The development of an embryo is based on changes that replace old with new. Gene expression programs direct changes in the RNA content of pluripotent cells, that lead them to assume more specialized identities. Large efforts strive to understand how transcription changes in the ‘birth’ of RNA direct those transitions. But RNA continues to be regulated after its transcription, during its processing (e.g., splicing), localization, and finally its ‘death’ by degradation. Such post-transcriptional changes are also an integral part of developmental transitions, but remains less studied.

We are using the zebrafish (Danio rerio) embryo as an in-vivo model system to study RNA biology of vertebrate development.

In particular, a key developmental transition in early embryos that is shared in all animals, is the maternal-to-zygotic transition. During the very early stages of development, the mother controls all functionality via RNAs and proteins that she deposited into the egg, while the embryonic genome remains silent. As development proceeds, embryos get rid of the old maternal RNAs and replace them with newly synthesized RNAs that define new developmental programs. This massive degradation of maternal RNAs is a powerful system to study RNA regulation in the absence of transcription.

The zebrafish embryo has emerged as an important in-vivo model system, with significant advantages in accessibility to large numbers of synchronized embryos, easy manipulations through microinjection and powerful imaging tools.