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Training plan for 1.1 Glycoproteome Measurements

The goal of the course module **Glycoproteome Measurements** is to give students an overview of current approaches for the analysis of protein glycosylation and understanding of the resulting data structure.

Objectives

1. The students will have basic knowledge of glycan biosynthetic pathways in mammals
2. The students will have an understanding of the information content of glycomics and glycoproteomics data
3. The students will be aware of the major technical limitations of the different methods
4. The students will understand how the specific glycomics data structure will influence data analysis
5. The students will be aware of the strengths and limitations of specific glycomics measurements methods

Learning outcomes

1. The students will be able to interpret glycomic profiles on the context of known biosynthetic pathways
2. The students will be able to choose a specific glycomic method for addressing a given clinical or biological research question
3. The students will be able to interpret glycomics data with respect to underlying proteomic and transcriptomic changes

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Training plan for 1.2	Genomics and epigenetics measurements

The goal of the module "Genomics and epigenetics measurements" is to give students an overview of epigenetic control of gene expression by CpG methylation, with emphasis on methods for analysis of CpG methylation and its external control by molecular tools based on the CRISPR-Cas9 system. Along with the CRISPR-Cas9 technology, basic concepts of genetic engineering and synthetic biology will be introduced.

Objectives

1. Introduction to gene regulation by CpG methylation
2. Methodological overview of DNA methylation analysis by pyrosequencing
3. Discussion of methods for identification of regulatory CpG sites
4. Introduction to tools for targeted CpG methylation and demethylation
5. Analysis of CRISPR-Cas9-based molecular tools and their application

Learning outcomes

1. Understanding the mechanics of gene regulation by CpG methylation
2. Basic knowledge of methylation analysis by pyrosequencing
3. Overview of CRISPR-Cas9 tools for targeted methylation and gene regulation

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Training plan for 1.3 Data Pre-processing Methods and Glycan data preprocessing

Objectives

1. The students will acquire knowledge on the basic steps of glycomic data pre-processing
2. The students will become aware of potential error sources sample measurement and data pre-processing
3. The student will learn principles of experimental design
4. The students will get introduced to principles of data quality assessment and data curation

Learning outcomes

1. The students can set up a study design that minimizes potential error sources
2. The students will be able to perform the basic steps of data pre-processing of a simple glycomics experiment
3. The students will be able to assess the quality of the pre-processed data and optimize pre-processing parameters accordingly
4. The students will be able to estimate the levels of technical and biological variation within a glycomic dataset