MAXIMIZING THE VALUE OF EVIDENCE THROUGH THE PHYLOGENETIC DIFFERENTIAL SEPARATION OF ENVIRONMENTAL SAMPLES

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Forensic DNA analysis is typically used to target a single organism that is only one component of a more diverse biological sample, e.g., human DNA. Forensic samples can be considered a type of environmental sample and will routinely consist of many organisms. Those non-targeted organisms may hold significant value and may be used to provide probative information about the potential crime or event of interest. For example, samples obtained from non-pristine surfaces will likely contain plant and microbial life, these organisms may have unique discriminatory powers and permit the identification of an individual or geospatial data that may help corroborate stories. Further, these organisms can be used to establish a geolocationdatabase which can help track items and organism of interest from their origin. This research project focuses on optimizing a method for the phylogenetic differential separation of mixed samples. Specifically, the separation of bacterial, plant, and human cells in a mixed sample. Thismethod uses size exclusion filtration and differential chemical lysis, whereby the different types of cells are separated based on the size difference and subsequently treated with specific enzymes that target unique components of each cell type. The enzymatic treatments were optimized for each organism type. This method will allow complex sequencing-based analysis tobe interpreted more easily, and thereby maximizing the amount of genetic information that can be gleaned. This project has successfully separated bacterial cells from human epithelial cells and work is ongoing to optimize a three-organism separation, which includes plant cells.