



## INSTITUTE OF CLINICAL SCIENCES

### **SK00032 Bacterial biofilms - microbiology and infection, 3 credits**

Bakteriella biofilmer - mikrobiologi och infektion, 3 högskolepoäng

*Third-cycle level / Forskarnivå*

---

#### **Confirmation**

This syllabus was confirmed by the Council for PhD Education at Sahlgrenska Academy on 2022-09-20, and is valid from Spring semester 2023.

##### *Responsible Department*

Institute of Clinical Sciences, Sahlgrenska Academy

##### *Participating Departments*

Institute of Biomedicine

#### **Entry requirements**

Registered as a PhD student.

#### **Learning outcomes**

After completing the course the PhD student is expected to be able to:

##### *Knowledge and understanding*

- Demonstrate a broad knowledge of the current facts about biofilms: i) Define the phenotypic and molecular characteristics of biofilms; ii) list the available models and techniques available for biofilm research; iii) review the health care problems related to infections involving biofilms, including their associated antimicrobial resistance; and iv) evaluate innovative and translational aspects for the infection control of biofilms.
- Describe and explain basic background on microbial cell biology, antimicrobial resistance, molecular characterization of strains and biofilm processes.
- Demonstrate a comprehensive knowledge about the microbiological aspects of biofilms: i) Define the phenomenon of biofilm formation; and ii) describe state-of-art methods to study biofilm formation.
- Demonstrate a comprehensive knowledge about the infectious aspects of biofilms: i) review the

pathogenesis, prevalence and treatment of biofilm-related infections (device-related and tissue infections); and ii) describe the impact and consequences that biomaterial-associated infections have on medical device outcome and human health.

### *Competence and skills*

- Select relevant methods that can help answer particular research questions.
- Perform the laboratory techniques included in the course.
- Apply the theoretical knowledge and analytical techniques to analyze biomaterial surfaces and implant-tissue interfaces in relation to their infection resistance and biofilm formation.
- Survey relevant literature and summarize it.
- Analyse data, including data presentation and statistical evaluation.

### *Judgement and approach*

- Interpret and critically evaluate scientific literature, formulate hypotheses, interpret the results from laboratory practices and demos, analyse data and draw conclusions, and communicate results applying the scientific method process.
- Discuss ethical aspects in infection, microbiology and biomaterial research.

## **Course content**

This course will provide participants with a theoretical understanding of bacterial biofilms and of the health care problems related to infections involving biofilms, including antimicrobial resistance. It will cover clinical, infectious and microbiological aspects of biofilm-related infections (device-related and tissue infections).

The course will also describe research methodology to study biofilms, including laboratory demonstrations of basic and advanced microbiological techniques: biofilm culturing methods (static and flow), viable colony counting (CFU), species identification (biochemical and 16S rRNA), strain typing (MLST, cgMLST), susceptibility testing (disk diffusion, MIC and MBEC), biofilm morphology (confocal microscopy and crystal violet), gene detection (antimicrobial resistant- and biofilm-related genes) and gene expression (qPCR/ddPCR). Participants will gain hands-on experience in data analysis of the mentioned techniques.

## **Types of instruction**

The course consists of lectures, laboratory work, demonstrations, group exercises, quizzes and a written assignment.

### *Language of instruction*

The course is given in English.

## **Grades**

The grade Pass (G) or Fail (U) is given in this course.

## **Types of assessment**

An approved course requires an approved written assignment (laboratory report with the format of a research article) and oral presentation (seminar), as well as active participation in laboratory work, demonstrations and group exercises.

If a PhD student, who has been failed on the same examining course component twice, requests a change of examiner before the next examination session, a request of this kind should be sent in writing to the department responsible for the course, and granted, unless there are special reasons to the contrary (Chapter 6, Section 22, Higher Education Ordinance).

## **Course evaluation**

The course evaluation will be provided both as a written questionnaire (joint for Sahlgrenska Academy) and orally as a discussion between the students and the course leader(s). The course responsible teacher compiles analysis of the course evaluation and makes suggestions for further development of the course. The result and any changes in the set-up of the course shall be communicated both to the students that carried out the evaluation and to the students who are about to start the course.