EDITORS' CHOICE

edited by Stella Hurtley

IMMUNOLOGY

Helping and Hindering Infection

Helper T cells are broadly divided into two types: those that invoke cellular inflammatory (T_H1) responses; and those that drive humoral (T_H2) immunity, including allergic-like reactions to large pathogens, such as parasitic worms. These two classes of response are generally incompatible with one another and require coordination by cytokines to promote one while dampening the other.

Interleukin (IL)–18 was originally characterized through its ability to co-induce IFNγ expression by T_H1 cells, but two studies now suggest that this cytokine has much broader functions. Neighbors *et al.* observed that IL-18 exerted a major influence on primary and secondary immune responses to the bacterium *Listeria monocytogenes* in mice. Indeed, IL-18 displayed even greater potency than the two principal T_H1-promoting cytokines IL-12 and IFNγ. IL-18 achieved this potency partly through the induction of the antimicrobial agents TNFα and nitric oxide. In a model of helminth infection, Helmby *et al.* found that IL-18 suppressed the cytokine IL-13. IL-13 is a major factor mediating expulsion of parasitic worms from the gut. Thus, alongside potent antimicrobial effects, IL-18 can negatively influence the course of T_H2 immunity. — SJS

J. Exp. Med. **194**, 343; 355 (2001).

CLIMATOLOGY

Seesawing on Seesawing

During the last deglaciation, ocean warming was interrupted in both the Northern and Southern Hemispheres, although apparently not synchronously. The apparent delay of the northern cooling event with respect to that of the south, inferred first from ice cores, has been interpreted as evidence of a "bipolar seesaw" in ocean circulation patterns. Results from the Taylor Dome, Antarctic ice core [Steig *et al.*, *Science* **282**, 92 (1998)] showed that warming there seemed to be in phase with the warming shown in Greenland ice cores, and provided an exception to the concept of bipolar antiphasing widely accepted at the time.

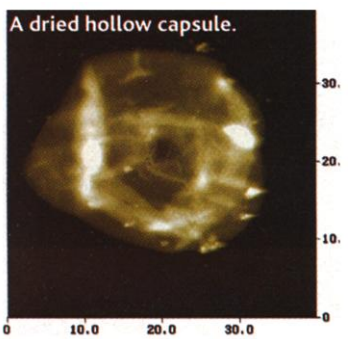
Now, Jouzel *et al.* present results from the high-accumulation-rate Dome Concordia, Antarctic ice core that strengthen the suspicion that the concept of a bipolar seesaw may be too simple. Their results support the idea that the gradual warming that occurred between 18,000 and 14,000 years ago in the south preceded the more abrupt warming at about 15,000 years ago in the north, but also indicate that both hemispheres cooled concurrently after 14,000 years ago. This finding suggests that the transfer of heat between high northern and southern latitudes is not strictly a zero-sum game. — HJS

Geophys. Res. Lett. **28**, 3199 (2001).

DRUG DELIVERY

A Coat of Many Layers

Several particle-coating methods have been developed for time-released drug delivery, but few have been tested under in vivo conditions. Recently, two groups have subjected their delivery systems to some of these conditions. Qui *et al.* encapsulated micrometer-sized ibuprofen crystals through repeated adsorption of oppositely charged biocompatible polysaccharides. The polymer coating delayed ibuprofen release at pH 1.4 (representative of gastric fluid) but did not significantly affect release at pH 7.4 (similar to intestinal pH). Marinakos *et al.* used gold colloidal particles to support small molecules or enzymes. Conductive polymer coatings were formed in situ without altering the biomolecules, and then the colloidal core was dissolved away. The addition of counterions was shown to influence the diffusion rate of the encapsulated small molecules, and coated enzymes showed greater resistance to harsh solvents. When



generated in this fashion, poly(pyrrole) capsules 25 to 100 nm in diameter were absorbed by mouse fibroblasts without compromising cell viability. — MSL

Langmuir, 10.1021/la010201w; *J. Phys. Chem. B.* 10.1021/jp010820d.

BIOMEDICINE

Healing the Heart

The old adage "A wounded heart never heals" may not apply to frogs, but it accurately

Normal plants possess a basal rosette of leaves and grow tall before flowering (left), plants with reduced levels of EMF1 flower early and remain short (middle and right).

PLANT BIOLOGY

It's Just a Phase

The tiny plant *Arabidopsis* normally goes through phases as it matures. It first develops a rosette of leaves, and after a period of vegetative growth makes a transition to the flowering phase when its shoot grows up from the basal rosette. This transition is regulated by about 40 genes. Two genes, *Embryonic Flower* (*EMF*) 1 and 2, affect the timing of this transition and also the initiation of flower development. Plants lacking *EMF* function skip the leafy rosette phase entirely, going straight from embryo to flower development.

