**ABSTRACT**

The ability to integrate a sensor platform with a cell phone for health monitoring and disease diagnosis in space exploration provides an innovative and cost-effective approach for space travel and low gravity applications. Intelligent Optical Systems (IOS) is continuing to develop lateral flow assays designed for integration into a customized Holomic LLC cell phone reader to enable the quantitative measurement of early cardiac and liver function biomarkers in serum. Multiplexed liver panel (ALT, AST, and ALP) and cardiac (troponin I) lateral flow assays have been developed and tested for sensitivity and cross-reactivity with a prototype cell phone reader. IOS is currently finalizing these assays for their CV and reproducibility. Assays under development include metabolic blood chemistry panels (glucose and creatinine). Holomic is optimizing the reader to enable the integration of a fully automated mechanical exchange mechanism for the selected optical bandpass filters.

The lateral flow assay (LFA) platform is an inexpensive, simple immunochromatographic assay comprised of a test strip with several membranes that house all the reagents necessary for the test. The sample medium (e.g., blood, saliva) containing the analyte of interest is applied at the beginning of the strip and capillary action moves the sample across the platform. No training is required and results can be verified within 10 minutes.

**Diverse Applications**

LFAs are ideal for testing a broad range of analytes in many areas of research.

- **Infectious Parasite Detection in Sandflies**
  - Crushed sandflies in extraction media
  - Detection of two species of *Leishmania*

- **Bone Loss Markers in Saliva**
  - (Deoxypyridinoline, Osteocalcin)

- **Toxin Screening**
  - Toxins such as Aflatoxin can be screened for safe limits in mashed corn grain feed

- **Drugs of Abuse in Saliva**
  - (THC, Amphetamine, Benzodiazepine, Benzoylecgonine, Methamphetamine, Morphine)

- **Cardiac and Liver Markers in Serum**
  - (Troponin I, AST/ALT/ALP)

- **Ovarian Cancer Markers**
  - HE4, CA125, MSLN

- **Multiplexing with fluorescent probes for multiple biomarker detection**

**Whole Blood Testing for Troponin I for NASA Application on ISS**

Fluorescent detection enables higher sensitivity to detect Troponin I levels down to 0.5 ng/mL.

**Other biomarkers currently under development for NASA application are creatinine and glucose monitoring in serum.**