

Module Guide

Master

Molecular Medicine

at the Medical Faculty of Ulm University



- Version 8, May 01, 2008 -

- *subject to alterations* -

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|--|--|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Module number: MOME-M0001 | |
| Course | Title: Specific Aspects of Molecular Medicine Lecture number: MOMEm0061 Seminar number: MOMEm0062 Number practical training: MOMEm0001 - MOMEm0042, for further information see pages X - XX |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dean of Studies |
| Further Lecturers: | Lectures of the Medical Faculty and the Faculty of Natural Sciences |
| Study Objectives: | Students should deepen their knowledge in the field of molecular medicine. For further information see compulsory optional courses on pages X - XX |
| Module Contents: | For further information see pages X- XX |
| Literature: | For further information see pages X - XX |
| Classification: | Lecture: compulsory course Seminar: compulsory course Practical training: compulsory optional courses |
| Prerequisites: | BSc degree or comparable |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Written and oral examinations |
| ECTS-Points: | 51 ECTS |
| Grade composition: | Written examination |
| Length of the Module: | 2 semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date: | Summer and winter term, 25 students |
| Semester: | 1 and 2 |

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|--|---|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Lecture, compulsory course of module number: MOME-M0001 | |
| Course | Title: Specific Aspects of Molecular Medicine Number: MOMEm0061 |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dean of Studies |
| Further Lecturers: | Lectures of the Medical Faculty and the Faculty of Natural Sciences |
| Study Objectives: | Students should deepen their knowledge in the field of molecular medicine. For further information see compulsory optional courses on pages X - XX |
| Module Contents: | For further information see pages X - XX |
| Literature: | For further information see pages X - XX |
| Classification: | Compulsory course |
| Prerequisites: | BSc degree or comparable |
| Teaching methods: | Lecture |
| Examinations: | Written |
| ECTS-Points: | 15 ECTS |
| Grade composition: | Written examination |
| Length of the Module: | 2 semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer and winter term, 25 students |
| Semester | 1 and 2 |

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|--|--|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Seminar, compulsory course of module number: MOME-M0001 | |
| Course | Title: Specific Aspects of Molecular Medicine Seminar number: MOMEm0062 |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dean of Studies |
| Further Lecturers: | Lectures of the Medical Faculty and the Faculty of Natural Sciences |
| Study Objectives: | - Students should deepen their knowledge in the field of molecular medicine. For further information see compulsory optional courses on pages X - XX - summarize and critically discuss their data obtained in the compulsory optional courses of this module in an oral presentation |
| Module Contents: | For further information see pages x - XX |
| Literature: | For further information see pages X - XX |
| Classification: | Compulsory course |
| Prerequisites: | Lecture series MOMEm0061, practical trainings MOMEm0001- MOMEm0042 (at least 8 ECTS per semester) |
| Teaching methods: | Seminar |
| Examinations: | Oral examination |
| ECTS-Points: | 4 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 2 semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date: | Summer and winter term |
| Semester: | 1 and 2 |

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|--|--|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Apoptosis signaling and cancer Number: MOMEm0001 Category: Hematology and Oncology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Simone Fulda |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - explain principal apoptosis pathways - explain the interplay of apoptosis pathways with other signaling cascades - understand that deregulation of apoptosis can lead to human diseases - comment how apoptosis pathways can be targeted for therapeutic purposes - present and discuss their data in oral presentations - summarize their data in a written report - critically discuss published data related to their project name & adhere to principles of good scientific practice |
| Module Contents: | <ul style="list-style-type: none"> - functional characterisation of apoptosis molecules by RNA interference - analysis of apoptosis regulators in primary material - targeting apoptosis pathways for tumor sensitization - retroviral gene transfer for analysis of apoptosis pathways |
| Literature: | <ul style="list-style-type: none"> - Johnstone, RW., Ruefli, AA., Lowe, SW. Apoptosis: a link between cancer genetics and chemotherapy. Cell, 108, 153-64. 2002. - Hengartner, MO. The biochemistry of apoptosis. Nature, 407, 770-6, 2000. - Fulda, S., Debatin, K. M. Targeting apoptosis pathways in cancer therapy. Curr. Cancer Drug Targets, 4, 569-76, 2004. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report, written examination |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester | 1 |

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|--|---|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: DNA repair Number: MOME0002 Category: Hematology and Oncology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Lisa Wiesmüller |
| Further Lecturers: | Dr. Michael Boehringer |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - understand the links between DNA repair deficiencies and breast carcinogenesis - explain the major double-strand break repair pathways - explain the cellular functions of the tumor suppressor p53 - comment on future directions in breast cancer therapy - present and discuss their data in oral presentations - summarize their data in a written report - critically discuss published data related to their project - name & adhere to principles of good scientific practice |
| Module Contents: | <ul style="list-style-type: none"> - analysis of different double-strand break repair pathways in living cells - introduction of DNA repair substrates in cancer cells/cells from individuals with high cancer risk - functional characterisation of DNA repair molecules by RNA interference/expression of cancer-related mutant proteins |
| Literature: | <ul style="list-style-type: none"> - Schrauder, M., and Wiesmüller, L. (2006). DNA repair. In Apoptosis and Cancer Therapy. Fulda, S. and Debatin, K.-M. (Eds), Wiley-VCH Verlag GmbH & Co.KGAA, Weinheim, in press. - Thompson LH and Schild D (2002) Recombinational DNA repair and human disease. <i>Mutat. Res.</i> 509: 49-78 - Jasin M: Homologous repair of DNA damage and tumorigenesis: the BRCA1 connection. <i>Oncogene</i> 2002, 21: 8981-8993. - Wiesmüller, L. and Kreienberg, R. (2006). Double strand break repair activities of p53 as potential tumor suppressor function counteracting mammary tumor development. <i>Current Women's Health Reviews</i>, in press. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOME0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

| Title of Module: Specific Aspects of Molecular Medicine | |
|--|--|
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Signal transduction and cancer Number: MOMEm0003 Category: Hematology and Oncology |
| Study Program: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Uwe Knippschild |
| Further Lecturers: | N.N. |
| Study objectives: | Students should be able to - understand signal transduction pathways related to cancer development - recognise the potential of kinases as new targets for drug development - know about the interplay between different kinases - present and critically discuss their data in oral presentations and to summarize their data in a written report |
| Module contents: | - signal transduction and oncology - the role of the CK1 family in tumorigenesis - kinases as targets for drug development: use in new therapy concepts - protein chemical methods (general methods, protein purification, protein kinase protocols); - identification and/or purification of kinases in normal and tumor cells - inhibition of specific kinases to sensitize resistant tumor cells towards apoptosis - modulation of kinase activity by site-directed phosphorylation and its functional consequences - chromatography methods; kinase assays, determination of phosphate incorporation, purification of GST-fusion proteins, fractionation of cellular extracts, phospho amino acid determination, 2D phospho-peptide analysis, FACS analysis, Western Blot analysis, site-directed mutagenesis |
| Literature: | - Koivunen, J., Aaltonen, V. & Peltonen, J. Protein kinase C (PKC) family in cancer progression. <i>Cancer Lett</i> (2005). - Rennefahrt, U., Janakiraman, M., Ollinger, R. & Troppmair, J. Stress kinase signaling in cancer: fact or fiction? <i>Cancer Lett</i> 217, 1-9 (2005). - Unger, G.M., Davis, A.T., Slaton, J.W. & Ahmed, K. Protein kinase CK2 as regulator of cell survival: implications for cancer therapy. <i>Curr Cancer Drug Targets</i> 4, 77-84 (2004). - Bellacosa, A., Kumar, C.C., Di Cristofano, A. & Testa, J.R. Activation of AKT kinases in cancer: implications for therapeutic targeting. <i>Adv Cancer Res</i> 94, 29-86 (2005). - Hayward, D.G. & Fry, A.M. Nek2 kinase in chromosome instability and cancer. <i>Cancer Lett</i> (2005). - Knippschild, U. et al. The casein kinase 1 family: participation in multiple cellular processes in eukaryotes. <i>Cell Signal</i> 17, 675-89 (2005). |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 5 students |
| Semester: | 1 |

