# Biomedicine

*Ron Cowen reports from New York City at a National Kidney Foundation science writers' briefing*

## Finding a transplant match for blacks

She was black, 19, and she needed a bone marrow transplant to treat her leukemia. But despite an exhaustive, nationwide search that went on for months, JoAnne Johnson of Washington, D.C., never found a donor whose tissue type matched hers closely enough to allow the transplant. She died last February, still waiting for the perfect match.

Molecular biologist Carolyn Katovich Hurley says her research team has now identified some of the reasons why blacks, and perhaps other minorities, have trouble finding appropriate donors for bone marrow, kidney or other transplants.

Scientists have known for years, she says, that a tissue donor and recipient must share certain antigens – inherited protein "markers" on cell surfaces – in order for the body's immune system to accept transplanted tissue as its own. While immunity-suppressing drugs such as cyclosporine can temporarily quell the rejection response, antigen matching helps ensure long-term survival of the transplanted tissue, Hurley notes.

In the case of kidney transplants, she says, a donor ideally should have two sets of three "human leukocyte antigens," or HLAs – one set inherited from each parent – that match those of the recipient. The three antigens, which have several subtypes, are known as HLA-A, HLA-B and HLA-DR.

But in a genetic study of about 200 U.S. blacks and 900 whites, Hurley and her colleagues at the Georgetown University School of Medicine in Washington, D.C., have found that one of the subtypes, called HLA-DR3, itself occurs in two different forms, only one of which exists in whites. Moreover, they discovered that 46 percent of the blacks in their study group possessed the form that is almost never found in the white population.

"Therefore, any attempts to find a matched kidney for a black individual [with this form of the subtype] among a white donor pool would be unlikely to succeed," Hurley says.

The study also revealed that blacks in the United States generally have a more diverse assortment of HLA antigens than whites, further complicating the search for appropriate donors, she says. Saulo Klahr, a kidney specialist at the Washington University School of Medicine in St. Louis, notes that several other minority groups, including Native Americans, may face similar difficulties in finding well-matched organ donors.

Hurley says HLA-typing laboratories are not yet equipped to detect the newly identified antigen subtypes. She adds, however, that her team has created a new database on HLA diversity in blacks, which gives researchers the information they need to start making new HLA-typing reagents, using short DNA pieces, or oligonucleotides, as antigen "detectors." The Georgetown investigators used such detectors, in combination with gene amplification, cloning and sequencing, to isolate and identify the HLA genes from the individuals in their study.

The new findings highlight the urgent need for more black organ donors. In 1985, 33 percent of U.S. patients with kidney failure (a condition requiring a transplant) were black, yet only 21 percent of the patients receiving kidney transplants that year were black, Hurley notes. In addition, the graft-survival rate in blacks lags 15 percent behind that in whites three years after a kidney transplant, she says. Hurley adds that several factors in addition to HLA-mismatching may explain the poorer survival rate, including the quality of medical care.

An improved understanding of HLA diversity among blacks may also help scientists study and treat autoimmune disorders such as insulin-dependent (Type I) diabetes, in which susceptibility appears linked to a person's HLA types, she adds.

Hurley next plans to study how a person's HLA makeup might affect the severity and frequency of a variety of illnesses, she told SCIENCE NEWS.

# Chemistry

## Sculpting light to maneuver molecules

Ever since lasers started becoming labhold items in the 1960s, scientists have dreamed of using them to precisely control the chemical behavior of molecules. Each type of chemical bond can absorb only specific amounts of energy, which correspond to certain frequencies of light. So, by exposing molecules to laser light tuned to those frequencies, chemists suspected they might someday be able to feed enough energy into specific bonds of a molecule to make them especially susceptible to reacting with nearby molecules.

Can they realize their dream of directing molecules' various chemical bonds with light the way a conductor uses a baton to louden the woodwinds while silencing the strings?

The answer started out as "who knows?" and changed to "almost certainly not" in the 1980s after many frustrated attempts, but it has now taken an upswing to "maybe eventually." MIT chemists Keith A. Nelson and Gary P. Wiederrecht teamed up with laser experts at Bell Communications Research in Red Bank, N.J., to create sequences of ultrashort laser pulses. They have used these to drive specific vibrations in a crystal lattice, likening the process to "repetitively pushing a child on a swing" so that the child swings higher and higher.

In the March 16 SCIENCE, the researchers describe how they produced and "shaped" vibration-driving sequences of 75-femtosecond laser pulses. As the pulses pass through a fine grating, their several optical frequencies separate. A lens directs these through a specially designed mask that alters, or "shapes," their relative phases. Another grating-and-lens duo then recombines the components and shines the sculpted pulses into a crystalline sample of pyrelene. When relaxed, pairs of pyrelene molecules in the crystal stack together. When pumped with specific wavelengths of light, the pairs vibrate toward and away from one another, with a net result of snuggling closer.

The team has succeeded in sculpting trains of laser pulses that ping pyrelene pairs into vibrational action. The pulses move the molecules by roughly one-thousandth of an angstrom – far too little to inspire most chemical reactions. To realize the dreams of the 1960s, laser-wielding scientists must learn more about the dynamics between light and molecular motions and how to sculpt more effective, ultrashort light pulses with ever more finesse, the researchers say.

## Unique atomic views from STM's new kin

Since its invention nearly a decade ago, the scanning tunneling microsope (STM) has enabled scientists to examine materials with atomic resolution. Seeing – or, more accurately, imaging – atoms is becoming routine in an increasing number of labs. Moreover, the STM has spawned a family of related microscopes that operate according to a variety of physical principles. Together they are providing researchers with a remarkably panoramic view of atomic and molecular landscapes and events.

In the March 22 NATURE, physicist Clayton C. Williams and electrical engineer H. Kumar Wickramasinghe of IBM's Thomas J. Watson Research Center in Yorktown Heights, N.Y., unveil yet another new member of the microscope family – the scanning chemical-potential microscope (SCPM). In STM images, the light, dark or colored areas represent the presence or absence of atoms. The spots on SCPM images provide unique information about how different atoms of a sample's surface vary in their chemical potential, a measure of their chemical reactivity. Among the SCPM's many possible applications, the researchers say, is the potential to distinguish between the atomic constituents of a surface rather than merely indicating the presence or absence of an atom at a specific location.