## AIDS virus accepts toxic Trojan horse

Researchers have harnessed a cancer-fighting toxin to a genetically engineered protein and produced a potentially potent new weapon against AIDS.

The AIDS virus, or human immunodeficiency virus (HIV), can infect an immune cell when it locks onto a cell receptor protein called CD4. After using this as an avenue to enter the cell, HIV can make many copies of itself, and some HIV proteins end up on the outside of the cell. If a highly toxic molecule is attached to genetically engineered CD4 proteins, laboratory tests show the HIV protein on infected cells will attach to those CD4 proteins and the toxin will enter and kill the cell, report scientists from the University of Texas Southwestern Medical Center at Dallas and Genentech, Inc. in South San Francisco, in the Nov. 25 SCIENCE.

The technique uses the virus' own infectious mechanisms against it, explains one of the researchers. "The virus thinks it's seeing another cell with CD4, and unfortunately for it, it's seeing a CD4 with a toxin attached," says Ellen S. Vitetta of the Southwestern Medical Center.

The toxin, ricin, has already been tested in 1,000 cancer patients using a similar technique, Vitetta says. To kill cancer cells, researchers attach the toxin to monoclonal antibodies that only latch onto cancer cells.

In the laboratory, the CD4-ricin combination attacks HIV-infected cells 1,000 times more often than non-infected cells, the researchers say. There are some cells that naturally interact with other cell's CD4 proteins, and there was some worry that these cells might also take up the toxin-CD4 combination. The toxic duo probably won't be a cure for AIDS because some infected cells don't have copies of HIV proteins on the cell exterior, but it might be possible to kill enough infected cells to prevent the disease from spreading and causing the life-threatening AIDS symptoms, they add.

"What we want to do is create a standoff" between HIV and the toxin, Vitetta says. "If you could create a standoff for thirty years or so you have effectively won the game," she adds.

If further research goes well, a CD4-ricin compound could be ready for clinical testing in a year or so, but there are still a lot of questions that have to be answered, Vitetta says. One important issue is whether the cells killed by the toxin release active AIDS virus that could go out and infect other cells. Researchers also need to know if the CD4-ricin combination will work against the many other strains of HIV and all the different types of immune cells that can be infected by HIV, she adds. *— C. Vaughan*

## ESA plans probe for U.S. Titan mission

A proposed NASA mission that would orbit Saturn and send a probe to the surface of its big, possibly ocean-covered moon Titan got a boost from the European Space Agency (ESA) last week. Called Cassini, the mission has yet to win White House or congressional approval, but ESA nonetheless chose development of the Titan probe as its next major scientific project.

Scheduled for launch in April 1996, Cassini would go into orbit around Saturn in October of 2002, releasing the probe about three months later to descend through Titan's largely nitrogen atmosphere, possibly 60 percent more dense at the surface than Earth's own. A joint NASA/ESA working group has proposed a suite of nine scientific instruments for the probe, including a "surface science package" that could find itself studying what may be a sea or lake of liquid ethane containing absorbed methane gas. Earth's waters are so far the only liquid yet confirmed on any planetary surface in the solar system.

NASA hopes Cassini will win approval next year from the Office of Management and Budget, and Congress, as part of a joint project with another mission called the Comet Rendezvous Asteroid Flyby (CRAF). CRAF would be launched earlier, in 1995, but NASA would build the two missions on similar versions of a spacecraft called Mariner Mark II, being developed for a variety of outer-planet forays.

The agency would like CRAF and Cassini to begin together in NASA's fiscal 1990 budget, assuming there is money to initiate both of them as well as pay for other projects such as the space station. As a joint project, according to NASA spokesman Charles Redmond, they would cost from $850 million to $950 million (in 1988 dollars), whereas initiating them separately would total $1.1 billion to $1.3 billion. The probe for Cassini, ESA officials estimate, would cost another $260 million.

NASA and ESA had previously planned to collaborate on a project called the International Solar Polar Mission, with each agency sending a spacecraft to fly close over the poles of the sun. NASA canceled plans for its craft in October of 1981, however, triggering ESA's wrath and leaving the European agency to conduct the mission on its own. Now called Ulysses, the European spacecraft is scheduled for launch next April by the U.S. space shuttle.

If U.S. plans for Cassini flounder, ESA will select one of several alternative projects over which the probe won approval. If ESA's probe plans go awry, NASA will seek additional funding to handle the job itself. *— J. Eberhart*

## A superlattice sieve for electron energies

The iridescent sheen of an oil slick is one example of light interference caused by reflections from the upper and lower surfaces of a thin film. The same principle can be applied in constructing thin-film optical filters that screen out all but a specified wavelength of light. Relying on the analogy that has been established between the passage of light waves through materials such as glass and the propagation of electrons as waves through semiconductors, researchers have now designed an interference filter not for light of a specified wavelength but for electrons with a certain energy.

"It is clear that a wide variety of electron-wave optical devices are possible using electron-wave propagation, and that these devices can be designed by directly using existing optical designs," says electrical engineer Thomas K. Gaylord of the Georgia Institute of Technology in Atlanta. Gaylord and Kevin F. Brennan describe their novel filter in the Nov. 21 APPLIED PHYSICS LETTERS.

Under the right circumstances, electrons can act as waves, showing a characteristic wavelength depending on the electron's energy. Overlapping these waves produces an interference pattern similar to the dark and light areas seen when light waves happen to cancel or reinforce each other. Furthermore, when such electron waves pass through a carefully structured semiconductor superlattice made of extremely thin, alternating layers of gallium arsenide and aluminum gallium arsenide, the lattice acts like an energy filter, allowing only electrons with a certain energy through.

In their theoretical analysis, Gaylord and Brennan consider a filter consisting of nine layers, each layer a quarter or a half of the electron wavelength in thickness. Only electrons with an energy of 0.139 electron-volts would pass through such a filter, with a spread of just 0.003 electron-volts. Such high-resolution energy filters could be incorporated into semiconductor devices, for example, providing electrons for injection into high-speed, ballistic transistors. They could also control electron-beam energies when such beams are used for creating the masks needed to fabricate microelectronics circuits.

Researchers at Georgia Tech are now attempting to fabricate semiconductor energy filters and other electron-wave devices. *— I. Peterson*