Master thesis in biology, genome science or biotechnology – Masteroppgave i biologi, genomvitenskap eller bioteknologi

The work will be done at the Norwegian Institute of Public health (NIPF; Folkehelseinstituttet).
Contact person at NIPH:
Senior scientist, PhD Ann-Karin Olsen
Section of Molecular Toxicology
Department of Environmental Health
Norwegian Institute of Public Health (NIPH),
Oslo. https://www.fhi.no/
Tlf. +47 21076296/92035022

Contact person at the Faculty of Biosciences (BIOVIT), NMBU:
Professor Jorunn E. Olsen
jorunn.olsen@nmbu.no
Tlf +47 67232829

Epigenetic changes in stem cells under environmental stress

Cells respond to external stimuli by changing their transcriptional activity, which is regulated by epigenetic mechanisms. These mechanisms include processes such as DNA methylation and histone modifications, changing the accessibility to chromatin for transcription. One method that encompass several of the epigenetic regulatory mechanisms is ATAC-seq (Assay for Transposase-Accessible Chromatin using sequencing) which is a technique used to assess genome-wide chromatin accessibility, i.e. identifying regions of the genome that is available for transcription. This method is established in our lab.

Human stem cells are progenitor cells for all cells of the body. We work with human inducible pluripotent stem cells (hIPSC) cells, that are representative stem cells for all cell types of the body and is a model system for early embryonal development and cancer, and investigate detrimental effects on these cells as a result of environmental stressors such as ionising radiation (giving rise to reactive oxygen species) and other environmental stressors, that often occur in symphony (i.e. simultaneously).

A research group at Department of Environment and Health; Section of Molecular Toxicology) at the Norwegian Institute of Public Health (NIPH) focus on effects of stressors in the environment on genetic and epigenetic regulation, linked to adverse effect and disease outcomes.

This master assignment may include

1. hIPSC cell culturing and characterization suing morphology assessment by microscopy, stem cell factor assessments by real-time q-PCR/fluorescence microscopy and karyotyping
2. Conducting experiments in hIPSC cell cultures exposed to ionizing radiation, alone and in combination with co-stressors), and assess effect markers such as
    a. Cell survival analyses (cytotoxicity)
    b. Changes in differentiation to the three germ cell layers
    c. Genotoxicity and DNA repair dynamics by DNA damage analyses (i.e. comet analyses)
    d. Epigenetic analyses
        i. ATAC seq for chomatin accessibility assessments
        ii. Gene expression analyses by q-PCR of mRNA sequencing
        iii. Bioinformatic analyses of sequencing data
        iv. DNA methylation assessment (EPIC)