Biomedicine

Janet Raloff reports from Atlanta at Experimental Biology '95

Troubling insights into AIDS wasting

In Africa, AIDS is known as the "thin disease" for the emaciation that characterizes victims suffering through its lethal latter stages. But preliminary findings from a new study suggest that the metabolic problem behind this wasting begins earlier than physicians had realized and expresses itself in a uniquely devastating form of malnutrition.

Many people with serious emphysema, or chronic obstructive pulmonary disease, also lose unhealthy amounts of weight. In their case, an overactive metabolism (probably fostered by the extra effort it takes them to breathe) causes the weight loss, according to work by Edward T. Mannix of Indiana University School of Medicine in Indianapolis. In other words, these people don't eat enough to compensate for the increased energy demanded by their disease.

In a study of five AIDS patients, Mannix once again encountered a disease-linked, overactive metabolism — but with a difference. Normally, when the body doesn't take in as much energy as it uses, it burns body fat to make up the deficit. This strategy spares the protein that makes up the heart, lungs, and other vital organs. But in the AIDS patients, Mannix finds, "it looks as if the protein is almost being targeted."

These individuals regularly derived 7 to 8 percent of their energy from protein — twice the normal amount. Moreover, he notes, even the three patients who still appear well nourished possess an unusually high ratio of fat to lean. What this implies, he says, is that they have already begun losing lean tissue and maintain their weight only by adding fat.

"It's pretty scary," Mannix says, because this insidious attack on the vital organs appears to begin early — maybe even in people with the AIDS virus who appear healthy.

Radiation damage's earliest signs

Fear of damaging healthy tissue is the major factor limiting how much therapeutic radiation can be targeted at a patient's cancer over a course of 30 or so separate treatments. Often, however, the first signs of damage do not occur until late in therapy, or even after it's completed. So when did this damage — itself potentially life-threatening — begin? Perhaps within 15 minutes of a patient's first exposure, new studies suggest.

Knowing this, radiation specialists may be able to provide palliative therapy to noncancerous tissue from the outset, says radiation biologist James Onoda of Wayne State University in Detroit, who directed the new work. If that treatment reduces the cumulative damage such tissues incur, physicians may be able to increase the amount of radiation delivered to the patient — dramatically improving his or her chances of surviving the cancer.

After just minutes of therapy, cells making up the endothelial tissue lining blood vessels begin retracting — briefly separating from one another. The gaps that form in this fairly water-impermeable tissue let liquids in, causing swelling. But Onoda's group also found that at the same time, receptors on these cells become activated in such a way as to begin attracting or capturing neutrophils, cells responsible for initiating the body's inflammatory response to irritation.

Once inflammation begins, other immune cells arrive, ultimately fostering an uncontrolled scarring of affected tissue and contributing to the serious, late-stage injury physicians try to head off. In both cell culture studies and animal experiments, several classes of drugs — calcium-channel blockers and lipoxygenase inhibitors — have blocked much of the initial radiation-induced inflammatory injury to healthy tissue, Onoda reported at the meeting.

The goal, he told SCIENCE NEWS, is to find a way to temporarily inhibit inflammation immediately following radiation treatment — perhaps for just a few hours a day.

Chemistry

Richard Lipkin reports from Anaheim, Calif., at a meeting of the American Chemical Society

No-itch latex

Natural latex from the Brazilian rubber plant, *Hevea brasiliensis,* has one serious drawback. Nearly 17 million people in the United States are allergic to it. This latex and the rubber extracted from it contain proteins that make some people itch and others burn with a rash. A mere touch sends a few highly sensitive people into life-threatening anaphylactic shock (see p.244).

Since 40,000 products contain latex — 300 of them with medical uses, such as surgical gloves and catheters — scientists want to find a suitable nonallergenic replacement. Plant biochemists Katrina Cornish and Deborah J. Siler of the Agriculture Department's Western Regional Research Center in Albany, Calif., report that latex from guayule, a wild desert shrub found in the Southwest, may fill the bill. Guayule, *Parthenium argentatum,* lacks *Hevea's* rash-causing proteins. Clinical tests on 65 people allergic to *Hevea* latex products produced no skin reactions to guayule latex.

Cornish and her coworkers have devised a way of speeding the plant's rate of latex production and processing the material on a large scale. The key lies in molecules that initiate guayule rubber formation, Siler says. She likens rubber molecules to beads on a string. The first molecule in the chain regulates how fast others connect to it. Some large initiator molecules prompt plants to make rubber up to six times faster than smaller ones. By genetically altering plants to produce more large initiator molecules, Siler and Cornish can breed guayule with superior rubber-producing capacities.

Compared to synthetic hypoallergenic latex, the guayule latex shows superior resilience, strength, and elasticity, Cornish says. It is also impermeable to viruses, a property not shared by many forms of synthetic latex.

With its natural affinity for the deserts of California, Nevada, Arizona, and New Mexico, guayule could yield a sizable commercial crop, Cornish adds. In 1992, the U.S. market for latex gloves alone totaled $2.8 billion.

Fumonisin: A moldy corn toxin to watch

A toxin found in certain molds on corn has aroused concern among toxicologists, who wonder whether the chemical poses a risk to humans.

Scientists already know that fumonisin, a toxin of the corn molds *Fusarium moniliforme* and *F. proliferatur,* causes a fatal brain disease in horses and a pneumonialike illness in pigs. They also know that in regions of the world where people eat moldy corn products (particularly in China and South Africa), studies show a possible correlation between fumonisin in the diet and cancer of the esophagus.

Researchers have not yet connected fumonisin to cancer directly, says Paul C. Howard, a biochemist at the National Center for Toxicology Research in Jefferson, Ark. Concern is high enough, however, to prompt researchers at the USDA and the Canadian health service to investigate fumonisin's potentially harmful effects. The Food and Drug Administration is monitoring fumonisin in the U.S. food supply.

Since only 10 percent of the U.S. diet consists of corn products, consumers face little risk from the compound, says William P. Norred, a USDA chemist in Athens, Ga. In fact, the incidence of esophageal cancer increased only when corn products made up 80 to 90 percent of a population's diet. The highest fumonisin concentrations appear in corn kernels, cornmeal, and grits.

Health risks of fumonisin apparently depend on dosage, Howard says. Below a certain threshold (several parts per million) in animals, there is no effect. Above that, it damages the livers and kidneys of mice and rats. Cooking, washing, and chemically treating corn products appear to break down the toxic molecules, reducing their potential hazards.