Abstract

Clarifying the underlying spatio-temporal mechanisms that determine body pattern is important for detailed understanding of embryonic development. A crucial question of vertebrate embryogenesis remains: when and how are single blastomeres determined for differentiation that subsequently leads to body axes specification and the formation of different tissues and organs? The answer to this question will be beneficial for primary research as well as in the field of applied medicine.

The main aim of the presented thesis was to study spatio-temporal molecular gradients of cell fate determinants during early embryonic development. The African clawed frog *Xenopus laevis* was used as a model organism because of their large size of oocytes and external embryonic development. Due to late activation of embryonic transcription, a crucial mechanism of early blastomeres determination is dependent on asymmetric localization of maternal factors within oocyte and their uneven distribution into single blastomeres during early cell division. Two main localization patterns were identified along the animal-vegetal axis of the mature *Xenopus* oocyte using qPCR tomography. The localization gradient with preference in either animal or vegetal hemisphere was found for maternal mRNA as well as miRNAs. Moreover, two vegetal subgroups were distinguished for maternal mRNAs, which differ in gradient pattern. Germ plasm determinants showed a very steep gradient towards the vegetal pole, whereas the other vegetal transcripts had a less steep spatial gradient towards the pole. We demonstrated that the animal-vegetal asymmetry within the mature oocyte is transferred to the single blastomeres of 8, 16 and 32-cell stage embryos during early cell division. No asymmetry of maternal mRNA distribution was found among single blastomeres that may be ascribed to the dorso-ventral specification and/or left-right body axis formation during early embryogenesis.

Summarizing the results of this thesis represents the first step of creating the spatio-temporal map of crucial biomolecules involved in body axis polarity formation and body pattern specification during early embryonic development in *Xenopus laevis*.