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|--|--|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOMO-M0001 | |
| Course | Title: Targeted therapy in gastroenterological oncology Number: MOMEm0004 Category: Hematology and Oncology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Thomas Seufferlein |
| Further Lecturers: | Dr. Götz von Wichert PD Dr. Martin Wagner |
| Study Objectives: | <p>Students should be able to</p> <ul style="list-style-type: none"> - explain principal mechanisms of cancer development and progression in different entities of GI-cancer - explain basic concepts of tumor-promoting signal transduction pathways - understand the concept of signaling modules in sub-cellular localizations/compartments - understand the importance of the interaction with the micro-environment for cell fate and transformation - understand the concept of metastasis as a multistep-process - understand how tumor-promoting pathways can be targeted for research and for therapeutic purposes - understand how dynamic processes can be visualized and quantified - be different experimental set-ups - present and discuss data in oral presentations - summarize their data in a written report - critically discuss published data related to their project - name & adhere to principles of good scientific practice |
| Module Contents: | <ul style="list-style-type: none"> - functional characterization of growth and migration in different entities of GI-cancer - analysis of signaling-cascades and transcriptional regulation in GI-cancer involved in growth and migration - targeting growth promoting pathways for tumor therapy - visualization and quantification of dynamic processes by different techniques of fluorescence- and live-cell imaging (i.e. FRAP, FRET, FLIM, FUAP) |
| Literature: | <ul style="list-style-type: none"> - Bissell MJ, Labarge MA. Context, tissue plasticity, and cancer: are tumor stem cells also regulated by the microenvironment? <i>Cancer Cell</i>. 2005 Jan;7(1):17-23 - Fidler IJ. The pathogenesis of cancer metastasis: the 'seed and soil' hypothesis revisited. <i>Nat Rev Cancer</i>. 2003 Jun;3(6):453-8. - Seufferlein T, Adler G. Gastrointestinal cancer: towards a tailored tumour therapy. <i>Scand J Gastroenterol Suppl</i>. 2003;(237):22-5.. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | Presentation 1/3, written report 2/3 |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 4 students |
| Semester: | 1 |

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|--|---|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Microarrays Number: MOMEm0005 Category: Hematology and Oncology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dr. Karlheinz Holzmann |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - distinguish between the different array platforms - perform basic microarray experiments - critically assess microarray publications - comment on the advantages /disadvantages of the different available platforms - know about the limitations of microarray analyses - present and discuss their data in oral presentations - summarize their data in a written report |
| Module Contents: | <ul style="list-style-type: none"> - DNA/RNA-Isolation - fluorescence labelling of DNA/RNA - Microarray production - Microarray hybridization for expression analysis - Matrix-CGH hybridization for detection of genomic imbalances - identification of differentially expressed genes using different approaches and software platforms - identification of genomic amplifications - Pathway analysis of differentially expressed genes |
| Literature: | - BioTechniques 34, Sonderheft: Microarrays in Cancer (March 2003) |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 4 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 2 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 4 students each |
| Semester: | 1 and 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Principles of radioimmunotherapy Number: MOMEm0006 Category: Hematology and Oncology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Gerhard Glatting |
| Further Lecturers: | Dr. C. Friesen, Dr. T. Kull |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - explain principal details of radioactivity and its measurement - explain the principles of radionuclide production - explain the measurement process of SPECT - explain the use of dosimetry before therapy - understand the principles of radioimmunotherapy - comment on how appropriate tracers are developed - present and discuss their data in oral presentations - summarize their data in a written report - critically discuss published data related to their project Optional: <ul style="list-style-type: none"> - understand the principles of Molecular Imaging - understand the use of an animal PET |
| Module Contents: | <ul style="list-style-type: none"> - principles of radioimmunotherapy (RIT) - radioactivity, measurement of radioactivity - radioactive nuclides for diagnostic and therapeutic use - radioactive labelling of antibodies - immunoreactivity of radiolabelled antibodies - dosimetry before RIT - literature search Optional: Introduction in Molecular Imaging (Animal PET) |
| Literature: | <ul style="list-style-type: none"> - Goldenberg DM, Sharkey RM, Paganelli G, Barbet J, Chatal JF. Antibody pretargeting advances cancer radioimmunodetection and radioimmunotherapy. J Clin Oncol 2006; 24(5): 823-34. - Verel I, Visser GWM, Dongen GA. The Promise of Immuno-PET in Radioimmunotherapy. J Nucl Med 2005;46:164-71. - Couturier O, Supiot S, Degraef-Mougin M, Faivre-Chauvet A, Carlier T, Chatal JF et al. Cancer radioimmunotherapy with alpha-emitting nuclides. Eur J Nucl Med Mol Imaging 2005;32:601-14. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 2 students |
| Semester: | 2 |

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|--|---|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Principles of apoptosis, DNA-damage and cell cycle Number: MOMEm0007 Category: Hematology and Oncology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dr. C. Friesen |
| Further Lecturers: | PD Dr. Gerhard Glatting |
| Study Objectives: | Students should be able to - explain principal details of induction of cell death, cell cycle and DNA-damage - present and discuss their data in oral presentations - summarize their data in a written report - critically discuss published data related to their project |
| Module Contents: | - principles of apoptosis, cell cycle and DNA-damage - molecular mechanisms of radioimmunotherapy and chemotherapy. - apoptosis and cell cycle detection by flow cytometry analysis - detection of apoptosis proteins, DNA-damage proteins and cell cycle proteins by Western blot analysis - immunoreactivity of radiolabelled antibodies by flow cytometry - detection of DNA-damage by Comet-Assay - literature search |
| Literature: | |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 2 students each |
| Semester: | 1 and 2 |

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|--|---|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Molecular deletion analysis / genomic disorders Number: MOMEm0008 Category: Human Genetics |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Hildegard Kehrer-Sawatzki |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to - enumerate frequent "genomic disorders" caused by segmental duplications - become aware of the impact of segmental duplications on genome instability - understand the mechanisms underlying repeat mediated deletions associated with human diseases |
| Module Contents: | - PCR and sequence analyses of deletion breakpoints of patients with neurofibromatosis type 1 - FISH analyses to characterize the deletion extent |
| Literature: | - Shaw CJ, Lupski JR (2004) Implications of human genome architecture for rearrangement-based disorders: the genomic basis of disease. Hum Mol Genet 13:R57-64 - Lupski JR (1998) Genomic disorders: structural features of the genome can lead to DNA rearrangements and human disease traits. Trends Genet 14:417-422 - Lupski JR, Stankiewicz P (2005) Genomic disorders: molecular mechanisms for rearrangements and conveyed phenotypes. PLoS Genet 1:e49 - López Correa C, Dorschner M, Brems H, Lazaro C, Clementi M, Upadhyaya M, Dooijes D, Moog U, Kehrer-Sawatzki H, Rutkowski JL, Fryns JP, Marynen P, Stephens K, Legius E (2001) Recombination hotspot in NF1 microdeletion patients. Hum Mol Genet 10:1387-1392 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Lab file written record of the experiments with interpretation of the results |
| ECTS-Points: | 4 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 2 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 2 students each |
| Semester: | 1 and 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Mitochondrial mutations and oligonucleotides Number: MOME0009 Category: Human Genetics |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Dieter Kaufmann |
| Further Lecturers: | Dr. Britta Bartelt-Kirbach |
| Study Objectives: | Students should be able to - become aware of the importance of mitochondrial mutations in tumors and ageing - perform mutation screening in mitochondrial DNA - understand the biology of uptake of oligonucleotides in cells and mitochondria and their biological effects - learn to discuss their own results in context of published data |
| Module Contents: | - isolation of mitochondria and mitochondrial DNA - detection of mutations in a mitochondrial gene by PCR and sequencing - transfection of cells and mitochondria with oligonucleotides and investigation of uptake - measuring the expression of a mitochondrial gene by real time PCR |
| Literature: | - Strachan and Read, Human Molecular Genetics 3, Garland Science - Kurtz A. et al. Somatic mitochondrial mutations in NF1 associated tumors, Mol Cancer Res 2004; 2(8), 433-441 - Greaves et al. Mitochondrial DNA mutations are established in human colonic stem cells...PNAS 2006, 03(3) 714-719 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOME0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Lab file written record of the experiments with interpretation of the results |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 2 students |
| Semester: | 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Genetic variability Number: MOMEm0010 Category: Human Genetics |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Walther Vogel |
| Further Lecturers: | Prof. Dr. Günter Assum, Dr. Christiane Maier |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - perform microsatellite typing for various applications - perform a paternity test - apply various methods of SNP typing - deduce haplotypes from genotypes by visual inspection and with computer programs - calculate linkage disequilibrium (LD) between marker pairs - perform mutation screenings - interpret genetic variability data in various contexts |
| Module Contents: | <ul style="list-style-type: none"> - isolation of DNA from human cells, PCR and microstellite typing - paternity testing (evaluate test results and give written evidence) - establishment of the LD profile of a genomic region - search of mutations causative of human disease |
| Literature: | <ul style="list-style-type: none"> - Strachan and Read, Human Molecular Genetics 3, Garland Science - Evett and Weir, Interpreting DNA Evidence, Statistical Genetics for Forensic Scientists, (Sinauer Associates Puplishers) |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Oral presentation of the results, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 2 students |
| Semester: | 2 |

