

Role of U13 small nucleolar RNA on biogenesis of 18S rRNA

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Since the second half of 1990's, many small nucleolar RNAs (snoRNAs) are shown to be involved in modification (2'-O-methylation or pseudouridylation) of nucleosides on rRNAs. U13 snoRNA was first identified in 1986 as a trimethylguanosine-capped, box C/D class snoRNA isolated from HeLa cells.

We have isolated and characterized the U13 snoRNA in chicken DT40 cells as a trimethylguanosine-capped small RNA associated with larger RNA species. According to the complementarity to the 3'-end of 18S rRNA, U13 RNA has been hypothesized to be involved in maturation of the 3'-end region of 18S rRNA. Cavaille et al. (1996) discussed the involvement of U13 snoRNA in cleavage of pre-rRNA at the 18S rRNA / ITS1 junction. There is, however, no direct evidence supporting the suggested function of U13 snoRNA so far.

In order to elucidate the function of U13 snoRNA we have established U13-knockout (U13-deficient) DT40 cell lines. The U13 snoRNA gene allele has been replaced by a neomycin-resistant gene and a histidinol-resistant gene, respectively. In the U13-knockout cells, the 3'-end position of 18S rRNA was the same as that of wild-type DT40 cells. This observation strongly suggests that U13 snoRNA is not essential for the processing (cleavage and trimming) of pre-rRNA at the 3'-end position of 18S rRNA. To examine the possibility that U13 RNA is involved in nucleoside modification, we have analyzed, with post-labeling method, the 3'-end region of 18S rRNAs isolated from wild type and knockout cells. While there is no difference on modification status of m⁶A1786, m₂A1804 and m₂A1805 respectively, a modified cytidine on position 1796 was not detected in the knockout cells. This observation suggests that U13 snoRNA is responsible for the modification of a cytidine residue in the 3'-end region of 18S rRNA. So far there is no report of any snoRNA responsible for modification of nucleoside except for 2'-O-methylation or pseudouridylation. Therefore U13 snoRNA is the first example of non-methylation-guide and non-pseudouridylation -guide snoRNA.

