Making the maker: structural study of a precursor to the yeast small ribosomal subunit

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Ribosome assembly is a complex process, that must be finely regulated to quickly adapt to cellular needs. It requires the production and the correct assembly of ~ 80 ribosomal proteins (RPs) with 4 ribosomal RNAs (rRNAs), and the intervention of more than 200 ribosomal assembly factors (RAFs). These SnoRNP and proteins are necessary for rRNA maturation, modifications as well as structural assembly of the ribosomal subunits. Defects in ribosome synthesis have been recently associated to an increasing list of human genetic diseases (called ribosomopathies) and cancers, which calls for a precise understanding of each and every step of ribosome biogenesis mechanisms. A wealth of molecular and functional studies has allowed to recently define several successive cytoplasmic maturation steps of yeast pre-40S particles. It is now crucial to integrate those highly detailed molecular descriptions of the ribosome maturation events into a three-dimensional vision of ribosome assembly, and to understand the structural remodeling that pre-ribosomal particles may undergo along their maturation path.

Using tandem affinity purification methods, coupled to cryo-electron microscopy and single particles analyses, we have determined a 6.8Å resolution 3D structure of a yeast cytoplasmic pre-40S particle. Using rigid body docking and flexible fitting analyses, we have obtained a pseudo-atomic model of this pre-40S particle, which will be presented and discussed here.

Keywords: Yeast ribosome biogenesis, small subunit, Cryo-TEM, Image analysis