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|--|--|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Sex chromosomes: aberrations and diagnostics Number: MOMEm0011 Category: Human Genetics |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Walter Just |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to - become aware of the importance of the sex chromosomes with respect to the autosomes - interpret Mendelian inheritance of X-chromosomal recessive and dominant disorders - recognize silencing of X-chromosomal genes by X inactivation - design an approach for molecular diagnosis of an X-linked disorder |
| Module Contents: | - PCR and sequencing of a gene related to X-linked mental retardation - analysis of skewed X inactivation by methylation-sensitive restriction digestion with subsequent quantitative PCR analysis of the alleles. |
| Literature: | - Lower, K. M., et al: Mutations in PHF6 are associated with Börjeson-Forssman-Lehmann syndrome Nature Genetics 32 (4), 661-665, (2002) - Strachan & Read: Molekulare Humangenetik; Spektrum, 2005 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Lab file written record of the experiments with interpretation of the results |
| ECTS-Points: | 8 ECTS |
| Grade composition: | - / - |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 2 students each |
| Semester: | 1 and 2 |

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|--|---|
| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Characterization of mitotic behaviors, DNA methylation patterns, and transcriptional regulation of the FMR1 gene of fragile X syndrome Number: MOMEm0012 Category: Human Genetics |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Peter Steinbach |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to - recapitulate the basic mechanisms of transcriptional regulation - be familiar with mechanisms leading to transcriptional silence in general and in the FMR1 gene of fragile X syndrome in particular. - to outline the basics of somatic cell hybridization and in vitro cell selection - be familiar with the biochemistry of DNA and DNA replication - be familiar with mechanisms by which abnormally structured repetitive sequences of trinucleotide repeats may undergo expansion or deletion upon continual mitotic cell division |
| Module Contents: | - assessment of DNA methylation patterns of FMR1 gene promoters by sequencing of bisulfite converted genomic DNA isolated from somatic cell hybrids. - assessment of the transcriptional activities of human and mouse FMR1 genes by RT-PCR of mRNA samples isolated from mouse/human somatic cell hybrids - isolation and characterization by PCR and DNA sequencing of deletion junction fragments generated upon continual mitotic instability of largely expanded triplet repeat sequences |
| Literature: | - Orphanides G, Reinberg D (2002) A unified theory of gene expression. Cell 108:439-451. - Richards EJ, Elgin SCR (2002) Epigenetic codes for heterochromatin formation and silencing: Rounding up the usual suspects. Cell 108:489-500. - Willemsen R, Oostra BA, Bassell GJ, Dichtenberg J (2004) The fragile X syndrome: From molecular genetics to neurobiology. Mental Retardation and Developmental Disabilities Research Reviews 10: 60-67. - Sinden RR (1999) Biological implications of the DNA structures associated with disease-causing triplet repeats. American Journal of Human Genetics 64: 346-353. - McMurray CT (1995) Mechanisms of DNA expansion. Chromosoma 104: 2-13 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Data presentation in research seminar, written report |
| ECTS-Points: | 4 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 2 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 2 students |
| Semester: | 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Genetics and expression of ion channels in skeletal muscle disorders Number: MOMEm0013 Category: Human Genetics |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | HD Dr. Karin Jurkat-Rott |
| Further Lecturers: | Prof. Dr. Dr. Frank Lehmann-Horn |
| Study Objectives: | for ion channels/channelopathies, students should be able to: - identify genetic mutations - genotype linkage markers - examine native tissue expression - perform heterologous expression - know about subsequent functional studies |
| Module Contents: | - isolation of DNA, RNA, and vectors - various PCR techniques - DNA sequencing - cell culture - transient heterologous expression - general knowledge on ion channels and channelopathies |
| Literature: | - James D. Watson, et al.: Molecular biology of the Gene - Jurkat-Rott K, Lehmann-Horn F. Muscle channelopathies and critical points in functional and genetic studies. J Clin Invest, 115: 2000-9, 2005 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Written report and PowerPoint presentation in research seminar |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 3 students each |
| Semester: | 1 and 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Pharmacogenetic diagnostic for individualized drug therapy Number: MOMEM0014 Category: Human Genetics |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Julia Kirchheiner |
| Further Lecturers: | Dr. Angela Seeringer |
| Study Objectives: | The students are thought to know - individual factors influencing drug response and adverse drug effects - methods for individualization of drug therapy - about pharmacogenetic polymorphisms which influence drug metabolism, drug transport or/and drug response - the problems on transforming pharmacogenetic data into clinical dose adjustments - methods for pharmacogenetic analyses |
| Module Contents: | - genotyping: analysis of SNPs, gene deletions and gene duplications - analysis of adverse drug effects in context with pharmacogenetics - drug concentrations in plasma and relation to genetic polymorphisms Methods: - DNA extraction from whole blood - Real-time PCR - PCR-RFLP and agarosis gel-electrophoresis - DNA-sequencing |
| Literature: | - Kirchheiner J, Fuhr U, Brockmüller J. Pharmacogenetics based therapeutic recommendations – ready to go into clinical practice? Nature Reviews Drug Discovery 2005; 4:639-48. - Kirchheiner J, Brockmüller J. Clinical impact of CYP2C9 polymorphisms. Clin Pharmacol Ther 2005; 77:1-16 - Kirchheiner J, Nickchen K, Bauer M, Licinio J, Wong M-L, Roots I, Brockmüller J. Pharmacogenetics of antidepressants and antipsychotics: the contribution of allelic variations to the phenotype of drug response. Mol Psychiatry 2004; 9: 442-473 - Kirchheiner J, Heesch C, Bauer S, Meisel C, Seringer A, Goldammer M, Tzvetkov M, Meineke I, Roots I, Brockmüller J. Impact of the ultra-rapid metabolizer genotype of CYP2D6 on metoprolol pharmacokinetics and pharmacodynamics. Clin Pharmacol Ther 2004;76:302-12. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 2 students each |
| Semester: | 1 and 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Signaling pathways in inflammation Number: MOMEm0016 Category: Infectious Diseases & Immune Reactions |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Tatiana Syrovets |
| Further Lecturers: | Prof. Th. Simmet, Dr. Yves Laumonnier |
| Study Objectives: | Students should learn: <ul style="list-style-type: none"> - diseases related to chronic inflammation - agents producing chronic inflammation - signs and mediators of inflammation - in vitro models of inflammation (chemotaxis, cytokine release, phagocytosis, expression of cell surface markers) - role of different cell types in inflammation - signaling pathways in inflammation and interaction between them - which and how the signaling pathways can be targeted for the experimental and therapeutic purposes - analyse and interpret scientific literature - perform experiments aimed to analyse parameters of inflammation on their own according to the principles of good scientific practice - present and discuss their data orally at the weekly department meetings - summarize their data in a written report |
| Module Contents: | <ul style="list-style-type: none"> - isolation of immune cells from human blood - analysis of inflammatory parameters in in vitro models (chemotaxis, phagocytosis, EMSA, Western blotting, kinase assay, ELISA) - pharmacological or molecular biological targeting of signaling pathways. Analysis of the consequences in in vitro models of inflammation |
| Literature: | <ul style="list-style-type: none"> - Gallin JI, Snyderman R. Inflammation: Basic Principles and Clinical Correlates. Philadelphia: Lippincott Williams & Wilkins; 1999. - Nathan C. Points of control in inflammation. Nature. 2002;420:846 - Clevers H. At the crossroads of inflammation and cancer. Cell. 2004;118:671 - Karin M et al. Innate immunity gone awry: linking microbial infections to chronic inflammation and cancer. Cell. 2006;124:823 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 4 students each |
| Semester | 1 and 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Immune evasion mechanisms of human immunodeficiency viruses Number: MOMEm0017 Category: Infectious Diseases & Immune Reactions |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. F. Kirchhoff |
| Further Lecturers: | Prof. Dr. J. Münch |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - understand how viruses evade the human immune system - appreciate the principles of antiretroviral therapy - achieve a basic knowledge about the pathogenesis of AIDS - understand how basic research might lead to novel therapies - perform literature searches - learn novel techniques - present their data and put them into context |
| Module Contents: | <ul style="list-style-type: none"> - generation of constructs expressing retroviral genes - DNA-Methods: Modification and analysis of HIV genes (PCR, mutagenesis, cloning techniques, transfections, reporter assays) - cell biology methods: Modulation of cellular properties by viral proteins (FACS, cell culture, microscopy) - biochemical Methods: Quantitation of viral gene expression (Western blot, ELISA, reporter assays) |
| Literature: | <ul style="list-style-type: none"> - Hahn, B.H., Shaw, G.M., De Cock, K.M., and Sharp, P.M. (2000). AIDS as a zoonosis: scientific and public health implications. Science 287, 607-614. - Stevenson, M. (2003). HIV-1 pathogenesis. Nat. Med. 9, 853-860. - Peterlin BM, Trono D. (2003) Hide, shield and strike back: how HIV-infected cells avoid immune eradication. Nat. Rev. Immunol. 3, 97-107. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, Seminar, practical training |
| Examinations: | Presentation of the data in a research seminar and oral examination |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term or summer term, 3 students per year |
| Semester | 1 or 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Local inflammatory response following lung contusion in a small animal model of blunt chest trauma Number: MOMEm0019 Category: Infectious Diseases & Immune Reactions |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Markus Knöferl |
| Further Lecturers: | Dr. Mario Perl, Dr. Daniel Seitz |
| Study Objectives: | Students should be able to - plan an animal experiment - prepare an animal experiment and the following analyses - perform sterile cell culture techniques - perform a RT-PCR or FACS analysis - perform a immunohistochemical analysis - present and discuss their data in an oral presentation and discuss two relevant papers related to their project - present their project in a written report |
| Module Contents: | - rodent model of blunt chest trauma under supervision - lung preparation for cell isolation under supervision - cell culture techniques: - isolation of Alveolar Type II Epithelial Cells - isolation of Alveolar Macrophages - analysis by RT-PCR or FACS - immunohistochemical analysis |
| Literature: | - M.W. Knöferl, U.C. Liener, D.H. Seitz, M. Perl, U.B. Brückner, L. Kinzl, F. Gebhard, Cardiopulmonary, histological and inflammatory alterations following lung contusion in a novel mouse model of blunt chest trauma, (2003), Shock 19 (6):519-525. - U.C. Liener, M.W. Knöferl, J. Sträter, T.F. Barth, E.M. Pauser, A.K. Nüssler, L. Kinzl, U.B. Brückner, F. Gebhard, Induction of Apoptosis Following Blunt Chest Trauma, (2003), Shock 20 (6):511-516. - M.W. Knöferl, U.C. Liener, M. Perl, U.B. Brückner, L. Kinzl, F. Gebhard, Blunt chest trauma induces delayed splenic immunosuppression, (2004), Shock 22 (1):51-56. - M. Perl, F. Gebhard, U.B. Brückner, A. Ayala, S. Braumüller, C. Büttner, L. Kinzl, M.W. Knöferl, Pulmonary contusion causes impairment of macrophage and lymphocyte immune functions and increases mortality associated with a subsequent septic challenge, (2005), Crit Care Med 33(6):1351-1358. - M. Perl, F. Gebhard, S. Braumüller, B. Tauchmann, U.B. Brückner, L. Kinzl, M.W. Knöferl, The pulmonary and hepatic immune microenvironment and its contribution to the early systemic inflammation following blunt chest trauma, (2006), Crit Care Med 13. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/-3 |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Influence of the human cytomegalovirus infection on the host cell metabolism and targets of antiviral therapy Number: MOMEm0042 Category: Infectious Diseases and Immune Reactions |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Thomas Mertens |
| Further Lecturers: | Prof. Dr. Detlef Michel |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - understand how viruses evade the human immune system - understand the different mechanisms of viral replication - achieve knowledge about antiviral prophylaxis, preemptive therapy and antiviral therapy - become aware of the problems of immunosuppressed patients to overcome severe viral infections - achieve knowledge about the possibilities of site directed mutagenesis of viral genomes - perform literature searches, extract data and present it |
| Module Contents: | <ul style="list-style-type: none"> - cell culture - basic techniques in manipulating viral genomes - basic molecular techniques (PCR, Western blot, electrophoresis...) |
| Literature: | <ul style="list-style-type: none"> - Snyderman DR. The case for cytomegalovirus prophylaxis in solid organ transplantation. Rev Med Virol. 2006;289-95. - Schleiss M. Progress in cytomegalovirus vaccine development. Herpes. 2005 12:66-75 - Gilbert C, Boivin G. Human cytomegalovirus resistance to antiviral drugs. Antimicrob Agents Chemother. 2005;49:873-83. - Tillmann HL. Antiviral therapy and resistance with hepatitis B virus infection. World J Gastroenterol. 2007;13:125-40. - Derdelinckx I, Wainberg MA, Lange JM, Hill A, Halima Y, Bouche Criteria for drugs used in pre-exposure prophylaxis trials against HIV infection. PLoS Med. 2006 Nov;3(11):e454. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Lab file written record of the experiments and oral presentation |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term or summer term, 1 student per year |
| Semester | 1 or 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: MuscleBrain Channelopathies Number: MOMEm0020 Category: Neurobiology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Dr. h.c. Frank Lehmann-Horn |
| Further Lecturers: | PD Dr. Werner Melzer |
| Study Objectives: | Students should know the basics of membrane physiology and electrophysiology |
| Module Contents: | - intracellular recordings of membrane and action potentials - Voltage clamping (patch clamping) |
| Literature: | - Specific knowledge on channelopathies, e.g. Jurkat-Rott, Lehmann-Horn. Muscle channelopathies and critical points in functional and genetic studies. <i>J Clin Invest</i> 115:2000-9,2005 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar and written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | Presentation 1/3, written report 2/3 |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 3 students |
| Semester: | 1 |

