Site-specific structure changes of the Rous Sarcoma virus capsid proteins upon assembly revealed by solid state NMR

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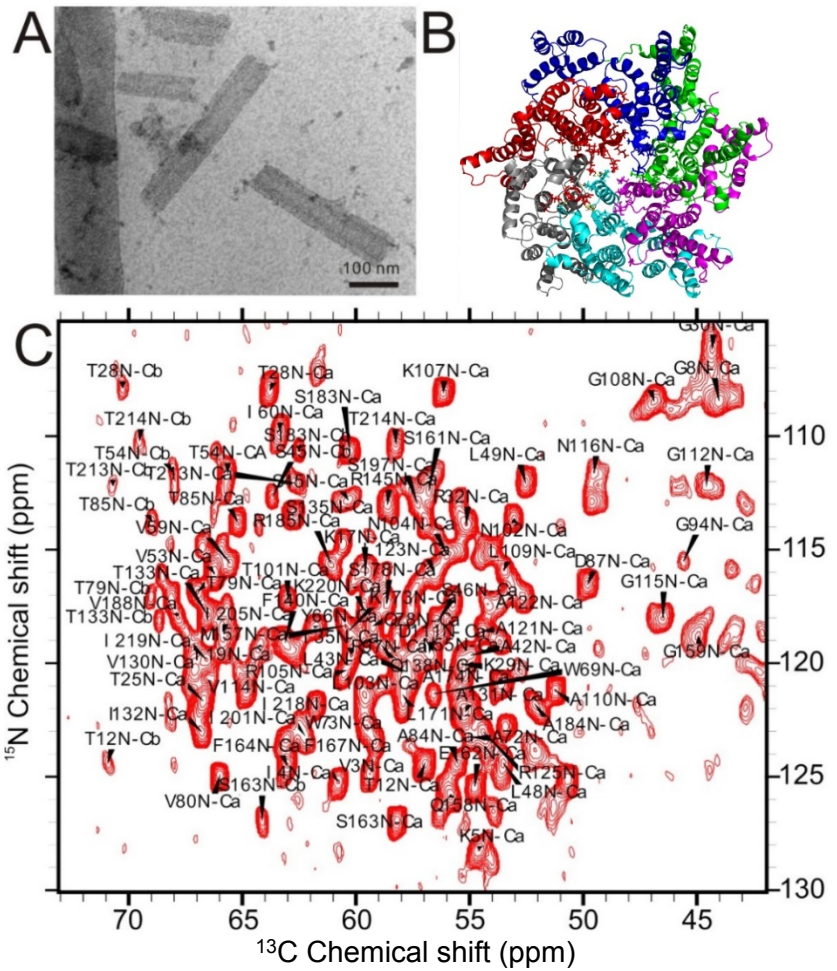
The Rous Sarcoma virus (RSV) is the archetype of the retrovirus family that includes many formidable pathogens such as HIV that causes AIDS. The viral genome is housed within and protected by a protein "capsid" shell. The capsid is formed by ~1500 copies of a single retrovirus capsid protein. All capsid proteins share a common tertiary structure (Fig.B), yet assemble into distinctly-shaped capsids. The *in vitro* retroviral capsid assemblies (Fig.A) provide a convenient avenue to study the *in vivo* capsids that are found in living systems. The high resolution structural knowledge of these assemblies will aid the design of antiviral drugs to disrupt this protective capsid. However, the intrinsic polymorphism of the retroviral capsid assemblies defies conventional structural characterization techniques.

High-magnetic-field solid state NMR (ssNMR) is the ideal technique to characterize the structure and dynamics of disordered systems at atomic resolution. The high magnetic fields plus the MagLab's low-electric-field probe[1] enable the acquisition of high resolution spectra (Fig.C) to study large and disordered assemblies formed by RSV capsid proteins.

Recent user results reveal detailed structural rearrangements of the capsid proteins upon capsid assembly. This provides critical insights for understanding retroviral capsid formation. The study more broadly advances sequential assignment strategies for ssNMR studies of large protein assemblies.

Facilities: MagLab solid state NMR systems, including low-E probe.

Citation: 1. McNeill, S.A.; Gor'kov, P.L.; Shetty,K.; Brey, W.W. and Long, J.R. *A low-E magic angle spinning probe for solid state NMR at 750 MHz*. J. Mag Reson. 197:135-144 (2009)



A. *In vitro* tubular assemblies formed by the RSV capsid proteins. B. Hexamer structure formed by the capsid protein. C. 2D ssNMR carbon/nitrogen correlation spectrum peak assignments leading to successful determination of the RSV capsid structure.