Module variant to: Trends in Microbiology

Module: Microbial stress responses and regulation of gene expression	
University/Department/Teaching Unit: Freie Universität Berlin/Biology, Chemistry, Pharmacy/Biology	
Module coordinator: Haike Antelmann, Eberhard Klauck, Vu Van Loi	
Prerequisites: none	
Learning objectives: The module provides a wide range of in-depth knowledge of microbial stress physiology and adaptation mechanisms of bacteria to environmental changes, including sporulation, specific and general stress responses and stationary phase processes. The students will learn about the basics of bacterial transcription and the role of transcriptional and post-transcriptional mechanisms of gene regulation in bacteria. In the practical work, methods of genetics, molecular biology and microbial physiology will be applied to study mechanisms of bacterial stress responses. After completing the module, the students are able to formulate specific research questions and apply experimental approaches to analyze bacterial gene regulatory mechanisms.	
Content: Basic knowledge on gene transcription, transcriptional and post-transcriptional gene regulatory mechanisms in bacteria. Physiological adaptation of bacteria to physical stressors and environmental changes. Signal transduction cascades and second messengers. Specific and general stress responses and stationary phase processes in bacteria. Oxidative stress and redox biosensors. Discussion of the actual literature using presentations or papers by the students. Classical and modern microbiological and molecular biological methods; construction of genetic variants; analysis of such mutants using microbiological, molecular biological and biochemical methods; investigation of changes in gene expression of microorganisms using transcriptional analyses.	

Modes of instruction	**Contact hours** (hours per week during the semester)	**Types of active participation**	**Workload** (in hours)	
Lecture (V)	2	–	Class attendance (lecture) Preparation, before and after (lecture)	30 30
Seminar (S)	1	Oral presentation	Class attendance (seminar) Preparation, before and after (seminar)	15 80
Safety lab (sP)	8	Carrying out and documenting lab experiments	Class attendance (safety lab) Preparation, before and after (safety lab)	120 75
			Exam preparation and exam	100

Module assessment	Written exam (60 minutes), wholly or partially in multiple-choice format; can also be carried out electronically or written report on research results (approx. 10 pages) or examination colloquium (approx. 20 minutes)	
Language	English	
Regular attendance required	Seminar and safety lab: yes, lecture: attendance recommended	
Total workload	450 hours	15 credit points
Duration	one semester	
Frequency	irregular	
Applicability	Master's degree program M.Sc. Biology	

Utilization in the following specializations (decision by the examining board):

Biodiversity, Evolution and Ecology	
Genetics and Genomics	X
Microbiology	x
Molecular- and Cellular Biology	x
Molecular Plant Sciences	
Neurobiology	
Biology	x

U. Leach