The archaeal exosome

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Exosomes are large, nine to ten subunit containing RNase complexes that emerge as the central RNA 3’-degradation and processing machinery in eukaryotes and archaea. We recently could obtain first high resolution models of two nine subunit archaeal exosome isoforms from Archaeoglobus fulgidus. The exosome complexes consist of a pseudo-hexameric ring of three Rrp41:Rrp42 heterodimers plus a (pseudo) trimer of Csl4 or Rrp4 subunits.

To see, if exosome complexes, especially the RNA binding subunits Rrp4 and Csl4, adopt flexible conformations in solution, we performed SAXS experiments. Ab initio models were calculated using GASBOR and overlayed with the crystal structure using DAMAVER. Interestingly, SAXS derived ab initio models of nine subunit exosomes show comparable conformations to the crystal structures, whereas the Rrp41 subunit of the RNase PH core exhibits conformational flexibility in the absence of Rrp4/Csl4: The long C-terminal helix, which adopts different conformations in the two nine-subunit complexes thus seems to be flexible in solution when no Rrp4 or Csl4 is bound (Figure 1).

Figure 1: Overlay of crystal structures of different exosome complexes with the corresponding solution structures (spheres). A: Rrp41+Rrp42 (green) + Rrp4 (red). B: Rrp41+Rrp42 (green) + Csl4 (orange). C: Rrp41+Rrp42 from the Rrp4-complex (light green) and Rrp41+Rrp42 from the Csl4-complex (dark green).

References