UA Toxicologist Tackles the Puzzle of Treating Venomous Bites and Stings

BIO5 Institute
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Arizona is home to the bark scorpion, the only scorpion considered lethal to humans in North America. Every year, the bark scorpion is responsible for about 8,000 stings and 200 life-threatening cases across the state, often in children under the age of 5. When in-state production of trial scorpion antivenom ceased in 1999, antivenom had to be smuggled across the U.S.-Mexico border to treat critically ill children.

This simply was not acceptable to UA pediatrician and toxicologist Dr. Leslie Boyer. She founded the **Venom Immunochemistry, Pharmacology and Emergency (VIPER) Institute** [1], based at the UA **College of Medicine** [2] – Tucson, in order to meet antivenom shortages and to improve diagnostics and therapeutics for venom injuries of all types.

In August 2011, the VIPER Institute introduced Anascorp, the first scorpion antivenom approved by the U.S. Food and Drug Administration, and the result of nearly 12 years of collaboration with the Institute of Biotechnology of the National Autonomous University of Mexico.

"This is just a wonderful team," Boyer said. "To maintain our international collaboration (with the Institute of Biotechnology), we have workshops in the U.S. and Mexico where different faculty experts present their work so that the central team benefits from the broader knowledge of both institutions."

Boyer's special interest in toxinology – natural products toxicology – stems from a pivotal day during her pediatrics residency at the UA when she was the only one able to identify the distinctive symptoms of a bark scorpion sting.

"I realized that I needed to get a video of an actual patient – with arms and legs jerking from nerve poisoning – so that I could show it to other students and colleagues who had never seen or studied this before," she said. "You only have to watch it once for 30 seconds and you are a better doctor as a result."

"I met Rick Collins around then, who at the time was the main videographer for AHSC Biomedical Communications. He gave me his pager number and said, 'As of this minute, I'm on call 24/7 for you. If you have an interesting scorpion sting in the emergency room they're willing to let me videotape, you call me.' Rick ended up on the receiving end of my ER pages for over a year. It was the beginning of an amazing friendship and a collection of instructional videos. It wasn't a project that I needed in order to accomplish a credential for my pediatrics residency. It was a project I was passionate about, and it was because of the video project that I met teachers in toxicology and chose my specialty," Boyer said.

Today, in addition to directing the VIPER Institute, Boyer is a member of the **BIO5 Institute** [3], associate professor of pathology at the UA College of Medicine – Tucson, and clinical toxicologist for the **UA Health Network** [4] laboratory.

While no two days are the same in Boyer's world, to relieve stress and keep her mind sharp – especially with pattern recognition – she enjoys solving three-dimensional **Berrocal** [5] sculptural puzzles.

"When I was a young girl, I read an article that said that statistically girls weren't as good as boys at spatial relationships and mathematics. I thought, 'Wow, I don't like that statistic, I'm going to do something about it.' So I started exercising my mind with puzzles. I find that when I'm looking at a medical problem involving venom, I use the same thought processes that I use when I stare at a puzzle: thinking through the layers and depths of anatomy, blood vessels and chemicals and seeing many things happening simultaneously. I turn it all around in my mind in order to capture a complete picture and connect the pieces."

Although Boyer has never been stung or bitten by a venomous creature, plenty of them visit her Tucson home, which she inherited from her grandparents. As a native Tucsonan and UA alumni, she jokes, "My family has been in Tucson long enough that we joke we have sand in our blood." Boyer's great-grandfather helped develop telescopes and had a home at the base of Tumamoc Hill, and her grandfather helped lay down Tucson roads as a city engineer.

As the descendant of a family filled with explorers, inventors and scientists, Boyer has passed on the pioneering spirit to her own children. "My daughter currently is doing a biology project on risk-taking behavior in people who are involved professionally with snakes at the (Arizona-Sonora) Desert Museum and the VIPER Institute. She will be involved in developing one of the tools we will use to assess the risk of being bitten or stung. My son is interested in science, too, but he wants to chart his own path."

In recognition of her achievements, the Arizona Bioindustry Association recently named Boyer the **2013 Arizona Bioscience Researcher of the Year** [6].

"Receiving a big award and having the public eye on you presents an opportunity for doctors and scientists to reflect at the impact they have had, and can still make," Boyer said. "Early in my career, my focus was on teaching. Mid-career was patient care. And now, I'm a researcher with the aim of improving patient care. I already can see that I have to have one

more phase before I retire. My last phase will be public health and public policy because my research only will be meaningful if it turns into society-wide change in the way patients are cared for."

Links
[1] http://viper.arizona.edu [2] http://medicine.arizona.edu [3] http://www.bio5.org [4] http://www.uahealth.com [5] http://puzzlemuseum.com/gallery/berrocal/berrocal.htm [6] http://opa.ahsc.arizona.edu/newsroom/news/2013/dr-leslie-boyer-named-2013-arizona-bioscience-researcher-year