Aubert *et al.* have now cloned the *EMF1* gene, and find that *EMF1* is a single-copy gene similar to a gene found in rice. The EMF1 protein is predicted to contain nuclear localization signals, phosphorylation sites, and a motif implicated in binding of hormone complexes to nuclear receptors. The protein is expressed throughout the plant, but its function may be more finely regulated by subcellular localization or by binding with partner components. In crop plants, the phenomena regulated by EMF1—shoot architecture, time for development to flowering, and growth pattern—are all useful traits to manipulate. — PJH

Plant Cell **13**, 1865 (2001).

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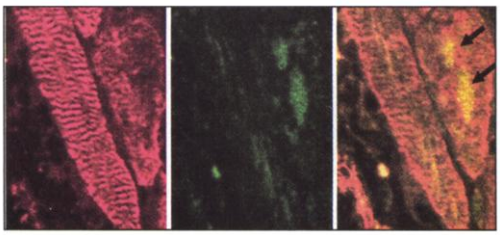
SOURCE: (LEFT) AUBERT *ET AL.*, *PLANT CELL* **13**, 1865 (2001); (RIGHT) QUI *ET AL.*, *LANGMUIR*, IN PRESS

summarizes the biology of the mammalian heart. Although amphibians can regenerate functional heart muscle after injury, mammals respond to heart injury by forming nonfunctional scar tissue, possibly due to the inability of adult heart muscle cells, cardiomyocytes, in mammals to undergo division {although this idea has been challenged [Beltrami *et al.*, *N. Engl. J. Med.* **344**, 1750 (2001)]}.

Now, Leferovich *et al.* describe an animal model that may provide insight into the mechanisms that determine how the heart responds to injury. They show that MRL mice, a spontaneously arising mutant strain unusually proficient at healing surgical wounds, also have an extraordinary capacity to regenerate functional heart tissue after injury. A severe experimentally induced infarction across the wall of the right ventricle healed within 60 to 90 days in the MRL mice and was accompanied by cardiomyocyte DNA synthesis and revascularization of the wound site. In response to the same injury, control mice showed massive tissue scarring and no evidence of cardiomyocyte division. Because the wound healing response in the MRL mice is a heritable trait, future comparisons with mouse strains that cannot regenerate heart tissue may help to identify the molecules involved in the regenerative response and how the process is controlled. — PAK



Damaged heart cells (red) can divide (new DNA green).

Proc. Natl. Acad. Sci. U.S.A. **98**, 9830 (2001).

CREDITS: LEFEROVICH ET AL., *PROC. NATL. ACAD. SCI. U.S.A.* **98**, 9830 (2001)

CHEMISTRY

Aromaticity Goes Flat Out

In principle, large cyclic molecules containing p–bonded subunits, such as pyrroles and thiophenes, should exhibit aromaticity if they follow the Huckel rule and contain $4n + 2$ electrons. In practice, rings with a large number of subunits tend to twist over to form a figure eight, so that the orbital overlap needed to induce aromaticity is destroyed. Anand *et al.* now show that derivatives of octaphyrin, a 34p electron ($n = 8$) system, can be formed as a flat molecule if the two halves, each containing four subunits, are brought together in a single coupling step. The crystal structure of the sulfur derivative shows that one thiophene of each bithiophene unit is inverted to form a flat molecule. Nuclear magnetic resonance and ultraviolet visible spectroscopy confirm their aromatic nature. — PDS

J. Am. Chem. Soc., 10.1021/ja011265w.

ECOLOGY

Weed Control

Weed suppression in cropping systems is generally achieved by herbicides, mulching, or mechanical means, all of which add substantially to the costs of farming. As an alternative, Weiner *et al.* examined the effects of manipulating crop density and spatial distribution on weeds. Using several varieties of wheat, they found that weed suppression was greatest at high crop densities, and when crop plants were evenly distributed (rather than planted in rows). Among the different varieties of wheat, there was a tradeoff between the ability of the plants to compete at high versus low density. Thus, the development of high-density varieties, together with more uniform sowing distributions, might reduce reliance on other means of weed control and take advantage of the natural competitive abilities of plants. — AMS

J. Appl. Ecol. **38**, 784 (2001).

GEOPHYSICS

Decaying Volcanic Tremor

Volcanic tremor is a distinctive high-frequency seismic signal that may be used to help predict eruptions. Although the mechanism that triggers tremor is not well understood, tremor is generally modeled as a pulsing fluid or gas trapped within a narrow conduit of the edifice.

Del Pezzo *et al.* used energy transport theory to model the dissipation of volcanic tremor as the energy moves from the source to the seismometer and compared this with observations of tremor at Mt. Etna, Italy, and Masaya volcano, Japan. The energy from tremor signals at the two volcanoes was dissipated within the conduit rather than being scattered outside in the surrounding country rock, possibly because of small structural heterogeneities in the conduit. Knowledge of the conduit structure and energy dissipation pattern should help to improve predictions of magma flow and possible eruption sites. — LR

Geophys. Res. Lett. **28**, 3038 (2001).