Science at the AAAS

From our reporters in San Francisco at the annual meeting of the American Association for the Advancement of Science

Reversing atherosclerosis

Reversing the build-up of fatty deposits in the arteries through diet, drugs or surgery may soon come into clinical use to prevent heart attacks. Laboratory experiments for many years have shown that the artery-blocking deposits (or "plaque") in experimental animals become smaller after long periods of low cholesterol in the blood, says M. René Malinow of the Oregon Regional Primate Research Center. Robert W. Wissler of the University of Chicago reports recent experiments in which cholesterol-sequestering chemicals, cholestyramine or colestipol, as well as a low-cholesterol, low-fat diet promote regression of the fatty deposits. Whether such treatment would aid patients with atherosclerosis is still open to question. A wide variety of studies suggest that lowering blood cholesterol is beneficial. For instance, Henry Buchwald and colleagues in Minneapolis have performed surgery, partial ileal bypass, to limit reabsorption of bile acids by the intestines and thus reduce blood cholesterol. They find that in more than half of the high risk patients treated with the surgery, the plaque stops building up and some lesions regressed.

All the clinical studies are limited by inability to measure conveniently and accurately blockage in the arteries. David Blankenhorn of the University of Southern California uses the most advanced technique. With a computer process developed to enhance spacecraft pictures of the moon, he analyzes angiograms, X-ray films of blood vessels filled with X-ray opaque material. He measures the roughness of the edges of blockage all along a vessel. Blankenhorn envisions in the future a simpler procedure using ultrasound to make such measurements and thus simplify medical studies. Eventually such artery measurements may become a part of general physical examination to determine susceptibility to heart attacks.

Healthful hallucinations

The Indians of the Amazon in South America may have eaten powerful hallucinogenic plants to seek mind-expanding or religious experiences, but at the same time they could have been preserving part of their own race. Psychoactive plants historically have been linked to social and religious ceremonies. But many such plants also had high toxicity levels and induced the same vomiting and purging actions taken in Western societies to treat a variety of parasitic diseases, including amebic dysentery.

Eloy Rodriguez of the University of California at Irvine proposes that the plants' medicinal powers had "tremendous importance" in preserving the health and perhaps the survival of Indians who were "highly susceptible to parasitic infection" in that area of the Tropics. Some of the Indians may not have been consciously aware of the medical benefits, he says, but they might have sensed an improvement in physical health, as well as spiritual enhancement.

Rodriguez's hypothesis is based not only on historical study and laboratory work but on his field work in the summer of 1977, when he lived with an elderly medicine man among the Kamsa Indians of the Amazon. The medicine man, Salvador Chindoy, now in his seventies, began taking hallucinogenic drugs when he was 6 years old and has continued to incorporate them in treatment and in religious and social rituals on a weekly basis. According to Rodriguez, Chindoy "says that these drugs make you feel good in the head, which results in your body feeling good. He doesn't exactly understand the medical connection but he believes that all illness in the body can be corrected by obtaining a good feeling in the head."

Rodriguez is focusing his laboratory studies on the ipecac root, which yields emetine, one of the most effective alkaloids known in combatting parasitic disease.

Birth defects: 'Faulty communication'?

A significant number of birth defects may be caused by "faulty communication" at the cellular level, according to Harold Slavkin, chairman of the graduate program in Craniofacial Biology at the University of California School of Dentistry. Slavkin's studies in California and at the University of London indicate that spina bifida, a spinal defect, may be caused by inadequate cell communication in both animals and in humans; the condition accounts for about 25 percent of all birth defects, he estimates.

When surface antigens — molecules in the cell's plasma membrane responsible for mediating cell-to-cell communication — fail to bind with proper substances in the embryo, such as growth hormones, defects may result, particularly if the cells bind with harmful environmental chemicals such as drugs (see page 21). Slavkin suggests that faulty cellular communication can lead to a number of birth defects, including neuromuscular disease, brain disorders and other spinal defects.

There's a STARS out tonight

Two lovers glance up at the sky on a clear night and one says: "Honey, isn't the STARS beautiful tonight?" "Yes, it is." While this could be a blood curdling scenario of a sci-fi tale in a world without grammar, it is meant to illustrate a possible side effect of a proposal put forth by two Franklin Institute researchers: the Solar Thermal Aerostat Research Station. As planned by Ernest C. Okress and Robert K. Soberman of the Philadelphia institute, STARS would be in effect a giant solar collector that could beam large amounts of solar energy to earth for conversion to electricity. Kept aloft in the stratosphere by vast amounts of hot air, this giant balloon — it would appear from the ground to be six times the size of a full moon — would absorb solar energy with mirrors or specially constructed plastic "envelopes." The huge craft could be launched on its own solar power and possibly assembled by helium-filled air ships. It would also be a valuable tool in weather observations and ground surveillance, according to the researchers. It could be manned or unmanned.

Hot beetles come out on top

The ability to warm their bodies with muscle-generated heat appears to be one key to the impressive success of beetles as a form of life. While scientists have long known that beetles must warm up before they can fly, George A. Bartholomew of the University of California at Los Angeles now reports that beetles are "perfectly good endotherms." When active, they can generate heat to maintain a temperature 1° to 20°C above air temperature for more than an hour — even in a refrigerator.

The elephant dung beetle, a large African variety, has been studied most extensively by Bartholomew. A 2-gram specimen can maintain the temperature of 40°C and a 13-gram individual can reach 45°C. Bartholomew staged a competition to demonstrate that for beetle survival hotter is better. A major activity of these beetles is rolling balls of elephant dung, which they use as food and into which they lay their eggs. Bartholomew placed two beetles on a single dung ball and observed the results of the combat. In most cases the warmer animal was the winner, even if smaller. He also observed that a warmer beetle could roll away its dung balls faster than could a cooler individual.

The elephant dung beetle is as large as a small mammal, such as a pocket mouse, and has as high a metabolic rate when active, Bartholomew finds. The beetle and pocket mouse have come to the same solution to the energy problem from different starting points. Each changes temperature, generating heat internally when it is necessary for activity. "Therefore they can compete on equal metabolic terms," Bartholomew observes.

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