

Announcing the Final Examination of Mr. Jaekyun Jeon for the Degree of Doctor of Philosophy in Physics

Date: Friday, July 8, 2016

Time: 9:00 a.m.

Room: PSB 248

Dissertation title: Self-assembly of Rous Sarcoma Virus (RSV) capsid protein probed by solid-state NMR and TEM

The retroviral capsid is derived from the cleavage of Gag protein in the maturation process, and self-assembles into a polymorphic fullerene-like form enclosing the viral genomic materials. Retroviral capsid proteins, for instance, HIV (Human Immunodeficiency Virus) and RSV (Rous Sarcoma Virus) capsids, have little similarity in their sequences and show very resembling tertiary structures, but form distinct capsid assemblies *in vivo* and a range of similar assemblies *in vitro*. These polymorphic characteristics of capsid assemblies are expected to make excellent applications to developing antiviral drugs or drug delivery vehicles, however, the fundamental mechanism for the capsid protein assembly is remained unclear.

In this study, we investigated the tubular assembly of RSV capsid by using Transmission Electron Microscopy (TEM) and solid-state NMR (ssNMR). While solid-state NMR was appointed for an ideal platform for investigating the retroviral capsid system, the site-specific analysis was challenging for such non-crystalline proteins with large sizes about 25 kDa as retroviral capsids, showing highly overlapping peaks and broadened line-widths in the spectra. Here we prepared recombinant RSV capsid protein with various ¹³C and ¹⁵N isotope labeling scheme, and acquired a series of ssNMR spectra at high magnetic fields. As a result, we were able to make a complete site-specific chemical shift assignment with a computer-aided assignment program based on Monte Carlo Simulated Annealing algorithm. Subsequently we established the atomistic resolution structure model for the tubular assembly of RSV capsid by combining the electron density map obtained by cryo Electron Microscopy (cryo-EM) and torsion angle restraints derived from the NMR site-specific assignment, and identified the residue-specific assembly interfaces. In this presentation, I will discuss more details including structural variations and the assembly pathways upon the tubular assembly.

Outline of Studies:

Major: Physics

Educational Career:

B. S., 2007, Hanyang University, S. Korea

M. S., 2009, Hanyang University, S. Korea

Committee in Charge:

Dr. Bo Chen

Dr. Suren A. Tatulian

Dr. Alfons F. Schulte

Dr. Alexander M. Cole

Approved for distribution by Bo Chen, Committee Chair, on June 24, 2016.

The public is welcome to attend.