Biomedicine

New treatment shuts off oncogene

A gene known as p53 plays a role in the development of many cancers, including a severe type of leukemia — cancer of blood and bone marrow cells. This gene is turned off in most immature bone marrow cells. However, scientists believe that cancer arises when something turns p53 on at an inappropriate time, causing blood and bone marrow cells to proliferate.

On the basis of this hypothesis, Jorge Spinolo of the University of Nebraska Medical Center in Omaha and his colleagues devised a treatment strategy, using so-called antisense molecules (SN: 6/10/89, p.360), for acute myelogenous leukemia (AML). The technique blocks the activity of the p53 gene. In laboratory studies, the new treatment has slowed the growth of malignant cells obtained from people suffering from AML. That *in vitro* finding raises the hope that a similar strategy might help combat leukemic cells in the human body, not just in a petri dish.

Before Spinolo's group could test the treatment's efficacy, the researchers had to demonstrate its safety. They gave the new drug to seven monkeys. Several weeks later, the team sacrificed four of the monkeys and found no evidence of drug-related toxicity.

The remaining three monkeys are alive and well, Spinolo reported May 22 at the American Association for Cancer Research meeting in San Diego.

Spinolo wants to treat 10 to 15 AML patients with the drug and plans to take such a research proposal to the U.S. Food and Drug Administration this month. If the team gains FDA approval, that preliminary human trial would begin sometime this summer, Spinolo says.

Not all semen infected alike

Scientists know that the AIDS-causing virus (HIV) spreads most commonly through sexual contact. But many researchers have found this route mysteriously inconsistent: Some HIV-infected men spread the virus after having sex only once, while others fail repeatedly to pass the infection on to their partners.

In an effort to untangle these conflicting results, Deborah J. Anderson of Brigham and Women's Hospital in Boston and her co-workers collected semen samples from 95 HIV-infected men. Only nine of the samples contained the virus, the researchers report in the May 27 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

Then the group asked: Are some men more likely than others to have HIV in their semen? The researchers found that men with AIDS were more likely to have HIV in their semen than infected men with no symptoms of the disease. Moreover, men undergoing zidovudine therapy were more likely to test negative for semen-borne HIV than men who weren't using the drug. This suggests that zidovudine may provide some protection against sexual transmission of the virus, Anderson says.

In a related experiment, the group tracked 14 HIV-infected men over eight months, testing each man's semen for HIV once each month. Surprisingly, the team found that some men's semen tested positive for HIV some months but not others. Although she doesn't know why this happens, Anderson says it shows that a single negative semen sample is not always reliable.

How does HIV get into semen in the first place? Anderson's team found that many men whose semen harbored HIV also had a genital tract inflammation — and resulting white blood cells in their semen. Since scientists know that HIV can stow away inside white blood cells, Anderson's group speculates that these cells may carry the virus into the semen.

Regardless of whether a man's semen contains the virus or not, cautions Anderson, "all men with HIV have the potential to be infectious."

Science & Society

Janet Raloff reports from Nashville, Tenn., at the International Science and Engineering Fair

In the name of the game

Several of the more than 750 high school research projects exhibited at this year's fair, May 10 to 16, were inspired by games young investigators play.

• Even if they're unfamiliar with the name, most golfers know the "gear effect" — the tendency for the head of a golf club to twist subtly as it hits the ball, imparting an unintentional spin. Brian D. Gerardot noticed that when a hammer strikes its target, its head seldom twisted. The reason? The golf club's shaft swings parallel to the head's moving center of gravity, not in line behind it, as the hammer's does. Redesigning a golf club to make it more hammer-like earned the sophomore from Snider High School in Fort Wayne, Ind., a first place "grand award" in engineering.

Gerardot moved the head's center of gravity closer to the shaft by removing most of the body from the head of a metal-and-plastic three-wood club, shaving off some of the toe (point on the head farthest from the shaft) and beefing up the heel (point closest to the shaft). In test "drives," the new design reduced overall torque compared to a conventional three wood and to one with a gear-effect-fighting enlarged head.

However, Gerardot's new design twisted more quickly, exaggerating the effect of its reduced torque. The result: The new club increased the spin on the ball.

Next year, Gerardot hopes to examine another spin-fighting design modification suggested by this year's computer-instrumented experiments. The wood's head has a bulge, a long-standing design feature aimed at compensating for the spin. If the ball contacts the head at a certain spot, however, this bulge actually increases the curve to the right. His data now indicate that a clockwise rotation of the bulge — "until it's parallel to the shaft" — should eliminate this.

• Cut a deck of cards and interleave the resulting halves. While a mathematical proof showed that seven such consecutive "riffles" will completely mix up a deck, that's more shuffling than most card players will happily endure, realized inveterate euchre player Aric J. DiPiero, a senior at the Center for the Arts and Sciences in Saginaw, Mich. So he sought — and found — a more efficient way to shuffle cards.

Twenty volunteers executed three common shuffling techniques: riffling, overhand (where piles of cards are peeled off the top of a deck and stacked in inverted order), and alternate (adding piles of cards peeled from the top of the deck alternately to the top and bottom of a new stack). After each of 300 such shuffles, DiPiero noted the deck's reordering and used the data to write computer programs simulating 15 different nine-shuffle sequences.

The result? A four-step riffle, riffle, riffle, overhand fully randomizes a deck. Indeed, DiPiero says, "further shuffling will generally be ineffective and may even . . . negate some of the effects of the previous four passes." But the overhand must be last or the deck will not become fully shuffled in four steps. Finally, he observes, "the alternating shuffle . . . has no apparent utility."

• Since he was 7, J. Paul Tindall has enjoyed tennis. But after practicing his serve, he doesn't enjoy scrambling all over the court to retrieve up to 100 balls. So the 18-year-old senior at Potosi (Mo.) High School has spent much of the last four years developing a radio-controlled Tenni-Runner to collect them, a project that earned him a first place ISEF award from the American Intellectual Property Law Association.

As the three-wheeled, rechargeable-battery-powered device passes over a ball, a pair of rotating paddles shoves the ball up a ramp and into a bin. At 40 pounds, the 11-by-28-inch aluminum-hulled retriever is too heavy for most tennis players to haul around. But Tindall expects that a molded plastic housing for the 150-ball collector — which he hopes to patent — should substantially lower its heft and cost.