UNUSUAL ISOTOPIC COMPOSITIONS OF HYDROGEN, NITROGEN, AND CARBON OF AMINO ACIDS AND CARBOXYLIC ACIDS FROM THE MURCHISON METEORITE; S. Epstein and R.V. Krishnamurthy, Division of Geological and Planetary Sciences, California Inst. of Tech., Pasadena, CA 91125, J.R. Cronin, S. Pizzarello, and G.U. Yuen, Department of Chemistry and Center for Meteorite Studies, Arizona State University, Tempe, AR 85287

A well characterized suite of amino acids and carboxylic acids were extracted from the water soluble fraction of the Murchison meteorite using well established techniques (1,2). The isotopic compositions of the amino acids gave a δD value of 1370°/oo (after correction for the hydrogen isotope of the exchangeable hydrogen), a $\delta^{15}N$ value of 90°/oo and a $\delta^{13}C$ value of 25°/oo. The monocarboxylic acid gave a δD value of 377°/oo and a $\delta^{13}C$ value of -1.3°/oo. The hydrogen, nitrogen and CO_2 were extracted under conditions which minimized the possible contributions of terrestrial contaminants. On the other hand the possible presence of unaccounted for terrestrial contamination cannot be entirely ruled out. Consequently the isotope values we report here are minimum values.

The isotope values provide very strong evidence of the extraterrestrial origin of these materials and generally bear on the historic problem of distinguishing indigenous material from terrestrial contamination in meteorites (1,3). We have previously argued that based on the high δD values of the total organic matter in HCl-HF residues of Murchison meteorites are of interstellar origin. On the other hand the δD values of the inorganic hydrogen in these meteorites which are similar to the δD values of terrestrial hydrogen are from the solar nebula (4). If these arguments are correct, amino acids or their precursors may very well be of interstellar origin.

References

(1) Cronin, J.R., Gandy, W.E. & Pizzarello, S. in Biogeochemistry of Amino Acids, (eds. Hare, P.E., Hoering, T.C. & King, K. Jr.) John Wiley, New York, 1980)

(2) Cronin, J.R. & Pizzarello, S. Geochim. Cosmochim. Acta 50, in press (1986)

(3) Kvenvolden, K.A. et al. Nature 228, 923-926 (1970)

(4) Yang, J. & Epstein, S. Geochim. Cosmochim. Acta 47, 2199-2216 (1983)