

Resource Summary Report

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Case - Heavy Water Assays by GC-mass spectrometry

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Protocol Information

URL: <https://dx.doi.org/10.17504/protocols.io.ydsfs6e>

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Group: Mouse Metabolic Phenotyping Centers, Metabolomics Protocols & Workflows

Summary: Heavy water can be used as a tracer for estimating metabolic rates (in vivo, in vitro) such as total energy expenditure (TEE) and fractional synthesis rates (FSR; eg. protein, lipids, triglycerides). When using both $^2\text{H}_2\text{O}$ and H^2^{18}O (DLW), TEE is estimated from the total production of CO_2 as measured by the differences in decay rates of labeled the ^{18}O and ^2H in body water over time following a single bolus of DLW (1). $^2\text{H}_2\text{O}$ can be used to estimate fractional synthesis rates of metabolic reactions such as those associated with proteins, lipids, triglycerides, and cholesterol (2,4).References: 1. Gas chromatography-mass spectrometry assay of the (^{18}O) O enrichment of water as trimethyl phosphate. Brunengraber DZ, McCabe BJ, Katanik J, and Previs SF. Anal Biochem 306: 278– 282 (2002). 2. Increased plasma membrane cholesterol in cystic fibrosis cells correlates with CFTR genotype and depends on de novo cholesterol synthesis. Fang D, West RH, Manson ME, Ruddy J, Jiang D, Previs SF, Sonawane ND, Burgess JD, Kelley TJ. Respir Res.; 11:61 (2010). 3. Triglyceride synthesis in epididymal adipose tissue: contribution of glucose and non-glucose carbon sources. Bederman IR, Foy S, Chandramouli V, Alexander JC, Previs SF. J Biol Chem.; 284(10):6101-8 (2009). 4. Novel application of the "doubly labeled" water method: measuring CO_2 production and the tissue-specific dynamics of lipid and protein in vivo. Bederman IR, Dufner DA, Alexander JC, Previs SF. Am J Physiol Endocrinol Metab.; 290(5):E1048-56 (2006).

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