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Subcellular modification of tissue by near-field laser ablation[1] M. E. REEVES, George Washington University, J. A. HOFFMANN, Applied Physics Laboratory, JASPER NIJDAM, BENJAMIN GAMARI, George Washington University, PROTEIN MICROSCOPE COLLABORATION — We report on the development of a near-field approach to MALDI (Matrix-assisted laser desorption and Ionization). In this technique analytes embedded in an energy absorbing matrix are ablated from the surface of a sample. In the infrared region, the matrix can be water by exciting the 3-micron vibrational mode of the water molecule. 3-micron wavelength lasers are available with sufficient power to ablate materials of interest, particularly biological samples, however, in most cases the spot size is fairly large, about 40 microns or more, due to the primitive optics available for this wavelength of light. In our laboratory, we have demonstrated near-field focusing of a 3-micron laser to a sub-wavelength spot size with energy sufficient to ablate material from the sample surface. We will review our findings and describe demonstrations of tissue modification by this approach at length scales smaller than a single cell. This approach has the potential to allow the identification and mapping of proteins expressed in intact cells and tissues, which is of great interest as protein expression connects genomic information with the functioning of an organism.

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