# Investigation of vertebrate head evolution using single cell RNA-Seq of amphioxus embryos

Markos Anna1, Kubovciak Jan1, Mikula Mrstakova Simona1, Zitova Anna1, Paces Jan1, Machacova Simona1, Kozmik Zbynek-Jr1, Kozmik Zbynek1, Kozmikova Irina1

1Institute of Molecular Genetics of the Czech Academy of Sciences

To shed light on the enigmatic origin of the vertebrate head, our study employs an integrated approach that combines single-cell transcriptomics, perturbations in signaling pathways, and cis-regulatory analysis in amphioxus. As a representative of a basal lineage within the chordate phylum, amphioxus retains many traits thought to have been present in the common chordate ancestor. Through cell type characterization, we identify the presence of prechordal plate-like, pre-migratory, and migratory neural crest-like cell populations in the developing amphioxus embryo. Our findings provide evidence that the key features of vertebrate head development can be traced back to the common ancestor of all chordates. Research was backed up by utilization of single-cell transcriptomics data (generated by 10x Chromium platform) from multiple timepoints of amphioxus embryonic development. Presented poster aims to emphasize analytical approaches chosen for processing of these data, including cell type annotation in each timepoint and subsequent pseudotime analysis along with computation of cell fate transition graph to explore focal developmental trajectories. Furthermore, transcriptional similarity-based homology between our data and already annotated zebrafish dataset was quantified in order to confirm shared evolutionary history of the cell types involved in embryonal head development.