

EDITORS' CHOICE

edited by Stella Hurtley

BIOMEDICINE

Repair by Satellite

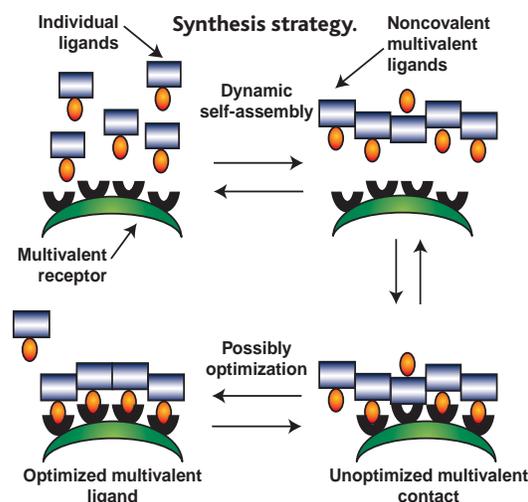
Several forms of muscular dystrophy are caused by mutations that disrupt the dystrophin-glycoprotein complex, a critical assembly of muscle proteins that links the cytoskeleton to the extracellular matrix. Cohn *et al.* investigated the function of dystroglycan, a major component of this complex, by generating mice in which expression of the protein was selectively ablated in differentiated skeletal muscle. Surprisingly, although these mice showed signs of skeletal muscle cell death within 6 weeks after birth, they developed only a mild form of muscular dystrophy. Disease progression was prevented by the reparative action of satellite cells, a resident population of undifferentiated cells in muscle that retained expression of dystroglycan in the mutant mice. This finding indicates that satellite cells play an important role in the pathogenesis of muscular dystrophy and offers hope that the progression of this and other muscle wasting disorders can be slowed by therapeutic strategies designed to maintain muscle regenerative capacity. — PAK

Cell 110, 639 (2002).

GEOLOGY

Missing (Tectonic) Link

The Galapagos Islands were formed by a mantle plume, or hot spot, whose earlier history is written in tracks on the Pacific seafloor that begin at the islands and terminate against the deep-sea trenches west of Central America and Ecuador. Geochemical evidence suggests that the hot spot also gave rise to the magmatic outpouring that, some 72 to 95 million years ago (Ma), formed the Caribbean large igneous province (CLIP), the oceanic plateau that be-



comes the Caribbean plate. Yet the oldest known rocks of the Galapagos hot spot tracks in the Pacific date to 15 Ma. That leaves more than 55 million years of the hot spot's record unaccounted for—and presumably subducted away.

Hoernle *et al.* studied a previously undated Pacific seamount and accreted igneous rock complexes on the coasts of Panama and Costa Rica, and have potentially discovered a direct tie between the hot spot and CLIP. The suite of samples, similar geochemically to both CLIP and Galapagos rocks, neatly spans the previously missing age range between the oldest hot spot traces and the youngest CLIP samples, providing a tangible geological link between the two now-separated areas. The continuous 95-million-year history of the Galapagos hot spot probably played a key role in the formation of land bridges that helped to drive biotic exchange and evolutionary patterns in the Americas during the late Mesozoic and Cenozoic eras. — SW

Geology 30, 795 (2002).

CHEMISTRY

Shaping Up

The control of nanoparticle size and shape is often difficult, and the tailored growth of only a few materials has been achieved so far. Lee *et al.* now show that the growth of lead sulfide (PbS) can not only be controlled, but a number of unusual and transient nanocrystal shapes can be obtained. When dodecylamine was used as the capping ligand, only cube-shaped nanocrystals were obtained. Switching to dodecanethiol, which forms a much stronger bond with the Pb, produced cubic nanocrystals but only at low concentrations of the ligand. At high concentrations, nearly spherical nanocrystals were observed, as the growth on the {111} faces was selectively restricted. Lower growth temperatures and high precursor flux rates led to kinetic control of the growth, with enhanced growth along the {100} faces, to create nanocrystals with T, L, star, and

CHEMISTRY

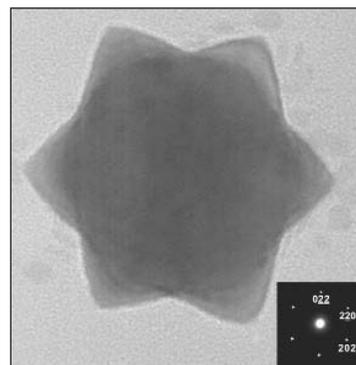
Strength in Numbers

Recognition events at cellular membranes frequently involve the simultaneous contact of several oligosaccharide ligands connected to one biomolecule with multiple protein receptors. Such polyvalent interactions serve to increase the strength of the interaction. Thoma *et al.* report a strategy for creating artificial polyvalent structures based on dendrimers—synthetic macromolecules with a tree-like chemical structure—that self-assemble into nanoparticles. The dendrimers carry carbohydrate ligands known to inhibit immunoglobulin binding. The authors show that the nanoparticles inhibit immunoglobulin binding both in vitro and in vivo in cynomolgus monkeys. Only assemblies from second- and third-generation dendrimers were highly potent, indicating that potency corre-

lates with the size of the aggregates. By tuning the aggregate size and the nature of the ligands, it should be possible to adapt the system to a variety of physiological polyvalent interactions. — JFU

