NASA SBIR 2008 Phase I Solicitation

X14.01 On Orbit Ambient Biological Sample Preservation Techniques

Lead Center: JSC

Measurement of blood and urine analytes is a common clinical medicine practice used for differential disease diagnosis and determination of the therapeutic response to treatment. Accurate biochemical results depend on maintaining the integrity of blood and urine samples until analyses can be completed. Improper sample collection, handling, or preservation may lead to critical errors in diagnostic interpretation of analytical results. Traditional methods have been developed that include the use of sample component separation by means of centrifugation, refrigeration, freezing or the addition of preservatives to maintain the integrity of biological samples. While such techniques are easily achieved in a routine clinical setting, the spaceflight environment presents unique challenges to sample processing and stowage. Diagnosis, treatment and research of health-related issues in human crewmembers during their confinement in the remote spaceflight environment depend on the ability to maintain the analytical integrity of biological samples. Thus, novel on-orbit methods for the ambient preservation of biological samples are critical for scientific research, monitoring of crew health and evaluation of countermeasure efficacy. The Dried Chemistry Technology developed at NASA/JSC represents one approach to the collection and preservation of in-flight blood and urine samples. Briefly, whole blood collected by venipuncture into flight-certified tubes is applied either directly to special filter cards, or alternatively, serum or plasma separated from the red cells by means of the ISS refrigerated centrifuge is applied to the filter cards. Urine samples can also be applied directly to the filter cards. The whole blood, plasma, serum, or urine filter cards are then dried and stored at ambient temperature pending analyses which may require that they be returned to Earth. Many analytes in blood and urine samples prepared and stored by means of the NASA/JSC Dried Chemistry Technology are stable for several months. The development of alternative innovative techniques with advantages over currently used methods for processing and preserving biological samples at ambient temperatures during spaceflight that provide a high level of reliability in maintaining a wide array of both blood and urine analytes over a long period of ambient stowage is highly desirable.

Phase 1 Requirements: Phase 1 expectations include at a minimum a fully developed concept with feasibility analyses and top-level drawings. A breadboard or prototype is highly desirable.