Investigator Spotlight

Cellular Metabolism and Metabolomics

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Isotope tracers are essential tools for monitoring metabolic pathway activity, *i.e.* flux. To quantitate flux in central carbon metabolism in cultured mammalian cells, D-Glucose ($^{13}C_6$, 99%) (CLM-1396) or L-Glutamine ($^{13}C_5$, 99%) (CLM-1822) is added to media lacking these principal nutrients. Cells are grown in the labeled media, and metabolite labeling is measured by GC/MS or LC/MS. Glucose has traditionally been considered to be the primary carbon source for many cell types, especially cancer cells. Recent studies show, however, the glutamine often plays a predominant role in feeding the tricarboxylic acid (TCA) cycle. The extent of contribution of glutamine to TCA cycle four-carbon units can be measured based on malate and asparate labeling, and to two-carbon units based on acetyl-CoA and fatty acid labeling. Citrate is a particularly informative molecule, because it reflects both two- and four-carbon units of the TCA cycle. With modern instrumentation, it is possible to measure in parallel the isotope labeling of all of these species, and dozens more, enabling systems-level flux quantitation. These methods can translate also to the *in vivo* setting, with mice or patients infused with labeled nutrients prior to resection of a tumor or other tissue specimen. The importance of metabolism in both bioengineering and disease pathophysiology is leading to wide application of these methods across the biochemical sciences.