

Epigenetics in Biomedicine

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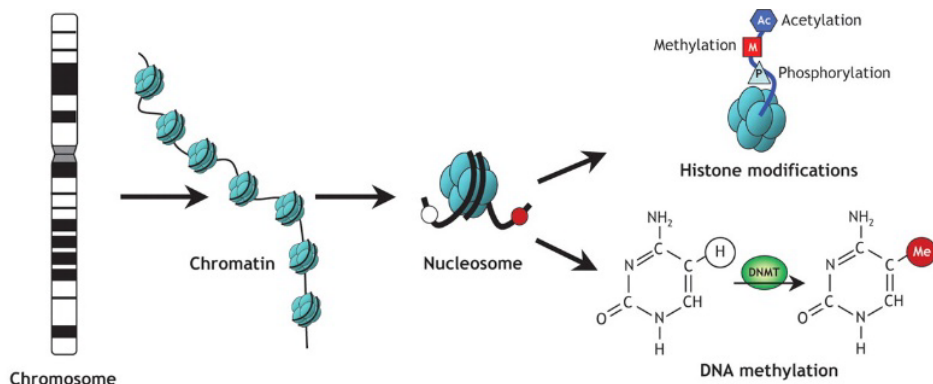


Current group members: 3 PhD students. 1 master student, 3 bachelor students, 1 technician.

Background

Above the genetic understanding of diseases, lies the field of epigenetics – which studies modifications in the genes and associated proteins that do not change the fundamental base sequences in the DNA. Certain events, i.e. environmental induced, can influence the cell epigenetically, damaging its normal function. This affect can be inherited to newly formed cells and have serious consequences for the human organism. In this context, we study how epigenetic changes are involved in the development of disease, and how environmental effects influence the epigenetic landscape. For instance, we examine the epigenetic changes in tumours as decisive causes of cancer progression and aim improve the efficacy of diagnosis and treatment. Further, based on animal models we examine the environment's impact on the development and inheritance of metabolic diseases through epigenetic modifications.

To gain a better understanding of genetic and epigenetic disease mechanisms we do research at multiple levels: molecular, cellular, organ, and individuals. We use DNA and RNA samples collected from case and control groups; or cells cultured in the laboratory; or animal models. Our research efforts are often multidisciplinary.



Projects and techniques

Clarifying the epigenetic background for frequently occurring types of illnesses and development of molecular-medicine epigenetics methods. The research in biomedical epigenetics identifies genes, gene variants, and epigenetic gene modifications. Further, through basic research it provides functional characterizations of the significance, from the level of the cell to that of the entire individual. The scientific methods used include, but are not restricted to: DNA methylation assays including bisulfite pyrosequencing; chromatin immunoprecipitation (ChIP) analyses of histone modifications and patterns; modification of epigenetics using Crispr/dCas9; and epigenetic scans and next-generation sequencing of epigenomes and transcriptomes.

Specific project proposals (briefly outlined – let's discuss more details if you are interested!)

1) Epigenetic mechanisms in lung cancer. By using cancer cell lines and patient samples, epigenetic mechanisms in i) development of drug-resistance or ii) tumour immunotherapy, will be examined. The primary goal is development of improved epigenetic based treatment and diagnostics.

2) Epigenetic inheritance of metabolic diseases. By using a high fat diet mouse model for obesity and associated metabolic dysfunctions, epigenetic mechanisms in inheritance of metabolic diseases to offspring will be examined. This i.e. involving epigenetic analyses of spermatozoa, as well as tissues, and addressing the possibility to reverse inheritable obesity induced epigenetic changes by anti-inflammatory treatments.