ELUCIDATING THE ABIOTIC ORIGINS OF CITRIC ACID CYCLE COMPOUNDS DETECTED IN CARBONACEOUS METEORITES.

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Introduction: Many of the citric acid cycle compounds along with pyruvate were recently detected in carbonaceous meteorites [1]. It was also reported that pyruvate could lead to the abiotic formation of the citric acid cycle metabolites [1]. In biology, pyruvate is a central molecule in metabolic processes. It is the formal product of glycolysis that occurs from the breakdown of glucose. Pyruvate then becomes the acetyl moiety of acetyl CoA which feeds the citric acid cycle. Others have hypothesized that pyruvate may have played a key role in the emergence of a proto-metabolism [2 –5]. Did the detection of pyruvate and related citric acid cycle compounds in meteorites provide evidence to this premise?

A main focus of this research has been on the elucidation of reaction mechanisms to explain the products observed in the meteorites and to understand the natural chemistry of pyruvate under alkaline conditions. Currently we are working towards understanding the formation of oxaloacetate, which appears to be the first formed citric acid cycle compound in the reaction mixtures. Understanding the molecular pathway for these reactions is the only way to determine if all of the citric acid cycle metabolites share a common core precursor or a set of related precursors that may have influenced their natural selection from prebiotic chemistry (Fig 1). Results from these studies including proposed mechanistic pathways will be presented.

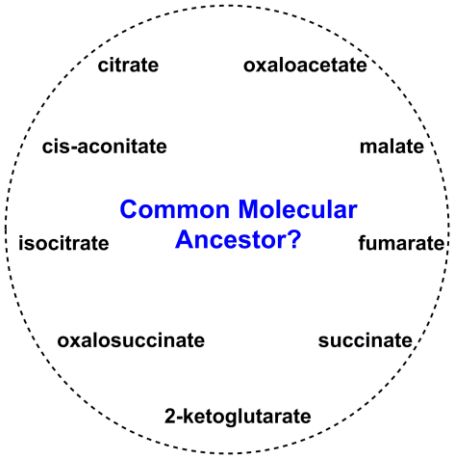

Figure 1. The family of intermediary metabolites associated with the citric acid cycle may have a common molecular precursor or set of precursors based on the natural chemistry of pyruvate, a compound detected in carbonaceous meteorites.

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