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Researchers hope patent can pave way to future treatments of heart, lung disease

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A Kansas State University research team has received a patent for its use of a peptide that has been shown to prevent or reduce damage to intestinal tissue.

The team's ongoing work may have far-reaching implications, including new ways to treat tissue damaged during a heart attack or stroke, and even a possible cure for cancer.

U.S. Patent No. 8,895,502, "B2-Glycoprotein I Peptide Inhibitors," was issued recently to the Kansas State University Research Foundation, a nonprofit corporation responsible for managing technology transfer activities at the university.

Sherry Fleming, associate professor of biology, said therapeutic peptides—or chains of amino acids—developed at Kansas State University can reduce or prevent the damage caused to intestinal tissue when blood and oxygen are restricted, called ischemia.

The peptides also are proving useful when blood flow returns to the affected tissue, called reperfusion, which usually is more damaging than ischemia.

"When cells are ischemic, they put out a novel molecular marker on their surface," Fleming said.

The markers, in effect, are the cell's way of telling the body's immune

system that it has a problem, she said.

However, during reperfusion—return of blood and oxygen flow to the affected area—the immune system "acts like a drama queen—it overreacts," according to Fleming. The immune system, trying to repair the area, clears out an entire region of tissue. Antibodies bind to large areas of affected tissue, activating the immune system and sending inflamed cells to the heart, lungs, liver and kidney.

In the human intestine, the risk is especially high because bacteria are present in high levels.

"That damage during reperfusion is caused by antibodies binding to that molecular marker," Fleming said. "The body can't stop the antibodies from being produced. We want to find a way to keep the antibody from binding to the marker. We designed peptides that prevent that binding. We have changed it so that it won't bind arbitrarily, but binds very specifically to the ischemic area."

Currently no drugs are available for treating reperfusion following ischemia, called mesenteric IR, which has a mortality rate of 65-70 percent.

"The peptide recognized by this patent has demonstrated a reduction to tissue damage, which lowers the mortality rate in animals," Fleming said.

Compared to other potential therapeutics for mesenteric IR, the peptide developed at Kansas State University is considered to be safer because it does not compromise the patient's immune system. It also is more effective and less expensive to manufacture.

Fleming's work on this project includes receiving approximately $2.1 million over nine years from the National Institutes of Health, though

she has studied the effects of ischemia and reperfusion for the past 15 years.

The peptides were designed by John Tomich, a Kansas State University molecular biologist who also is named on the patent. Fleming, Tomich and graduate students are continuing trials that are showing additional promise for heart, lung and kidney health.

If proven effective, the peptide will reduce tissue damage caused by heart attack, stroke or trauma injuries in humans and animals. In surgery, the peptide could be added to an intravenous solution to aid in recovery during reperfusion.

The peptide also is a potential defense against cancer tumors, which Fleming said are capable of recruiting blood vessels to attack healthy tissue.

"Our peptide seems to stop recruitment of blood vessels, which ultimately means the cancerous tumor can't grow," she said.

Fleming said the technology is not yet licensed by a company, but receiving the patent is another step toward expanding the research and increasing opportunities for human trials.

Provided by Kansas State University