

## Brain injury can break smoking habit, study says

By Benedict Carey

Scientists studying stroke patients say that an injury to a specific part of the brain, near the ear, can instantly and permanently break a smoking habit, effectively erasing the most stubborn of addictions. People with the injury who stopped smoking found that their bodies, as one man put it, "forgot the urge to smoke."

The finding, appearing Friday in the journal *Science*, is likely to alter the course of addiction research, pointing researchers toward new ideas for treatment, experts say. While no one is suggesting brain injury as a solution for addiction, the findings suggest that therapies might focus on the insula, a prune-sized region under the frontal lobes that is thought to register gut feelings and is apparently a critical part of the network that sustains addictive behavior.

Previous research on addicts focused on regions of the cortex involved in thinking and decision-making. But while those regions are involved in maintaining habits, the new study sug-

gests that they are not as central.

The study did not examine dependence on alcohol, cocaine or other substances. Yet smoking is at least as hard to quit as any habit, and it probably involves the same brain circuits, experts said.

"This is the first time we've shown anything like this, that damage to a specific brain area could remove the problem of addiction entirely," said Nora Volkow, director of the National Institute on Drug Abuse, which financed the study, along with the National Institute of Neurological Disorders and Stroke. "It's absolutely mind-boggling."

Others cautioned that the study was small, and that scientists still knew little about the widely distributed neural networks involved in sustaining habits.

"One has to be careful not to extrapolate too much based on brain injuries to what's going on in all addictive behavior in healthy brains," said Martin Paulus, a psychiatric researcher at the University of California in San Diego, and the San Diego VA Medical Center. Still, he added, the study "opens up a whole new way to think about addiction."

The researchers, from the University of Iowa and the University of Southern California, examined 32 former smokers, all of whom had suffered a brain injury. The men and women were lucid enough to answer a battery of questions about their habits, and to rate how hard it was to quit and the strength of their subsequent urges to smoke. They all had smoked at least five cigarettes a day for two years or more, and 16 of them said they quit with ease, losing their cravings entirely.

The researchers performed scans on all of the patients' brains to specify the location and extent of each injury. They found that these 16 were far more likely to have an injury to their insula than to any other area.

The researchers found no association between a diminished urge to smoke and injuries to other regions of the brain, including tissue surrounding the insula.

"There's a whole neural circuit critical to maintaining addiction, but if you knock out this one area, it appears to wipe out the behavior," said Antoine Bechara, a senior author of the new paper and a neuroscientist at the Brain

and Creativity Institute at the University of Southern California. His co-authors were Hanna Damasio, also of the University of Southern California, and Nasir Naqvi and David Rudrauf of the University of Iowa.

The patients' desire to eat, by contrast, was intact. This suggests, the authors wrote, that the insula is critical for behaviors whose bodily effects become pleasurable because they are learned, like cigarette smoking.

The insula has emerged as a region of interest based in part on recent work by Antonio Damasio, a neurologist and director of the Brain and Creativity Institute. The insula has widely distributed connections, both in the thinking cortex above, and down below in subcortical areas, like the brain stem, that maintain heart rate, blood pressure and body temperature, the body's primal survival systems.

Based on his studies and others', Damasio argues that the insula, in effect, maps these signals from the body's physical plant, and integrates them so the conscious brain can interpret them as a coherent emotion.