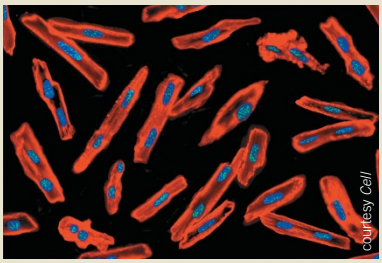
Heart stem cells unmasked

Researchers have identified heart cells that meet most of the criteria for stem cells. The existence of heart stem cells contradicts a longstanding belief that the heart is a postmitotic organ with little capacity to regenerate itself after injury. Over the years, various clues—such as the discovery of replicating myocytes and of primitive heart cells expressing stem cell markers—have pointed to the error of this view. Now, Anversa and colleagues have identified rat cardiac Lin^- $c\text{-}kit^+$ cells that are self-renewing and multipotent, with the ability to differentiate *in vivo* into myocytes, smooth muscle cells and endothelial cells. When transplanted into ischemic rat hearts, the Lin^- $c\text{-}kit^+$ cells produced new, functional myocardium. The existence of heart stem cells suggests novel therapeutic approaches to heart disease such as the development of drugs that could stimulate latent endogenous repair mechanisms. (*Cell* **114**, 763–776, 2003) *KA*



Green dwarfs

Dwarf plants are largely credited with powering the green revolution of the 1960's because short, stocky crops withstand adverse wind and rain conditions and can be grown at high densities. Now Johal and coworkers have solved the mysteries behind dwarf varieties of corn and sorghum. They found that *Brachytic2* (*br2*) mutants of corn, which had been around since the 1950s, have altered auxin transport in the lower stalk, which is caused by a mutation in a P-glycoprotein transporter. These *br2* plants not only have short internode distances, but also have more cells per unit area, resulting in stronger stalks. The notoriously unstable sorghum variant (*dwarf3, dw3*) has a duplication in the analogous transporter gene, which could explain its instability. Chromosomal analysis of *dw3* mutants shows that unequal crossing over between the duplicated genes can result in some plants with three copies of the gene and others with one, suggesting that stable strains of dwarf sorghum could be isolated for use in parts of Africa where sorghum is a staple. (*Science* 302, 81–84, 2003) *LD*

Reengineering biosensors

Synthetic cellular signal transduction pathways sensitive to metals could have applications ranging from metal detection in the environment to gene expression control during bioprocessing. Triggering of a signal by an extracellular molecule depends on the specificity and sensitivity of the periplasmic binding proteins (PBPs) associated with a particular signal transduction pathway. Using automated, structure-based computational design, Hellinga and colleagues now report the successful reengineering of a PBP that binds ribose into a PBP that binds zinc. Taking into account the primary and secondary coordination spheres necessary for optimal zinc binding, the researchers modified a total of eight different amino acids, generating zinc-binding proteins of comparable, if not better, binding characteristics than the original ribose-binding protein (RBP). *Escherichia coli* containing the zinc-binding proteins together with the RBP-associated signal transduction pathway were capable of detecting zinc in solution. (*Proc. Natl. Acad. Sci. USA* **100**, 11255–11260, 2003) *GTO*

Research Notes written by Kathy Aschheim, Laura DeFrancesco, Meeghan Sinclair and Gaspar Taroncher-Oldenburg.

Finding T cells in a haystack

A new method identifies and isolates rare, tumor-killing T cells from patients for use in T-cell cancer therapy, a cancer treatment that is more specific and potentially less toxic than traditional chemotherapeutics. Current methods for measuring antigen-specific T-cell responses do not provide a way to link specificity with tumor-cell killing, and some do not allow further analysis or isolation of the cells. To overcome these obstacles, Lee and colleagues use flow cytometric analysis to isolate antigen-specific T cells expressing a marker that is upregulated on the surface of T cells during the process of cell killing (CD107a). They identify rare, tumor antigen–specific T cells that can destroy tumor targets from individuals vaccinated with tumor antigen and grow these cells in culture. A significant advantage of the method is that it is not necessary to know the tumor antigen target of the T cells to perform the assay—a requirement of most current assays. This is important because only a small number of tumor antigens have been identified to date. (*Nat. Med.* 9, 1377–1382, 2003) *MS*

Double rats!

The rat—an important animal model for human physiology and disease—has been successfully cloned for the first time. This rodent had previously proven recalcitrant to cloning efforts, mostly due to a quirk in the development of rat eggs, which start multiplying shortly after removal from the animal and thus do not allow sufficient time to perform somatic cell nuclear transfer (SCNT). Renard and colleagues have overcome this limitation with a simple and elegant approach in which a drug is added that prevents cell division of the rat eggs in culture, buying researchers enough time to perform SCNT. The authors produced two healthy pups, which in turn generated litters of healthy second-generation pups. The technology paves the way for the production of rats in which specific genes can now be manipulated to generate models relevant to medical research. (*Science*; published online 25 September 2003, doi:10.1126/science.1088313) *GTO*