

## Current topics in microbiology (J000452)

Course size (nominal values; actual values may depend on programme)

|         |     |            |      |             |        |
|---------|-----|------------|------|-------------|--------|
| Credits | 3.0 | Study time | 90 h | Contact hrs | 20.0 h |
|---------|-----|------------|------|-------------|--------|

Course offerings and teaching methods in academic year 2018-2019

|                |         |                               |        |
|----------------|---------|-------------------------------|--------|
| A (semester 2) | English | lecture                       | 10.0 h |
|                |         | self-reliant study activities | 10.0 h |

Lecturers in academic year 2018-2019

|             |      |                    |
|-------------|------|--------------------|
| Coenye, Tom | FW02 | lecturer-in-charge |
|-------------|------|--------------------|

Offered in the following programmes in 2018-2019

|   |       |          |
|---|-------|----------|
| <a href="#">Master of Science in Drug Development</a> | crdts | offering |
|   | 3     | A        |

Teaching languages

English

Keywords

Microbiology, bacteriology, infections, antibiotics & antibiotic resistance, sociomicrobiology (biofilm, quorum sensing), microbiome research

Position of the course

The aim of this course is to bring students in contact with a number of topics that are not covered (or for which only basic aspects are covered) in the "General microbiology" course. The focus will be on the worldwide problem of antimicrobial resistance, on social interactions between micro-organisms (including biofilm formation and quorum sensing) and on the role of the human microbiome (and its disturbance) in health and disease. In addition, innovative therapeutic approaches based on novel insights in these domains will be discussed.

Contents

### 1. Antimicrobial resistance

- 1.1. Impact of antimicrobial resistance
- 1.2. Antibiotic (mis)use and development of antimicrobial resistance
- 1.3. Antimicrobial resistance in some key pathogens (ESKAPE pathogens, CDC Urgent Threat Pathogens)
  - Staphylococcus aureus* (MRSA, VISA)
  - ESBL positive and carbapenemase-producing Enterobacteriaceae
  - Resistance in selected Gram-negative non-fermenters
  - Colistin resistance

### 2. Novel antimicrobial agents: where are they and how can we find them?

- 2.1. The antibiotic pipeline
- 2.2. Genome-based approaches to find novel antimicrobials
- 2.3. Innovations in antibiotic discovery

### 3. Sociomicrobiology

- 3.1. Microbial biofilms
  - Biofilm formation
  - Structure and composition of microbial biofilms
  - Differences between sessile and planktonic cells
- 3.2. Cell-cell communication
  - In Gram-negative micro-organisms

- In Gram-positive micro-organisms
- Autoinducer-2
- Quorum sensing in fungi
- 3.3. Chronic biofilm-related infections
- 3.4. Prevention and eradication of microbial biofilms
- 3.5. Case studies

#### **4. The human microbiome and its role in health and disease**

- 4.1. What is the human microbiome ?
- 4.2. Tools to study the microbiome
- 4.3. Role of the microbiome in human metabolism and the link with obesity
- 4.4. Inflammatory bowel disease and the microbiome
- 4.5. Antibiotic-induced microbiome perturbation
- 4.6. Microbiome-based therapeutic interventions

##### Initial competences

Having successfully completed courses in General microbiology, Immunology and Pharmaceutical Biotechnology or having acquired the corresponding competences in another way.

##### Final competences

- 1 To have a good insight in the importance of biofilm formation and cell-cell communication in medical microbiology
- 2 To understand novel approaches for the treatment of biofilm-related infections
- 3 To understand the origin and consequences of antimicrobial resistance.
- 4 To be able to independently interpret a scientific publication in the domain of sociomicrobiology or microbiome research
- 5 To have a good insight in approaches that are used to develop innovative (antimicrobial) strategies based on novel scientific findings.

##### Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

##### Conditions for exam contract

Access to this course unit via an exam contract is unrestricted

##### Teaching methods

Lecture, self-reliant study activities

##### Extra information on the teaching methods

- Lectures
- Reading and discussing a recent scientific paper (independently) in the field of sociomicrobiology and/or microbiome research

##### Learning materials and price

Slides used during lectures will be made freely available via Minerva. Relevant scientific publications will be made available when necessary.

##### References

##### Course content-related study coaching

Students have the possibility to ask questions before, during or after the lectures. The lecturer is also available on other moment to answer questions, but students are asked to make an appointment (individual or in group) first.

##### Evaluation methods

end-of-term evaluation

##### Examination methods in case of periodic evaluation during the first examination period

Oral examination, assignment

##### Examination methods in case of periodic evaluation during the second examination period

Oral examination, assignment

##### Examination methods in case of permanent evaluation

##### Possibilities of retake in case of permanent evaluation

not applicable

##### Extra information on the examination methods

- Oral exam with written preparation

-Written report about a scientific paper and oral discussion about this paper and the report

Calculation of the examination mark

-60%: exam

-40%: report about paper