Labeling and detection of biological molecules in Mars analog regolith using an antibody microarray

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Antibody (Ab) microarrays are grid-like arrays of antibodies printed on the surface of a glass slide. They are only a few millimeters across but consist of hundreds of different antibodies, each discretely located in a separate spot of 100-200μm-diameter. Each antibody binds to and recognizes a specific biological molecule termed the "antigen". Some antibodies printed in a microarray format can detect antigens at concentrations below 1ng/ml (Haab et al. 2001). Used extensively in biomedical applications, this technique has not yet been used for the detection of bacterial antigens in geological samples. A "microbe-specific" Ab microarray would provide a useful tool for *in situ* life detection in space due to its low mass, broad search capability and the reduced amount of sample required. We took Mars analog regolith spiked with *E. coli* lysate, labeled the lysate (via amine groups) with a fluorescent molecule and detected labeled antigen using an Ab microarray printed with 8 different antibodies. Two *E. coli* antigens were detected in the spiked regolith and array function was retained eight months following printing, indicating its stability for Earth-Mars travel. This study indicates the enormous potential of Ab microarrays as an *in situ* tool to search for life in the Solar System.