with respect to different characters, including presence and activity within various cellular compartments, or special biochemical features. The lecture addresses the diverse biochemical life styles of microbes – from photosynthesis via biofilms and methanogenesis to pathogenicity. The role of microbes for the cycling of elements on our planet will be exemplarily demonstrated for carbon, nitrogen and sulfur. Basic differences between microbes and their hosts will be delineated in order to equip the students with knowledge about ways how to defeat microorganisms.
7.21.2.4 Global Health – Historical context and future challenges

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<tr>
<td>Big Questions: Global Health – Historical context and future challenges</td>
<td>JTBQ-BQ-004</td>
<td>Year 3 (Jacobs Track)</td>
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<td>JTBQ-004</td>
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<tbody>
<tr>
<td>A. M. Lisewski</td>
<td>Jacobs Track - Big Questions</td>
<td>Mandatory elective for students of all undergraduate study programs except IEM</td>
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<th>Entry Requirements</th>
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<tr>
<td>Pre-requisites</td>
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<th>Frequency</th>
<th>Forms of Learning and Teaching</th>
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<tbody>
<tr>
<td>annually</td>
<td>Lectures (35 hours)</td>
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<td>Private Study (90 hours)</td>
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<tr>
<th>Duration</th>
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<td>1 semester</td>
<td>125 hours</td>
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Recommendations for Preparation

Critical following of the media coverage on the module’s topics in question.

Content and Educational Aims

All “Big Questions” (BQ) modules deal with the economic, technological, societal and environmental contexts of the global issues and challenges of the coming decades. The BQ modules intend to raise awareness of those challenges and broaden the students’ horizon with applied problem solving beyond the borders of their own disciplines. Knowledge and skills offered in the interdisciplinary BQ modules support students in their development to become an informed and responsible citizen in a global society.

This module gives a historical, societal, technical, scientific and medical overview over the past and future milestones and challenges of global health. Particular focus is on future global health issues in a world that is interconnected both through mobility and through communication networks. Presented are the main milestones along the path to modern health systems, including the development of public hygiene, health monitoring and disease response, and health related breakthroughs in science, technology, and economy. Focus is given to children, maternal and adolescent health, as these are most critical to the well-being of next generations. The module also provides key concepts in global health, epidemiology and demographics such as the connection between a society’s economical level and its population’s health status, measures of health status, demographic and epidemiologic transitions, as well as modern issues such as the growing fragmentation (to a personal level) of disease conditions and the resulting emergence of personalized medicine. Finally, attention is also given to publicly less prominent global health issues, such as re-emergent diseases, neglected tropical diseases, and complex humanitarian crises.