



International Conference & Exhibition on Analytical and Bioanalytical Techniques 2010

ANALBIOANAL - 2010

Pharmaceutical R & D Summit

doi:10.4172/2155-9872.1000076

Carbon Isotope Ratio Mass Spectrometric Studies in Medicine

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The use of stable carbon isotopes in metabolic research on humans has expanded significantly since the early 1980s. This is due to a combination of factors such as the availability of increasing variety of labeled compounds, absence of health risk from radiation and more significantly due to the development of sophisticated instrumentation and greater availability of analytical facilities. Usage of ^{13}C labeled substrates in human studies has provided an array of information especially on the biochemistry, physiology and disease status. Some examples of this include the utilization of ^{13}C -octanoate in the Gastric Mobility Breath Test, ^{13}C -Methionine in the methionine Breath Test for measuring hepatic mitochondrial function, and ^{13}C -Phenylalanine in ^{13}C -Phenylalanine Breath Test. While simpler ^{13}C substrates such as sugars, amino acids and fatty acids are readily commercially available, proteins and carbohydrates generally are not. One can obtain these by labeling photosynthetic organisms with $^{13}\text{CO}_2$ during photosynthesis and then isolating the compound of interest. One can also take advantage of the naturally enriched substrates for metabolic studies by a prudent selection of these material from plants following different photosynthetic pathways. Most of the human diet is derived from food items from plants following the C_3 photosynthetic pathway which display more negative carbon-13 signature than the plants that follow C_4 type of photosynthetic metabolism. Thus by a simple and imaginative manipulation of the diet by mixing material obtained from both C_3 and C_4 plants, one could obtain a significant physiological information which might lead to the synthesis of newer pharmacological compounds.