| Title of Module: Specific Aspects of Molecular Medicine | |
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| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Axonal Regeneration Number: MOMEm0021 Category: Neurobiology |
| Study Programme: | Master degree in Molecular Medicine |
| Instructor: | Prof. Dr. Dietmar Fischer |
| Further Instructor: | -/- |
| Study Objectives: | Students should be able to - get an overview of the mechanism underlying the failure of axonal regeneration in the CNS - get an overview of animal models to study axon regeneration (surgery) - get an overview of labeling techniques of regenerating axons and labeling of retinal ganglion cells by different tracers <i>in vivo</i> |
| Study Contents: | - culture and differentiation of PC12-cells as model for neurite outgrowth - culture of rat retina and quantification of regenerating axons - immunohistochemical staining of regenerating axons - transduction of RGC by Adeno associated virus (AAV) <i>in vivo</i> |
| Literature: | - Fischer D, Petkova V, Thanos S, Benowitz LI (2004) Switching mature retinal ganglion cells to a robust growth state <i>in vivo</i> : gene expression and synergy with RhoA inactivation. J. Neuroscience; 24: 8726-8740. - Fischer D, He Z and Benowitz LI (2004) Counteracting the Nogo receptor enhances optic nerve regeneration if retinal ganglion cells are in an active growth state J Neuroscience; 24(6): 1646-1651 - Gooley JJ, Lu J, Fischer D and Saper CB (2003) A broad role for melanopsin in non-visual photoreception J Neuroscience; 23 7093-7106 - Fischer D, Pavlidis M and Thanos S (2000) Cataractogenic lens injury prevents traumatic ganglion cell death and promotes axonal regeneration both <i>in vivo</i> and <i>in culture</i> . Invest Ophthalmol Vis Sci 41: 3943-3954 |
| Classification: | Compulsory optional course |
| Prerequisite: | Lecture series MOMEm0061 |
| Teaching method: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Cell adhesion in the nervous system Number: MOMEm0022 Category: Neurobiology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Nikola Golenhofen |
| Further Lecturers: | Dr. Katharina Langer |
| Study Objectives: | Students should be able to - get an overview of the different families of cell adhesion molecules and kind of cell contacts in the nervous system - know about the different functional roles of cell adhesion molecules in the nervous system - know possible mechanisms of regulation of cell adhesion - learn about techniques to investigate strength and regulation of cell adhesion - learn to present their own data in oral presentations as well as in written reports |
| Module Contents: | - culture and transfection of primary neuronal cells - protein purification of recombinant fusion proteins via affinity chromatography for the use in cell adhesion assays - advanced microscopical techniques such as live cell imaging or laser tweezer |
| Literature: | - Baumgartner W, Golenhofen N (Co-First-Author), Grundhofer N, Wiegand J, Drenckhahn D (2003) Ca ²⁺ dependency of N-cadherin function probed by laser tweezer and atomic force microscopy. J Neurosci 23:11008-14 - Huntley GW, Gil O, Bozdagi O (2002) The cadherin family of cell adhesion molecules: multiple roles in synaptic plasticity. Neuroscientist 8:221-33 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar and written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 2 students |
| Semester: | 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Neurodegenerative Diseases Number: MOMEm0023 Category: Neurobiology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Christine v. Arnim |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - name common features of neurodegenerative diseases - recapitulate important steps and mechanisms in APP processing - comment on recent developments in Alzheimer's disease therapeutic strategies - present their own data in oral presentations - write on their own data in style of a 'mini-paper' - to discuss their own results in the context of published data. |
| Module Contents: | <ul style="list-style-type: none"> - culture of different cell lines - cloning of various DNA-vectors - transfection - microscopic imaging - observation of protein-protein interaction/ protein trafficking |
| Literature: | <ul style="list-style-type: none"> - MP Mattson, Pathways towards and away from Alzheimer's disease. Nature. 2004 Aug 5;430(7000):631-9. Review. - CAF v. Arnim et al, Demonstration of BACE (β-secretase) phosphorylation and its interaction with GGA1 in cells by Fluorescence lifetime imaging, J. Cell Sci. 2004 117: 5437-5445. - NC Shaner et al., A guide to choosing fluorescent proteins Nature methods. 2005 Dec; 2 (12): 905-9. Review |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSC course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Protein-protein interactions in PSDs Number: MOMEm0024 Category: Neurobiology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr.T.M Böckers |
| Further Lecturers: | PD Dr. Bockmann, Dr. Stefan Liebau, Dr. Christian Pröpper |
| Study Objectives: | Students should be able to - get an overview on different methods to find and confirm protein-protein interactions at PSDs - perform a set of methods related to the function and localization of synaptic proteins |
| Module Contents: | - culture and transfection of tumour cell lines, primary hippocampal neurons and neuronal precursor cells - immunohistochemistry and light microscopy of brain slices and/or cultured cells - screening and confirmation of novel protein-protein interactions |
| Literature: | - Ziff EB, Enlightening the postsynaptic density. Neuron 19;1163-1174 (1997) - Kim E and Sheng M, PDZ domain proteins of synapses. Nature Reviews Neuroscience, 5; 771-781 (2004) - Garner et al., PDZ domains in synapse assembly and signalling. Trends in Cell Biology, 10; 274-280 (2000) - Böckers et al., ProSAP/Shank proteins – a family of higher order organizing molecules of the postsynaptic density with an emerging role in human neurological disease. J Neurochem. 81; 903-910 (2002) |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar and written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 2 students |
| Semester: | 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Ionchannels in epileptic diseases Number: MOMEm0025 Category: Neurobiology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. H. Lerche |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - name the main different classes of ion channels important for the regulation of neuronal excitability - give an overview of how a neuron is built and how it functions - give examples of ion channel dysfunction that can be associated with hereditary epilepsy and explain the probable pathophysiological mechanisms of such ion channel mutations - comment on recent developments in the pathophysiology of idiopathic epilepsy - present their own data in oral presentations • should learn to write on their own data in style of a „mini-paper“ (written report for this modul) - learn to discuss their own results in the context of published data. |
| Module Contents: | <ul style="list-style-type: none"> - recordings of ion channels heterologously expressed in mammalian cells using the patch clamp technique - recordings of electrophysiological properties of neurons and ionic currents from neurons - data evaluation and comparison between cloned and natively occurring channels and between mutant and wild type channels |
| Literature: | <ul style="list-style-type: none"> - Neher/Sakmann: Single Channel Recording - Kandel/Schwartz: Principles of Neural Science - Hille: Ion Channels of Excitable Membranes |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 4 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 2 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term or summer term, 2 students |
| Semester: | 1 or 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Proteomic approaches in biomarker identification Number: MOMEm0026 Category: Neurobiology |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Markus Otto |
| Further Lecturers: | Dr. Petra Steinacker, Dr. Stefan Lehnert |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - distinguish between different types of proteomic approaches - name the importance convenience and limits of the different approaches - recapitulate basic of CSF flow - comment on recent developments in proteomic approaches - learn to present their own data in oral presentations - learn to write on their own data in style of a „mini-paper“ (written report for his module) - learn to discuss their own results in the context of published data. |
| Module Content: | <ul style="list-style-type: none"> - preparation and manipulation of body fluid samples, tissues and/or cell cultures - performance of isoelectric focussing - performance of 2nd dimension gel - performance of silverstaining of 2D-Gels - basics in data analysis of 2D-Gels |
| Literature: | Rainer Westermeier: Electrophoresis in practice |
| Classification: | Compulsory optional course |
| Prerequisites: | BSc degree in Life Sciences |
| Teaching Methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade Composition: | Presentation 1/3, written report 2/3 |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Tumor stem cells and stem cells for tumor therapy Number: MOMEm0027 Category: Regenerative Medicine |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Christian Beltinger |
| Further Lecturers: | Dr. Joachim Wahl |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - distinguish between hierarchical and non-hierarchical models of tumorigenesis - define key characteristics of tumor stem cells - know the similarities and differences between tissue stem cells, cells of tumor origin and tumor stem cells - know the power and limitations of the methods use to isolate tumor stem cells - critically assess the role of the tumor stem cells in clinical oncology - define the power and limitations of stem and progenitor cells for tumor therapy - present their own data in oral presentations - write on their own data in style of a „mini-paper“ (written report for his modul) - discuss their own results in the context of published data |
| Module Contents: | <ul style="list-style-type: none"> - enrichment of putative tumor stem cells by spheroid culture - MACS sorting of tumor stem cells - differentiation of tumor stem cells - Analysis of tumor stem cells and differentiated derivatives by FACS, immunocytochemistry and RT-PCR |
| Literature: | <ul style="list-style-type: none"> - Al-Haji M et al., 2004, Oncogene 23, 7247-7282 - Warner J et al., 2004, Oncogene 23, 7164-7177 - Wicha M et al., 2006, Cancer Res 66, 1883-1890 - Hill P, 2006 Cancer Res 66, 1991-1896 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 4 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 2 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Genetic modification of adult stem cells for in-vivo application Number: MOMEm0028 Category: Regenerative Medicine |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Jan Torzewski |
| Further Lecturers: | Dr. Juliane M. Wiehe |
| Study Objectives: | Students should be able to - get an overview of therapeutic approaches using adult stem cells in cardiology - get an overview of labeling techniques for in vivo application of adult stem cells |
| Module Contents: | - culture of human CD34-positive adult stem cells - culture of human mesenchymal stem cells - transfection of adult human stem cells - analysis of transfected cells using RT-PCR and FACS |
| Literature: | - Greiner J., Wiehe J., Wiesneth M., Zwaka T.P., Prill T., Schwarz K., Bienek-Ziolkowski M., Schmitt M., Döhner H., Hombach V. and Torzewski J (2004). Transient genetic labeling of human CD34 positive hematopoietic stem cells using nucleofection. <i>Transfus Med Hemother.</i> 31: 136-141. - Wiehe J, Zimmermann O, Greiner J, Homann J, Wiesneth M, Hombach V, Torzewski J (2005): Labeling of adult stem cells for in vivo-application in the human heart. <i>Histol Histopathol.</i> 20: 901-906 - Wiehe JMI, Niesler C, Torzewski J, Zimmermann O, Wiesneth M, Schmitt M, Schwarz K, Döhner H, Hombach V, Greiner J (2006): Efficient Transient Genetic Labeling Of Human CD34+ Progenitor Cells for in vivo-Application. <i>Regenerative Med.</i> , in press |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 4 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 2 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: In vitro differentiation of cardiomyocytes from pluripotent precursor cells Number: MOMEm0029 Category: Regenerative Medicine |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Michael Kühl |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - distinguish between different types of pluripotent precursor cells. - name the importance of developmental biology for stem cell biology. - recapitulate key steps of cardiac development in invertebrates and vertebrates - comment on recent developments in cardiac regenerative medicine. - present their own data in oral presentations - write on their own data in style of a „mini-paper“ (written report for this modul) - discuss their own results in the context of published data. |
