Module Name: Redox Metabolism

Identification Number	Workload	Credit Points	Term	Offered Every	Start	Duration
MN-BC-BSM12	360 h	12 CP	2nd term of studying	Summer term	Second half of summer term	7 weeks

1	Course Types	Contact Time	Private Study	Planned Group Size*
	a) Lectures	24 h	90 h	max. 8
	b) Practical/Lab	154 h	60 h	max. 2
	c) Seminar	6 h	26 h	max. 2

2 Module Objectives and Skills to be Acquired

Students who successfully completed this module

- have acquired detailed knowledge on cellular redox processes (e.g. redox reactions, oxidative protein folding, redox metabolism, sources of reactive oxygen species, antioxidative defence systems).
- have acquired detailed knowledge on and can employ techniques to investigate cellular redox processes (e.g. tools to assess small redox molecules in intact cells [genetically encoded fluorescent protein sensors], tools for characterizing redox pathways in vitro [protein purification and enzymatic characterization], tools to assess the redox state of proteins [thiol modification and subsequent analysis]).
- can independently design experiments for characterization of redox processes including planning of suitable controls, definition of expected outcomes and pitfalls.
- can independently carry out small scientific projects (i.e. a series of experiments) related to the topic of the module.
- have learned how to present research results in oral and written form and to critically discuss scientific publications related to the topic of the module.
- are able to transfer skills acquired in this module to other fields of biochemistry.

3 Module Content

- Theory: e.g. redox processes, evolution of redox signalling, origins of reactive oxygen species, cellular antioxidative systems, cellular machineries for oxidative protein folding, redox reactions in metabolism, the central role of NAD(P)H, redox modifications on biomolecules, consequences of cellular redox perturbations
- Practical methods: e.g. genetically encoded fluorescent proteins as tools to measure small redox molecules, experiments to determine protein redox states in intact cells and in vitro, in vitro characterization of redox proteins and pathways, experiments to assess mitochondrial reactive oxygen species production, assessment of cellular behaviour upon redox stress (proliferation, cell death), redox stress response pathway analysis in cells and in silico

4 Teaching Methods

Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form

5 Prerequisites (for the Module)

Enrollment in the Master´s degree course “Genetics and Biology of Aging and Regeneration” or in the Master’s degree course “Biochemistry and Molecular Medicine”

Additional academic requirements

For Students of Master “Genetics and Biology of Aging and Regeneration”: Previous attendance of the lecture module “Principles of Molecular Genetics, Development and Aging (A/D/G)”.

6	**Type of Examination** The final examination consists of two parts (Type BC3): Written examination on topics of lectures, seminars and the practical/lab part (60 min; 50 % of the total module mark), poster presentation (20 min presentation and discussion, 50 % of the total module mark; this part also includes the preparation of the poster).
7	**Credits Awarded** Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)
8	**Compatibility with other Curricula*** Biochemical subject module in the Master´s degree course "Biochemistry and Molecular Medicine"
9	**Proportion of Final Grade** In the Master´s degree course "Biochemistry and Molecular Medicine": 10 % of the overall grade (see also appendix of the examination regulations)
10	**Module Coordinator** Prof. Dr. Jan Riemer, phone 470-7306, e-mail: jan.riemer@uni-koeln.de
11	**Further Information** **Subject module** of the Master´s degree course "Genetics and Biology of Aging and Regeneration", **Participating faculty**: Prof. Dr. J. Riemer, Dr. Matthias Weith **Literature:** Information about textbooks and other reading material will be given on the ILIAS representation of the course **General time schedule:** Week 1-5 (Mon.-Fri.): Lectures, preparations for practical work, practical work, and analysis and documentation of practical work; Week 6 (Mon.-Fri.): Preparing posters, and poster presentation about the content of the practical course and conceptual development of a research project delineating from the practical; Week 7 (Mon.-Fri.): Preparation for the written examination and written examination **Introduction to the module:** May, 27th, 2024 at 08:00 a.m. (this date is also the start of the module = week 1), Center for Molecular Biosciences (COMB), room 0.01 (ground floor) or online (in this case, further information/link will be sent to your Smail-Account); for preparation to the module before this introduction see ILIAS link under literature. **Written examination:** July 19th, 2023, second/supplementary examination August 30th, 2024; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.

* 4 students from the Master´s degree course "Genetics and Biology of Aging and regeneration" and 4 students from the Master's degree course "Biochemistry and Molecular Medicine".