Biology

Tea time for T cells

Immunologists have a mystery on their hands. Immune cells called T cells circulate in the human bloodstream, but the roles of a portion of the cells, so-called gamma-delta T cells, remain murky. In the July IMMUNITY, scientists now report that these T cells respond to substances secreted by bacteria, as well as to molecules found in tea, wine, apples, and other edible plants.

"They recognize molecular structures that occur in bacteria and in plants that we eat every day," says study author Jack F. Bukowski of Brigham and Women's Hospital and Harvard Medical School, both in Boston.

Gamma-delta T cells make up nearly 5 percent of circulating T cells. Their distinguishing characteristic is that their receptors, surface proteins that bind to molecules and trigger the cells into action, consist of small proteins called gamma and delta chains, instead of the more common alpha and beta chains.

Studies of gamma-delta cells in mice suggest that these T cells fight off bacteria, such as those that cause tuberculosis, as well as viruses, but it has been unclear what those results mean for people. "The molecular structures recognized by human gamma-delta cells are much different than those recognized by the mouse cells. You can't necessarily extrapolate from mice to humans," says Bukowski.

He and his colleagues now report that human gamma-delta T cells proliferate and release an immune signal called interleukin 2 when they're exposed to alkylamines, a class of molecules secreted by bacteria. Alkylamines from green and black tea, red and white wine, and apples also stimulate the T cells. As a result, the investigators have just launched a study in people to examine whether drinking tea stimulates the activity of the gamma-delta T cells and bolsters overall immunity. —*J.T.*

A BlySful way to stimulate B cells

To help fight off infection, the human body depends on antibody-making factories called B cells. In the July 9 SCIENCE, scientists describe a natural human protein, named B lymphocyte stimulator or BlyS, that triggers the proliferation of these crucial factories of the immune system.

Paul A. Moore of Human Genome Sciences in Rockville, Md., and his colleagues found BlyS after sifting through the genes active in immune cells called monocytes. They found that one of the genes encodes a protein that, when given to mice, triggers B cell proliferation and boosts antibody production. Monocytes were known to regulate B cells, but this finding is the first indication of how the two cell types interact.

The investigators predict that BlyS will one day help people with weakened immune systems, such as AIDS patients. Also, since vaccines often depend on stimulating significant antibody production, BlyS might be combined with immunization shots, the scientists suggest. Human Genome Sciences may face a patent battle over BlyS: A group at the University of Lausanne in Switzerland recently reported on a seemingly identical protein that also stimulates B cell proliferation. —*J.T.*

Patently unpatentable

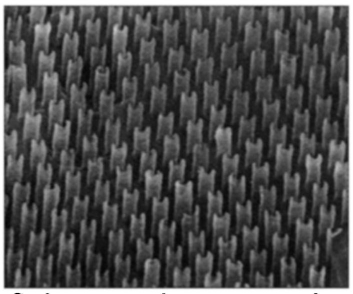
The U.S Patent and Trademark Office has rejected an application for a broad patent on the creation of human-animal chimeras. Last year, cell biologist Stuart A. Newman of New York Medical College in Valhalla and biotech critic Jeremy Rifkin of the Foundation on Economic Trends in Washington, D.C., filed for the patent (SN: 5/9/98, p. 299). They hoped to ignite a public debate on the patenting of life-forms and, if the patent was granted, block the creation of such chimeras.

Their patent was rejected because a chimera "includes within its scope a human being," and people are not patentable, according to the patent agency. Newman and Rifkin plan to appeal the ruling to the U.S. Supreme Court if necessary. —*J.T.*

Materials Science

Pillars of the thin-film community

For a computer chip to have a chance of working properly, the thin layers of materials that make up the chip must be perfectly crystalline and flat. Now, however, researchers are making thin films with unusual microstructures that could have a host of other applications, such as sensors, magnetic recording media, or flat-panel displays. Two recent studies describe ways to create films with a microstructure reminiscent of trees growing in a forest.



J. Li *et al.*/APPL. PHYS. LETT.

Carbon nanotubes grow out of an aluminum film.

At the University of Toronto, a team of scientists has succeeded in planting a forest of carbon nanotubes on an aluminum foundation. The technique not only allows the nanotubes to grow in a regular arrangement but is also "a way of mass-producing nanotubes of the diameter that you want," says study coauthor Jimmy Xu, soon to be at Brown University in Providence, R.I.

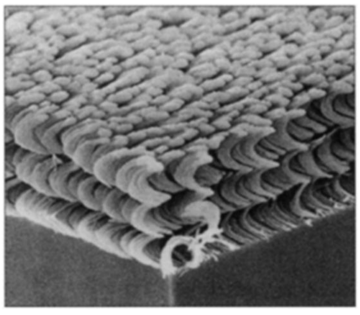
Xu and his colleagues etch an array of tiny holes into a thin piece of aluminum. Inside each hole, they deposit a cobalt catalyst. When the template is exposed to an acetylene vapor at 650°C, carbon nanotubes, about 47 nanometers in diameter, grow out of the holes. They can reach heights of up to 100 micrometers, Xu says.

Researchers commonly make nanotubes by coursing electricity through a rod of solid carbon, which then throws off soot containing carbon molecules of many shapes and sizes. Bundles of nanotubes produced this way must be chemically separated, sorted by size, and manipulated. "That's a pain," Xu notes. Nanotubes produced with the Toronto group's technique, by contrast, are already pure, uniform in size, and untangled. He and his colleagues report their finding in the July 19 APPLIED PHYSICS LETTERS.

Since carbon nanotubes can emit electrons from their tips, scientists are tapping them for flat-panel television and computer screens (SN: 9/16/95, p. 183). Today's flat-panel technology uses crystalline semiconductors that can't be bent easily. Xu says that his nanotube film can be deposited on curved surfaces to make flexible displays.

Michael J. Brett of the University of Alberta in Edmonton and his colleagues take another route to growing films thickly populated with tiny pillars. Their trick is to rotate the foundation while bombarding it with atoms at a very shallow angle. Once a pillar begins to grow at some location, it shadows an area around it, preventing atoms from sticking. Depending on how fast they rotate the foundation, the researchers can create posts that are straight and smooth, twisty like a spring, or something in between. They describe their technique in the July JOURNAL OF MATERIALS RESEARCH.

Scientists developing better magnetic storage media are "considering having individual pillars as recording bits. That might allow greater density," Brett says. "The standard way is to make a film, then etch away the parts you don't want, leaving pillars. Maybe we have a simple process to make the pillars in just one step." —*C.W.*



Brett

Pillars of magnesium fluoride take on a corkscrew shape.