



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 28, 2014 – 05:00 AM GMT

PDB ID : 1TYB
Title : STRUCTURAL ANALYSIS OF A SERIES OF MUTANTS OF TYROSYL-
TRNA SYNTHETASE: ENHANCEMENT OF CATALYSIS BY HY-
DROPHOBIC INTERACTIONS
Authors : Brown, K.A.; De Meester, P.; Blow, D.M.
Deposited on : 1992-07-06
Resolution : 2.50 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

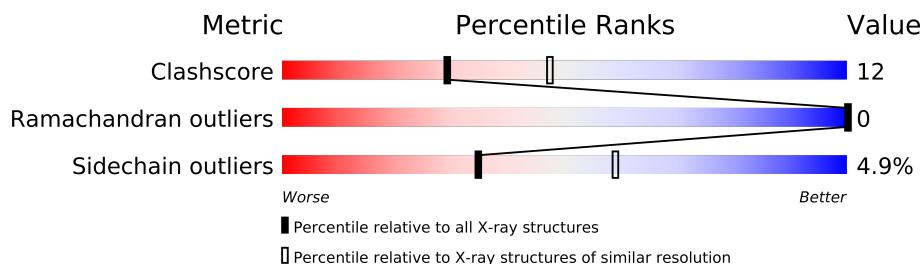
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 21963
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.50 Å.


Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	79885	3562 (2.50-2.50)
Ramachandran outliers	78287	3480 (2.50-2.50)
Sidechain outliers	78261	3482 (2.50-2.50)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	E	319	

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 2638 atoms, of which 0 are hydrogen and 0 are deuterium.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

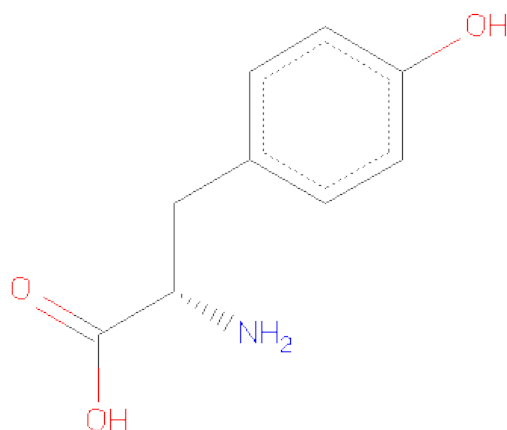
- Molecule 1 is a protein called TYROSYL-tRNA SYNTHETASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	E	317	2460	1569	428	456	7	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	51	GLY	THR	CONFLICT	UNP P00952

- Molecule 2 is TYROSINE (three-letter code: TYR) (formula: C₉H₁₁NO₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	E	1	13	9	1	3	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	E	165	Total 165	O 165	0	0

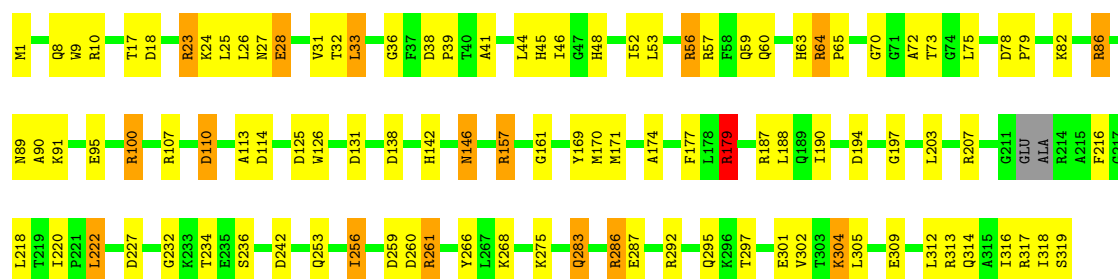
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS was not executed.

• Molecule 1: TYROSYL-tRNA SYNTHETASE

Chain E: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	64.46Å 64.46Å 237.60Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	(Not available) – 2.50	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.50)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.230 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2638	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	E	0.86	2/2508 (0.1%)	1.71	42/3391 (1.2%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	287	GLU	CB-CG	-5.67	1.41	1.52
1	E	86	ARG	CD-NE	-5.11	1.37	1.46

