NANYANG TECHNOLOGICAL UNIVERSITY

School of Biological Sciences

SBS Seminar Announcement

Professor Jaanus Remme
Chair of Molecular Biology
The Institute of Molecular and Cell Biology
University of Tartu, Estonia

Ribosomal RNA modification during ribosome assembly

Abstract

Ribosome assembly involves processing and modification of rRNA and r-proteins, association of both components into functional subunits via series of conformational changes. Nucleolytic processing and modification of rRNA are coordinated with the stepwise r-protein association into functional ribosome. We have analyzed synthesis of individual rRNA modifications during different stages of ribosome assembly in E. coli. It was found that specific modifications are formed during early steps of ribosome assembly. Another group of modifications are made during intermediate stage of ribosome subunit assembly. The third group of rRNA modifications is made during late stages of ribosome subunit assembly, after the binding of r-proteins. Interestingly, most of the modified nucleosides of the ribosome large subunit are made during early assembly events while majority of the small subunit modifications belong to the late assembly group. In particular, modifications of the helices 44 and 45 of 16S rRNA are made during late stage of the small subunit assembly. The last modification of the rRNA is the methylation of pseudouridine 1915 of 23S rRNA. The corresponding enzyme (RlmH) requires association of ribosomal subunits into 70S. Some specific modification events seem to stimulate progression of ribosome assembly (RlmE, RlmA). Over modification of rRNA can inhibit ribosome assembly. Excessive pseudouridines introduced into the rRNA by mutant pseudourdine syunthase RluD block progression of ribosome assembly due to the accumulation of misassembled particles. Pseudouridines in the central part of 23S rRNA prevent formation of the ribosome 50S subunits. About 20 positions in 23S rRNA were identified as assembly interference sites. Possible roles of pseudouridines during rRNA folding are discussed. We conclude that rRNSA modifications at non-native positions can facilitate formation of misfolded rRNA structures.

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Host: A/Prof Gao Yonggui

60 Nanyang Drive, Singapore 637551
Tel: +65 6316 2800 Fax: +65 6791 3856
Email: d-sbs@ntu.edu.sg www.ntu.edu.sg/sbs