

## PhD course "Antimicrobial Peptide Therapeutics: Design Principles, Mechanisms and Clinical Application"

### SYLLABUS

#### 1 Lecturer information

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#### 2 Title of the course

Antimicrobial Peptide Therapeutics: Design Principles, Mechanisms and Clinical Application

#### 3 Course program

Antimicrobial peptides (AMPs) are usually short peptides (<50 amino acids) and present in all forms of life, where they play a major role in the innate immune system and act as the "first line of defense" against invading pathogens. Notably, they share widespread toxicity against bacteria, yeasts, and fungi but are relatively inactive toward host eukaryotic cells at bactericidal concentrations. Membrane permeabilization is their main mechanism of action, but also intracellular targets have been supposed. AMPs, but also peptide conjugates containing AMPs, have come more and more into the focus of research during the last few years. This is based on their remarkable properties that make AMPs one of the most promising drug candidates in a foreseeable future to overcome the alarming rise in microbial drug resistance.

This course will introduce into the highly active field of antimicrobial peptides and highlight their different activity mechanisms, AMP chemical synthesis and modification strategies and their possible application as future therapeutics.

#### 4 Course content detailed per lesson of two hours (possibly with dates and room real and virtual)

Lesson 1 – Introduction to Antimicrobial Peptides (real)

Lesson 2 – Activity Mechanisms of Antimicrobial Peptides and Analytical Tools (real)

Lesson 3 – Design and Modification of Antimicrobial Peptides (real)

Lesson 4 – Clinical Application of Antimicrobial Peptides (real)

#### 5 Suggested reading

There are several good reviews that can be found via pubmed library search and that are available via open access:

<https://pubmed.ncbi.nlm.nih.gov/?term=antimicrobial+peptides+%5Bti%2Fab%5D&filter=pubt.review>

## 6 Learning Objectives

Students who successfully completed this lecture series

- have a general understanding about the biology of antimicrobial peptides, their activity mechanisms and how to determine their physicochemical characteristics.
- learnt techniques to improve the activity spectrum of antimicrobial peptides and to tackle the different challenges in their development (e.g. resistance mechanisms, proteolytic degradation, etc.)

## 7 Knowledge and Skills to be acquired

Students who successfully completed this lecture series

- got insights in recent developments in the field of antimicrobial peptides including state of the art synthetic methodologies, application of antimicrobial peptides and their conjugates in medicinal context.
- are able to transfer the skills acquired in this lecture series to other fields of (bio)chemistry, biology, pharmacy, or beyond.

## 8 Prerequisites

- Knowledge about peptide/protein structure (including the different amino acid building blocks, peptide bond formation, primary/secondary/tertiary/quarternary structure); biosynthesis (ribosomal and non-ribosomal peptide/protein biosynthesis), etc.
- Basics in solid phase peptide synthesis
- Basic understanding of prokaryotic and eukaryotic cell organisation (cell membranes, organelles, etc.)

## 9 Teaching Methods

MODE 1 - Pre-recorded lessons uploaded on the moodle platform (a meeting must be organized with PhD students in order to clarify eventual doubts)

MODE 2 (preferred) - Lessons delivered in-person and in remote with simultaneous recording by the WEBEX platform

(The lessons must be recorded and available to all the students that cannot take part to the lessons in streaming. The Webex platform must be used. All course content should be uploaded to the Moodle platform on the Chemical Sciences PhD page "Courses and Seminars of the PhD in Chemical Sciences 2021-2022")

## **10 Further information**

n.a.

## **11 Type of Assessment**

The final evaluations will have to be validated maximum 1 month after the end of the course

Evaluation sheets will be handed out directly after the course.

## **12 Period**

13.03.-17.03.2023