All (42) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	86	ARG	CD-NE-CZ	39.33	178.66	123.60
1	E	86	ARG	NE-CZ-NH2	13.02	126.81	120.30
1	E	10	ARG	NE-CZ-NH1	11.71	126.15	120.30
1	E	313	ARG	NE-CZ-NH1	9.86	125.23	120.30
1	E	261	ARG	NE-CZ-NH1	9.33	124.96	120.30
1	E	286	ARG	NE-CZ-NH2	-9.32	115.64	120.30
1	E	261	ARG	CD-NE-CZ	9.19	136.46	123.60
1	E	110	ASP	CB-CG-OD1	8.99	126.39	118.30
1	E	261	ARG	CG-CD-NE	8.85	130.38	111.80
1	E	157	ARG	NE-CZ-NH2	-8.68	115.96	120.30
1	E	179	ARG	NE-CZ-NH2	-8.46	116.07	120.30
1	E	138	ASP	CB-CG-OD1	7.66	125.20	118.30
1	E	10	ARG	CD-NE-CZ	7.41	133.97	123.60
1	E	313	ARG	CD-NE-CZ	6.97	133.36	123.60
1	E	64	ARG	NE-CZ-NH1	6.92	123.76	120.30
1	E	131	ASP	CB-CG-OD2	6.91	124.52	118.30
1	E	207	ARG	NE-CZ-NH1	6.85	123.73	120.30
1	E	100	ARG	NE-CZ-NH2	-6.80	116.90	120.30
1	E	56	ARG	NE-CZ-NH2	-6.66	116.97	120.30
1	E	41	ALA	N-CA-CB	6.51	119.21	110.10
1	E	64	ARG	CD-NE-CZ	6.48	132.67	123.60
1	E	194	ASP	CB-CG-OD1	6.45	124.10	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	28	GLU	CA-CB-CG	6.24	127.12	113.40
1	E	157	ARG	NE-CZ-NH1	6.04	123.32	120.30
1	E	23	ARG	NE-CZ-NH2	-5.96	117.32	120.30
1	E	86	ARG	NH1-CZ-NH2	-5.92	112.89	119.40
1	E	286	ARG	NE-CZ-NH1	5.80	123.20	120.30
1	E	266	TYR	CB-CG-CD2	-5.75	117.55	121.00
1	E	10	ARG	NE-CZ-NH2	-5.72	117.44	120.30
1	E	266	TYR	CB-CG-CD1	5.71	124.43	121.00
1	E	100	ARG	NE-CZ-NH1	5.65	123.12	120.30
1	E	227	ASP	CB-CG-OD1	5.60	123.34	118.30
1	E	18	ASP	CB-CG-OD1	5.49	123.24	118.30
1	E	125	ASP	CB-CG-OD2	5.37	123.13	118.30
1	E	23	ARG	NE-CZ-NH1	5.36	122.98	120.30
1	E	142	HIS	CA-CB-CG	-5.36	104.49	113.60
1	E	179	ARG	NE-CZ-NH1	5.28	122.94	120.30
1	E	261	ARG	NE-CZ-NH2	-5.14	117.73	120.30
1	E	317	ARG	NE-CZ-NH2	-5.11	117.74	120.30
1	E	319	SER	CA-C-O	5.08	130.78	120.10
1	E	107	ARG	CB-CA-C	-5.03	100.34	110.40
1	E	32	THR	N-CA-CB	5.03	119.85	110.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	2460	0	2392	60	2
2	E	13	0	8	2	0
3	E	165	0	0	6	2
All	All	2638	0	2400	60	2

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 12.

