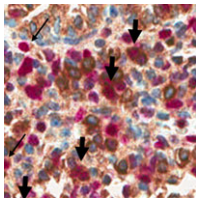
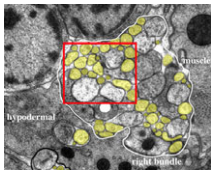


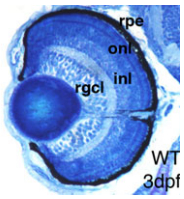
CARM1 airs out lung development

Numerous hormones and transcription factors regulate the development of the 'business' end of the lungs – the alveoli, where gas exchange occurs. Now, Tenen, Kobayashi and colleagues report that coactivator-associated arginine methyltransferase (CARM1, a transcriptional coactivator that methylates histones and various transcription factors) also plays a crucial regulatory role during lung development (see p. 2147). The researchers show that alveolar type II (AT2) cells hyperproliferate in the lungs of *Carm1*-null (*Carm1*$^{\Delta/\Delta}$) mutant mouse embryos (which fail to breathe and die shortly after birth), an unexpected result given that CARM1 knockdown inhibits the proliferation of breast cancer cell lines. Using electron microscopy, they show that the AT2 cells in the lungs of the *Carm1*$^{\Delta/\Delta}$ mice do not differentiate normally into alveolar type I (AT1) cells. Finally, they report that the expression of many cell-cycle genes and markers of AT1 differentiation is dysregulated in *Carm1*$^{\Delta/\Delta}$ embryos. Thus, the researchers conclude, CARM1 is required for the proper control of proliferation and differentiation of these pulmonary epithelial cells.



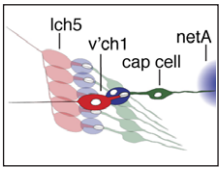
Synaptogenesis needs a happy mRNA ending

Nuclear processing of the 3′-end of pre-mRNA is crucial for the production of mature RNA and for the generation of the 3′ untranslated region. It is, therefore, involved in the post-transcriptional regulation of gene expression. However, the developmental role of this processing pathway is unclear. On p. 2237, Yishi Jin and colleagues now reveal that pre-mRNA 3′-end processing regulates synapse and axon development in *C. elegans*. In a genetic enhancer screen for synaptogenesis mutants, they identify Synaptic defective enhancer-1 (SYDN-1), a novel polyproline-rich protein required for synapse and axon development that localises to distinct nuclear regions. In a genetic suppressor screen, they discover that loss of function of Polyadenylation factor subunit-2, which interacts with the pre-mRNA 3′-end processing machinery, suppresses the neuronal defects of *sydn-1* mutants. Furthermore, lack of *sydn-1* increases 3′-end processing activity, and inactivation of several members of the pre-mRNA 3′-end processing machinery suppresses *sydn-1* mutants. Thus, pre-mRNA 3′-end processing plays an important regulatory role during neuronal development.



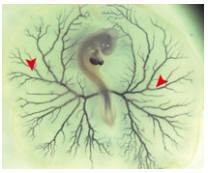
Over-riding signals from the niche

During neurogenesis in the vertebrate retina, multipotent retinal progenitor cells (RPCs) exit the cell cycle and acquire postmitotic neuronal fates in a highly coordinated manner, but what triggers this transition? On p. 2107, Stephen Wilson and co-workers reveal that the local retinal environment plays a key role in this transition in zebrafish. In zebrafish, RPCs in a stem cell niche called the ciliary marginal zone (CMZ) differentiate into neurons throughout life. To study how these RPCs transition towards differentiation, the researchers used the zebrafish *flotte lotte* (*flo*) mutant. *flo* encodes Elys, a nuclear pore component required for cell-cycle progression. In *flo* mutants, the researchers report, CMZ cells retain the capacity to proliferate but do not enter their final neurogenic divisions to differentiate as neurons. However, in mosaic retinae, *flo* mutant cells near to wild-type retinal neurons progress from proliferation to differentiation. Thus, suggest the researchers, cell-extrinsic signals are able to over-ride a cell-cycle progression defect to promote differentiation of cell-cycle-defective neuronal progenitors.



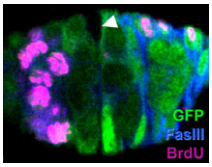
Accessory to neuronal development

Neuronal development is often regulated by non-neuronal, 'accessory' cells, but the mechanisms underlying such regulation are poorly understood. Now, Paul Whitington and colleagues report that Netrin-A (a secreted axon guidance protein) controls the dendrite orientation and migration of a *Drosophila* sensory neuron by directing the morphogenesis of an accessory cell (see p. 2227). Insect chordotonal organs are mechanosensory organs that contain two or more accessory cells and one neuron. The researchers report that the cap cell of v'ch1, an abdominal chordotonal organ, extends a long process soon after birth that attaches to the epidermis in the body wall. Netrin-A produced in epidermal cells at the future attachment site of this accessory cell regulates cap cell morphogenesis, they report, which subsequently aligns the dendrite of the chordotonal neuron and tows its cell body into its final position. Together, these results begin to reveal how the cap cell, which helps to transduce sensory stimuli into electrical activity in the mature chordotonal organ, also regulates the development of the organ's neuron.



Feel the pulse in arteriogenesis

Arterial and venous vascular networks express different molecular markers and have different functions and branching architecture. Both arterial-venous identity specification and vascular branching during early embryogenesis are modulated by haemodynamic factors, but what is the nature of these factors? On p. 2187, Ferdinand le Noble and co-workers provide new insights into this question. They report that, in the chicken embryo yolk sac (vitelline) vasculature in vivo, a unique parameter related to the pulsatility of blood flow is significantly higher in arteries than in veins. They show that loss of this pulsatility reduces arterial marker expression in arterial cells both in vitro and in vivo. Then, by ligating vitelline arteries, they show that flow-driven collateral arterial network formation (arteriogenesis) is associated with increased arterial expression of Gja (connexin 40). Finally, they report that genetic ablation of Gja5 function in mice reduces arteriogenesis in two arterial occlusion models. Together, these results suggest that pulsatile flow and Gja5 expression modulate arterial identity and remodelling during flow-driven arteriogenesis.



TOR de force links stem cell maintenance to nutrition

Stem cells depend on intrinsic and local factors to maintain their identity and activity but they also respond to external conditions. For example, *Drosophila* germline stem cells (GSCs) and follicle stem cells (FSCs) respond to diet via insulin signals. Now, Daniela Drummond-Barbosa and colleagues reveal that the nutrient sensor Target of rapamycin (TOR) controls the stem cells in the *Drosophila* ovary in numerous ways (see p. 2117). TOR, they show, promotes GSC proliferation and maintenance independently of insulin signalling and is required for the proliferation, growth and survival of differentiating germ cells. By contrast, although TOR controls the proliferation of FSCs, it is not required for their maintenance or for the proliferation of their differentiating progeny. Instead, TOR controls follicle cell numbers by promoting their growth and survival independently of apoptosis or autophagy. The researchers speculate, therefore, that TOR is part of a conserved mechanism that ties stem cell maintenance and function, and the survival, proliferation and growth of their descendants, to diet-dependent factors.

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