Application and Demonstration of Macroarray Analytical Techniques for the Detection of Fungal Bioaerosols in Buildings

Award Recipient: **Environmental Laboratory Services,** 7280 Caswell Street, North Syracuse, NY 13212 *(els-lab.com)*

Project Title: Application and Demonstration of Macroarray Analytical Techniques for the Detection of Fungal Bioaerosols in Buildings

Collaborator: **SUNY College of Environmental Science and Forestry** *(esf.edu)*

Project Directors: Matthew DaRin, ELS, and Dr. Susan Anagnost, SUNY-ESF

Project Term: Jan 1 to December 31, 2008

Funding Amount: $149,141

Project Summary

The main objective of this project is to improve the ability to detect and characterize fungal bioaerosols in indoor environments through the integration of macroarray analytical techniques in a commercial laboratory. As medical researchers continue to evaluate the health effects of fungi (indoor bioaerosols), it is imperative that the analytical technologies being employed are as accurate, rigorous, and reproducible as possible. Correlations of health effects to individual species or genera based on inaccurate identifications are counterproductive to this critical research.

The current technologies are limited in many respects and oftentimes identifications themselves are inaccurate. The macroarray technique is a type of DNA array utilizing the same principle of DNA hybridization as the microarray. Macroarray is a membrane-based DNA array that simultaneously detects multiple fungal species in a single procedure. This project builds on the research currently being conducted at the SUNY College of Environmental Science & Forestry (SUNY ESF) under a previous grant from the Syracuse Center of Excellence (CoE), CARTI program. The primary objective of the research being performed at ESF is to develop species and genus specific probes for the detection of fungi commonly encountered in indoor environments utilizing macroarray technologies. The specific goals of the project are to (1) integrate this analytical technology into a commercial laboratory, (2) develop sampling methodologies for the collection of bioaerosols in environmental samples, (3) evaluate its efficacy compared to other existing analytical technologies and (4) ultimately develop commercialization strategies to integrate macroarray into the IAQ marketplace.

Our ability as IAQ consultants to diagnose problems associated with bioaerosols and provide mitigation recommendations is severely inhibited by the limitations of the current available analytical methodologies (culturable, direct microscopic exam, and PCR). Culturable methodologies (i.e. impaction plates) provide more definitive identification characteristics, but are also subjective and limited by both the viability and culturability of the fungi collected. Furthermore, culturable techniques are time consuming, often requiring 7-12 days of incubation before identifications can be made.

Direct microscopic examination techniques (i.e. spore traps) provide a means for collecting both viable and non-viable fungi and can be analyzed in a very short amount of time, but their identification is based on spores, which is not a reliable identification characteristic. Realtime PCR features shorter turn-around time, less laborious taxonomic accuracy and robustness, but at cost inhibitive price. A macroarray features comparable characteristics, furthermore it is cost-efficient and can detect hundreds of more targets in a single procedure. The multiplex capability of macroarray will exceed real-time PCR as more and more species are targeted. To better diagnose building problems and serve our clients it is necessary to employ analytical methodologies that provide the greatest and most empirical resolution at the most cost effective rate.

Environmental Laboratory Services and SUNY ESF have formed a team of research and industry professionals to help develop this technology and ultimately make it available to the broader IAQ marketplace. SUNY ESF will provide the initial training for the analysts and some of the necessary materials for the analyses. ELS will be providing the sampling method development, efficacy assays, and commercialization strategies.