LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

LEHRSTUHL FÜR BIOCHEMIE UND CHEMIE
VETERINÄRWISSENSCHAFTLICHES DEPARTMENT
TIERÄRZTLICHE FAKULTÄT

Who We Are:

Our laboratory investigates the biological functions of glycan–lectin interactions, with a particular focus on galectins and C-type lectins. These carbohydrate-binding proteins regulate essential cellular processes, including immune responses, inflammation, and tissue homeostasis. Using molecular, biochemical, and immunological approaches, we aim to elucidate the mechanisms underlying lectin-mediated signaling in health and disease.

What We Offer:

3 Master's Thesis Opportunities in Biochemistry and Glycobiology (Internship possible)

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Project 1: Isolation and characterization of extracellular vesicles from cancer cells for probing EV-lectin interactions

Project 2: Recombinant Expression and Engineering of Enzymes and Glycoproteins

Project 3: Analysis of Transcriptional Regulation of Galectin Genes

Detailed project descriptions are provided on the following pages.

Duration: 6 Months

Application Deadline: 15th August 2026

Project 1

Isolation and Characterization of Extracellular Vesicles for Probing Lectin-EV Interactions

Background & Aim

Extracellular vesicles (EVs) are nanosized membrane particles released by both mammalian cells and microorganisms. They have emerged as important mediators of intercellular communication and play key roles in processes such as cancer progression, host-pathogen interactions, and immune regulation. Their glycan-rich surfaces are increasingly recognized as important determinants of EV recognition and biological function. Lectins, including galectins and C-type lectins, are endogenous glycan-binding proteins that regulate cell adhesion, immune responses, and extracellular signaling. However, how lectins recognize the diverse glycan signatures displayed on EVs remains poorly understood.
This project aims to isolate and characterize extracellular vesicles from mammalian or bacterial sources and investigate their interactions with lectins using biochemical and cell biological approaches. The successful candidate will gain hands-on experience in extracellular vesicle research, glycobiology, advanced imaging, and flow cytometry while contributing to our understanding of glycan-mediated extracellular communication.

Your Tasks

- Mammalian and/or bacterial cell culture.
- Isolation and characterization of extracellular vesicles (EVs).
- Analysis of lectin-EV interactions using bead-based flow cytometry.
- Immunofluorescence staining and confocal microscopy.
- Live-cell imaging and data analysis.

What We Offer

- A research project at the interface of glycobiology, cancer biology, and extracellular vesicle research.
- Integration into a motivated and collaborative research team at the Faculty of Veterinary Medicine, LMU Munich.
- Comprehensive hands-on training in modern molecular and cell biology techniques.
- Individual supervision throughout the internship and Master's thesis.
- The opportunity to contribute to ongoing international research projects and scientific publications.

Application & Contact Please email your CV to the team leader, **Dr. Anna-Kristin Ludwig** (an.ludwig@lmu.de). We are recruiting one Master's student for the upcoming Winter Semester. Shortlisted candidates will be invited for a brief interview and lab tour.

Project 2

Recombinant Expression and Engineering of Enzymes and Glycoproteins

Background and Aim of the Research

Protein glycosylation is one of the most important post-translational modification events occurring in all biological systems. Many transmembrane and secreted proteins are glycoproteins, modified with glycans (sugars); some of the structures are recognised by immune receptors, playing important roles in host-pathogen interactions. In eukaryotes, glycans are synthesised by enzymes residing in the ER and Golgi apparatus; however, many of the glycan biosynthetic pathways in invertebrates remain poorly understood.
Our research aims to investigate a selection of novel glycoenzymes, including glycosyltransferases (GTs) and glycosidases (GHs), with a particular focus on those derived from parasitic worms. In the laboratory, we'll recombinantly express these enzymes and characterise their enzymatic properties *in vitro*. As valuable tools for glycoengineering, the activity-proven enzymes will be used to alter the glycosylation of established mammalian and insect cell lines. This will optimise these cell lines for the production of high-value viral and parasitic glycoproteins, which can subsequently be tested in downstream *in vitro* and *in vivo* models.

Your tasks:

- Maintain cell cultures and perform molecular cloning.
- Express various recombinant proteins, including target enzymes and antigens.
- Perform affinity chromatography (e.g., His-tag purification) to isolate recombinant products.
- Conduct enzymatic assays utilizing mass spectrometry.

Your opportunities:

- Join a newly established research team on campus and gain lab skills from experienced and enthusiastic team members.
- Work safely with non-infectious genetic material.
- Gain hands-on experience on molecular biology, cell culture and protein purification
- Benefit from 1-to-1 supervision and rapid troubleshooting.

Contact: If you are interested in this research topic, please send an email with your CV directly to the team leader, **Priv.-Doz. Dr. Shi Yan** (shi.yan@lmu.de). Following a preliminary review, selected candidates will be invited for a brief interview and a lab tour. Please note that we are currently recruiting for only one Master's student for the upcoming Winter Semester. Inquiries regarding Bachelor's thesis projects are also welcome.

Project 3:

Analysis of Transcriptional Regulation of Galectin Genes

Background and Aim of the Research

Galectins are glycan-binding proteins that regulate numerous cellular processes, including inflammation, immune responses, and tissue homeostasis. Dysregulated galectin expression has been implicated in various diseases, including osteoarthritis, but the transcriptional mechanisms controlling galectin gene expression remain poorly understood. This project aims to investigate the transcriptional regulation of galectin genes using molecular biology approaches in established cell models and, depending on project progress, primary cells. Particular emphasis will be placed on identifying and functionally characterizing transcription factors and cis-regulatory promoter elements that control galectin gene expression.

Your tasks:

- Mammalian cell culture and maintenance of cell lines (and, if applicable, primary cells)
- Transient transfection of plasmid constructs
- Luciferase reporter gene assays
- Promoter analysis using deletion constructs, site-directed mutagenesis, and in silico identification of transcription factor binding sites
- RNA isolation, cDNA synthesis, and RT-qPCR
- Functional analysis of transcription factors involved in galectin gene regulation
- Protein expression analysis (e.g. Western blotting) depending on project progress
- Data analysis, interpretation, and presentation

Your opportunities:

- Hands-on training in modern molecular biology techniques
- Experience in transcriptional regulation and gene expression analysis
- Training in promoter analysis and functional characterization of transcription factors
- Close supervision within an interdisciplinary research team
- Contribution to an ongoing research project
- Development of skills in experimental design, data analysis, and scientific communication

Contact: If you are interested in this research topic, please send an email with your CV directly to the team leader, **Dr. Sebastian Schmidt** (sebastian.schmidt@lmu.de). Following a preliminary review, selected candidates will be invited for a brief interview and a lab tour.