

SMITH June 2012 Status Report

Three independent sampling chambers have been constructed with the all stainless steel components. We are in the process of verifying the systems are capable of maintaining a seal over the course of four days. This will ensure our sample will remain sealed during recovery and transport back to LSU without being exposed to ambient air and contaminating bacteria. Following these tests, the chambers will be decontaminated and the next tests can begin. We will run the system for 5 hours at STP and 5 hours at 5 mbar and compare the number of cells collected in order to ensure there is no contamination of the system that we have not addressed. Similar tests will be repeated to determine the number of cells that may remain in the chamber after filter removal and the most effective filter material to use during flight.

Research is underway enumerate bacterial endospores. The thioflavin T staining protocol will be a new piece of data we will collect on this year's sampling of the stratosphere. Previous staining techniques were impermeable to the bacterial endospore. Endospores have demonstrated increased resistance to ultraviolet (UV) radiation, chemical species such as H₂O₂, temperature, and low water availability when compared to vegetative cells. We hypothesize that spores will be able to endure environmental conditions in the stratosphere. We are currently finalizing our decontamination protocols and have begun testing on model organisms. We aim to demonstrate our decontamination protocols exceed the bioburden reductions level of the Viking missions.

We are currently finalizing the UV sensor boards. This will allow us to measure total UV fluence rates as well as rates for germicidal UV (250 nm). Because SMITH is sampling for microbes above the ozone layer, we predict UV radiation will be a major environmental constraint on bacterial survival.