Apparatus for Sampling Surface Contamination

Liquid suspensions of samples can be dispensed systematically into analytical instruments.

Marshall Space Flight Center, Alabama

An apparatus denoted a swab device has been developed as a convenient means of acquiring samples of contaminants from surfaces and suspending the samples in liquids. (Thereafter, the liquids can be dispensed, in controlled volumes, into scientific instruments for analysis of the contaminants.) The swab device is designed so as not to introduce additional contamination and to facilitate, simplify, and systematize the dispensing of controlled volumes of liquid into analytical instruments.

The use of currently commercially available contamination-sampling devices involves significant mechanical manipulation of samples and liquids, and there is no provision for systematic dispensing of controlled volumes of liquid into analytical instruments: A typical use involves wiping a surface of interest with a standard implement resembling a cotton swab. The implement is then placed into a volume containing the liquid in which the sample is to be suspended. Ultimately, the liquid must be extracted from this volume and dispensed into an analytical instrument by use of a pipette. The swab device is a single apparatus into which are combined all the equipment and materials needed for sampling surface contamination. The swab device contains disposable components stacked together on a nondisposable dispensing head. One of the disposable components is a supply cartridge holding a sufficient volume of liquid for one complete set of samples. (The liquid could be clean water or another suitable solvent, depending on the application.) This supply of liquid is sealed by Luer valves.

At the beginning of a sampling process, the user tears open a sealed bag containing the supply cartridge. A tip on the nondisposable dispensing head is engaged with a Luer valve on one end of the supply cartridge and rotated, locking the supply cartridge on the dispensing head and opening the valve. A bag containing a disposable swab tip is opened, and the end of the supply cartridge opposite the aforementioned end is engaged with the swab tip and rotated, opening a valve.

The swab tip includes a fabric swab that is wiped across the surface of interest to acquire a sample. A sealed bag containing a disposable dispensing tip (not to be confused with the non-disposable dispensing head) is then opened, and the swab tip is pushed into the dispensing tip until seated. The dispensing head contains a piston that passes through a spring-loaded lip seal. The air volume displaced by this piston forces the liquid out of the supply cartridge, over the swab, and into the dispensing tip. The piston is manually cycled to enforce oscillation of the air volume and thereby to cause water to flow to wash contaminants from the swab and cause the resulting liquid suspension of contaminants to flow into the dispensing tip. After cycling several times to ensure adequate mixing, liquid containing the suspended contaminant sample is dispensed through the dispensing tip in 25-μL increments into an analytical instrument. The disposable components are then removed from the dispensing head. Thereafter, the dispensing head can be reused with a fresh set of disposable components.

This work was done by Mark Wells of UAH for Marshall Space Flight Center. For further information, contact Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov. Refer to MFS-32560-1.

Novel Species of Non-Spore-Forming Bacteria

One new bacterial species was discovered in a regenerative enclosed life-support module air system.

NASA's Jet Propulsion Laboratory, Pasadena, California

While cataloging cultivatable microbes from the airborne biological diversity of the atmosphere of the Regenerative Enclosed life-support Module Simulator (REMS) system at Marshall Space Flight Center, two strains that belong to one novel bacterial species were isolated. Based on 16S rRNA gene sequencing and the unique morphology and the taxonomic characteristics of these strains, it is shown that they belong to the family *Intrasporangiaceae*, related to the genus *Tetrasphaera*, with phylogenetic distances from any validly described species of the genus *Tetrasphaera* ranging from 96.71 to 97.76 percent.

The fatty acid profile supported the affiliation of these novel strains to the genus *Tetrasphaera* except for the presence of higher concentrations of octadecenoic acid ($C_{18:0}$) and *cis*-9-octadecenoic acid ($C_{18:1}$), which discriminates these strains from other valid species. In addition, DNA-DNA hybridization studies indicate that these strains belong to a novel species that could be readily distinguished from its nearest neighbor, *Tetrasphaera japonica* AMC 5116^T, with less than 20 percent DNA relatedness. Physiological and biochemical tests show few phenotypic dissimilarities, but genotypic analysis allowed the differentiation of these gelatin-liquefying strains from previously reported strains. The name *Tetrasphaera remsis* sp. Nov. is proposed with the type strain 3-M5-R-4^T (=ATCC BAA-1496^T=CIP 109413^T). The GenBank/EMBL/DDBJ accession numbers for the 16S rRNA gene sequence are DQ447774 and EF028236 for the strains 3-M5-R-4^T and 3-M5-R-7, respectively.