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Compilation of mutant suppressor tRNA sequences *

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Compilation of mutant suppressor tRNA sequences

As a supplement to the compilation of tRNA sequences, this section presents the nucleotide sequence of published mutant suppressor tRNAs together with a brief description of some interesting properties of these mutants. We have listed only mutants that alter the coding part of the sequence of tRNA genes. Alterations in 5' or 3' flanking sequences or in intervening sequences are not listed, neither are extragenic mutations that modify suppressor activity.

To designate a particular nucleotide substitution one refers to the identity of the new nucleotide followed by a number indicating its position in the tRNA sequence starting from the 5'end. For example, the mutant A31 in *E. coli* tyrosine suppressor tRNA refers to a tRNA that contains an A at position 31 instead of the usual base (G). To conform with the rules for numbering tRNAs used by Gauss and Sprinzl (1) we have added the new numbering system for these mutants.

In the case of mutant T4 tRNAs,many of these have been sequenced in the precursor as these mutants do not produce any detectable amount of mature tRNA. In this case we have listed these mutants in a separate table and have indicated which part of the tRNA precursor is the one carrying the mutation. The position of the nucleotide substitution in this case has been numbered from the 5'terminus of the altered tRNA in the precursor sequence.

The mutant yeast tRNAs listed at the end of the compilation have been isolated in laboratory strains of *Saccharomyces cerevisiae* and are derived by second-site mutation of the SUP4 ochre suppressor.

(1) Gauss, D.H., and Sprinzl, M. (1981) Nucleic Acid Res. 9, r1-r23

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*Mutant suppressor tyrosine tRNAs of E. coli su$^+$3 am**

Mutant[a]	Position[b]	Base change from	to	Interesting properties[c]	References
A1	1	G	A	Mischarger; inserts glutamine *in vivo*. Strong suppressor	1,2
A	1 72	G C	A U	Mischarger; inserts tyrosine and glutamine *in vivo*. Strong suppressor.	2,3
A1G82	1 73	G A	A G	Mischarger; inserts glutamine *in vivo*. Strong suppressor	4
A2	2	G	A	ts; mischarger; inserts tyrosine and glutamine *in vivo*. Weak suppressor.	5,2
A2U80	2 71	G C	A U	tr; indistinguishable from original suppressor. Strong suppressor	5,2
A15	15	G	A	Defective in a step subsequent to its binding to the ribosome; accumulates tRNA precursor. Weak suppressor.	6
A15D19	15 20	G C	A D	Strong suppressor	5
A15D20	15 20:1	G C	A D	Strong suppressor	5
A17	18	Gm	A	Accumulates tRNA precursor. Weak suppressor.	6
A25	24	G	A	Accummulates tRNA precursor. No detectable suppressor activity	5

A25U11	24 11	G C	A U	Indistinguishable from original suppressor. Strong suppressor	5
A25U19	24 20	G C	A U	Strong suppressor.	5
A31	30	G	A	Altered Km of aminoacylation: accumulates precursor. Weak suppressor.	6,7
A31U16	30 16	G C	A U	Strong suppressor	7
A31U41	30 40	G C	A U	Strong suppressor	7
A31U45	30 44	G C	A U	Strong suppressor	7
U31	30	G	U	Accummulates tRNA precursor. Weak suppressor.	7
U31U16	30 16	G C	U U	Strong suppressor	7
U31A41	30 40	G C	U A	Strong suppressor	7
U31U45	30 44	G C	C U	Strong suppressor	7
A46	45	G	A	Altered Km of aminoacylation; accummulates tRNA precursor. Weak suppressor	8
A46U54	45 47:6	G C	A U	Strong suppressor	8

Mutant suppressor tyrosine tRNAs of E. coli su$^+$3 am (continuation)

Mutant[a]	Position[b]	Base change from	to	Interesting properties[c]	References
A62	53	G	A	Accummulates tRNA precursor. No detectable suppressor activity	9
+C(73-78)	64-69	C	insertion	Cannot be aminoacylated under normal conditions. No detectable suppressor activity.	10
U80	71	C	U	Mischarger; inserts tyrosine and a neutral amino acid *in vivo*.Strong suppressor.	5,2
A81	72	C	A	Mischarger; inserts tyrosine and a neutral amino acid *in vivo*. Strong suppressor.	5,2
U81	72	C	U	Mischarger; inserts tyrosine and glutamine *in vivo*. Strong suppressor	11, 12, 2
G82	73	A	G	Mischarger; inserts glutamine *in vivo*	11, 12, 13, 2

[a]Mutant denomination in the original literature

[b]Numbering according to tRNA compilation

[c]Strong suppressors are defined as those having >50% of the wild type suppressor activity. Weak suppressor present less that 20% of the wild type suppressor activity.

