Technology Summary for US201615655988 (Pending)

Title: A Compact Low-Cost Fiberless Flow-Oximeter for Monitoring of Cerebral Hemodynamics and Metabolism in Neonatal and Infant Brains

Key Advantages:

- Provide for a device that can perform noninvasive, continuous, fast, direct measurements of tissue blood flow variations in relatively deep tissue
- May provide greater efficiency and simplicity in monitoring cerebral hemodynamics in infants
- May reduce cost and time in monitoring neonatal cerebral hemodynamics

Market Opportunities: Intermittent hypoxemia (IH) is typically a consequence of immature respiratory control in preterm infants. The need to stabilize oxygenation in neonatal intensive care has been recognized as a significant clinical problem. Currently, finger pulse oximetry (PO) is the standard of care for continuous monitoring of frequency and magnitude of IH in a majority of neonatal intensive care units (NICUs). Because the sensor is located on the finger, there are many false alarms due to motion artifacts and low blood perfusion in the peripheral body area. There remains a need in the field for a more accurate representation and monitoring of the IH impact on neonatal brain. Near-infrared diffuse correlation spectroscopy (DCS) is an emerging optical modality that can be useful in monitoring cerebral blood flow (CBF) without ionizing radiation effects. However, DCS utilizes large and expensive long-coherence lasers and single-photon avalanche photodiodes, which limit the instrument's spatial-temporal resolution and increase the instrumentation dimension and cost. Furthermore, the fiber-optical probe used for DCS measurement is difficult to longitudinally install on the small heads of infants.

Technology Solution: Researchers at the University of Kentucky have developed a miniaturized, fiberless, easy to use, high throughput diffuse speckle contrast flow-oximeter (DCSFO) sensor for rapid, continual monitoring of both CBF and cerebral oxygenation in neonates and infants. DSCFO uses inexpensive and compact laser diodes and small bare CCD/CMOS chip with no lenses to rapidly quantify spatial speckle fluctuations resulting from moving red blood cells in relatively deep tissues (up to 10 mm). This penetration depth has been proven to be sufficient for transcranially detecting CBF in infant's cortex through the intact skull.

Commercialization Status: Patent filed

Patent Number: US Patent Application #15655988

Available Fields of Use:

- Biomedical Device
- Pediatrics

Inventors: Yu, Guoqiang; Huang, Chong; Hastings, Jeffrey T.

Tags: Biotech, Blood Flow, Biomarkers, cerebral vascular disease, Devices, Diagnostics, medical imaging, Optical human health monitoring, Sensors, Therapy monitoring, Stroke, Sleep

References:

1. C. Huang, M. Seong, J. P. Morgan, S. Mazdeyasna, G.G. Kim, J. T. Hastings, G. Yu, "A low-cost compact diffuse speckle contrast flowmeter using small laser diode and bare charge-coupled-device chip", *Journal of Biomedical Optics Letters*, 21(8), 080501 (2016)