Angew. Chem. Int. Ed. 41, 3195 (2002).

cross shapes. By programming the right conditions for each of the variables, the authors believe it should be possible to consistently obtain desired nanocrystal



Star-shaped PbS nanocrystals.

products, including species that were previously only transient, such as the star shapes. — MSL

J. Am. Chem. Soc. 10.1021/ja025805j (2002).

CELL BIOLOGY

Hitching a Ride

Heterotrimeric G proteins function in multiple signalling pathways at the plasma membrane; however, their intracellular

CONTINUED ON PAGE 1961

itinerary to achieve their correct localization at the cytoplasmic face of the plasma membrane is not clear. Michaelson *et al.* examined the synthesis and transport of fluorescently tagged G-protein α and γ subunits in living cells. The $G\gamma$ subunit and $G\beta$ subunit form a dimer soon after synthesis in the cytosol and are trafficked together through the cell. Soon after synthesis, the $G\gamma$ subunit acquires a lipid modification. The $G\gamma$ subunit also contains a CAAX motif that targets the dimer to the cytoplasmic face of the endoplasmic reticulum, where AAX is cleaved and the subunit is carboxymethylated. The processed dimer is then transported to the Golgi complex and then needs to assemble with the $G\alpha$ subunit, which is also lipid-modified, before transport along the secretory pathway to the plasma membrane. The requirement for two separate targeting signals—CAAX processing and heterotrimerization—to allow correct localization of the heterotrimer is analogous to the dual-signal plasma membrane targeting observed in another family of signalling proteins, the Ras proteins. — SMH

MBC in Press 10.1091/mbc.E02-02-0095 (2002).

MICROBIOLOGY

Snakevine and Munumbi Miller

The munumbicins are a group of peptide antibiotics named by Gary Strobel, the discoverer of taxol, in honor of an Australian aboriginal friend (*Science* **296**, 1597 (2002)). The plant was originally selected on the basis of

its ethnobotanical uses as a wound dressing, and subsequently munumbicins A to D have been discovered to have a wide spectrum of activity against some cancer cell lines, plant-



Snakevine, *Kennedia nigricans*.

pathogenic fungi, and Gram-positive bacteria, as well as the malaria parasite *Plasmodium falciparum*.

Castillo *et al.* now find that the antibiotics are produced by an endophytic *Streptomyces* species that lives within the tissues of the snakevine, *Kennedia nigricans*, and which apparently acts symbiotically to ward off infection by phytopathogens. The munumbicins have a basic structure of Glx, Pro, Thr, and Val roughly in a 1:2:1:3 ratio, with variably Asx and/or Leu, coupled to a pigmented moiety, possibly a macrolide. These compounds hold out some pharmacological interest as potential new antibiotics against *Mycobacterium tuberculosis* and also as antimalarials. — CA

Microbiology **148**, 2675 (2002).

HIGHLIGHTED IN SCIENCE'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT



Semaphorins Signal a New Pathway

The semaphorins, a large family of secreted and membrane-bound proteins, regulate axonal pathfinding and play a prominent role in nervous system development. The widespread distribution of semaphorin receptors, or plexins, in various adult and embryonic tissues, however, suggests that these proteins may serve nonneuronal functions as well.

Giordano *et al.* found that Semaphorin 4D (Sema 4D) elicited a pattern of cell proliferation, migration, anchorage-independent growth, and branching morphology in a hepatic cell line. The response was identical to "invasive growth," a programmed cellular response to Scatter Factor 1 due to activation of the Met receptor. Endogenous Plexin B1—the Sema 4D receptor—and Met formed a complex. Sema 4D elicited tyrosine phosphorylation of Plexin B1, Met, and a Met substrate. Cells overexpressing Plexin B1 constitutively displayed the invasive phenotype and showed basal Met phosphorylation. The response to Sema 4D depended on expression of a functional Met receptor and was inhibited by a Met dominant negative construct. This expands the known spectrum of semaphorin functions and raises the intriguing possibility that the semaphorins could be implicated in metastatic processes through activation of the Met pathway. — EA

Nature Cell Biol. **4**, 720 (2002).

Science

Shaping Up

Marc S. Lavine

Science **297** (5589), 1959.

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