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Real-Time Monitoring of Cellular Metabolism Using a Bioreactor in a Benchtop NMR Spectrometer JAMES MULHERN, KHOA NGUYEN, BRIANNA ROYER, KATHLEEN DOMALOGDOG, STUART MALINA, ESHA BANSAL, QING WANG, FATEMEH KASHAMI, LLOYD LUMATA, Department of Physics, University of Texas at Dallas, Richardson, TX 75080 — Nuclear magnetic resonance (NMR) is a non-destructive analytical technique that uses non-ionizing radiofrequency (RF) waves for chemical elucidation of living and non-living objects. In this project, we have demonstrated that the metabolism of glucose, fructose, and sucrose in cancer cells and Saccharomyces cerevisae (Baker's yeast) can be monitored in real-time with high chemical specificity using either static or continuous-flow bioreactor tubes inside a benchtop NMR spectrometer. Both proton (1H) and carbon-13 NMR spectroscopic measurements were performed which allowed us to track the biochemical fates of a variety of nutrients in cells. Experimental results will be discussed in light of the importance of real-time biochemical detection in living cells, as well as possible expansion to a variety of cell lines and biochemical quantitation of their enzymatic reactions. This study is supported by the Welch Foundation grant AT-1877-20180324, DOD grants W18XWH-17-1-0303 and W81XWH-19-1-0741, Cancer Prevention and Research Institute of Texas (CPRIT) grant RP180716, and the UTD Collaborative Biomedical Research Award (CoBRA).

James Mulhern
Department of Physics, University of Texas at Dallas, Richardson, TX 75080

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