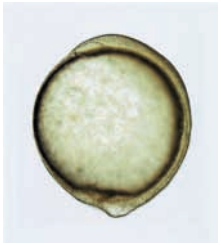
In this issue

Dissecting convergent extension

The extracellular polysaccharide Hyaluronan (HA) regulates cell proliferation, adhesion and migration by organising the extracellular matrix and participating with signal transduction pathways. Studies on HA tend to concentrate on its role in cancer, but Bakkers et al. (p. 525) now show that HA is required for the migration of several mesodermal cell types during vertebrate development. Convergent extension occurs during gastrulation: lateral cells move towards the dorsal side (convergence) and the dorsal axis extends (extension). Using zebrafish, the authors demonstrate that the HA synthase Has2 is required for dorsal convergence but not extension of the dorsal axis, confirming that, although they are closely linked, convergence and extension are independent. In addition, the Has2 enzyme reaction product – probably HA – activates the small GTPase Rac1. This results in lamellipodia formation and the subsequent migration of *has2*-expressing cells, indicating that HA has an autocrine and instructive, rather than a structural, role during cell migration.



Regulating heart differentiation

A major question regarding vertebrate heart development is how transcription factors broadly expressed in the embryo regulate the tightly restricted expression patterns of genes involved in cardiac muscle differentiation. Latinkić and co-workers (p. 669) address this by examining how transcription factors interact to regulate the pan-myocardial expression of the *Xenopus* gene myosin light chain 2 (*XMLC2*), a sensitive marker for the onset of cardiac muscle differentiation. They show that *XMLC2* has a remarkably small 82 bp core promoter containing several transcription factor-binding sites: two GATA-binding sites and a low-affinity serum response factor (SRF)-binding site overlapping a YY1-binding site. Although GATA4, SRF and YY1 are synthesised broadly in the developing embryo, it is their overlapping expression in the heart that apparently provides cardiac-specific expression of *XMCL2*. The *XMCL2* promoter also drives pan-myocardial expression of a reporter gene in mice and the authors go on to consider the evolution of the mechanisms that drive *XMCL2* expression.

When sperm meets egg

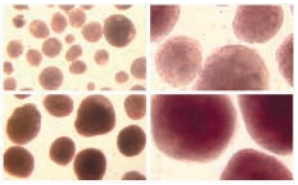
During mammalian fertilisation, sperm undergo capacitation before they adhere to the egg coat (zona pellucida) and enter the egg. A sperm is normally maintained in an uncapacitated state by the binding of glycoconjugates produced in the male to the sperm's cell-surface receptor β1,4-galactosyltransferase I (GalT I). Rodeheffer and Shur (p. 503) demonstrate that GalT I regulates capacitation by suppressing Ca^{2+}- and HCO_3^--dependent signaling cascades. On p. 491, the same authors show for the first time that sperm-egg adhesion involves at least two distinct binding events. During sperm-egg adhesion, GalT I binds to the zona pellucida glycoprotein ZP3 of ovarian eggs. Puzzlingly, however, GalT I-null sperm are able to bind to the zona pellucida of ovulated eggs. Rodeheffer and Shur have identified a novel ligand present in the zona pellucida of ovulated eggs that binds both wild-type and GalT I-null sperm, providing evidence for a ZP3- and GalT I-independent receptor-ligand interaction.

Novel dynamics in early plant development

On p. 657, Haecker and co-workers describe a new family of plant WUSCHEL-related homeobox (WOX) genes that have conspicuous expression dynamics before fertilisation and throughout early development. *WOX2* and *WOX8* mRNAs co-exist in the egg cell and zygote before becoming restricted to the apical and basal daughter cells, respectively, by asymmetric cell division. WOX5 is localised to the root quiescent centre precursors and WOX1 to the cotyledon primordia, while the expression dynamics of WOX9 seem to reflect the initiation of the central domain of the embryo. These very specific expression patterns mean that WOX genes will serve as useful markers of early embryonic cell identity. Furthermore, WOX2 is required for the proper development of the apical domain, and although possible functional redundancy currently masks the functions of other WOX genes, their expression patterns may reflect important roles during early embryogenesis.

Erythrocytes: a matter of life and death

The primitive erythroid (red blood cell) lineage is the first haematopoietic lineage to arise during vertebrate embryogenesis. Vascular endothelial growth factor (VEGF) and SCL are both important during the establishment of the haematopoietic system, and Martin and co-workers (p. 693) examine their roles during early erythrocyte development. Using *Vegf* ^{lo}, an allele that generates low levels of VEGF, they find that VEGF promotes the expansion potential and lifespan of primitive erythrocyte precursors. It also has a tight dose-dependent effect on the survival of erythrocytes in the yolk sac; low levels of VEGF appear to result in high levels of apoptosis. Gain-of-function SCL partly alleviates the haematopoietic defect caused by *Vegf* ^{lo}, and the authors suggest that VEGF promotes erythrocyte survival via the anti-apoptotic function of SCL. Martin et al. also speculate that SCL could be involved in the increased expansion potential of primitive erythrocyte precursors.



In *Journal of Cell Science*

DEP-1: a brake on cell growth

Protein kinases and phosphorylation tend to hog the limelight when it comes to studies on cell signalling. But phosphatases and dephosphorylation are also important in controlling cellular processes. Kellie et al. fill in some of the gaps in what we know about density-enhanced phosphatase 1 (DEP-1), a receptor-like protein tyrosine phosphatase that is upregulated in epithelial cells as they become confluent. DEP-1 has been implicated in cancer development and in immune cell function but little is known about its function in cells. By overexpressing DEP-1, Kellie et al. show that DEP-1 antagonises PDGF receptor signalling and reduces cell proliferation. Noting that DEP-1 expression alters the morphology of the overexpressing cells – they round up and become phase bright – the authors also investigated cell-cell and cell-substratum interactions. They conclude that DEP-1 negatively regulates cell proliferation, cell-substratum contacts, motility and chemotaxis.

Kellie, S. et al. (2004). The tyrosine phosphatase DEP-1 induces cytoskeletal rearrangements, aberrant cell-substratum interactions and a reduction in cell proliferation. *J. Cell Sci.* **117**, 609-618.