Microchip miracles

'We're talking projects like restoring sight to the blind'

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The first bites of pizza fall into your eager stomach. All feels great, until you grab that extra slice and your gastric pacemaker awakens.

The tiny device, which doctors sewed onto your gut, watches what you eat. Whenever you overindulge, a faint shock makes you too ill for more.

Science fiction? No. The gastric pacemaker exists, and it's just one of many medical prototypes that run on microchips from Texas Instruments Inc.

The Dallas-based company, which grew rich by planting tiny devices in machines, hopes to grow richer by planting them in you. It also hopes to heal many ills and enrich the Dallas area, where existing centers for medical research and mobile computing may spawn a medical computing hub.

"The potential is incredible," said TI chief executive Rich Templeton, explaining his company's plans for medical technology at a conference last week. "We're talking projects like restoring sight to the blind."

Indeed, researchers at the University of Southern California can already make blind patients "see."

Camera glasses send video to a computerized belt, which translates digital images to electrical pulses for the brain. Patients today see blocky images that evoke early video games. It's enough to navigate everyday tasks, though, and improvements are in the works.

Bionic arm

The improving tie between tissue and silicon also underlies a new generation of artificial limbs.

Scientists at UT Southwestern Medical Center have attached a mechanical arm, one wire per nerve, to a volunteer's shoulder. The man can now use his mind to move fingers, hand, wrist, elbow and shoulder.

The device still lacks the control needed for pro sports or safecracking, but it's an honest-to-goodness bionic arm.

"The cells sit right on top of the chips and talk to one another," said Dr. Dennis Stone, vice president for technology development at the Dallas hospital and research center.

"We're at the dawn of something huge, and Dallas is right in the middle of it."

The promise of microchip medicine lies not only in bionic body parts, but also long-term care for chronic problems.

The same TI chips that turn plastic boxes into cellphones can also turn pacemakers into cellphones.

Prototype devices already reduce arduous office visits by sending information directly from a patient's chest to a doctor's computer. A smart pacemaker may someday sense a pending heart attack, call 911 and use a built-in GPS device to guide medics to a patient in crisis.

Other chip-based devices may prevent that heart attack from ever happening.

Engineers have used TI chips in prototype systems that constantly measure blood pressure. When readings get too high, the system zaps the gland that expands blood vessels during exercise. When blood vessels expand, blood pressure decreases.

Drugs can also cut blood pressure, of course, but current medications sedate patients and produce other annoying side effects.

Smart implants may produce fewer side effects when treating many conditions that drugs treat today. Blood thinners, antidepressants, painkillers: Those and other drugs work by affecting chemical levels inside your body. Smart mechanical devices, in theory, could eliminate the imprecision by telling your body exactly how to fix itself.

In theory.

The market

To date, the total annual sales of medical microchips by all companies is just $2 billion.

Texas Instruments estimates it generated less than $200 million of its $14 billion revenue, but the potential market is enormous.

The world market for medical devices is $100 billion and growing by double-digit increments as machines do more and more. World drug sales exceeded $600 billion last year.

TI execs think they're particularly well-positioned to infiltrate those markets.

The same attributes that suit chips for cellphones and other mobile devices – small size, low power consumption – suit them for human bodies.

Custom chips

TI also markets analog chips, chips that detect not ones and zeros but the vibrations, chemicals and electrical pulses the body uses to control itself.

"We may design custom chips once a technology nears major production, but researchers mostly use our existing products. We're getting a shot at a big new market without risking too many research dollars," said Doug Rasor, TI's vice president for emerging medical technologies.

TI does spend money looking for talent and supplying its existing chips to promising researchers. The company says it's easier to get in at the ground floor than to win converts who have designed products with chips from other companies.

Mr. Rasor says it may take several years for the medical technology division to land a runaway hit. Testing requirements tend to slow medical progress, which is why the decoding of the human genome has yet to bring many new drugs to market.

Medical devices face fewer regulatory hurdles than drugs, though. TI hopes to cut the lapse between great idea and marketed product to three years. It seems an eternity to computer researchers but an eye blink compared with drugs, which generally take more than a decade to reach pharmacy shelves.

"Devices offer much faster time to market than pharmaceuticals," said Mir Imran, chief executive of InCube Laboratories and a major backer of the gastric pacemaker. "Today's new devices will be helping patients when today's new chemicals are still many years from government approval."