

Bachelor and master thesis projects studying the role of nuclear hormone receptors in inflammation and metabolism.

For potential master students, we highly encourage a 6-8 weeks internship before starting a master thesis in our lab.

Topics:

- Role of cellular metabolic state in gene regulation by the glucocorticoid receptor (focus on inflammation) (Greulich)
- Histone methyl transferases as anti-inflammatory targets (Greulich)
- Mechanisms of gene repression by the glucocorticoid receptor (Greulich)
- Role of testicular receptors in arteriosclerosis and macrophage inflammation
- Nuclear hormone receptors in *C. elegans* as modulators of lipid metabolism (Spanier)
- Nuclear hormone receptors in *C. elegans* as modulators of aging processes (Spanier)

Methods applied (depending on the project)

Bachelor projects:

- Expression analysis: RNA extraction, reverse transcription, quantitative PCR
- Cell culture: cell lines and primary cells
- Chromatin-immunoprecipitation qPCR
- Western blotting
- Protein expression, in-vitro enzymatic assays
- Luciferase assay
- Genetic engineering of recombinant cell lines
- Cloning
- *C. elegans*: RNA interference, lifespan, cloning, genetic crossings, Western Blot, PCR
- Bioinformatics analysis of next-generation sequencing data (theoretical thesis requires previous knowledge of R)

Master projects:

- CRISPR/Cas9-mediated mutagenesis in cell lines, genetic engineering
- Mouse work: organ harvest, histology, immunostaining, genotyping
- Chromatin-Immunoprecipitation-coupled with sequencing/PCR
- Cloning
- *C. elegans*: RNA interference, lifespan, body fat analysis, fatty acid analysis, cloning, PCR, qPCR, Western Blot
- NGS data analysis (previous knowledge of R and linux command line)

Relevant publications:

- Greulich F, Mechtidou A, Horn T, Uhlenhaut NH: Protocol for using heterologous spike-ins to normalize for technical variation in chromatin immunoprecipitation. STAR Protoc . 2021 Jun 16;2(3):100609. doi: 10.1016/j.xpro.2021.100609. PMID: 34189474
- Greulich F, Wierer M, Mechtidou A, Gonzales-Garcia O, Uhlenhaut NH: The glucocorticoid receptor recruits the COMPASS complex to regulate inflammatory transcription at macrophage enhancers. Cell Rep. 2021 Feb 9;34(6):108742. doi: 10.1016/j.celrep.2021.108742. PMID: 33567280

- Escoter-Torres L, Caratti G, Mechtidou A, Tuckermann J, Uhlenhaut NH, Vettorazzi S. Fighting the Fire: Mechanisms of Inflammatory Gene Regulation by the Glucocorticoid Receptor. *Front Immunol.* 2019 Aug 7;10:1859. doi: 10.3389/fimmu.2019.01859. PMID: 31440248; PMCID: PMC6693390.
- Greulich F, Hemmer MC, Rollins DA, Rogatsky I, Uhlenhaut NH. There goes the neighborhood: Assembly of transcriptional complexes during the regulation of metabolism and inflammation by the glucocorticoid receptor. *Steroids.* 2016 Oct;114:7-15. doi: 10.1016/j.steroids.2016.05.003. Epub 2016 May 15. PMID: 27192428; PMCID: PMC5052104.
- Syed AP, Greulich F, Ansari SA, Uhlenhaut NH. Anti-inflammatory glucocorticoid action: genomic insights and emerging concepts. *Curr Opin Pharmacol.* 2020 May 13;53:35-44. doi: 10.1016/j.coph.2020.03.003. Epub ahead of print. PMID: 32416533.
- Hemmer MC, Wierer M, Schachtrup K, Downes M, Hübner N, Evans RM, Uhlenhaut NH. E47 modulates hepatic glucocorticoid action. *Nat Commun.* 2019 Jan 18;10(1):306. doi: 10.1038/s41467-018-08196-5. PMID: 30659202; PMCID: PMC6338785.
- Quagliarini F, Mir AA, Balazs K, Wierer M, Dyar KA, Jouffe C, Makris K, Hawe J, Heinig M, Filipp FV, Barish GD, Uhlenhaut NH. Cistromic Reprogramming of the Diurnal Glucocorticoid Hormone Response by High-Fat Diet. *Mol Cell.* 2019 Nov 21;76(4):531-545.e5. doi: 10.1016/j.molcel.2019.10.007. Epub 2019 Nov 6. PMID: 31706703.
- Wei Y, Corbalán-Campos J, Gurung R, Natarelli L, Zhu M, Exner N, Erhard F, Greulich F, Geißler C, Uhlenhaut NH, Zimmer R, Schober A. Dicer in Macrophages Prevents Atherosclerosis by Promoting Mitochondrial Oxidative Metabolism. *Circulation.* 2018 Oct 30;138(18):2007-2020. doi: 10.1161/CIRCULATIONAHA.117.031589. Erratum in: *Circulation.* 2019 Apr 23;139(17):e888. PMID: 29748186.
- Spanier B, Lang R, Weber D, Lechner A, Thoma T, Rothner M, Petzold K, Lang T, Beusch A, Bösl M, Schlagbauer V, Daniel H, Hofmann T. Bioavailability and Biological Effects of 2- O-β-d-Glucopyranosyl-carboxyatractyligenin from Green Coffee in *Caenorhabditis elegans*. *J Agric Food Chem.* 2019 May 1;67(17):4774-4781. doi: 10.1021/acs.jafc.8b06785.