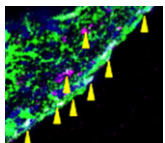


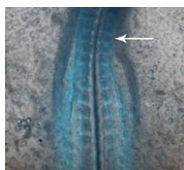
Nodal regulates germ cell potency

During mammalian gonadal development, somatic cues regulate the sex-specific development of foetal germ cells and control the transition between proliferation and cell-fate commitment. This transition is particularly important for male germ cells: too little proliferation reduces sperm numbers and fertility, whereas escape from commitment and prolonged pluripotency can cause testicular germ cell tumours. Now, Josephine Bowles, Peter Koopman and colleagues (p. 4123) report that the TGF β morphogen Nodal regulates this transition in mice. The researchers show that Nodal signalling is active in XY germ cells at the developmental stage when this transition occurs and that Nodal signalling is triggered when somatic signals, including FGF9, induce testicular germ cells to upregulate the Nodal co-receptor Cripto. Genetic suppression of Nodal signalling leads to depressed pluripotency marker expression and early XY germ cell differentiation, they report, whereas *NODAL* and *CRIPTO* are upregulated in human testicular tumours. These results indicate that Nodal signalling regulates male germ cell potency during normal development and provides new clues about the aetiology of testicular cancer.



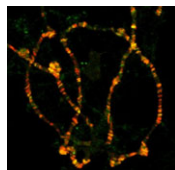
Cardiomyocyte migration mends broken hearts

Unlike adult mammals, adult zebrafish can regenerate injured heart tissue. Heart regeneration in zebrafish is known to involve partial de-differentiation and proliferation of cardiomyocytes, but are cardiomyocytes involved in any other processes during heart repair? Here (p. 4133), Yasuhiko Kawakami and co-workers report that cardiomyocyte migration to the injury site is required for zebrafish heart regeneration. Ventricular amputation, they report, induces expression of the chemokine ligand *cxc12a* and the chemokine receptor *cxc4b* in epicardial tissue and cardiomyocytes, respectively. Both pharmacological inhibition of Cxcr4 function and genetic loss of *cxc4b* function prevent heart regeneration, they show, and lead to mislocalisation of proliferating cardiomyocytes outside the injury site without affecting cardiomyocyte proliferation. Finally, the researchers use a photoconvertible fluorescent marker to show that, although cardiomyocytes migrate into the injury site in control hearts, their migration is inhibited in Cxcr4-antagonist-treated hearts. Thus, cardiomyocyte migration into injured zebrafish heart tissue is regulated independently of cardiomyocyte proliferation, and coordination of both processes is essential for heart regeneration.



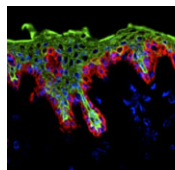
Hox genes specify nephric ducts

In amniote embryos, three kidneys – the pronephros (a transient embryonic structure), the mesonephros (the embryonic kidney) and the metanephros (the adult kidney) – form sequentially along the anterior-posterior (AP) axis of the intermediate mesoderm (IM). Here (p. 4143), Thomas Schultheiss and colleagues investigate AP patterning in the mesoderm by analysing the specification of the avian embryonic nephric duct – an unbranched epithelial tube that originates in the anterior IM. Using quail-chick chimaeric embryos, the researchers show that nephric duct specification occurs early in development when IM precursor cells are still in the primitive streak. *HoxB4*, they report, is expressed in nephric duct precursors from the primitive streak stage onwards, whereas the more posterior Hox gene *HoxA6* is expressed in non-duct IM. Notably, misexpression of *HoxA6* in the duct-forming regions of the IM represses duct formation. Together, these results indicate that Hox genes regulate AP patterning in the IM and provide new insights into general mesodermal patterning along the AP axis and into kidney evolution.



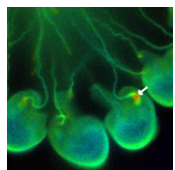
Cohesin quells Polycomb group silencing

Polycomb group (PcG) genes encode transcriptional repressors that regulate gene expression during development. Most PcG genes encode subunits of chromatin-modifying complexes, but exactly how PcG proteins repress transcription is unclear. Now, Judith Kassis and colleagues report that Wapl, a cohesin-associated protein involved in cohesin removal from chromosomes, promotes PcG silencing in *Drosophila* (p. 4172). To identify genes involved in PcG silencing, the researchers conduct a screen for suppressors of silencing mediated by an *engrailed* PcG response element. They identify one of the suppressors obtained from this screen as *wapl^{AG}*, a dominant *wapl* mutation that produces a truncated Wapl protein. The researchers show that *wapl^{AG}* hemizygotes die as pharate adults (insects prior to emergence from pupae) but have an extra-sex-comb phenotype similar to that produced by mutations in PcG genes. Finally, the researchers show that Wapl-AG increases the stability of cohesin binding to polytene chromosomes. Together, these results suggest that increasing cohesin stability can interfere with PcG silencing, and that cohesin thus directly inhibits PcG function.



Human skin innate immunity develops early

The skin protects the body from microbial pathogens by employing Toll-like receptors (TLRs) and other molecules that recognise pathogen-associated molecular patterns to initiate innate immune responses and to direct subsequent adaptive immunity. But when does the innate immune system in human skin become immunologically competent? On p. 4210, Adelheid Elbe-Bürger and co-workers answer this question by analysing TLR expression and function in human skin. The researchers report that, although prenatal and adult skin express a similar spectrum of TLRs, prenatal, infant and child skin express higher levels of several TLRs (particularly TLR3) than adult skin. Moreover, a synthetic TLR3 ligand that mimics viral double-stranded RNA significantly enhances the secretion of several chemokines and cytokines by keratinocytes isolated from foetal and neonatal donors but not by those isolated from adult donors. Thus, the researchers conclude, human skin exhibits age-related changes in TLR expression and function, and foetal keratinocytes are already endowed with specific immune functions that may protect the developing human body from viral infections.



Calcium crosstalk during plant fertilisation

During sexual reproduction in flowering plants, cellular interactions guide the growth of the pollen tube from the stigma to the embryo sac where fertilisation occurs. The cytoplasmic Ca²⁺ concentration ([Ca²⁺]_{cyt}) regulates pollen tube growth, but does it also regulate pollen tube guidance and reception? On p. 4202, Seiji Takayama and colleagues investigate Ca²⁺ dynamics during fertilisation by expressing a Ca²⁺ sensor in *Arabidopsis* pollen tubes and synergid cells (cells in the ovule that guide the pollen tube). During semi-in vivo fertilisation, they report, pollen tubes turn towards wild-type ovules but not towards ovules in which pollen tube guidance has been genetically disrupted. Notably, [Ca²⁺]_{cyt} is higher in turning pollen tube tips than in non-turning tips. Moreover, [Ca²⁺]_{cyt} oscillation in the synergid cells, which reaches a maximum at pollen tube rupture, begins only upon pollen tube arrival. These results suggest that signals from the synergid cells induce Ca²⁺ oscillations in the pollen tube and vice versa, and that these oscillations are involved in pollen tube guidance and reception.

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