Wednesday, June 23rd 2:00 pm CDT

Could β-NMR and stardust help explain why we get sick?

Abstract:

Of 118 known chemical elements, 26 are essential for life. They perform life-sustaining function inside of our body, like carrying oxygen from the lungs to the rest of the body, building the bones, or relaxing the muscles. Two of these elements – copper (Cu) and zinc (Zn) - make up less than 0.1% of our body mass, but they are nevertheless critical to our health. Both deficiency and excess of either of them is pathological and has been linked to various severe diseases, including Alzheimer's Disease and Parkinson's Disease. Therefore, strict control mechanisms exist in our body to ensure that the amount of these elements are kept in steady state. In order to understand the exact role of Cu and Zn in health and disease, it is important to understand the binding chemistry and the coordination environment of Cu and Zn in different biomolecules.
Unfortunately, the absence of convenient physical and spectroscopic properties to study Cu and Zn directly has so far held back a detailed understanding of their biochemistry.
Nuclear magnetic resonance (NMR) spectroscopy is probably the most powerful single technique to explore the structure and dynamics of metal-binding biomolecules in solution. In practice however, NMR suffers from poor sensitivity for several elements, including both Cu and Zn. β-radiation detected NMR (β-NMR) spectroscopy is an ultrasensitive variation of NMR technique which is based on the detection of β-particles emitted anisotropically by spin polarized nuclei. The combination of nuclear spin polarization and high detection efficiency of β-particles gives rise to a billion fold (10^9) or higher increase in sensitivity as compared to conventional NMR, and allows for interrogation of elements which are otherwise difficult to access.
In this talk I will demonstrate the potential of the β-NMR technique and recent advances of β-NMR experiments with biomolecules in solution. I will also highlight the advances made towards β-NMR measurements on Ac isotopes, and hint at how β-NMR and stardust could help us understand why we get sick.

Zoom Link:
https://tamu.zoom.us/j/96561564984?pwd=cDNDc1VSQW1XaEh3VnRmVFBjSWg1QT09

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