(1) Smith, J.D. and Celis, J.E. (1973) Nature 234, 66-71
(2) Ghysen, A. and Celis, J.E. (1974) J. Mol. Biol. 83, 333-351
(3) Celis, J.E., Squire, M., Kaltoft, K. and Riisom, E. (1977) Nucleic Acids Res. 4, 2799-2809
(4) Inokuchi, H., Celis, J.E. and Smith, J.D. (1974) J. Mol. Biol 85, 187-192
(5) Smith, J.D., Barnett, L., Brenner, S. and Russell, R.L. (1970). J. Mol. Biol. 54, 1-14
(6) Abelson, J., Barnett, L., Brenner, S., Gefter, M., Landy, A., Russell, R. and Smith, J.D. (1969). FEBS Letters, 3, 1-4
(7) Anderson, K.W. and Smith, J.D. (1972) J. Mol. Biol. 69, 349-356
(8) Hooper, M.L. Ph.D. thesis. University of Cambridge (1972).
(9) Smith, J.D. (unpublished)
(10) Riddle, D. *et al.* unpublished
(11) Hooper, M.L., Russell, R.L. and Smith, J.D. (1972) FEBS Letters. 22, 149-155
(12) Celis, J.E., Hooper, M.L. and Smith, J.D. (1973) Nature New Biol 244, 261-264
(13) Shimura, Y., Aono, H., Ozeki, H., Sarabhai, A., Lamfrom, H. and Abelson, J. (1972) FEBS Letters 22, 144-149.

Mutant suppressor T4 tRNAs glutamine (psu+2 oc, 0531) and serine (psu+1 am, 1631).

tRNA	Mutant[a]	Base change Position[b]	from	to	Interesting properties	References
Gln	U11	11	C	U	Synthesizes reduced amount of Gln tRNA (49% of *psu+2*). No detectable suppressor activity. It accummulates small amount of Gln-Leu tRNA precursor.	1
Gln	A40	40	G	A	Synthesizes reduced amount of Gln tRNA (41% of *psu+2*). No detectable suppressor activity. It accummulates small amount of Gln-Leu tRNA precursor.	1
Gln	A62	62	C	U	Synthesizes reduced amount of Gln tRNA (17% of *psu+2*). No detectable suppressor activity. It accummulates small amount of Gln-Leu tRNA precursor.	1
Ser	U26	25	C	U	Synthesizes normal amount of serine tRNA. No suppressor activity.	2
Ser	G27	26	A	G	Synthesizes normal amount of serine tRNA. No suppressor activity.	2
Ser	C48	47	U	C	Synthesizes reduced amount of Ser tRNA (25% of *psu+1*). No suppressor activity.	2

[a] Mutant denomination in the original literature.
[b] Numbering according to tRNA compilation.

(1) Seidman, J.D., Comer, M.M. and McClain W.H. (1974) J. Mol. Biol. 90, 677-689.
(2) McClain, W.H. (1977) Accounts Chem. Res, 10, 418-425.

Mutant T4 tRNAs serine, glutamine and leucine sequenced at the precursor level.

tRNA precursor[a]	Mutant[b]	Base change position[c]	from	to	Interesting properties	References
Pro-Ser	U1	1	G	U	Accummulates Pro-Ser tRNA precursor lacking many modified nucleotides. Block RNAse P reaction. Precursor RNA terminates in CCA_{OH}.	1
"	03	3	A	- (deletion)	"	1
"	C8	8	U	C	"	1
"	G12	12	A	G	Accummulates Pro-Ser tRNA precursor lacking many modified nucleotides. Defective in the first step of the biosynthetic pathway, the removal of UAA_{OH} residues at the serine terminus.	1
"	U17	18	G	U	"	1
"	A29	28	C	A	"	1
"	A30	29	G	A	"	1
"	U58	47:10	G	U	"	1
"	A67	53	G	A	"	2
"	C68	54	T	C	"	1
"	U70	56	C	U	"	2
"	U75	61	C	U	"	2
"	C77	63	U	C	"	1

