

Module sheet

Title of module	VI Pathology of Degenerative Diseases
Module - coordinator	Dr. Markus Napirei

Credit points	5	Semester(s) in which the module is taught	3
Contact hours	3	Workload	150 hours

Lecturer(s)	Bockholt, Böing, Brand-Saberi, Burger, Dunger, Faustmann, Förster, Kleiter, Krenn, Milting, Mügge, Napirei, Pu, Schmelzle, Tatzelt, Vorgerd, Winklhofer
Type of teaching	Lecture: 2 hours per week Seminar: 1 hour per week including practical microscopical exercises
Relation to curriculum	Compulsory
Recommended prerequisites	Module I “Stem Cell Physiology” and module V “Tissue Engineering” are recommended
Aims	In the module “Pathology of Degenerative Diseases” students will learn the medical basics necessary for the understanding of significant degenerative diseases of different organ systems including stem cell populations.
Learning outcome	<p>Knowledge: Students have gained knowledge of the microscopic and macroscopic morphology of five organ systems:</p> <ul style="list-style-type: none"> • the locomotory system • the cardiovascular system • the nervous system • the sensory system (the eye) • the hepatopancreatic system <p>Students have an up-to date overview of degenerative diseases and their stem cell-related therapies, which are state of the art or even are theoretically planned.</p> <p>Skills: Students have acquired skills in:</p> <ol style="list-style-type: none"> a) Identification and assignment of tissue sections b) Terminologically correct description of the cellular and extracellular composition of tissues c) Terminologically correct description of the pathological alterations of diverse tissues d) Designation of the necessary stem cells for tissue repair during different degenerative disease <p>Competencies: Students have gained the</p> <ol style="list-style-type: none"> a) ability to develop strategies for stem-cell based, therapeutical approaches for different degenerative disease b) capability to recapitulate and apply the content of the lectures to complex issues in free speech in front of a peer group

	<p>c) competence to discuss, to raise scientifically based questions and to answer appropriately</p> <p>d) competence to moderate a scientific group discussion</p> <p>e) team capability to process and discuss a common learning content.</p>
<p>Contents of module</p>	<p>The series of lectures within this module is divided into six parts. The first part is an introduction into the organization and function of the immune system, as well as into the basic mechanisms of inflammatory reactions and autoimmunity. Since degenerative diseases are often accompanied by inflammatory reactions or are even caused by autoimmunity this knowledge is of essential importance to understand parts of the underlying pathological mechanisms.</p> <p>Within these lectures the students will learn the differences between the innate- and adaptive immune system as well as principles of the generation of immune-competent and self-tolerant immune cells. Typical immune- and inflammatory reactions will be discussed. The establishment of autoimmune reactions and typical autoimmune diseases will be presented.</p> <p>The next five parts of the series of lectures are divided according to the five different organ systems listed above and which are major targets of degenerative diseases: Each part will be introduced by one or two lectures teaching the basics of the organ system with respect to macroscopic anatomy and histology as well as molecular cell biology. This introduction is essentially necessary because not all of the Master-students have the medical education necessary for the understanding of diseases. Accompanying histological and patho-histological seminars will be performed weekly to consolidate and complete the knowledge about the building of organs and tissues as well as their degenerative changes.</p> <p>In a following lecture the development of the organ system during embryogenesis will be described. This part should encompass the description of the natural stem cells and stem cell derived tissues involved in the formation of the terminally differentiated organ. Important developmental factors regulating these processes will be discussed by reviewing the topical primary scientific literature.</p> <p>Finally, for each organ system the patho-mechanism of significant degenerative diseases will be presented and potential therapeutic stem cell strategies or the results of stem cell-based therapies will be discussed, which are just in practice. These lectures will be mostly given by clinicians from the hospitals of the Ruhr-University to ensure an authentic presentation.</p> <p>Lectures (Lecturer):</p> <p>Immune System 1+2 Organisation / Function of the innate and adaptive immune system (Napirei) 3+4 Hypersensitivity reactions, inflammation and autoimmunity (Napirei)</p> <p>Locomotory System 5 Anatomy of skeletal muscles, tendons and joints (Balakrishnan) 6 Development of skeletal muscle (Balakrishnan) 7 Exemplary myopathies, e.g. Duchenne muscle dystrophy (Vorgerd) 8 Anatomy of connective/supporting tissues and the skin (Balakrishnan) 9 Exemplary chondro- and osteopathies (Osteoporosis, Arthropathies) (Krenn) 10 Exemplary collagenoses (Rheumatoid arthritis, Sklerodermy and Systemic Lupus erythematosus) (Bockkholt)</p> <p>Cardiovascular System 11+12 Anatomy and development of blood vessels (Pu) 13+14 Introduction to the anatomy of the human heart and cardio myopathies (Milting) 15 Atherosclerosis and myocardial infarction (Mügge)</p> <p>Nervous System 16+17 Anatomy and organisation of the central and peripheral nervous system (Förster) 18 Development of the nervous system (Förster) 19+20 Exemplary neurodegenerative diseases (Parkinson, Alzheimer) (Tatzelt)</p>

	<p>21 Cerebrovascular diseases (Stroke) (Faustmann)</p> <p>22 Exemplary diseases of the spinal cord and peripheral nerves (Faustmann)</p> <p>23 Anatomy and development of the Eye (Petrasch-Parwez)</p> <p>24+25 Hereditary eye diseases (Retinitis pigmentosa), Old-Age related eye diseases (Macular degeneration, Glaucoma, Limbal stem cell deficiency) (Petrasch)</p> <p>26 Anatomy and development of the abdominal digestive glands (Napirei)</p> <p>27 Diabetes mellitus type 1a/b (Nambiar)</p> <p>28 Liver fibrosis (Giri)</p>
<p>Study and examination requirements; Forms of examination</p>	<p>Students active participation during discussions and interactions in the context of the lecture with lecturers and fellow students is required; Individual oral presentations of histological specimens are given by the students to monitor study progress.</p> <p>The mode of examination will be a multiple choice test on which the module mark will be based. The examination will be of one hour and the question paper will consist of 30 questions with five choices for each question.</p>
<p>Literature</p>	<p>Gray's Anatomy for Students 2nd Edition, R.L. Drake, W. Vogl, A.W.M. Mitchell, Churchill Livingstone Elsevier.</p> <p>Wheater's Functional Histology 5th Edition, B. Young, J.S. Lowe, A. Stevens, J.W. Heath, Churchill Livingstone Elsevier.</p> <p>Janeway's Immunobiology 8th Edition, The Immune System in Health and Disease, C.A. Janeway, P. Travers, M. Walport and M. Shlomchik, Garland Publishing.</p> <p>Netter's Illustrated Human Pathology, M.L. Buja and G.R.F. Krueger, Netter Basic Science.</p> <p>Pathologic Basis of Disease 8th edition, Robbins and Cotran, Saunders Elsevier.</p>