ISCHEMIC INJURY PROTECTIVE ULTRASOUND
20-40 million people in the US have chronic kidney disease (CKD) and have a high risk of sustaining acute kidney injury (AKI).

In the US, about 17 million hospital admissions are complicated by acute kidney injury resulting in $10 billion in additional healthcare costs annually.

The mortality rate in patients with AKI ranges from 40-60%.

Clinical problem: Acute kidney injury is a significant healthcare concern, yet few pharmacologic advances have been made toward prevention or treatment.

Solution: University of Virginia researchers have developed a non-invasive approach to imaging patients experiencing or at risk of experiencing ischemia reperfusion injury and administering ultrasound energy of a sufficient intensity and duration to achieve a protective effect against ischemia reperfusion injury.
Prior exposure to ultrasound (US) alone prevents ischemia reperfusion injury (IRI) and preserves kidney function in naïve mice. Mice were exposed to US 24 hours before 26 minutes of kidney ischemia, followed by 24 hours of reperfusion (IRI).

(Giglioatti et al., 2013)
Protective effects of ultrasound are seen when administered within two days prior to the ischemia reperfusion event.

(Giglioitti et al., 2013)
Prior ultrasound (US) exposure improves survival after kidney IRI. Mice were exposed to a modified ultrasound regimen 24 hours before bilateral IRI (26 minutes of ischemia, 24 hours of reperfusion).

(Giglioitti et al., 2015)
UVA researchers have developed an optimal workflow for the use of ultrasound to prevent and treat ischemia reperfusion injury that comprises:

- Imaging the spleen tissue
- Identifying a region of interest
- Applying ultrasonic energy* to the region of interest
- Treatment time is about 10 minutes

*Proprietary pulse sequences having predetermined frequency, mechanical index, pulse length, and pulse spacing.
INTELLECTUAL PROPERTY

• UVA Tech ID: OKUSA-PROTECTION (2016-119)
  Title: Systems, methods, and computer readable media for ischemic injury protective ultrasound
  Inventors: Mark D. Okusa, Joseph C. Gogliotti, John A. Hossack

SCIENTIFIC PUBLICATIONS

• Ultrasound prevents renal ischemia-reperfusion injury by stimulating the splenic cholinergic anti-inflammatory pathway

• Ultrasound modulates the splenic neuroimmune axis in attenuating AKI