EDITORS' CHOICE

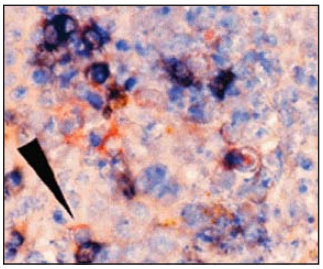
edited by Stella Hurtley

IMMUNOLOGY

More to the Marrow

The bone marrow acts as a primary lymphoid organ with a role in the generation of blood cells, but has not been thought to be involved in generating specific immune responses. Thus, mature naïve lymphocytes have been presumed to recirculate passively through bone marrow.

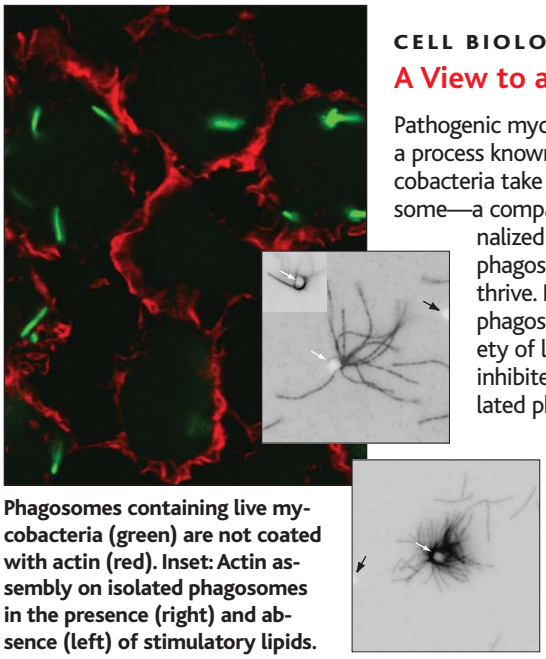
Work by Feurer *et al*. revises this traditional view by revealing that T cell immunity can, in fact, be spawned within bone marrow. Presentation of systemic antigen by bone marrow dendritic cells induced a strong cytotoxic T cell response, even in mice that lacked lymph nodes and a spleen. Clusters of responding T cells and dendritic cells observed in the bone marrow parenchyma appeared to represent foci of the primary response, comparable to structures seen in conventional secondary lymphoid organs: the lymph nodes and spleen. Systemic immunity induced in



Clusters of T cells (dark blue) near dendritic cells (red) in mouse bone marrow.

the bone marrow also protected from intradermal tumor challenge and produced long-lasting immune memory. The large numbers of lymphocytes that traffic through the bone marrow from the blood might suggest that immunity generated here could be geared more toward systemic infection, rather than at local tissue sites such as the skin or mucosa. — SJS

Nature Med. 10.1038/nm914 (2003).



Phagosomes containing live mycobacteria (green) are not coated with actin (red). Inset: Actin assembly on isolated phagosomes in the presence (right) and absence (left) of stimulatory lipids.

CELL BIOLOGY

A View to a Kill

Pathogenic mycobacteria are engulfed by host macrophages in a process known as phagocytosis. Once inside the cell, the mycobacteria take up residence within the macrophage phagosome—a compartment that generally acts to degrade internalized material. However, the mycobacteria inhibit phagosome maturation and so are able to survive and thrive. In a reconstituted in vitro assay using isolated phagosomes, Anes *et al*. examined the effect of a variety of lipids on phagosome behavior. Different lipids inhibited or stimulated the assembly of actin on isolated phagosomes. In infected macrophages, selected lipids could promote the assembly of actin on phagosomes, and this was correlated with an increase in the maturation of the phagosomes and mycobacterial killing. Another set of lipids had the opposite effect and promoted pathogen growth. The lipid composition of phagosomes can thus be critical in the clearance of mycobacterial infections. — SMH *Nature Cell Biol*. **5**, 793 (2003).

CHEMISTRY

Exploiting CDs

Methods for screening molecular recognition events abound in chemistry and biology, but many of them are too expensive for routine use. La Clair and Burkart developed a screening method that promises to be accessible, inexpensive, and durable. The method uses a standard recordable compact disk (CD-R), an inkjet printer, and a personal computer.

CD-Rs are made from a polycarbonate substrate, an organic dye layer, a reflective metalized layer, and a protective lacquer coating. During recording, a digital code is burned into the organic dye. CD players read this code by measuring changes in the reflection of an infrared laser. When organic molecules are printed onto the polycarbonate surface with an inkjet printer, they introduce errors in the readout. These "baseline" errors record where a given molecule has been placed. The CD is next exposed to recognition molecules. The difference between the baseline error rate and the recognition error rate reveals binding events. The method successfully measured the interactions between two proteins and several ligands and may find future applications in areas from biomedicine to environmental science. — JFU

Org. Biomol. Chem. 10.1039/b306391g (2003).

