The role of the C-terminal tail of the ribosomal protein S13 in protein synthesis

Popular Science Summary

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The ibosome is a large molecular machine that plays an important role in the expression of genetic information. The information in genomic DNA is carried on mRNA by transcription, and then passed onto proteins by translation. The ribosome synthesizes proteins based on the information on the mRNA sequence in the cell; like building a house using bricks according to a blueprint. Bacterial growth is determined by how fast the whole process is.

The bacterial ribosome is composed of two subunits called the 30S and 50S; each subunit consists of rRNAs and several proteins. There are two functional regions in the ribosome: the decoding center ensures fidelity of translation by complementarity of anticodon of the amino acid bound tRNA and the mRNA, and the peptidyl transferase center where the peptide bond formation occurs. There are also several factors to assist the function of the ribosome including initiation factors to aid in starting the translation, elongation factors during translation and release factors for translation termination.

The ribosomal protein S13 is one of the proteins in the 30S subunit and it is 118 amino acids long in *Escherichia coli*. Protein S13 in *Escherichia coli* and *Thermus thermophilus* have different lengths of their C-terminal tails, this tail is seen to be close to the tRNAs in ribosome structures and may affect the translation. We were interested in the different length of the C-terminal tail of protein S13 from species to species and modified the tail of S13 in *E. coli*. Three different strains were engineered; four amino acids truncation, three amino acids extension and a seven amino acids extension which is a longer extension than the same tail in *T. thermophilus*. The growth rate of each E. coli strain was measured and the translation experiments were conducted using purified ribosomes of our strains.

We found out that the E. coli strains with shorter and longer C-terminal tail of protein S13 grow slower than the wild type. We also found that the strain with the longest tail of S13 has defects in translocation (the movement of a ribosome and tRNA along the mRNA during protein synthesis). It took around 4 times longer for the ribosome with the longest tail to move along the mRNA compared to the wild type.

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