

<b>M4401</b>		<b>Molecular Microbiology</b>		
<b>Coordinator (responsible lecturer)</b> PD. Dr. Ursula N. Fleig ( <a href="mailto:fleigu@hhu.de">fleigu@hhu.de</a> )				
<b>Lecturers</b> PD. Dr. Ursula N. Fleig Prof. Dr. Johannes H. Hegemann ( <a href="mailto:hegemann@hhu.de">hegemann@hhu.de</a> )				
<b>Contact and organization</b> PD. Dr. Ursula N. Fleig				
<b>Workload</b> 420 h	<b>Credit points</b> 14 CP	<b>Contact time</b> 300 h	<b>Self-study</b> 120 h	<b>Duration</b> 1 semester
<b>Course components</b> Practical course: 18 PPW Lectures/Seminar: 2 PPW		<b>Frequency</b> Once a year		<b>Group size</b> 16 students
<b>Learning outcomes/skills:</b> The aim of this course is to introduce the student to two topics: eukaryotic microorganisms (model yeasts) and prokaryotic bacterial pathogens (human pathogenic <i>Chlamydiae</i> ). Part 1: Knowledge and understanding of the main pathogenicity mechanisms of human pathogens; knowledge and understanding of the infection cycle of <i>Chlamydiae</i> . Part 2: Knowledge about genetic and molecular biological processes in fungi. Knowledge about the structure and function of microbial genomes. Description and elucidation of the yeasts <i>S. cerevisiae</i> and <i>S. pombe</i> as eukaryotic model systems for specific topics concerning cell cycle, aneuploidy, ageing, cell morphogenesis and fungal pathogenicity. In summary: the students should be able to recite, explain and comment on the content of the lectures and understand in detail (theoretical background) the methods used during the practical course. Students will be able to design and carry out experiments independently and draw their own conclusions.				
<b>Forms of teaching</b> lectures/seminars/practical course				
<b>Content</b> Practical course: <ul style="list-style-type: none"> <li>- Microbial genomics: Using databases: sequence analyses, literature searches, prediction programs (e.g. secondary structural analyses).</li> <li>- Microscopic analysis of the chlamydia infection cycle; expression and affinity purification of specific chlamydial proteins; analysis of the binding capacity of such proteins to human cells. Ectopic expression of chlamydial proteins in yeast and human cells and analysis of phenotypic consequences.</li> <li>- Gene tagging in yeast: targeted chromosomal gene manipulation (deletion, mutation, tagging) in <i>S. cerevisiae</i> or <i>S. pombe</i> using homologous recombination; verification of correct genomic integration (PCR, southern blots); analysis of biological phenotypes.</li> <li>- Determination of protein-protein interaction using different methods: yeast-2-hybrid system; co-immunoprecipitation of epitope-tagged proteins, genetic suppressor analysis.</li> <li>- Use of reporter proteins for subcellular protein localisation in yeasts, qualitative and quantitative proof of gene expression in yeasts using reporter proteins (e.g. <math>\beta</math>-galactosidase, GFP).</li> <li>- Yeasts as eukaryotic model systems for chromosome segregation/aneuploidy, cell ageing,</li> </ul>				

morphogenesis and characterisation of bacterial effector proteins.

Lectures:

- Functional genome analysis of bacteria and yeasts.
- Yeasts as eukaryotic model systems for (i) functional characterisation of bacterial human pathogenic effector proteins, (ii) cell division and cell cycle of prokaryotic and eukaryotic microorganisms (chromosome segregation, meiosis), (iii) ageing, (iv) cell morphogenesis.
- Pathogenicity mechanisms in human pathogenic agents: infection cycles and diseases; molecular reciprocation between bacterium and host cell; secretion systems; pathogenicity mechanisms. Example, chlamydia: life cycle; diseases; adhesins, receptors; effector proteins.
- Seminar: each student will read a subject-related publication and present the main results of this publication orally and in English.

**Eligibility**

**Formal:** Masterstudent

**Content-related:** none

**Examination types**

- (1) Skill area – Knowledge (70% of the grade): written examination (generally) on the content of the lecture and the practical course
- (2) Skill area – Documentation (15% of the grade): protocol (presentation of subject, execution, evaluation and discussions of scientific experiments)
- (3) Skill area – Scientific presentation (15% of the grade): presentation of a subject-related publication (preparation of material, graphical presentation of content, lecture, discussion) and writing of a one-page summary

**Requirements for the award of credit points for this course**

- (1) Pass grade in the skill area – Knowledge
- (2) Regular and active participation in the practical course
- (3) Submission of a protocol complying with the requirements of scientific documentation
- (4) Oral seminar

**Relevant for following study programmes/major (only MSc programme)**

M.Sc. Biology

M.Sc. Biology International;

**Compatibility with other curricula**

M.Sc. Biochemistry

**Significance of the mark for the overall grade**

The mark given will contribute to the final grade in proper relation to its credits.

M.Sc. Biology International 14/44 CP

**Course language**

German; some experiments will be explained in English; if necessary the entire course can be taught in English.

**Additional information**

Central administration

Attendance of the pre-course talk and the introductory lecture is compulsory and counts as part of the module.