Prized projects win Westinghouse honors

Projects designed to advance medical research and help the disabled won highest honors this week in Washington, D.C., at the Westinghouse Science Talent Search, sponsored by Westinghouse Electric Corp. in partnership with Science Service.

First place and a $40,000 scholarship went to Irene Ann Chen, 17, of La Jolla (Calif.) H.S. for her study of the role played in the spread of cancer by two genes isolated from lymphoma cells. The pem gene appears to promote angiogenesis, the formation of new blood vessels, while the mCAT-2 gene is involved in transporting amino acids needed for protein synthesis.

Second-place winner Tracy Caroline Phillips, 17, of Long Beach (N.Y.) H.S. won a $30,000 scholarship for her design of an electronic device that fits in a wallet and tells the visually impaired the denominations of their paper money. It converts the intensities of infrared light passing through different bills into electric signals that enable a voice chip to say each bill's value.

Martin Tibor Stiaszny, 17, of Shawnee Mission (Kan.) South H.S. won third place and a $20,000 scholarship. He compared dendritic and detergent molecules to see how to use dendrimers more effectively in creating pharmaceuticals and other compounds.

The judges awarded the fourth- through sixth-place winners $15,000 scholarships each. Samit Dasgupta, 16, of Montgomery Blair H.S. in Silver Spring, Md., came in fourth for his mathematics project expanding on Schinzel's hypothesis, which describes how often a prime number will result from plugging whole numbers into a polynomial expression.

Chen

Phillips

Westinghouse

Stiaszny

Fifth-place winner Deborah Chuan Yeh, 18, of Plano (Texas) Senior H.S. developed a new method for detecting choline, a key molecule in the liver. Gina Petrocelli, 17, of the Edward R. Murrow H.S. in New York City, won sixth place for her project on the attitudes and behaviors of nurses who smoke.

Four students each won $10,000 scholarships: Aleksandr Leonidovich Khazanov, 15, of Stuyvesant H.S. in New York City; Griffin M. Weber, 17, of Denbigh H.S. in Newport News, Va.; Jordan Matthew Cummins, 18, of Livingston (N.J.) H.S.; and Franz Edward Boas, 17, of La Jolla (Calif.) H.S.

The remaining 30 finalists received $1,000 scholarships each. — *T. Adler*

Gums and resins

Periodontal disease wears out most patients' patience and tolerance for pain — and it may indirectly soften their fillings as well, a new study suggests.

Where there's gum disease, there are inflammatory cells, including monocyte macrophages, which release a host of enzymes. One of those enzymes, cholesterol esterase, softens the polymers, or resins, used in dental work, Shiu Heman Tsang of the University of Toronto in Ontario reported last week at the American Association for Dental Research in San Antonio. Other studies suggest that a number of enzymes weaken dental polymers.

Tsang and his coworkers exposed three commonly used methacrylate polymers to buffer solutions both with and without cholesterol esterase for periods of 2 to 8 days. They used enzyme concentrations typical of what a filling sitting next to inflamed tissue would encounter. The researchers now plan to investigate how the enzyme softens the polymers.

Dentists often use polymer fillings because they can be made to match the color of teeth and have few known side effects. However, they fracture more easily than metallic fillings. Restorations wear out mainly because of chewing, but if they soften, they'll degrade more easily.

Scientists worry about the durability of dental polymers, in part because of the possibility — as yet undemonstrated — that toxic chemicals are released when the polymers degrade, says Tsang's research supervisor, J. Paul Santerre. — *T. Adler*

Defending us from our dirty mouths

Our mouths are filthy, full of disease-causing microbes picked up from food, dirty fingers, and anything else that makes it past our lips. Bathed in this sea of germs, why doesn't even the slightest cut fall prey to serious infection? New data suggest that, at the first sign of injury, the inside of our mouths applies its own antibiotic.

The concept is hardly new. While working at the National Institutes of Health, Michael A. Zasloff discovered that the skin of wounded frogs secreted natural antibiotics (SN: 8/8/87, p.85). He termed the compounds "magainins," after the Hebrew word for shield. Two years ago, he found that sharks produce similar antimicrobial agents.

Now, Zasloff has observed related infection-fighting peptides in and around grazing injuries on the tongues of cows. He and his colleagues at Magainin Pharmaceuticals, a company he founded in Plymouth Meeting, Pa., report their finding in the March 17 SCIENCE. In fact, Zasloff adds, follow-up studies suggest that all moist surface linings — from the eye and cheek to the gut, rectum, and lung — respond to injury by producing these antibiotics.

His team isolated the predominant antibiotic — a defensin — from freshly slaughtered cattle. The group then looked for heightened activity of the gene that codes for the production of defensin. Invariably, they found it at sites of injury.

In fact, elevated antibiotic production occurred wherever other, more familiar germ-fighting elements of the immune system had been triggered, observes Barry S. Schonwetter, who led the study. Work by others has shown that defensins can recruit circulating immune system cells, such as neutrophils, to sores, where they release a related antibiotic, says Zasloff. This suggests that the tongue's antibiotics "are part of the immune system," Schonwetter explains, "and associated with acute or chronic inflammation."

Because animals ranging from chickens to humans produce related defensins, these antibiotics appear primitive and fairly universal, Zasloff says. "The same system, using different molecules, dominates the insect world."

Zasloff suspects that many diseases "represent failures of the system to keep up with the [attack] of certain bacteria or viruses." If so, drugs might be fashioned to jump-start dormant systems or rev up sluggish ones.

"I don't think anyone had thought about the tongue as a potential site for antimicrobial peptides," notes Robert I. Lehrer of the University of California, Los Angeles, Center for Health Sciences. "One nice contribution of this lovely paper is calling our attention to this."

When a dog or cat gets cut, it licks the wound. Traditionally, Lehrer says, "we physicians saw that as cleaning — debriding — it." But it now appears that "they may be putting a little antibiotic on as well." — *J. Raloff*