An AIDS-Associated Microbe Unmasked

Scientists who isolated a mysterious infectious agent in 1986 from a deceased AIDS patient now identify the organism as a type of mycoplasma – a life form representing an intermediate step between viruses and bacteria. Using tagged antibodies and pieces of the mycoplasma's DNA, they have found the organism in 22 of 32 deceased AIDS patients and in placentas delivered from two pregnant women with AIDS. It also appeared in tissues from six AIDS-free individuals who died of an unidentified illness.

The newly identified microbe, which the researchers call *Mycoplasma incognitus*, can cause widespread, fatal tissue damage in humans and laboratory monkeys without prompting a normal immune response, report Shyh-Ching Lo and his colleagues at the Armed Forces Institute of Pathology in Washington, D.C., and the National Institutes of Health in Bethesda, Md. Whether it plays a role in AIDS remains unclear, Lo says. However, because the mycoplasma appears to exist in such a high percentage of AIDS patients, and because many common antibiotics kill it *in vitro*, diagnosing and treating this infection may prove clinically important, he says. The researchers detail their findings in two articles in the November AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

In the September issue of the same journal, Lo's group reported detecting the mycoplasma in postmortem tissues from people without AIDS. Although many organs from those patients showed severe damage, the immune response appeared scant, Lo says.

Simpler than bacteria but more complex than viruses, mycoplasmas are the smallest known organisms that can live without a host (SN: 9/20/86, p.184). Several species cause pneumonia, kidney stones and premature labor. But until the advent of DNA probes and gene amplification techniques, mycoplasmas largely resisted study or diagnosis.

When Lo's team first isolated the organism's DNA from a Kaposi's sarcoma lesion of an AIDS victim, they thought it might be a large virus and named it VLIA, for virus-like infectious agent. They went on to detect the DNA in the spleen, liver, blood, brain and other organs of people who had died of AIDS and in the blood of 12 of 23 living AIDS patients, but found no sign of it in blood from 22 healthy donors. Later, however, Lo's lab received tissue from six people who had died one to seven weeks after the onset of flu-like symptoms. Microscopic tissue examination showed no signs of infection by bacteria, fungi, viruses or other parasites, but DNA probes and antibodies revealed the so-called VLIA.

Many fundamental questions remain for further research, Lo says. The researchers do not know how the mycoplasma sidesteps the immune system, or how it might relate to AIDS. Many people with AIDS show the same widespread organ damage and faulty immune response that *M. incognitus* can cause, Lo says, but no one knows how much of that damage results directly from the mycoplasma.

Researchers "should approach with caution" the question of whether Lo's group has truly found a new species of mycoplasma, says Joseph G. Tully, chief of the mycoplasma section of the National Institute of Allergy and Infectious Diseases. Nevertheless, he says, Lo's findings highlight the importance of mycoplasmas in human disease. "It's some very new information that may be very important down the road." – *A. McKenzie*

Forging superstrong conducting polymers

More than a decade after the discovery of electrically conductive polymers, metal wires remain the premier roadways for electrical traffic. But researchers are finding routes around the technical roadblocks that have so far prevented conducting plastics from fulfilling their early promise as lightweight, tough, inexpensive and easier-to-process substitutes for metal wires and as new materials for unprecedented applications.

By increasing the length of the polymers' chain-like molecules and the degree to which these molecules align with each other, Alan J. Heeger, Paul Smith and colleagues at the University of California, Santa Barbara, have made conducting plastic fibers that point the way to stronger-than-steel polymers capable of conducting electricity like metals.

The same molecular factors that make carbon-based, or organic, polymers so strong are the ones that make certain polymers more electrically conductive, Heeger told a meeting of the Materials Research Society in Boston this week. In one approach, his team dissolves polymer precursor molecules in a solvent, heats the mixture until the molecules link into long, randomly arranged polymer chains, and then draws a fiber of the viscous intermediate material through a furnace. The stretch-and-heat step chemically transforms the polymer molecules into a conductive form while aligning them like pencils in a tube.

The microscopic alignment strengthens the polymer by allowing adjacent molecules to develop many more weak attractive interactions, such as hydrogen bonds and van der Waals forces. These interactions prevent the molecules from sliding past each other when the fiber is stressed. The same orderliness enables electrons traveling along a polymer chain to hop to adjacent chains, thus avoiding molecular dead-ends or other conduction-killing material imperfections.

Heeger reports using the processing strategy to make fibers of several new polymers. His measurements show that one of them (called PDMPV for short) is as strong as parachute cord and several hundredths as conductive as copper – nearly good enough to use as a material for protecting planes or electronic components from static electricity. "That's a result which I think many of us thought was likely never to happen," he says.

In another approach, the group polymerizes aniline molecules directly into conductive polyaniline in a solvent such as sulfuric acid. Heeger notes that this strategy enables researchers to blend conductive polymers with superstrong polymers such as Du Pont's Kevlar, which also dissolves in the acid. Several years ago, related experiments with polyacetylene showed that the resulting blends, though not quite as strong as pure Kevlar or as conductive as pure polyacetylene, retained a good measure of each component's virtues.

Heeger admits that his best conductive polymers remain too crude for commercial use. But he says they do suggest a route to practical, superstrong, conducting polymers. "We have to learn how to get higher degrees of chain extension and chain alignment," he says.

In other studies of solid organic materials with unusual properties, physicist Paul M. Chaikin of Princeton (N.J.) University is investigating what he calls "the most interesting materials ever discovered with respect to the wealth of phenomena associated with them" – a class of organic salts known as tetramethyl-tetraseleno-fulvalinium. By varying temperature, pressure, magnetic field strength and other conditions, Chaikin says he can turn one of these salts (TMTSF-PF_6) into a superconductor, a semiconductor, an insulator, a magnet or a material that displays previously unobserved oscillating quantum mechanical properties. "All of these behaviors are found [under different conditions] in a single material," he says.

– *I. Amato*