| Module Contents: | <ul style="list-style-type: none"> - preparation and manipulation of Xenopus animal cap cells - culture of murine embryonic stem cells - differentiation of ES cells in hanging drops - analysis of differentiation by RT-PCR and FACS - observation of a contractile phenotype |
| Literature: | <ul style="list-style-type: none"> - Brand T - Olson and Schneider - Gilbert, Developmental Biology, Sinauer |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Matrix biology in regenerative medicine Number: MOMEm0030 Category: Regenerative Medicine |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Rolf Brenner |
| Further Lecturers: | Dr. Jörg Fiedler |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - explain principles of tissue engineering and guided tissue regeneration of skeletal tissues - name essential biologic properties of mesenchymal (stem) cells and connective tissues - recapitulate the relevance of cell- matrix- interactions for regenerative medicine - describe basic experimental techniques to study cell-biomaterial interactions - discuss own results in the context of published data - present and discuss their data in an oral presentation - write a report on their data in the style of a short scientific paper |
| Module Contents: | <ul style="list-style-type: none"> - establishment and cultivation of primary mesenchymal cell cultures (chondrocytes, osteoblasts, mesenchymal stem cells) - 2d and 3d-cell culture techniques - chemotaxis analysis (Boyden chamber assay) - analysis of cell adhesion and cell-matrix-interactions in contact with different (bio-) materials - morphologic analysis of connective tissues (histology, immunostaining) - analysis of differentiation / gene expression by RT-PCR |
| Literature: | <ul style="list-style-type: none"> - Lutolf and Hubbel, Nature Biotechnology, 2005, 23: 47-55 - Karsenty, Nature, 2003, 423: 316-318 - Pittenger et al., Science, 1999, 284: 143-147 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 2 students each |
| Semester: | 1 and 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Cellular senescence and skin aging Number: MOMEm0031 Category: Regenerative Medicine |
| Study Programme: | Master degree in Molecular Medicine |
| Instructor: | Prof. Dr. Karin Scharffetter-Kochanek |
| Further Instructor: | Dr. Meinhard Wlaschek, Dr. Sebastian Iben |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - explain the principle morphological and functional structure of the skin - name essential mechanisms of cellular senescence - describe basic experimental techniques to study gene expression and localization - analyse and explain raw data of experiments, draw conclusions and present it in a form suitable for evaluation - evaluate the results in the context of published data - present and discuss data in an oral presentation - write a report on the data in the style of a short scientific paper |
| Study Contents: | <ul style="list-style-type: none"> - analysis of physiological and stress-induced senescence in skin cells - induction of cellular senescence by stressors - signalling in cellular senescence - analysis of ribosomal biogenesis in aging syndromes - histological and immunohistological methods to study expression and localization of senescence associated proteins in skin - analysis of gene expression by RT-PCR |
| Literature: | <ul style="list-style-type: none"> - Campisi J. Senescent Cells, Tumor Suppression, and Organismal Aging: Good Citizens, Bad Neighbors. Cell 120, 513-522, 2005 - Guarente L and Picard F. Calorie Restriction— the SIR2 Connection. Cell 120, 473-482, 2005 - Schneider LA, Wlaschek M, Scharffetter-Kochanek K. Skin aging-clinical aspects and pathogenesis. J Dtsch Dermatol Ges. 1:223-32, 2003 |
| Classification: | Compulsory optional course |
| Prerequisite: | Lecture series MOMEm0061 |
| Teaching method: | Lecture, seminar, practical training |
| Type of Activity: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 2 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 2 students |
| Semester: | 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Cell biomechanics and tissue engineering of bone Number: MOMEm0032 Category: Regenerative Medicine |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Anita Ignatius |
| Further Lecturers: | --/-- |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - understand the principle of tissue engineering of bone - comment on current strategies of tissue engineering of bone - summarize key steps of osteogenic differentiation of mesenchymal progenitor cells - understand the importance of mechanical load for bone remodeling and the possible use of mechanical stimuli in the field of tissue engineering - understand the mechanisms of mechanotransduction - learn to present their own data in oral and written presentations - learn to discuss their data in the context of the literature - learn to communicate in an interdisciplinary team |
| Module Contents: | <ul style="list-style-type: none"> - isolation of human mesenchymal progenitor cells from bone marrow - differentiation of mesenchymal progenitor cells into the osteogenic lineage - characterization of these cells by PCR and staining methods - three-dimensional cell culture on a scaffold for tissue engineering - observation of mechanical stimulation of cells |
| Literature: | <ul style="list-style-type: none"> - Liedert, A. et al. in: A. Kamkin, I. Kiseleva (Eds.), Mechanosensitivity in Cells and Tissues, Academia, 418-433, 2005 - Caplan, A.L., Tissue Engineering 11 (7-8), 1198-211, 2005 - Mistry AS, Adv Biochem Eng Biotechnol, 94, 1-22, 2005 - Hollinger et al., Bone tissue engineering, CRC Press, 2005 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 1 student each |
| Semester: | 1 and 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Analysis of transcription factor action in differentiation, tumor development and neurodegeneration Number: MOMEm0039 Category: Regenerative Medicine |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Thomas Wirth |
| Further Lecturers: | -/- |
| Study Objectives: | Students should - learn how to study transcription factor action - be able to describe major signaling pathways upstream and downstream NFκB - be able to discuss the importance of animal models for the analysis of transcription factor action - learn to present their own data in oral presentations. - learn to write on their own data in style of a „mini-paper“ (written report for this modul). - learn to discuss their own results in the context of published data. |
| Module Contents: | - cell culture - preparation and manipulation of primary cells from mice. - analysis of cell population by FACS. - analysis of signaling pathways by western blot - analysis of transcription factor activity by EMSA and RT-PCR of target genes - reporter gene assays - fluorescence microscopy - immunocytochemistry |
| Literature: | - Janeway, Immunobiology, Garland, 5 th edition - Weinberg, The biology of Cancer, Garland - Krauss, Biochemistry of Signal Transduction and regulation, Wiley VCH 2003 - Karin, M., Nuclear factor-kappaB in cancer development and progression, Nature 441: 431-436, 2006 - Herrmann et al., IKK mediates ischemia-induced neuronal death, Nature Medicine 11: 1322-1329, 2005 - Hayden and Ghosh, Signaling of NF-kappaB, Genes Dev 18: 2195-2224. 2004 - Denk et al., NF-kappaB transcription factors: critical regulators of hematopoiesis and neural survival, Cytokine Growth Factor Rev 11: 303-320 |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Adenovirus vector rescue, production and analysis Number: MOMEm0040 Category: Regenerative Medicine |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dr. Florian Kreppel |
| Further Lecturers: | Prof. Dr. Stefan Kochanek |
| Study Objectives: | Students should <ul style="list-style-type: none"> - learn to produce a replication-defective adenovirus vector - become familiar with different molecular biology and virology techniques, including plasmid production, cell transfection, virus rescue, virus production, virus purification and analysis, flow cytometric analysis of transgene expression - become familiar with different types of adenovirus vectors and their potential use in different applications - learn to protocol their own data - learn to present their data in a written report - learn to discuss their data in the context of published data |
| Module Contents: | <ul style="list-style-type: none"> - transformation of bacteria with plasmids followed by plasmid production and purification - transfection of human cells with viral shuttle plasmids - rescue of adenovirus vector and serial amplification - large scale production of adenovirus vectors in complementation cells - purification of adenovirus vectors by CsCl density gradient centrifugation - quality control and functional analysis of produced adenovirus vectors |
| Literature: | <ul style="list-style-type: none"> - Imperiale, M. J. and S. Kochanek. 2004. Adenovirus vectors: biology, design, and production. <i>Curr Top Microbiol Immunol</i> 273: 335-357. - Volpers, C. and S. Kochanek. 2004. Adenoviral vectors for gene transfer and therapy. <i>J. Gene Med</i> 6: 164-171. - Kreppel, F., V. Biermann, S. Kochanek, and G. Schiedner. 2002. A DNA-based method to assay total and infectious particle contents and helper virus contamination in high-capacity adenoviral vector preparations. <i>Hum Gene Ther</i> 13: 1151-1156. - Schiedner, G., S. Hertel, and S. Kochanek. 2000. Efficient transformation of primary human amniocytes by E1 functions of Ad5: generation of new cell lines for adenoviral vector production. <i>Hum Gene Ther</i> 11: 2105-2116. |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 2 students each |
| Semester: | 1 and 2 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Fluorescence microscopic methods Number: MOMEm0034 Category: all |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dr. Edward Felder |
| Further Lecturers: | -/- |
| Study Objectives: | Students should be able to - understand principles of modern microscopic and fluorescence microscopic methods on an advanced level - understand the function of different fluorescence probes to choose the appropriate ones according to the experimental needs and the available equipment - independently operate several different types of fluorescence microscopes |
| Module Contents: | - lecture with a presentation of general background knowledge, and a practically oriented introduction in microscopic techniques - "hands on" – presentation of different types of microscopes and use of the microscopes by the students under supervision - practical part, were groups of 2 students work on several mini-projects, that involve different aspects of microscopic techniques and fluorescence dyes |
| Literature: | Any good textbook (or Internet source) that provides principles of optics, microscopy, fluorescence microscopy and related topics |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Students have to solve methodological problems during the course and answer questions that are closely related to the actual mini-project |
| ECTS-Points: | 2 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 1 week |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 6 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Modeling of signal transduction pathways and genetic regulatory networks Number: MOMEm0036 Category: all |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dr. H. Kestler |
| Further Lecturers: | Prof. Dr. M. Kühl |
| Study Objectives: | Students should be able to - distinguish between different modeling approaches - comment on recent developments in modeling approaches - present own data in oral presentations - write on their own data in style of a "mini-paper" (written report for this module) - discuss their own results in the context of published data |
| Module Contents: | - preparation of a simplified model for a selected signal transduction pathway/genetic regulatory network - implementation of the model for computer simulation (i.e. Python, Matlab, Maple, etc.) - simulation of network behavior |
| Literature: | Will be announced |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term, 2 students |
| Semester: | 1 |

