

De.Coding Metabolic Disease - Noncoding RNAs & Epigenetic Principles of Energy Homeostasis

Research Group Leader Jan-Wilhelm Kornfeld

Our Research Interests

Adipose (fat) tissue is fundamental for energy homeostasis and organ crosstalk and adipose tissue dysfunction underlies metabolic disorders like obesity and type 2 diabetes mellitus.

Our group has a longstanding curiosity for adipose tissue molecular principles and is particularly interested to know how **noncoding RNAs like miRNAs & lncRNAs** and **epigenetic regulatory processes** shape adipocyte function & how these affect metabolism. We are also fascinated to learn more how **transcriptional processes & chromatin (histone) mediated regulation of thermogenic brown adipose tissue** can protect against obesity-associated metabolic decline.

We are furthermore asking how **paternal lifestyle affects offspring health** and would like to understand if **epigenetic intergenerational heredity of metabolic decline** can be abated by healthy lifestyle interventions in parents.

In our work, we apply NGS-based approaches (sRNA & mRNA & ATAC-seq), primary cells cultures of adipocytes, cellular bioenergetics and transgenic mouse models of metabolic disease.

Projects	Description
Project Area 1	Noncoding RNAs in adipose tissue dysfunction
Project Area 2	Adipose chromatin dynamics in metabolic disease.
Project Area 3	Intergenerational Epigenetic Inheritance of Disease.



Brown Fat - A Silver Bullet against Obesity?

In vivo Activation of BAT Thermogenesis and Molecular Analyses

Lean Obese
22°C 4°C

Adrenergic Stimulation of Primary Adipocytes

Cellular Metabolism and Bioenergetics

Mouse KO Generation and Metabolic Phenotyping

Research interests:
Cold-Inducible Protein Isoforms in BAT.
Regulation of BAT Chromatin by Diet.
Surface Proteostasis on Brown Adipocytes.
Noncoding RNA Regulation of BAT.

PA1

Noncoding RNAs - Dark Matter of the Genome

Mouse Models of Metabolic Disease

Ex vivo 1st Adipocyte and Hepatocyte Culture

Computational noncoding RNA Prediction

RNA-Sequencing
Noncoding RNA validation

In vivo Phenotyping of Energy Metabolism

Mouse Knockout Generation

Molecular Mechanisms of noncoding RNAs

PA2

Intergenerational Control of Metabolism

Research interests:
F1 Effects of F0 Paternal Metabolic Disease?
Effects of F0 Obesity on Germline ncRNAs?
Plasticity and Regression of Obesity?
Epigenetic ('Soft') Inheritance of F0 Obesity?

Characterisation of F0/F1 Obesity

Interrogating Intergenerational Metabolic Disease in C57BL/6 Wildtype Mice

HFD Feeding F0 X LFD Feeding F0

LFD Feeding F1

Analysis of F0 Germline Transcriptomes

• F1 and F2 Effects of F0 Obesity?
• Effects of F0 Weight loss in F1?
• Identification and Functional Analysis of transgenerational Obesity noncoding RNAs.

PA3