Regulation of germline gene expression in simple chordate embryos

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Separation of the germline from the somatic lineage is tightly linked to the suppression of zygotic transcription in the germline. Invertebrate embryos utilize localized maternal factors that are successively inherited by the germline cells and silence the germline. We have recently identified such a factor, PEM, in an ascidian *Halocynthia roretzi*, which, similar to Pgc of *Drosophila* and PIE-1 of *C. elegans*, represses germline transcription by keeping RNAP II under-phosphorylated through binding to the p-TEFb complex. Interestingly, these three factors are evolutionarily new and unique to their respective taxa, raising a question regarding how they could have been integrated into the germline gene expression regulation while keeping it functional in the course of evolution. To address this question, we have investigated germline silencing mechanisms in closely related species to *H. roretzi* such as another ascidian *Ciona savignyi* and an appendicularian *Oikopleura dioica*. Our results suggest that even PEMs in different ascidian species exert their transcriptional repression activities differetnly. In addition, we have also investigated the function of other maternally localized factors inherited by the germline of the *H. roretzi* embryo and found that two factors, POPK-1 and ZF-1, play essential roles in germline gene expression regulation. These studies highlight importance of using simple chordate species as model animals in studying evolutionary and developmental aspects of PGC development.