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Functional network of human tRNA synthetases

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Aminoacyl-tRNA synthetases (ARSs) are essential enzymes for protein synthesis and cell viability. These enzymes of higher eukaryotes are distinguished from the prokaryotic enzymes by the presence of non-catalytic extra peptides within their structures and the formation of macromolecular complex. In the present work, we have investigated the interaction network of twenty human aminoacyl-tRNA synthetases. These enzymes are not only connected with each other but also functionally linked to diverse cellular regulators. To our surprise, many of the enzymes are associated with nuclear factors involved in RNA and DNA metabolisms and some are linked to mediators of signal transduction. In addition, these enzymes showed dramatic change of cellular location between cytoplasm and nucleus according to the change of cell growth condition. All of these results suggest that ARSs in higher eukaryotes play pleiotropic roles not only as catalysis but also as novel regulatory factors, and thus link protein synthesis with other essential biological processes.