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| Title of Module: Specific Aspects of Molecular Medicine | |
| Practical training, compulsory optional course of module number: MOME-M0001 | |
| Course | Title: Biomarker Number: MOMEm0041 Category: all |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dr. Thomas Joos |
| Further Lecturers: | Prof. Dr. Marion Schneider |
| Study Objectives: | Students should be able to <ul style="list-style-type: none"> - explain "biomarker" - explain the principle of a microarray - explain proteomic approaches to discover biomarkers - understand the basic principles of immunoassays - understand the concepts of miniaturized and parallelized immunoassays - present and discuss their own results in an oral presentation - summarize their results in a written report - critically discuss published data related to the project - name and adhere to principles of good scientific practice |
| Module Contents: | <ul style="list-style-type: none"> - biomarker - protein microarray technology - immunoassay development and validation - data analysis |
| Literature: | <ul style="list-style-type: none"> - L. Anderson Candidate-based proteomics in the search for biomarkers of cardiovascular disease. J Physiol. Feb 15;563(Pt 1):23-60, 2005 - R. Aebersold, L. Anderson, R. Caprioli, B. Druker, L. Hartwell and R. Smith. Perspective: a program to improve protein biomarker discovery for cancer. J Proteome Res. Jul-Aug;4(4):1104-9, 2005 - Stoll D., Bachmann J., Templin M.F., and Joos T.O. Protein Microarrays: Applications and future challenges. Curr. Opin. Drug Disc. Devel. 8(2): 239-252, 2005 Will be announced |
| Classification: | Compulsory optional course |
| Prerequisites: | Lecture series MOMEm0061 |
| Teaching methods: | Lecture, seminar, practical training |
| Examinations: | Presentation of data in research seminar, written report |
| ECTS-Points: | 8 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 4 weeks |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Winter term and summer term, 2 students each |
| Semester: | 1 and 2 |

