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From bookshelf to bedside: Seeking help for stroke victims

Every year, more than 20 million people worldwide suffer strokes, resulting in nearly 6 million deaths. In the U.S., stroke creates annual health-care and lost-productivity costs exceeding $36 billion. That figure is expected to top $180 billion by 2030.

On her office bookshelf, Ewa Bienkiewicz found clues to fighting the problem.

Currently, no drugs effectively mitigate the damage caused when a weakened blood vessel in the brain bursts and leaks blood into the surrounding tissue. Hemoglobin, a red protein that transports oxygen in the blood and is vital to survival, is the source of the often crippling damage.

When it breaks down it generates toxic levels of hemin, triggering a series of events harmful to the injury site and killing neurons in the brain. A significant amount of the damage from stroke occurs in the days and weeks that follow.

Bienkiewicz's love of reading and natural curiosity led her to connect the dots on research done by others, and by her laboratory team. Her thoughts came back to a naturally occurring protein that protects neurons following injury, and to a fragment, or peptide, from the protein known to bind hemin.

Subsequent research in her lab has created hope that she has identified a peptide to serve as a "high-capacity scavenger" that would collect toxic hemin in brain tissue following a stroke.

"In stroke, the expression of a cellular protein known as PrP goes up as part of a natural response mechanism to injury," said Bienkiewicz, a research associate professor in the Department of Biomedical Sciences. "In our laboratory we identified fragments of that protein that bind hemin, and our goal is to use that mechanism to diminish cell damage in the brain."

Bienkiewicz's lab is testing one of those fragments (called OR2), along with a novel peptide engineered to mimic OR2's protective response to injury, but with greater capability to neutralize the toxic effects of hemin. The work will help determine which, if either, could be developed into a drug for physicians to use in treating stroke victims.

The discoveries created a flurry of successful funding activity that suggests her work has great potential.

The Florida State University Research Foundation granted Bienkiewicz two GAP awards, funding intended to quickly improve the odds that current research will lead to the public availability of new products or services.

Using those funds, Bienkiewicz advanced her research enough to be awarded two patents, prompting a private, Seattle-based product-development company to express interest. The company, Virtici, partners with scientists and clinicians with the goal of commercializing innovations that could help improve quality of life and save lives.

"The collaboration with Virtici demonstrates that there is interest outside FSU for Dr. Bienkiewicz's work, and that the interest has a commercial basis," said Brent Edington, director of Florida State's Office of Commercialization. "Virtici is not interested in basic science. They are interested in commercial potential."

Additional optimism for the work came from the National Institutes of Health, which awarded a $430,000 Small Business Innovative Research grant to Virtici with Bienkiewicz as the academic principal investigator. The NIH describes the grants as "an integral source of capital for early-stage U.S. small businesses that are creating innovative technologies to improve health … and create life-saving technologies."

Bienkiewicz is cautious about whether her theory will result in such a drug.

"You see on a personal level how stroke can affect people and change not just their life but their family's life as well," she said. "This is one of the reasons why I am a very strong proponent of translational research.

"In the context of hemorrhagic stroke, there is no pharmacological intervention. If we fail we will be in good company, as many people before us have failed at this. But because it does have the potential to work, I thought it was my responsibility to try."