Skin Treatments

Epidermolysis bullosa is the term used to describe a group of inherited disorders that are characterized by severe blistering and skin fragility. Two recent papers show the beginnings of new therapeutic approaches. Dystrophic epidermolysis bullosa is associated with mutations in type VII collagen that result in blistering, deformities, and aggressive squamous cell carcinoma. Woodley et al. demonstrated that intravenously injected, recombinant type VII collagen was able to home to the region of wounds and restore expression for several weeks in two animal models. Junctional epidermolysis bullosa, in which the causative mutation may occur in the type XVII collagen gene, is corrected in some cells by a secondary mutation, leading to revertant mosaicism. Revertant keratinocytes should have significant potential as an autologous therapeutic agent. Gostynski et al. found that although colony-forming potential was high, revertant cells divided more slowly than wild-type cells. However, revertant cells were capable of engraftment and skin regeneration in a humanized mouse model if the cells were first grown as part of a skin equivalent on a plasma-based scaffold. — BJ


Experimental Intervention

We know that some viruses can rapidly spread among wild birds, as witnessed by pandemic influenza viruses. Realizing their close similarity to mammalian retroviruses, Niewiadomska and Gifford have been sleuthing among the genomes of reticuloendotheliosis viruses (REV) of birds. Sequences of these viruses have surprisingly also turned up within the genomes of a couple of large DNA viruses: fowlpox and gallid herpesvirus 2 (Marek’s disease). Phylogenetically, REV history stretches back beyond the origins of echidnas in the mammalian lineage, more than 8 million years ago, but they only turned up in birds during the 1930s. How? Via human intervention. Further sleuthing in the literature led to just one archived sample of duck infectious anemia virus, which traced back to a series of experiments on a bird malaria isolate collected in Southeast Asia. There was a lot of interest in this newly discovered parasite, and samples were disseminated to five differ-

Continued on page 17
Materials Science

Doping by Diffusion

The electronic properties of bulk semiconductors can be improved by doping, the deliberate introduction of impurity atoms that increase the number or mobility of charge carriers. Usually, just doping the surface of a bulk semiconductor is sufficient, but for semiconductor nanocrystals, the entire particle needs to be doped to achieve the desired properties. Vlaskin et al. report on the doping of CdSe nanocrystals with Mn ions, a process that has proven especially difficult at the high levels desired to impart magnetic properties. Hot-injection synthesis of Mn-doped CdSe nanocrystals (where the particles rapidly form in solution from precursors) results in particles that are depleted in Cd at the surface. The authors were able to incorporate Mn ions uniformly by starting with CdSe seed nanocrystals, which were injected as a solution along with selenium into a solution of manganese acetate at ~300°C for times varying from seconds to several hours. This thermodynamically controlled process, which uniformly increased the size of the seeds, resulted in diffusion doping of the entire crystal without requiring Cd ion ejection and allowed doping levels of Mn as high as 20% to be achieved. — PDS


Microbiology

Parasite Palmitoylation

The molecular mechanisms involved in the active invasion processes used by apicomplexan parasites such as Toxoplasma gondii to enter host cells are not well understood. Compounds that inhibit—or in some cases enhance—the infectivity of T. gondii parasites were recently identified in a chemical-genetic screen. How such small-molecule invasion enhancers might work, however, remains obscure. Child et al. have now been able to identify the molecular target of one class of small-molecule enhancers: a Toxoplasma enzyme, palmitoyl protein thioesterase-1 (TgPPT1). Inhibiting this thioesterase enhanced the invasive capacity of tachyzoites by increasing parasite motility and promoting secretion from micronemes, the parasite’s invasion-associated organelles. TgPPT1 acts as a depalmitoylase, removing fatty acids that have been attached to proteins post-translationally. Thus, reversible palmitoylation within the parasite appears to play a key role in the invasion of host cells by T. gondii. — SMH


Plant Science

Dissected Dispersal

Equisetum plants (horsetail) have a lineage dating back to the Paleozoic, and these unusual vascular plants reproduce with spores. Marmottant et al. have now taken a closer look at how the spores get around. The spores have four long legs that, in humid conditions, are wrapped closely around the spore body, but as the relative humidity decreases, the legs straighten out. The change in shape is driven by the two-layer construction of the legs, with one layer having a greater tendency than the other to change volume in response to moisture, similar to the change in shape of old bimetallic thermostats in response to changes in temperature. The process is reversible, with legs furling and unfurling as the humidity goes up and down. In the naturally moist habitat that Equisetum frequents, a shaft of bright sunshine or a dry breeze can effectively change the local humidity surrounding a spore. As the legs move, so moves the spore. Occasionally the legs get stuck on each other, and, when they get unstuck, the release of elastic energy can propel the spore into a rather large leap. Whether crawling or leaping, repeated cycles of motility would increase the dispersion of these otherwise sedate plants. — PJH


Continued from page 15

ent laboratories. Unfortunately, the malaria samples had somehow become contaminated with REV’s, possibly during serial passage using mammalian blood or possibly by contact with the bêtes noirs for pathogen spillovers—bats. The REV was then able to integrate into bona fide bird viruses, and thence into vaccine strains, and ineluctably became one of the hazards modern poultry have to face. — CA