

Dynamic DNA and RNA Methylation/Demethylation in Biological Regulation

Chuan He

*Department of Chemistry, University of Chicago, 929 East 57th Street, Chicago, IL, 60637, USA
Email: chuanhe@uchicago.edu*

Reversible chemical modifications on nucleic acids and proteins determine cell fates. The five bases that comprise nucleic acids — adenine, guanine, cytosine, thymine, and uracil — can be chemically and enzymatically modified. These chemical events can have significant biological consequences, particularly for gene expression. I will present chemical strategies we have developed to enrich, sequence, and study novel nucleic acid modifications that include 5-hydroxymethylcytosine and its further oxidized forms in mammalian genome. Several AlkB family proteins have been identified in the human genome that may mediate nucleic acids oxidation. Some of these proteins play critical roles in obesity/diabetes and various cancers. I will present our recent results that reveal demethylation of mammalian messenger RNA catalyzed by some of these intriguing enzymes. Based on these discoveries we propose a new mode of biological regulation that depends on reversible RNA modification, for which we termed “RNA Epigenetics”.