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Migration of the Mesodermal Mantle

The migration of mesodermal precursor cells inside the embryo is part of a remarkably well coordinated series of global cellular migrations. One of the most important aspects of amphibian gastrulation is the narrowing (convergence) and lengthening (extension) of the INVOLUTING MARGINAL ZONE (IMZ), which is that region of cells residing immediately above the blastopore lip. This zone contains the prospective endodermal roof of the archenteron in its superficial layer (IMZ_S) and the prospective mesodermal cells (including those of the notochord) in its deep region (IMZ_D).

During gastrulation, the animal cap and noninvoluting marginal zone cells expand by epiboly to cover the entire embryo. The dorsal portion of the noninvoluting marginal cells expands more rapidly than the ventral portion, thus causing the blastopore lips to move toward the ventral side. Cells from these two zones will form the ectoderm of the embryo. The deep involuting marginal zone is a ring of cells that gives rise to the notochord, head mesoderm, somitic mesoderm, and lateral-ventral mesoderm. During gastrulation, this ring involutes around the blastopore lips to form the mesodermal mantle. The head and mesodermal precursors spread across the embryo as the notochord and somitic mesodermal regions converge and extend dorsally to form the dorsal axial structures. The superficial involuting marginal zone cells also undergo convergent extension to form the endodermal tissues of the archenteron roof. The subblastoral endoderm is covered by the epibolizing noninvoluting marginal zone cells and forms the archenteron floor (Keller, 1986).

During the convergent extension of the deep IMZ, the cells rearrange themselves, intercalating with nearby cells to produce a thin, elongated structure from the originally broad, small band of cells. We have already discussed a similar phenomenon involving archenteron extension during sea urchin gastrulation. Many rows of cells have intercalated to form fewer, but longer, rows of cells. Convergent extension of the mesoderm appears to be autonomous, because the movements of the cells occur even if the cells are removed from the rest of the embryo (Keller, 1986).

Literature Cited

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