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Ribosome recycling in prokaryotes and eukaryotes

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Protein synthesis consists of initiation, elongation, and termination followed by disassembly of the post-termination complex so that the machinery for protein synthesis can be utilized for the next round of translation. Ribosome Recycling Factor (RRF) and EF-G of prokaryotes catalyze prokaryotic ribosome recycling step. RRF releases mRNA and tRNA from the post-termination complexes (PoTC). We characterized PoTC and found that it consists of tRNA at the P/E site and mRNA with empty A-site. With EF-G and RRF, release of tRNA, mRNA, and splitting of ribosomes occur in that order. Recent findings in our laboratory that RRF, in addition to its well accepted role in the recycling, may be involved in the elongation step will be explored.

In fungus, elongation factor 3 (eEF3) and ATP function as the ribosome recycling factor (1). We compare the role of eEF3 as an elongation factor with that as a recycling factor. We will present our recent results that well-known translocation inhibitor, cycloheximide, is also an effective inhibitor of the eEF3 dependent ribosome recycling system. It should be noted that eEF2 (translocation factor) is not involved in ribosome recycling in yeast. From the inhibitor studies we deduced that eEF3 releases tRNA, mRNA and splits ribosome from the post-termination complex in that order. Long-term objectives are to elucidate the mechanism of protein synthesis, one of life's fundamental processes. We will use this knowledge to develop a new class of antibiotics that target bacterial RRF and fungal eEF3 in order to control human microbial infections.

Biography

Hideko Kaji received Ph.D. from Purdue University. She had postdoctoral trainings at The Johns Hopkins School of Medicine and Oak Ridge National Laboratory. Then, she became faculty members of Vanderbilt University School of Medicine, University of Pennsylvania School of Medicine, Fox Chase Cancer Center and currently Jefferson Medical College as a professor. She spent sabbatical years with Drs. H. G. Wittmann, Max Planck Institute, R. Michael E. Parkhouse in London MRC and Carlo M. Croce in Wistar Institute. During her scientific careers she discovered specific tRNA binding to mRNA-ribosome complexes, N-terminal protein modification by arginine, and ribosome recycling in eukaryotes, the last step of protein synthesis. She is a fellow of the American Association for the Advancement of Science (AAAS).

Akira Kaji received Ph.D. from The Johns Hopkins University. He had postdoctoral trainings at The Johns Hopkins School of Medicine, Vanderbilt School of Medicine, and Oak Ridge National Laboratory. He is a professor of University of Pennsylvania, School of Medicine. He spent sabbatical year with Dr. R. Dulbecco at Imperial Cancer Research Fund, London. During his scientific careers, he discovered specific tRNA binding to mRNA-ribosome complexes, N-terminal protein modification by arginine and ribosome recycling.

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