Understanding the formation of astrobiological molecules in star-forming regions

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The increasing number of detections of complex organic molecules around young stellar objects strongly suggests that they are part of the material of which planetary systems are made of. These molecules play a central role in interstellar prebiotic chemistry and may be directly linked to the origin of life. Since the hot and dense molecular cores surrounding massive stars harbor the richest chemistry in the insterstellar medium, they are the best natural laboratories to study the formation of these complex molecules. While the detection of the simplest amino acids such as glycine still remains elusive, the search of two other families of prebiotic molecules has been more successful: aldoses and polyols. The monosaccharide sugar glycolaldehyde, CH_2OHCHO, is the simplest representative of the aldoses. This molecule can react with propenal to form ribose, a central constituent of RNA. The simplest representative of the polyols is the reduced alcohol of glycolaldehyde, ethylene glycol, $(CH_2OH)_2$. In my talk I will present our results from observations towards the hot molecular core G31.41+0.31, one of the most chemically rich astronomical sources. Among many other simpler molecules, we have confirmed the presence of glycolaldehyde (for the first time outside the center of our galaxy) and ethylene glycol, along with their proposed precursor, the formyl radical HCO. I will discuss how these findings can help us to understand the formation of these building blocks of life in the insterstellar medium, with the help of chemical models and laboratory works.

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