UTP21 is an essential gene that is found in both the 90S preribosomeand the SSU processomecomplexes. A mutation in UTP21 exhibits a synthetic growth defect with a deletion of STI1, which encodes an Hsp90 cochaperone. The human homolog of UTP21 is WDR36, a protein which contains nine WD40 repeats and is one of several genes linked to primary open angle glaucoma, the most common form of glaucoma and a leading cause of blindness worldwide. The zebrafish homolog, Wdr36, is essential and loss of function causes defects in 18S rRNA production, consistent with the phenotype of loss of utp21 function in S. cerevisiae, and activation of the p53 stress response pathway.About the early stages of rRNA processing and 40S small ribosomal subunit assembly The early stages of ribosome assembly occur in conjunction with processing of the 35S pre-ribosomal RNA transcript into the mature 18S, 5.8S, and 25S rRNA molecules. The first three cleavages at A0, A1, and A2are essential for production of the 18S rRNA and the 40S small ribosomal subunit, but mutations which interfere with these cleavages have little effect on production of the 60S large ribosomal subunit. These three early cleavages occur in a series of large U3-associated ribonucleoprotein complexesand require base pairing of the U3 snoRNA with sequences in the 5'-ETS and the 18S rRNA. Click on the following figure for more details about the rDNA repeat and cleavage sites within the rRNA transcript:About the 90S preribosome and SSU processome complexes A number of U3-containing early ribosome assembly and rRNA processing complexes have been identified that contain the 35S pre-rRNA transcript and have overlapping but not identical protein compositions. Both the 90S preribosome and the small subunitprocessome complexes contain ribosomal proteins, primarily of the small subunit, and non-ribosomal proteins presumably involved in rRNA processing and assembly of the small 40S ribsomal subunit. While many proteins are found in both complexes, some are found in only one or the other. It may be that the 90S preribosome and SSU processome complexes are both intermediates in a series of complexes leading to the assembly of the small ribosomal subunit, or it may be that the SSU processome lies on an alternate assembly pathway. The 90S preribosome complex is described as corresponding to the earliest detectable rRNA processing and ribosome assembly complex. The 90S is itself assembled from a number of stable subcomplexes including the t-UTP subcomplex, the Pwp2p/UTP-B subcomplexwhich interacts directly with the 5'-ETS of the 35S pre-rRNA, the UTP-C subcomplex, and the Mpp10 subcomplex. The t-UTP subcomplex is also found as part of the SSU processome complex, which is slightly smaller at 80S. Depletion of any of the members of the t-UTP subcomplex results in decreased transcription of rDNA leading to decreased levels of the primary 35S rRNA transcript. In contrast, mutation or depletion of most other members of either the 90S preribosome or SSU processome complexes causes decreased 18S rRNA levels without affecting the levels of the 25S or 5.8S rRNAs.Non-ribosomal protein components of the 90S preribosome and SSU processome Subunits of both the 90S preribosomeand SSU processomeinclude: Bud21p, Dip2p, Ecm16p, Emg1p, Imp3p, Imp4p, Krr1p, Mpp10p, Nan1p, Noc4p, Nop1p, Nop14p, Nop58p, Pwp2p, Rrp5p, Rrp9p, Nop56p, Sof1p, Utp4p, Utp6p, Utp7p, Utp8p, Utp9p, Utp10p, Utp13p, Utp15p, Utp18p, Utp20p, Utp21p, and Utp22p Additional subunits of the 90S preribosomeinclude: Bfr2p, Bms1p, Cbf5p, Cms1p, Dbp8p, Dim1p, Enp1p, Enp2p, Has1p, Kre33p, Mrd1p, Nop9p, Pno1p, Prp43p, Rcl1p, Rok1p, Rrp12p, Scl1p, Slx9p, Tsr1p, and Utp30p Additional subunits of the SSU processomeinclude: Fcf1p, Utp23p, Sas10p, Snu13p, Utp5p, Utp11p, and Utp14p