All (60) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:E:45:HIS:H	1:E:48:HIS:HD2	1.26	0.80
1:E:169:TYR:HH	2:E:320:TYR:N	1.84	0.74
1:E:283:GLN:HE21	1:E:286:ARG:HH12	1.32	0.74
1:E:59:GLN:HB2	1:E:65:PRO:HG3	1.82	0.61
1:E:9:TRP:CZ2	1:E:275:LYS:HG3	2.36	0.60
1:E:283:GLN:NE2	1:E:286:ARG:HH12	2.01	0.59
1:E:72:ALA:O	1:E:75:LEU:HB2	2.04	0.56
1:E:100:ARG:NH2	1:E:242:ASP:OD2	2.38	0.56
1:E:253:GLN:HA	1:E:256:ILE:HG22	1.88	0.56
1:E:82:LYS:HD3	1:E:86:ARG:HH11	1.69	0.56
1:E:48:HIS:O	1:E:52:ILE:HG13	2.05	0.56
1:E:56:ARG:O	1:E:60:GLN:HG3	2.07	0.54
1:E:110:ASP:OD2	1:E:113:ALA:HB2	2.06	0.54
1:E:234:THR:HG22	1:E:236:SER:H	1.73	0.54
1:E:44:LEU:HD13	1:E:52:ILE:HD11	1.90	0.54
1:E:26:LEU:HD23	1:E:31:VAL:HG21	1.90	0.53
1:E:64:ARG:HD2	3:E:384:HOH:O	2.08	0.52
1:E:78:ASP:HB2	1:E:169:TYR:CZ	2.45	0.52
1:E:45:HIS:H	1:E:48:HIS:CD2	2.16	0.51
1:E:302:VAL:HA	1:E:305:LEU:HD12	1.93	0.51
1:E:53:LEU:O	1:E:57:ARG:HG3	2.10	0.51
1:E:36:GLY:HA3	2:E:320:TYR:CD1	2.46	0.50
1:E:190:ILE:HA	1:E:218:LEU:O	2.11	0.50
1:E:25:LEU:HD22	1:E:216:PHE:HE2	1.77	0.50
1:E:33:LEU:HA	1:E:188:LEU:O	2.12	0.49
1:E:170:MET:HG3	1:E:171:MET:HE2	1.94	0.49
1:E:304:LYS:HE3	1:E:309:GLU:OE1	2.13	0.48
1:E:222:LEU:HD23	3:E:392:HOH:O	2.12	0.48
1:E:73:THR:HB	1:E:169:TYR:CE2	2.49	0.48
1:E:283:GLN:HE21	1:E:286:ARG:NH1	2.07	0.48
1:E:82:LYS:CG	1:E:86:ARG:HH11	2.26	0.48
1:E:17:THR:HG21	1:E:203:LEU:CD1	2.44	0.48
1:E:38:ASP:HA	1:E:39:PRO:HD3	1.76	0.47
1:E:146:ASN:HB2	3:E:377:HOH:O	2.15	0.47
1:E:297:THR:O	1:E:301:GLU:HG2	2.15	0.47
1:E:179:ARG:HE	1:E:179:ARG:HB3	1.33	0.47
1:E:46:ILE:HD11	1:E:232:GLY:HA2	1.97	0.47
1:E:1:MET:H1	1:E:23:ARG:HG3	1.80	0.46
1:E:187:ARG:HG3	3:E:321:HOH:O	2.14	0.46
1:E:31:VAL:O	1:E:63:HIS:HB3	2.16	0.45
1:E:292:ARG:NH1	1:E:295:GLN:HG2	2.31	0.45
1:E:75:LEU:HD21	1:E:91:LYS:HA	1.99	0.45

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:E:91:LYS:O	1:E:95:GLU:HB2	2.17	0.44
1:E:157:ARG:O	1:E:161:GLY:N	2.47	0.43
1:E:24:LYS:NZ	1:E:28:GLU:OE2	2.44	0.43
1:E:126:TRP:HB2	3:E:364:HOH:O	2.19	0.43
1:E:82:LYS:CD	1:E:86:ARG:HH11	2.30	0.42
1:E:197:GLY:HA3	3:E:373:HOH:O	2.18	0.42
1:E:312:LEU:O	1:E:316:ILE:HG13	2.19	0.42
1:E:171:MET:O	1:E:174:ALA:HB3	2.19	0.42
1:E:78:ASP:HA	1:E:79:PRO:HD2	1.93	0.42
1:E:309:GLU:OE1	1:E:312:LEU:HD23	2.20	0.42
1:E:38:ASP:OD1	1:E:70:GLY:HA3	2.19	0.41
1:E:25:LEU:HD22	1:E:216:PHE:CE2	2.55	0.41
1:E:59:GLN:HA	1:E:63:HIS:O	2.21	0.41
1:E:9:TRP:CZ2	1:E:268:LYS:HE2	2.56	0.41
1:E:259:ASP:OD1	1:E:260:ASP:N	2.54	0.41
1:E:1:MET:N	1:E:27:ASN:HD21	2.17	0.41
1:E:82:LYS:HG2	1:E:86:ARG:NH1	2.36	0.41
1:E:314:GLN:O	1:E:318:ILE:HG13	2.22	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:E:90:ALA:N	3:E:418:HOH:O[5_664]	1.46	0.74
1:E:89:ASN:C	3:E:418:HOH:O[5_664]	2.15	0.05

5.3 Torsion angles

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution. The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	313/319 (98%)	304 (97%)	9 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution. The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	E	244/268 (91%)	232 (95%)	12 (5%)	35 59

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	8	GLN
1	E	33	LEU
1	E	114	ASP
1	E	146	ASN
1	E	177	PHE
1	E	179	ARG
1	E	220	ILE
1	E	222	LEU
1	E	256	ILE
1	E	261	ARG
1	E	283	GLN
1	E	304	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	E	27	ASN
1	E	48	HIS
1	E	60	GLN
1	E	257	ASN
1	E	283	GLN
1	E	314	GLN

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	TYR	E	320	-	13,13,13	0.60	0	17,17,17	0.76	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	TYR	E	320	-	-	0/8/8/8	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.