

Research Plan Summary

Intestinal failure (IF) in neonates is a serious condition characterized by a reduction in the functional intestinal mass, leading to undernourishment. IF is caused by several developmental issues associated with poor blood flow to the intestines in preterm infants. We intend to design and build two optical imaging devices, based on the principles of Laser Speckle Imaging (LSI), to non-invasively measure blood flow. The first device will be used in the neonatal intensive care unit (NICU) at CHOC Children's Hospital (CHOC) to monitor intestinal blood flow, and the second device will be used in the CHOC operating room (OR) during surgery to map intestinal blood flow.

The first LSI device will allow clinicians to objectively monitor and assess the health of the neonatal intestine. In doing so, we expect to assist clinicians in diagnosing neonates with IF sooner, which would allow surgical intervention to have the greatest impact. The surgical interventions required to treat IF are challenging, as there is currently no tool used to reliably identify ischemic regions within the intestine during surgery. The second LSI device will provide wide field, real-time blood flow maps of the intestines that would allow surgeons to objectively identify ischemic portions of the intestines that need to be resected. After the ischemic tissue is removed, the LSI device can also be used to immediately assess whether successful anastomosis of the remaining healthy intestine has been achieved.