Developmental Biology

SVA53, A MATERNAL GENE REGULATING MEIOSIS IN DROSOPHILA

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In Drosophila, maternal factors sufficient for germline development are localized in germ plasm and are partitioned into the germline progenitors, or pole cells. It has been believed that these factors may ultimately trigger germline-specific events, such as meiosis. Here, we report an X-linked maternal mutation, sva53 that affects meiosis. Pole cells which were formed in the embryos derived from sva53homozygous germline clone (sva53pole cells) were able to develop into the oocytes, but they failed to execute meiosis. In addition, this maternal phenotype was enhanced by reducing zygotic dose of mei-S332 gene, which is known to be required for meiosis. We also found that the germline-specific expression of vasa gene was severely affected in sva53 pole cells. These results indicate that the maternal factor encoded by sva53 gene is essential for germline-specific gene expression, as well as for meiosis.

CELLULAR LOCALIZATION OF THE STARFISH EMBRYO NUCLEAR TRANSGLUTAMINASE EXPRESSED IN MAMMALIAN CELLS

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During the course of early embryogenesis of the starfish Asterina pectinifera, histone heterodimers which contain an ε -(γ -Glu)Lys cross-link between the Gln and Lys residues at the N-terminal regions of core histones appear at the mid-blastula stage. We have discovered the occurrence of nuclear transglutaminase (nTGase) in the nucleus of the blastula, which is possibly involved in the formation of histone heterodimers. The cDNA of nTGase has been cloned, sequenced and transfected in COS 7 cells. The expressed nTGase localized specifically in the nucleus, suggesting that the nuclear localization signal of nTGase is active in mammalian cells as in starfish embryo cells.

ANALYSIS OF mRNA LOCALIZED IN POLAR PLASM OF *DROSOPHILA* EMBRYOS, WHICH ENCODES A NOVEL SERINE/THREONINE KINASE Y. NINOMIYA¹ and S. KOBAYASHI^{1, 2}.

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In Drosophila, maternal factors sufficient for germ-line development are localized in the posterior pole region, or polar plasm. We have previously isolated 7 kinds of novel cDNAs which hybridize with RNAs localized in polar plasm. Among these cDNAs, we focused on Group B cDNA in this study. Group B cDNA hybridized with two transcripts (4.8 and 2.4 kb) on the Northern blot of poly(A)*RNA from ovaries and early embryos. Full length cDNAs corresponding to the 4.8 and 2.4 kb mRNAs were isolated and their nucleotide sequences were determined. The 4.8 kb mRNA encodes a protein which is homologous to a rat serine/threonine kinase (STK), while the 2.4 kb mRNA encodes a truncated form of STK which lack N-terminal region encompassing kinase domain. Comparison of the nucleotide sequences among these mRNAs and genomic DNA suggests that both mRNAs are produced from a single gene by alternative promoter usage. In situ hybridization analysis revealed that both mRNAs were localized in polar plasm and pole cells during stage 1-14 of embryogenesis. These results suggest the possibility that the STK gene plays an important role in germ-line development. Functional analysis of this gene is now on going by using mutations in this locus.

PRESENCE OF MITOCHONDRIAL TYPE OF RIBOSOMES AROUND GER-MINAL GRANULES IN *Xenopus* EMBRYOS

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In *Drosophila*, mitochondrial large rRNA (mtlrRNA) is essential for germline formation. The mtlrRNA, collaborating with mitochondrial small rRNA, forms mitochondrial type of ribosomes on the surface of polar granules to form germline. We have previously reported in *Xenopus* that both mitochondrial rRNAs (mtrRNAs) are also present on the germinal granules during 4-cell to blastula stages. This leads us to speculate that these rRNAs form mitochondrial type of ribosomes on the granules. To address this issue, we examined the diameter of ribosomes around the germinal granules. We found that there are smaller ribosomes on the germinal granules during short period from 4-cell to blastula stages. This observation suggests that mtrRNAs constitute mitochondrial type of ribosomes on the germinal granules are in *Drosophila* embryos.

The appearance and structure of a starfish histone H2B-H4 dimer

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In the nucleus of starfish (Asterina pectinifera) sperm, one-tenth of histone H2B forms covalently cross-linked heterodimers with histone H4. This dimers contain ε -(γ -Glu)Lys cross-bridge. Such dimers are not found in early embryos at the morula through early blastula stages when cells divide rapidly. However, a heterodimer which is composed of embryonic histones H2B and H4 appears at the mid-blastula stage. The sequence of the embryonic histone H2B which is different from that of sperm histone H2B has been determined by cloning its cDNA and DNA sequencing. The embryonic histone H2B acts as an amine acceptor of transglutaminase which appears in the nucleus of embryonic cells of the mid-blastula.

EARLY DEVELOPMENT OF ZOOXANTHELLA-CONTAINING EGGS OF FOUR SCLERACTINIAN CORALS WITH SPECIAL REFERENCE TO THE DISTRIBUTION OF ZOOXANTHELLAE

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Reef-building corals harbor symbiotic dinoflagellates, zooxanthellae, in their endodermal cells. Some corals spawn eggs that contain zooxanthellae. During the development of zooxanthella-containing eggs, zooxanthellae are found in every blastomere at least two cell stage, but later they become restricted to the endoderm of planulae. We observed early development of zooxanthella-containing eggs of four scleractinian corals, Pocillopora verrucosa, P. eydouxi, Porites cylindrica and Montipora digitata to study the mechanism by which zooxanthellae become restricted to the endoderm of planulae. The distribution of zooxanthellae in oocytes, the manner of gastrulation, and the timing and process of changes in the distribution of zooxanthellae were different among three genera studied. Zooxanthellae were concentrated in a hemisphere of oocytes and zooxanthella-rich blastomeres and those with few zooxanthellae were formed after second cleavage in Pocillopora. In Porites and Montipora, zooxanthellae were distributed evenly in oocytes and were delivered to blastomeres almost equally. In Pocillopora and Porites, blastomeres containing zooxanthellae into the blastocoel. Gastrulation appeared to occur by ingression rather than invagination in Pocillopora and Porites. In Montipora, gastrulation occurred by invagination and zooxanthellae were observed in both the ectoderm and endoderm of gastrulae. Zooxanthellae in the ectoderm, however, disappeared as planulae developed further. The present results show that zooxanthellae became restricted to the endoderm of planulae in four species but that the timing and process of changes in the distribution pattern of zooxanthellae were different among three genera studied.