University of Zurich[UZH]
URPP Human Reproduction Reloaded | H2R

CAVAZZA LAB
CELLULAR EMBRYOLOGY AND GENOME EDITING

USZ Universitäts Spital Zürich

Master Thesis in Reproductive Biology / Early embryogenesis

Cavazza Lab, Department of Reproductive Endocrinology, UZH – USZ

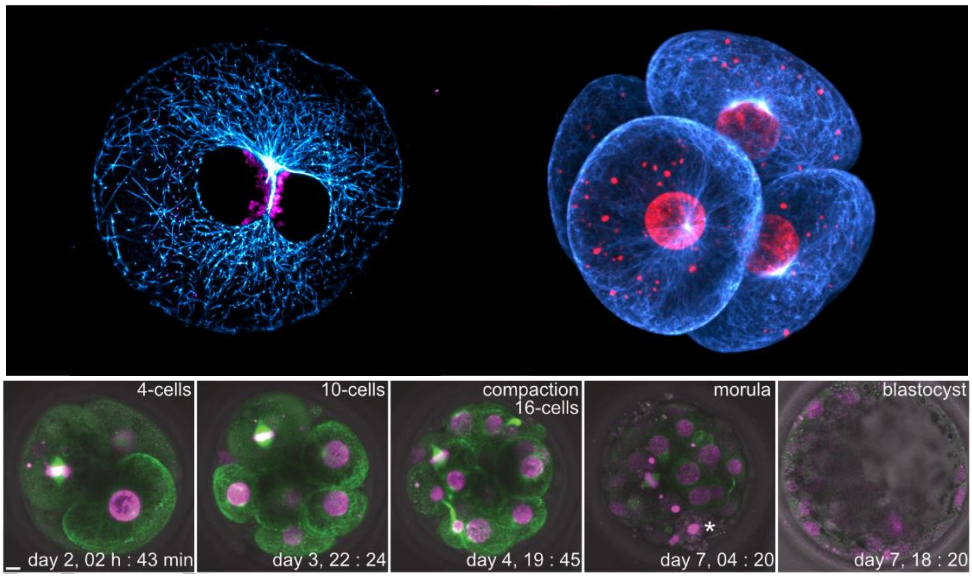
www.reproendo.uzh.ch/en/CavazzaLab

The Cavazza lab aims to understand the key cellular mechanisms driving early mammalian embryogenesis. Ultimately, our research aims to lay the basis for improving assisted reproductive technologies (ARTs), providing better treatments for infertility and preventing genetic diseases.

In our lab, we study how cellular processes control embryogenesis, and how defects in these processes lead to embryonic failure. We combine the power of early bovine embryos and quantitative live microscopy, with proteomics and genomics techniques. We are open to your ideas, but we are also interested in these two specific projects.

Project 1: Is DNA damage response silenced upon fertilization?

Project 2: Unveil the interplay between embryonic cellular structures and differentiation by establishing system biology tools



Project 1: Is DNA damage response silenced upon fertilization?

Genome integrity is crucial for embryogenesis. Recently, it was found that human and bovine fertilized eggs (zygotes) have an inefficient DNA repair pathway. In line with this, our preliminary

data show that unfertilized eggs have a stronger response than zygotes to the same amount of X-ray irradiation.

This observation raises several key questions:

-Is the DNA of zygotes not damaged by the same amount of radiation? Or is the DNA damage response less efficient?

-What creates this difference? Are specific DNA damage-related proteins degraded upon fertilization?

-Is this difference in DNA damage response necessary for development?

You will address these questions by setting up in the lab methods to investigate DNA damage in zygotes (eg. Comet asssays), perform a proteomic comparison of oocytes, eggs, and zygotes, verify proteomic data using western blot and immunofluorescence, establish a live imaging method to measure DNA repair in oocytes/zygotes. Finally, if the results will have promising clinical relevance for the assisted reproductive treatments, you will perform targeted experiments with human oocytes to test the conservation of your findings in the human system.

For this project, we are looking for candidates with a background in systems/cell/developmental biology or biophysics.

Starting dates are flexible. Contact Tommaso for further information: tommaso.cavazza@uzh.ch

Project 2: Unveil the interplay between embryonic cellular structures and differentiation by establishing system biology tools

The first 5-7 days of mammalian development involve cell divisions, multiple morphogenetic events, and the first cell differentiation event. These events kick off at fertilization, which generates the unpatterned fertilized egg (zygote). The zygotes will begin a self-organization process that culminates with the formation of the blastocyst.

What is the interplay between cellular events (eg cell division, microtubule organization) and differentiation?

We can already image bovine embryos from zygote to blastocyst, and we now want to establish image-based multiplexing technologies. These technologies will allow us to determine the interplay between specific cellular structures and cell differentiation, which is crucial for embryonic development.

For this project, we are looking for candidates with a background in systems/cell/developmental biology or biophysics. We also welcome a strong interest in method development, light microscopy, and image analysis. Previous coding experience is highly beneficial but not mandatory.

Starting dates are flexible. Contact Tommaso for further information: tommaso.cavazza@uzh.ch