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Three Case Western faculty members receive funding to develop new diagnostic technologies

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Three Case Western Reserve University faculty members have received funding to further develop emerging technologies aimed at malaria, cystic fibrosis, and sickle cell anemia.

The funding is provided by the National Center for Accelerated Innovation, established by Case Western Reserve University, Cleveland Clinic, Ohio State University, University of Cincinnati, and Cincinnati Children's Hospital Medical Center. The center supports new products and technologies related to priority targets set by the National Heart, Lung, and Blood Institute of the National Institutes of Health.

The recipients are Brian T. Grimberg, PhD, assistant professor of international health; Miklos Gratzl, PhD, associate professor of biomedical engineering; and Umut Gurkan, PhD, assistant professor of mechanical and aerospace engineering.

Grimberg and his team will improve the sensitivity and portability of a malaria diagnostic device that allows high-sensitivity magneto-optical detection of malaria pigment (hemozoin crystals) in the blood, thereby avoiding staining and microscope-based examination of patient blood. The original, laboratory-based device is highly accurate but large, not easily portable, and requires a computer to read and interpret information about a patient's blood sample. Grimberg's project will create a more rugged, field-ready device that eliminates expensive and bulky equipment and test the prototype on human samples in Peru as part of the World Health Organization-device approval process.

"More than three billion people live with the threat of malaria throughout the world," said Grimberg. "While improvements in terms of morbidity, mortality, and transmission have been achieved in the past five years, malaria parasites continue to evade elimination. Current malaria diagnosis methods are slow, expensive, and sometimes inaccurate. Our portable device will cost 51 cents per diagnosis compared to $3.18 for microscopy when including all costs and labor and allow for onsite detection of malaria."

Gratzl and his team will develop and clinically test a device for diagnosing cystic fibrosis in newborns at two weeks of age, compared to current testing of diagnostic value which can only begin at the age of three months or later.

"Cystic fibrosis is a genetic disease that leads to the secretion of abnormally thick mucus," said Gratzl. "This causes obstructions in the airways and recurring pneumonia. If treatment begins after the presentation of symptoms, which typically occurs about three months of age or later, irreversible damage has already occurred. Our diagnostic technology will make it possible to begin treatment shortly after birth." Currently, the most widely used test for cystic fibrosis measures chloride in sweat at the age of three months or later. The reason for the delay is that the volume of sweat required is larger than what can be obtained from a newborn. The Gratzl team's technology requires only two microliters of sweat, which can be obtained from two-week-old babies.

Gurkan and his team will test new technology in Ghana to diagnose sickle cell disease onsite. HemeChip is a mobile device capable of detecting a number of genetic blood disorders including sickle cell disease in a much more efficient fashion than conventional tests. The device will enable a $2-per-screening test that takes 10 minutes to run.

"Although sickle cell newborn screening is standard in this country, very few infants are tested in Africa because of the expense and lack of trained personnel to carry out conventional tests," said Gurkan. "This new mobile technology is an easy to use, cost-effective tool with worldwide applicability, potentially saving many lives."

The World Health Organization estimates that 70 percent of deaths attributable to sickle cell disease in Africa could be prevented with early detection and medical intervention. Over six million people alone in West and Central Africa have the disease. There are approximately 20 million births every year in sub-Saharan Africa.

Source:
Case Western Reserve University
