DETECT SEPSIS IN FOUR HOURS

If you've ever laid in a hospital bed or kept vigil next to your loved one's bedside waiting on a blood culture to determine if an infection needs treatment, then you know how frustrating the wait can be. When blood cultures can take up to 15 days to reveal bacterial infection, a patient can spend days in a hospital — all while having massive doses of antibiotics pumped into their system just in case. On the other hand, it can be terrifying to realize that the diagnostic process takes longer than the disease progression, rendering treatment useless.

It's no wonder sepsis is the leading cause of death worldwide, even with improved health care outcomes. However, thanks to researchers from TTUHSC and Texas Tech University (TTU), a valuable breakthrough has arrived.

Dimitri Pappas, PhD, an associate professor in the TTU College of Arts and Sciences Department of Chemistry and Biochemistry, and graduate student, Ye Zhang, developed a microfluidic chip to detect sepsis at a much faster rate — decreasing the mortality frequencies caused by late validation of infection. They've since been working with John Griswold, MD, (Resident '86) professor and chair emeritus in the TTUHSC School of Medicine Department of Surgery, to conduct a study using human blood. They published their study, "Multiparameter Affinity Microchip for Early Sepsis Diagnosis Based on CD64 and CD69 Expression and Cell Capture," in the Analytical Chemistry journal in 2018 — volume 90, issue 12.

The microfluidic chip detects sepsis within four hours using only a drop of blood; and only three out of the 12 patients who tested positive for sepsis on the chip showed a positive blood culture within a 72-hour study window. This rapid detection decreases unnecessary antibiotic use and prevents unnecessary hospital stays, providing a revolutionary solution to sepsis diagnosis.

FRUIT FLIES CURE CANCER?

The KRAS protein — often referred to as "undruggable" or treatment resistant once its mutation causes cancer in cells — has been a popular topic in the medical profession for more than 30 years. According to multiple scientific journals, KRAS mutation drives about 90 percent of pancreatic cancers, 45 percent of colorectal cancers and 35 percent of lung cancers. It doesn't stop there. The gene also blocks the effectiveness of EFGR-inhibiting drugs in about 40 percent of cancer patients.

Jeffrey Thomas, PhD, assistant professor in the School of Medicine Department of Cell Biology and Biochemistry is collaborating with TOSK Inc., a biotechnology company specializing in developing Companion drugs. When these drugs are administered alongside certain cancer therapies, they significantly improve patient outcomes, dosing regimens, and cut the cost of treating both cancer and toxic side effects that may occur. They received a two-year $2 million National Institutes of Health National Cancer Institute SBIR Phase II grant to find a way to halt the progression of cancer caused by KRAS — or reverse it completely — using fruit flies.

"We've taken a somewhat novel approach in our efforts to find a drug to stop or reverse cancer-causing KRAS genes," Thomas said. "We've developed a way of expressing cancer-causing KRAS inside the wings of a fruit fly — we use flies because of their accessibility in helping us understand how (genes) work. This doesn't cause cancer in the fly, but it does cause a severe wing deformity. So, we take this fly and test compounds and chemicals to see what could make the deformed wing return to normal, all without killing or harming the fly."

TOSK plans to submit an investigational new drug application to the Federal Drug Administration to enter human clinical studies within the next 18-24 months.