Determinants and consequences of ribosomal poverty and subsistence

Caenorhabditis elegans provides an amenable system to explore whether newly composed ribosomes are required to progress through development. Despite the complex pattern of tissues that are formed during embryonic development, we found that null homozygotes lacking any of the five different ribosomal proteins (RPs) can produce fully functional first-stage larvae, with similar developmental competence seen upon complete deletion of the multi-copy ribosomal RNA locus. These animals, relying on maternal but not zygotic contribution of ribosomal components, are capable of completing embryogenesis. In the absence of new ribosomal components, the resulting animals are arrested before progression from the first larval stage and fail in two assays for postembryonic plasticity of neuronal structure. Mosaic analyses of larvae that are a mixture of ribosome-competent and non-competent cells suggest a global regulatory mechanism in which ribosomal insufficiency in a subset of cells triggers organism-wide growth arrest.