Serpent sleuth uncoils mysteries of venom

While wandering too close to a military zone near the Bulgarian-Greek border at age 15, Zoltan Takacs was arrested and jailed for something that eventually would make him an innovator in medical research: hunting snakes.

His interest in the cold-blooded creatures brought him to ask why their venom—among the most toxic substances in nature—can kill animals a thousand times larger but has no ill effects on the snakes themselves.

"They need their venom to be as potent and universal as possible because their survival depends on it," said Takacs, a natural-toxins scientist. "That same venom does not harm the snake itself."

A few years ago, before he became a research associate at the University of Chicago in the lab of pediatrics chairman Steven Goldstein, Takacs discovered that cobras possess a sugar molecule on their acetylcholine receptors—molecules on the surface of muscle cells—that blocks toxins from binding to their target, much like an umbrella blocks rain.

Acetylcholine receptors exist in humans too, but they lack the molecular "umbrella" and therefore are susceptible to the deadly toxin. Because these receptors play a key role in cell signaling, they have been implicated in many diseases, including epilepsy and Alzheimer's.

Now Takacs is attempting to apply what he learned from cobras to human biology. In a lab located in Chicago's new Center for Integrative Science, he brings together cross-disciplinary groups to develop animal toxins into novel drug leads. By better understanding animal toxins, scientists may learn new ways to manipulate ion channels and use that knowledge to prevent or treat disease.

"My interest," said the Hungarian-born scientist, "is linking evolution to physiology—using nature's invention for medicine."

—Katie Brandt

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Background: Sahara sand viper *(Cerastes vipera)* found in the Negev desert, southern Israel; *clockwise from top:* king cobra *(Ophiophagus hannah)* in northern Vietnam, forest cobra *(Naja melanoleuca)* in the Kakamega Forest, Kenya, and gwardar *(Pseudonaja nuchalis)* in the Gibson desert, Australia. *Photos by Zoltan Takacs*

On the cover
Eleven-month-old Nasier Dixon of Biloxi, Miss., was one of 1.5 million people forced from their homes because of Hurricane Katrina. Doctors and nurses from the University of Chicago Hospitals were among those who responded to the call for help. *Photo by usaf/illinoisphoto.com*