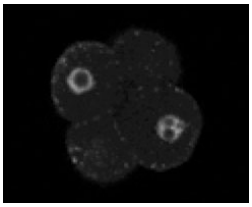
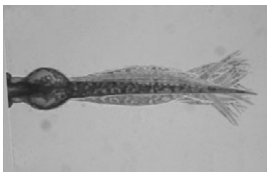


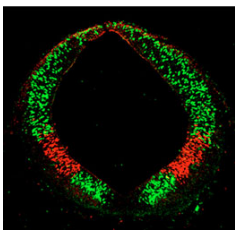
ERKsome disruption of early embryos

Preimplantation development is crucial for successful implantation and pregnancy in mammals. Compaction, an essential morphological change that occurs in eight-cell-stage embryos, has been extensively studied, but what regulates the preceding cell division stages? On p. 2751, Maekawa and colleagues report that extracellular-signal-regulated kinase (ERK) mitogen-activated protein (MAP) kinase function is needed for these divisions in mouse embryos. They show that inhibition of ERK activation in late two-cell-stage embryos causes reversible arrest in G2 phase at the four-cell stage and that cell-cell adhesion is weaker in these embryos than in control embryos. Their microarray analysis shows that, although most of the changes in gene expression that occur during the four- to eight-cell stages of development occur in the four-cell-stage-arrested embryos, the expression of a subset of genes, including those encoding intercellular adhesion molecules and a set of cell cycle-related genes, is altered. Thus, the researchers conclude, ERK MAP kinase function is essential during the earliest stages of preimplantation development.



Myopathy model's relatively relaxed

Zebrafish mutant embryos provide useful models for several human diseases. Now, Hirata and co-workers identify the *relatively relaxed* (*ryr*) mutant as a model for the human congenital myopathy multi-minicore disease (MmD; see p. 2771). MmD is caused by mutations in ryanodine receptor 1 (RYR1; a Ca^{2+}-release channel) and characterized by small amorphous cores in muscle fibres. *ryr* embryos, unlike wild-type embryos, only swim slowly when touched. This phenotype, the researchers show, is caused by impaired excitation-contraction coupling, which prevents strong contractions of the mutant's fast muscles. As in MmD, these muscles have amorphous cores. Furthermore, most of the *ryr1b* mRNA (which encodes RyR1) in *ryr* mutants carries a nonsense mutation generated by aberrant splicing; a similar deficit occurs in one type of MmD. Finally, the researchers report, *ryr* mutant embryos treated with antisense morpholino oligonucleotides that block this aberrant splicing swim normally. A therapeutic strategy based on this approach might, therefore, provide a treatment for some cases of MmD.

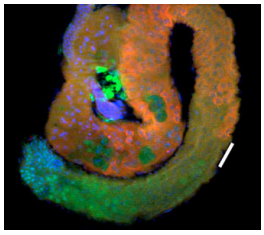


Helt! Who goes there?

GABAergic and glutamatergic neurons are the principal inhibitory and excitatory neurons in the brain, respectively. Selector genes that determine which neurotransmitter phenotype a neuron adopts during development have been identified for some regions of the brain. Now, Nakatani and colleagues report that the basic helix-loop-helix (bHLH) transcriptional repressor gene *Helt* (also known as *Heslike* and *Megane*) promotes GABAergic fate throughout the developing mouse midbrain by repressing the proneural Ngn genes (see p. 2783). The researchers show that glutamatergic neurons replace GABAergic neurons in the midbrain of *Helt*-deficient mice. Ectopic expression of *Helt*, they report, has the opposite effect. Neither *Helt* manipulation, however, affects progenitor domain formation, which indicates that *Helt* does not specify neuronal identity. In other experiments, the researchers show that *Helt* promotes a GABAergic fate by suppressing the expression of *Ngn1* and *Ngn2*, bHLH factors that are expressed in glutamatergic progenitors. Thus, they conclude, a bHLH transcription factor network determines the neurotransmitter phenotype of neurons in the midbrain.

Burst into bloom with brassinosteroids

For plants, accurate timing of the transition from vegetative to reproductive growth maximizes reproductive success. The transition is known to be controlled by numerous interacting endogenous and environmental factors, but more, it seems, remain to be discovered. On p. 2841, Domagalska and colleagues describe an unexpected role for brassinosteroid signalling – namely, the regulation of expression of *FLOWERING LOCUS C* (*FLC*), a potent floral repressor – in the control of flowering time in *Arabidopsis thaliana*. Brassinosteroids are plant steroid hormones that signal through a receptor-like kinase called BRASSINOSTEROID INSENSITIVE 1 (BRI1). The researchers identify two alleles of *bri1* that are strong enhancers of several flowering-time mutants. Double mutants that combine *bri1* (or *cpd*, a brassinosteroid-deficient mutant) with known flowering-time mutants (for example, *luminidependens*) express raised levels of *FLC* transcripts, they report, which leads to extremely late flowering. RNAi directed against the *FLC* transcript reverses this phenotype. The researchers propose, therefore, that brassinosteroid signalling regulates *FLC* expression and thus helps to control flowering time.



Spermatogenesis: lost in translational control

Translational control is crucial for the correct timing of developmental events such as spermatogenesis that take place in the absence of transcription. In this issue of *Development*, two papers describe the role of eIF4G2 – a novel orthologue of eukaryotic initiation factor 4G (eIF4G) – in translational control of spermatogenesis in *Drosophila*. eIF4G acts as a scaffold protein in the eIF4F translation initiation complex. On p. 2851, Franklin-Dumont et al. report that eIF4G2, which they call Off-schedule (Ofs), couples translational control to meiosis and differentiation during spermatogenesis. They show that, during the meiotic G2 phase of spermatogenesis, *ofs* mutant germ cells do not reach their correct size and fail to undergo meiosis or differentiate significantly. Furthermore, they report, the accumulation of four cell cycle regulators (Cyclin A, Boule, Twine and Roughex) is altered. They also show that Ofs has eIF4G activity and suggest that it substitutes for this protein in spermatocytes. Given these results, Franklin-Dumont and colleagues speculate that spermatocytes must accumulate sufficient cell mass (a process that requires active translation) before they can execute meiosis and differentiation, and that a checkpoint stops these processes if the spermatocytes have not grown enough. On p. 2863, Baker and Fuller also provide evidence that translational control regulates meiosis and differentiation in *Drosophila* spermatocytes. They report that flies mutant for eIF4G2 are viable but that the males are sterile. They then show that, although spermatocytes form in the mutant flies, the germ cells skip the major events of the meiotic divisions. eIF4G2 function, they report, is needed for the normal accumulation of the core cell cycle regulators Twine and Cyclin B in mature spermatocytes; loss of eIF4G2 function also causes widespread defects in spermatid differentiation, including a failure to elongate properly. Thus, suggest Baker and Fuller, a specialized form of the translation initiation machinery is required for the regulation and execution of key steps in male germ cell differentiation. Together, these two papers thus provide important new insights into how translational control ensures that the meiotic cell cycle is coordinated with differentiation during spermatogenesis to produce viable spermatozoa.

Jane Bradbury