

The neural crest is a transient structure formed during the neurulation which undergoes change of phenotype in the process of epithelial-mesenchymal transition. Subsequently, neural crest cells delaminate and migrate collectively and individually to their place of destination, where they differentiate into a broad repertoire of mesenchymal and non-mesenchymal cell types.

This thesis aims to examine true differential potential of these cells based on crucial *in vitro* experiments. Neural crest cells show not only high migration potential, but also stem cells characteristics like multipotency and self-renewal capacity. I also provide answers to questions about cellular potency at the level of neural crest population and along anterior-posterior axis.

It was necessary to clarify the essence of events leading to induction, specification, epithelial-mesenchymal transition and migration of neural crest cells, since they are crucial for their differentiation potential. A major role in differentiation as well as in previous processes plays the gene regulatory network which is comprised of mutually affecting signalling pathways.

Studying the behaviour of migratory and post-migratory neural crest cells is important for the research of regenerative medicine and even cancer and neurocristopathic treatment.