

A NOVEL APPROACH FOR IDENTIFICATION AND QUANTIFICATION OF ENANTIOMERIC EXCESS IN CHIRAL CARBOXYLIC ACIDS FROM EET87770 AND MURCHISON.

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Introduction: The origins of the chirality that rules life on Earth is one of the most fundamental questions remains to be answered and fully understood [1]. The discovery of enantiomeric excess (ee) for amino acids present in Murray and Murchison CM2 type carbonaceous chondrites (CC) has contributed the now-thriving hypothesis that this CC may have seeded Earth with the critical initial inventory of prebiotic organic compounds necessary for the origin of life and that left-handed molecules in meteorites initiated the chiral homogeneity that defines life today [2].

In spite of this, there are few reports attempting to define the ee of organic compounds other than amino acids found on CC [3]. Monocarboxylic acids and Dicarboxylic acids (CAs) are synthetic precursors for many biologically important compounds and are even more abundant than amino acids in CC such as Murchison [4]. Understanding the chirality of these compound classes is therefore crucial for deciphering the origin of molecular asymmetry in meteorites and on Earth.

We have developed a robust method to efficiently separate branched-chiral CAs found in water soluble fractions of meteorites and those derived from RuO₄ oxidation of meteorite insoluble organic matter. We apply the new approach to EET87770 and Murchison samples. The conversion of the CAs containing one chiral center to their corresponding diastereomers-esters allowed a rapid identification of one monocarboxylic acid (2-methyl butyric acid ester), one dicarboxylic acid (3-methyl adipic acid ester) and seven other diastereomeric carboxylic esters, without the need of using the relatively fragile chiral GC columns. The identity and ee of these esters was determined by direct retention time comparison with reference standards using GC-FID and GC-MS/MS analyses. Accurate quantification of ee was achieved by GC-MS/MS analysis that allows elimination of coelution by defining the parent-daughter ions simultaneously.

References: [1] Pizzarello S. 2006. *Accounts of Chemical Research* 39:231-237. [2] Cronin J. R. and Carleton B. M. 1971. *Science* 172:1327-1329. [3] Huang Y. et al. 2005. *Geochimica et Cosmochimica Acta* 69:1073-1084. [4] Kawasaki T. et. al. 2006. *Geochimica et Cosmochimica Acta* 70:5395-5402.