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| Title of Module: Clinical Trials | |
| Module number: MOME-M0002 | |
| Course: | Title: Clinical Trials Number: MOMEm0070 |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Rainer Muche |
| Further Lecturers: | NN |
| Study Objectives: | Students should <ul style="list-style-type: none"> - have the ability of summing up the main steps in clinical trials - be able to recapitulate the key steps in planning, conducting, monitoring and reporting a clinical trial - be able to distinguish between different types of studies - be able to get the ideas of planning the sample size - know the important role and problems of randomization - know the most important guidelines - be able to plan a short trial - be able to name the measures for quality assurance - learn the advantages of study software (database, statistics) - learn how to report a clinical trial |
| Module Contents: | <ul style="list-style-type: none"> - Planning a trial - Aspects of performing a trial - Aspects of data management before analyzing a trial - Reporting a trial |
| Literature: | <ul style="list-style-type: none"> - D.G. Altman: Practical statistics for medical research. Chapman&Hall, London, 1991 (Chapter 5: Designing Research, Chapter 6: Using a Computer, Chapter 15: Clinical Trials). - W. Gaus: Dokumentation und Datenverarbeitung bei klinischen Studien. In: Kuemmerle: Klinische Pharmakologie. Lose Blöatt Sammlung, 4. Auflage, Ecomed Verlag, Landsberg am Lech 2002. - Guideline ICH E6/GCP www.emea.eu.int/pdfs/human/ich/013595en.pdf - D. Moher, K.F. Schulz, D.G. Altman for the Consort Group: The CONSORT statement: revised recommendations for improving the quality of reports of parallel-group trials. The Lancet 357, 2001, 1191ff. |
| Classification: | Compulsory course |
| Prerequisites: | Descriptive statistics |
| Teaching methods: | Lecture, seminar and practical course |
| Examinations: | Written or oral examination |
| ECTS-Points: | 5 ECTS |
| Grade composition: | Written and/or oral examination 100% (voluntarily presentation 20%) |
| Length of the Module: | 1 Semester |
| Usability: | <ul style="list-style-type: none"> - BSc course of studies Biomathematics - MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 40 students |
| Semester: | 2 |

