SUGARS AND THEIR DERIVATIVES IN RESIDUES PRODUCED FROM THE UV IRRADIATION OF ASTROPHYSICAL ICE ANALOGS. M. Nuevo[1,2], S. A. Sandford[1], and G. Cooper[1], [1]NASA Ames Research Center, MS 245-6, Moffett Field, CA 94035, USA, [2]BAER Institute, 625 2nd St., Ste. 209, Petaluma, CA 94952, USA; E-mails: michel.nuevo-1@nasa.gov; scott.a.sandford@nasa.gov.

Introduction: Murchison as well as other carbonaceous chondrites contain a large variety of organics, which include amino acids **[1,2]**, amphiphiles **[3,4]**, nucleobases **[5,6]**, functionalized polycylic aromatic hydrocarbons **[7,8]**, and sugar derivatives **[9]** (Fig. 1). The presence of these compounds of prebiotic significance in meteorites suggests that molecules essential to life can form abiotically under astrophysical conditions. Among the sugar derivatives found in Murchison and Murray **[9]**, one sugar (dihydroxyacetone) and a large variety of sugar derivatives containing up to 6 carbon atoms were identified.

Laboratory studies in the last two decades have routinely shown that complex organics are formed when simulated astrophysical ice mixtures consisting of H_2O, CO, CO_2, CH_3OH, CH_4, NH_3, etc., are irradiated with ultraviolet (UV) light at low temperature. The organic residues recovered at room temperature in these experiments were shown to contain similar organics to those found in meteorites **[10–17]**.

However, the formation of sugars and their derivatives in such residues has only been studied very recently. Sugar alcohols, sugars, and sugar acids were first detected **[18,19]**, before ribose (the sugar of RNA) and other large sugar derivatives (with up to 6 carbon atoms) were identified in one residue **[20]**.

Results: We have performed a large number of experiments in which ice mixtures containing H_2O, CH_3OH, CO, CO_2, and/or NH_3 were UV irradiated at 10 K, and carried out a systematic search for sugars and sugar derivatives in the resulting organic residues. Results confirm the presence of a wide variety of sugar alcohols, sugars, and sugar acids with up to 6 carbon atoms, including ribose, and shows the presence of several other variants of sugar derivatives that have not been reported in previous studies **[21]**. Finally, these experimental results can be compared with meteoritic data **[9]**.

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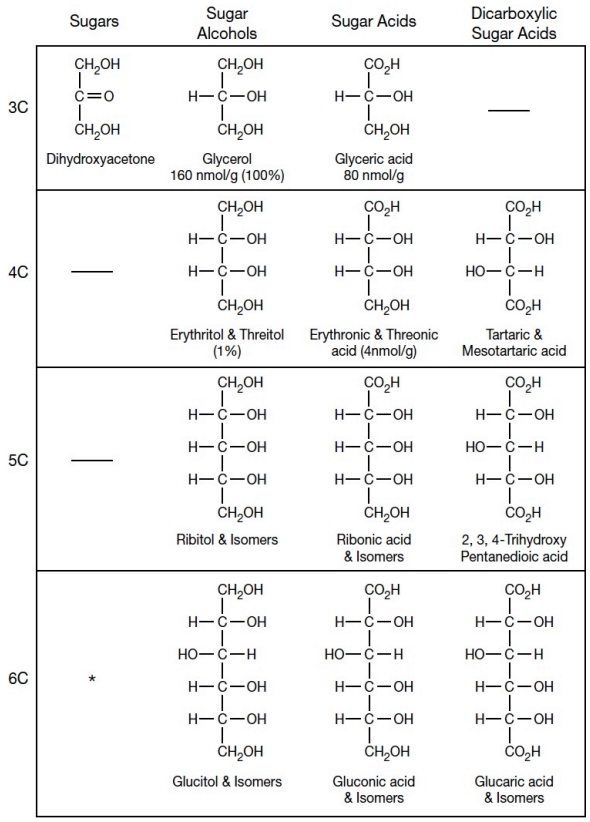

Fig. 1. *Sugars, sugar alcohols, sugar acids, and dicarboxylic sugar acids found in the Murchison and Murray meteorites (from Ref. **[9]**).*