

Overview of ongoing research projects

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The Functional Genomics group is part of the Institute of Veterinary Anatomy and located at the AgroVet-Strickhof research station, a cooperation in education and research between the cantonal agricultural school Strickhof, ETH Zurich Animal Sciences and the Vetsuisse Faculty Zurich. We are a small interdisciplinary team of veterinarians and molecular biologists working in Animal Functional Genomics.

Our central goal is to advance the current understanding of reproductive biology under physiological and pathological conditions to provide a strong molecular basis for improved diagnosis and treatments of fertility problems. In addition, we are studying the impact of assisted reproduction techniques (ART) on gamete and embryo development to provide new insights and support for improvement of current techniques used in different mammalian species. The main research approaches are based on the analysis of gene expression at RNA (including protein-coding and small non-coding RNAs) and protein level in reproductive tissues (endometrium, oviduct) and associated fluids as well as gametes and embryos. Extracellular vesicles and exosomes, as a fundamental part of reproductive fluids and key players in embryo-maternal communication by transferring important signals are also an important part of our research. With respect to the endometrium, low-input RNA sequencing of samples collected by laser capture microdissection allows us to study the spatial transcriptome regulations of the endometrial cell types.

Current research projects are focused on studying the embryo-maternal cross-talk during maternal recognition of pregnancy in the mare and also, investigating the influence of the uterine microbiome composition on female fertility. Both projects use a combination of spatial transcriptome and exosome approaches and are funded by the Swiss National Science Foundation. Another project is focused on embryonic and oviductal exosomes as a new strategy to improve assisted reproductive technologies in cattle and funded by EU Horizon 2020 through a Marie Skłodowska Curie Postdoctoral Fellowship. In the field of circulating biomarkers for stress, we are studying the effect of aircraft noise exposure on livestock performance through the analysis of stress markers in milk and in milk EVs, which is supported by the Bundesamt für Umwelt (BAFU). Additionally, we have different ongoing projects with national and international collaboration partners with the common objective to reveal alterations in the quality of embryo subjected to different biotechnologies, exploring the sperm miRNA profile in animals with different fertility, and unveiling differences in the EVs' RNA cargo in female and male reproductive fluids associated with different fertility in different species.