Mutant T4 tRNAs serine, glutamine ..... (continued)

tRNA precursor[a]	Mutant[b]	Base change position[c]	from	to	Interesting properties	References
Gln-Leu	U11	11	C	U	Accummulates Gln-Leu tRNA precursor lacking many modified nucleotides. Partial reduction of RNAse P and cca repair at Gln moiety	3
"	A40	40	G	A	"	3
"	U62	62	C	U	"	3
Gln-Leu	U72	61	C	U	Accummulates Gln-Leu precursor lacking many nucleotides modifications. RNAse P cleavage reduced at both moieties.	3

[a] In all cases nucleotide substitutions have been localized in the precursor. The underlying tRNA contains the mutation. The serine tRNA in the Pro-Ser precursor has the anticodon N$_2$UA (*psu*$^+$*1*, 1631). The glutamine tRNA in the Gln-Leu precursor has the anticodon NUA (*psu*$^+$*2*, 0531), and the leucine tRNA has the normal anticodon NAA (su$^-$, 1030).

[b] Mutant denomination in the original literature.

[c] Numbering according to tRNA compilation.

(1) McClain, W.H. (1977) Accounts Chem. Res. 10, 418-425
(2) McClain, W.H., Barrell, B.G. and Seidmann, J.G. (1975) J. Mol. Biol. 99, 717-732
(3) McClain, W.H. and Seidmann, J.G. (1975) Nature 257, 106-110.

Mutant suppressor tyrosine tRNAs of Saccharomyces cerevisiae SUP4-O *

Mutant[a]	Position	Base change from	to	Interesting properties	References
U3	3	C	U	Weak suppressor	1
G3	3	C	G	No suppressor activity	1
U6	6	G	U	No suppressor activity	1
U10	10	m^2G	U	No suppressor activity	1
G14	14	A	G	No suppressor activity	1
U15	15	G	U	No suppressor activity. Enhances transcription with synthesis of shorter transcripts[b]	1,2
U21	21	A	U		1,2
G27	27	C	G	No suppressor activity	1
U29	29	A	U	No suppressor activity	2
U30	30	G	U	No suppressor activity	2
G32	32	C	G	Weak suppressor	1
A32	32	C	A	Very weak suppressor	1
U32	32	C	U	No suppressor activity	1
C35	35	U	C	Probably a UGA suppressor	1
-A36A37	Deletion of nucleotides 36 and 37			No suppressor activity. Causes premature transcription termination[b]	2
G37	37	i^6A	G	Weak suppressor	1

Mutant suppressor tyrosine tRNAs of Saccharomyces cerevisiae SUP4-O

Mutant[a]	Position	Base change from	to	Interesting properties	References
A40	40	C	A	No suppressor activity	1
A45	45	G	A	Partial suppressor activity	1
G46	46	A	G	Very weak suppressor	1
A51	51	G	A	Weak suppressor. Synthesis of slightly shortened transcripts[b]	1,2
A52	52	C	A	No suppressor activity. Synthesis of slightly shortened transcripts[b]	1,2
G56	56	C	G	Dramatic reduction of transcription. No suppressor activity[b]	1,2
U56	56	C	U		
G60	60	U	G	No suppressor activity	1
C62	62	G	C	Very weak suppressor. Synthesis of slightly shortened transcripts[b]	1,2
-C(63-67)	63-67, cytidine deletion			No suppressor activity	1,2
U67	67	C	U	Very weak suppressor	1
C68	68	G	C	No suppressor activity	1
U73	73	A	U	Very weak suppressor	1

[a]Mutant designation as in original literature

[b]In an *in vitro* transcription system from *Xenopus laevis* (Koski, R.A., Clarkson, S.G., Kurjan, J., Hall, B,D. and Smith, M. (1980) Cell 22, 415-425).

(1) Kurjan, J., Hall, B.D., Gillam, S. and Smith, M. (1980) Cell 20, 701-709.
(2) Koski, R.A., Clarkson, S.G., Kurjan, J., Hall, B.D. and Smith, M. (1980) Cell 22, 415-425.

*From Goodman, H.M., Olson, M.V. and Hall B.D. (1977) Proc. Natl. Acad. Sci. USA 74, 5453-5457.