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| Title of Module: Project Management | |
| Module number: MOME-M0003 | |
| Course: | Title: Project Management Number: MOMEm0071 |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Simone Fulda |
| Further Lecturers: | Prof. Dr. Frank Richter |
| Study Objectives: | <ul style="list-style-type: none"> - Explain different phases of project management - Know different types of research projects and understand the distinct levels of complexity in their management - Comment on various aspects of project management - Discuss relevant knowledge and skills required for successful project management - Plan, present and evaluate the management of a research project |
| Module Contents: | <ul style="list-style-type: none"> - Types of research projects and their management - Phases of project management - Levels of project management - Project work |
| Literature: | Rosenthal, T., Wagner, E., Organisationsentwicklung und Projektmanagement im Gesundheitswesen. Economica-Verlag 2004 |
| Classification: | Compulsory course |
| Prerequisites: | BSC degree in Life Sciences |
| Teaching methods: | Lecture, seminar, project work |
| Examinations: | Oral examination, project work |
| ECTS-Points: | 3 ECTS |
| Grade composition: | Oral examination (2/3), project work (1/3) |
| Length of the Module: | 1 Semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date and Capacity: | Summer term, 25 students |
| Semester: | 2 |

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| Title of Module: European Patent Law | |
| Module number: MOME-M0004 | |
| Course: | Title: European Patent Law Number: MOMEm0072 |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dr. Helmut Reitzle |
| Further Lecturers: | Dr. Hermann Gleiter |
| Course number: | |
| Study Objectives: | Students should |
| Module Contents: | |
| Literature: | |
| Classification: | Compulsory course |
| Prerequisites: | |
| Teaching methods: | |
| Examinations: | Written or oral examination |
| ECTS-Points: | 3 ECTS |
| Grade composition: | Written and/or oral examination |
| Length of the Module: | 1 Semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date: | Summer term |
| Semester: | 2 |

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| Title of Module: Basics of Scientific Working and Ethics in Science | |
| Module number: MOME-M0005 | |
| Course: | Title: Basics of Scientific Working and Ethics in Science Number: MOMEm0073 Category: Soft Skill |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Prof. Dr. Jörg Wernecke |
| Further Lecturers: | PD Dr. Dieter Brockmann |
| Study Objectives: | <ul style="list-style-type: none"> - knowledge of the fundamental issues concerning scientific practice in methodological (working techniques) and historical-systematic point of view; logic of scientific discovery and the practice of research - elementary insight in contents and methods of modern empirical sciences, in scientific techniques dealing with scientific literature - critical awareness concerning the possibilities and limitations of scientific practice (ethic of sciences) - acquisition in competences concerning reflection and reasoning - competences of knowledge-transformation and research - competences regarding language, issues of social affairs and forms of presentation - working independently and teamwork (e.g. bibliography inquiries) - informations about institutional research promotion |
| Module Contents: | <ul style="list-style-type: none"> - exemplary presentation and discussion of selected forms of epistemic working techniques - introduction in scientific working techniques (e.g. bibliography inquiry [print and electronic medias]) - acquisition of information in the context of different medias and the question of information assessment - composing epistemic publication - introduction in the science of science and the theory of reasoning (induction, deduction, logic, statistics) - the ethics of sciences and the science of ethics; fraud and deceit in sciences |
| Literature: | |
| Classification: | Compulsory course |
| Prerequisites: | -/- |
| Teaching methods: | Lecture, seminar, exercise |
| Examinations: | Presentation |
| ECTS-Points: | 3 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 1 Semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date: | Winter term |
| Semester: | 1 |

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|---|---|
| Title of Module: Biomedical Ethics | |
| Module number: MOME-M0006 | |
| Course: | Title: Biomedical Ethics Number: MOMEm0074 Category: Soft Skill |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | PD Dr. Renate Breuninger |
| Further Lecturers: | Dr. Hans-Klaus Keul |
| Study Objectives: | <ul style="list-style-type: none"> - knowledge of the distinction between sciences and ethics, between facts, values and norms - knowledge of fundamental issues of ethical theories - discussion of the actual ethical positions - knowledge of the principles of bioethics and their foundations - application of bioethical principles, ethical competence and practical judgement |
| Module Contents: | <ul style="list-style-type: none"> - biotechnics and bioethics - the concept of person and dignity of man: discussions and foundations - principles of biomedical ethics: respect for autonomy, nonmaleficence and justice – presentation and foundation - ethical problems in the research with stem cells, reproductive medicine, gene therapy, medicine of transplantation - ethical problems in the research and experiments with living human beings and the medicine development - ethics and justice – the rights of man, bioethics in the conflict of civilizations and the Conventions of Bioethics; the slippery-slope argument - animal rights; ethical problems by experiments with animals; the principle of responsibility and the respect for life - making applications of research in the domain of bioethics and experiments with animals |
| Literature: | Handbook available at the beginning module |
| Classification: | Compulsory course |
| Prerequisites: | BSc degree |
| Teaching methods: | Lecture, seminar, exercise |
| Examinations: | Presentation |
| ECTS-Points: | 3 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 1 Semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date: | Summer term |
| Semester | 2 |

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| Title of Module: Journal Club | |
| Module number: MOME-M0008 | |
| Course | MOMEm00080 |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dean of Studies |
| Further Lecturers: | Lectures of the Medical Faculty and the Faculty of Natural Sciences |
| Study Objectives: | Students should be able to review and discuss critically original scientific literature published recently |
| Module Contents: | - dependent on original paper selected |
| Literature: | - dependent on the original paper selected |
| Classification: | Compulsory subject |
| Prerequisites: | BSc; intermediate examination; proof of the participation of the courses Clinical Trials, Project Management, European Patent Law, Good Scientific Practice, Bioethics |
| Teaching methods: | Seminar |
| Examinations: | Oral examination |
| ECTS-Points: | 2 ECTS |
| Grade composition: | -/- |
| Length of the Module: | 1 semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date: | Winter term |
| Semester: | 3 |

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| Title of Module: Master Thesis | |
| Module number: MOME-M0007 | |
| Courses | Number Thesis Work: MOMEm0090 Number Progress Report: MOMEm0091 |
| Study Programme: | Master degree in Molecular Medicine |
| Responsible Lecturer: | Dean of Studies |
| Further Lecturers: | Lectures of the Medical Faculty and the Faculty of Natural Sciences |
| Study Objectives: | Students should be able to - learn self-reliantly new molecular biological methods - learn to perform original scientific projects in the field of molecular medicine - summarize their data in a written report in the context of published data - critically discuss published data related to their project in a scientific presentation |
| Module Contents: | - dependent on the Thesis Work |
| Literature: | - dependent on the Thesis Work |
| Classification: | Thesis Work: compulsory subject Disputation: compulsory subject Progress Report: compulsory subject |
| Prerequisites: | BSc degree; intermediate examination; proof of the participation of the courses Clinical Trials, Project Management, European Patent Law, Good Scientific Practice, Bioethics |
| Teaching methods: | Seminar, practical training |
| Examinations: | Written (thesis) and oral (disputation) examination |
| ECTS-Points: | 50 ECTS (Master thesis = 40 ECTS; Disputation = 8 ECTS; Progress report = 2 ECTS) |
| Grade composition: | Thesis 50%, Disputation 50% |
| Length of the Module: | 1 semester |
| Usability: | MSc course of studies Molecular Medicine |
| Date: | Winter term or summer term |
| Semester: | 3 |

