Supplemental File S3. Published tRNA recharging parameters.

Amino acid	Cytoplasmic synthetase gene (yeast)	Abundance (molecules/ cell)[a]	k_{cat} value (s^{-1})	k_{cat} organism	k_{cat} Ref.
Arg	*YDR341c*	14783	32.2	*S. cerevisiae*	(1)
Ile	*ILS1*	28565	0.2	*S. cerevisiae*	(2)
Leu	*CDC60*	72269	3.4	*S. cerevisiae*	(2)
Lys	*KRS1*	30249	129.3	*S. cerevisiae*	(3)
Met	*ARC1/MES1/GUS1*	33531[b]	4.5	*S. cerevisiae*	(4)
Phe	*FRS1/FRS2*	5200[b]	2.3	*S. cerevisiae*	(5)
Ser	*SES1*	45686	0.6	*S.cerevisiae*	(6)
Thr	*THS1*	29399	1.28	*S. cerevisiae*	(7)
Tyr	*TYS1*	16433	5.1	*S cerevisiae*	(8)
Val	*VAS1*	17665	3.2	*S cerevisiae*	(9)
Pro	*YHR020w*	21120	2	rat	(10)
Ala	*ALA1*	18525	1.1	*E. coli*	(11)
Asp	*DPS1*	31570	0.061	*T.kodakarensis*	(12)
Cys	*YNL247w*	19293	18	*M. jannaschii*	(13)
Gln	*GLN4*	17263	2.6	*E. coli*	(14)
Glu	*ARC1/MES1/GUS1*	33531[b]	2.1	*T. thermophilus*	(15)
Gly	*GRS1*	49866	0.5	*T. thermophilus*	(16)
His	*HTS1*	12981	2.6	*E coli*	(17)
Trp	*WRS1*	10185	1500	*E coli*	(18)
Asn	*DED81*	29944	2.6	(median of above)	

[a] From reference (19) [b] least abundant subunit

1. Fersht, A.R., Gangloff, J. and Dirheimer, G. (1978) Reaction pathway and rate-determining step in the aminoacylation of tRNAArg catalyzed by the arginyl-tRNA synthetase from yeast. *Biochemistry*, **17**, 3740-3746.
2. Englisch, S., Englisch, U., von der Haar, F. and Cramer, F. (1986) The proofreading of hydroxy analogues of leucine and isoleucine by leucyl-tRNA synthetases from E. coli and yeast. *Nucleic Acids Res*, **14**, 7529-7539.
3. Freist, W., Sternbach, H. and Cramer, F. (1992) Lysyl-tRNA synthetase from yeast. Discrimination of amino acids by native and phosphorylated species. *Eur J Biochem*, **204**, 1015-1023.
4. Schwob, E., Sanni, A., Fasiolo, F. and Martin, R.P. (1988) Purification of the yeast mitochondrial methionyl-tRNA synthetase. Common and distinctive features of the cytoplasmic and mitochondrial isoenzymes. *Eur J Biochem*, **178**, 235-242.
5. Freist, W., Sternbach, H. and Cramer, F. (1996) Phenylalanyl-tRNA synthetase from yeast and its discrimination of 19 amino acids in aminoacylation of tRNA(Phe)-C-C-A and tRNA(Phe)-C-C-A(3'NH2). *Eur J Biochem*, **240**, 526-531.
6. Weygand-Durasevic, I., Lenhard, B., Filipic, S. and Soll, D. (1996) The C-terminal extension of yeast seryl-tRNA synthetase affects stability of the enzyme and its substrate affinity. *J Biol Chem*, **271**, 2455-2461.
7. Freist, W., Sternbach, H. and Cramer, F. (1994) Threonyl-tRNA synthetase from yeast. Discrimination of 19 amino acids in aminoacylation of tRNA(Thr)-C-C-A and tRNA(Thr)-C-C-A(2'NH2). *Eur J Biochem*, **220**, 745-752.

8. Freist, W. and Sternbach, H. (1988) Tyrosyl-tRNA synthetase from baker's yeast. Order of substrate addition, discrimination of 20 amino acids in aminoacylation of tRNATyr-C-C-A and tRNATyr-C-C-A(3'NH2). *Eur J Biochem*, **177**, 425-433.
9. Freist, W. and Cramer, F. (1990) Valyl-tRNA synthetase from yeast. Discrimination between 20 amino acids in aminoacylation of tRNA(Val)-C-C-A and tRNA(Val)-C-C-A(3'NH2). *Eur J Biochem*, **191**, 123-129.
10. Ting, S.M., Bogner, P. and Dignam, J.D. (1992) Isolation of prolyl-tRNA synthetase as a free form and as a form associated with glutamyl-tRNA synthetase. *J Biol Chem*, **267**, 17701-17709.
11. Shi, J.P., Francklyn, C., Hill, K. and Schimmel, P. (1990) A nucleotide that enhances the charging of RNA minihelix sequence variants with alanine. *Biochemistry*, **29**, 3621-3626.
12. Feng, L., Tumbula-Hansen, D., Toogood, H. and Soll, D. (2003) Expanding tRNA recognition of a tRNA synthetase by a single amino acid change. *Proc Natl Acad Sci U S A*, **100**, 5676-5681.
13. Hohn, M.J., Park, H.S., O'Donoghue, P., Schnitzbauer, M. and Soll, D. (2006) Emergence of the universal genetic code imprinted in an RNA record. *Proc Natl Acad Sci U S A*, **103**, 18095-18100.
14. Hayase, Y., Jahn, M., Rogers, M.J., Sylvers, L.A., Koizumi, M., Inoue, H., Ohtsuka, E. and Soll, D. (1992) Recognition of bases in Escherichia coli tRNA(Gln) by glutaminyl-tRNA synthetase: a complete identity set. *Embo J*, **11**, 4159-4165.
15. Sekine, S., Nureki, O., Shimada, A., Vassylyev, D.G. and Yokoyama, S. (2001) Structural basis for anticodon recognition by discriminating glutamyl-tRNA synthetase. *Nat Struct Biol*, **8**, 203-206.
16. Mazauric, M.H., Keith, G., Logan, D., Kreutzer, R., Giege, R. and Kern, D. (1998) Glycyl-tRNA synthetase from Thermus thermophilus--wide structural divergence with other prokaryotic glycyl-tRNA synthetases and functional inter-relation with prokaryotic and eukaryotic glycylation systems. *Eur J Biochem*, **251**, 744-757.
17. Arnez, J.G., Augustine, J.G., Moras, D. and Francklyn, C.S. (1997) The first step of aminoacylation at the atomic level in histidyl-tRNA synthetase. *Proc Natl Acad Sci U S A*, **94**, 7144-7149.
18. Chan, K.W. and Koeppe, R.E., 2nd. (1995) Role of lysine-195 in the KMSKS sequence of E. coli tryptophanyl-tRNA synthetase. *FEBS Lett*, **363**, 33-36.
19. von der Haar, T. (2008) A quantitative estimation of the global translational activity in logarithmically growing yeast cells. *BMC Syst Biol*, **2**, 87.