GEOLOGY

Cowabunga! Yarrabubba

When surfers find a good wave to ride, they often shout out "Cowabunga!" to express their gratitude to Mother Nature. Now Macdonald *et al*. are expressing similar excitement about the discovery of Yarrabubba, an atypical impact crater in the Yilgarn Craton of Western Australia. The impact event is recognized in a potassium-rich granite outcrop, a rare rock type in the Yilgarn. The K-rich minerals may have formed by impact melt remobilization. The granitic rock is fractured and contains pseudotachylites (melted fault zones) and shocked quartz, all signatures of impact. Some of the granite is brecciated and contains shatter cones, related to the shock wave front interacting with inhomogeneities in the rock fabric. The Yarrabubba crater is at least 2 billion years old and may represent the oldest terrestrial crater known. The lack of any obvious crater topography, the amount of time available to erode the impact structure, and the rock fabric and mineralogy suggest that this is a unique window into the lower part of an impact crater. — LR

Large (bottom) and small (top) shatter cones from Yarrabubba.

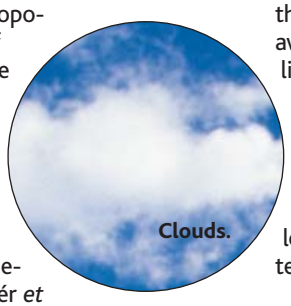
Earth Planet. Sci. Lett. **213**, 235 (2003).

CONTINUED ON PAGE 1447

ATMOSPHERIC SCIENCE

Violet Rain

Most analyses of the amount of solar absorption by clouds assume that cloud droplets are composed of pure water. This assumption is particularly important for climate models, because they tend to underestimate the amount of solar energy absorbed by the troposphere. However, if cloud droplets were not pure water, they could absorb more radiation, which might help explain one apparent shortcoming of cloud parameterization. Gelencsér *et al*. report laboratory experimental results that demonstrate that aromatic hydroxyacids, species that are produced by biomass burning and are commonly found in fine continental aerosols, can react in rain droplets with hydroxyl radicals to form colored organic species that absorb solar radiation in the ultraviolet and visible spectra. These chromophoric droplets could absorb six times as much solar radiation as pure water droplets. Although it is unlikely that this phenomenon can resolve the discrepancy between models and observations of solar absorption by clouds, it could be an important contributing factor and adds to the understanding of the effects of polar organic compounds in natural systems. — HJS


Clouds.

J. Atmos. Chem. **45**, 25 (2003).

BIOMEDICINE

Hit for the Cycle

A major focus of cancer research is identifying molecular mechanisms that regulate the cell division cycle which often go awry in tumor cells. One molecule believed to be essential for the initiation of cell division is cyclin-dependent kinase 2 (CDK2), an enzyme that phosphorylates protein substrates critical for G_1 and S phase progression, centrosome duplication, and DNA synthesis. Drugs that selectively inhibit CDK2 are currently being tested as potential cancer therapies.

Surprising results from a study of CDK2-deficient mice by Ortega *et al*. cast doubt on whether this enzyme is a master regulator of cell cycle progression after all. Contrary to expectations, mice lacking CDK2 were fully viable and showed no abnormalities in cell division, except in germ cells. The finding that CDK2 is dispensable for normal cell growth and survival–coupled with earlier work by Tetsu and McCormick, who showed that cultured tumor cells can proliferate in the absence of CDK2 activity–will stimulate further discussions about the suitability of CDK2 as a target for cancer therapy. — PAK

Nature Genet. **35**, 25 (2003); *Cancer Cell* **3**, 233 (2003).

HIGHLIGHTED IN *SCIENCE*'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

Science's stke www.stke.org

Behavior and Vulval Development

Development of the vulva of the nematode *Caenorhabditis elegans* is a model for studying cell fate signaling. The epidermal growth factor receptor-like tyrosine kinase (LET-23) stimulating a Ras-mitogen-activated protein kinase pathway, as well as the Notch-like pathway and the Wnt pathway, contribute to vulval development. A gain-of-function mutant of the $G\alpha_q$ homolog, EGL-30, exhibited rare ectopic vulval tissue. These worms also exhibit hyperactive locomotor and egg-laying behaviors.

Moghal *et al*. used genetic interactions and targeted gene expression to show that EGL-30 expressed in motor neurons promoted vulval induction. The ability of EGL-30 to promote vulval development required the L-type voltage-gated calcium channel (EGL-19) expressed in body wall muscles. EGL-30 did not appear to be acting through the LET-23 pathway; however, EGL-30 vulval development was inhibited by loss of β-catenin (BAR-1) of the Wnt pathway. Consistent with locomotory behavior modulating vulval development, loss-of-function mutations in *egl-30* did not affect vulval development of worms grown on solid media but did inhibit vulval development of worms grown in liquid culture. In liquid, the worms exhibit a dramatically more vigorous movement than that observed in worms grown on solid media. Thus, behavioral changes in response to environmental conditions may play a role in cell fate specification. — NG

Development **130**, 4553 (2003).

CREDIT: PHOTODISC

Violet Rain

Science **301** (5639), 1447.
DOI: 10.1126/science.301.5639.1447a