wwPDB X-ray Structure Validation Summary Report (i)

Jan 31, 2016 – 10:26 PM GMT

PDB ID	:	1TN2
Title	:	CRYSTALLOGRAPHIC AND BIOCHEMICAL INVESTIGATION OF THE LEAD(II)-CATALYZED HYDROLYSIS OF YEAST PHENYLALANINE T-RNA
Authors	:	Brown, R.S.; Dewan, J.C.; Klug, A.
Deposited on	:	1986-08-22
Resolution	:	3.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

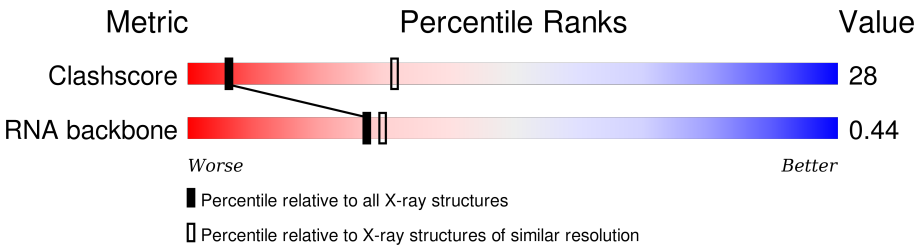
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	102246	1912 (3.00-3.00)
RNA backbone	2183	1036 (3.40-2.60)

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. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	76	5% 37% 42% 16%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	SPM	A	77	-	-	X	-

2 Entry composition (i)

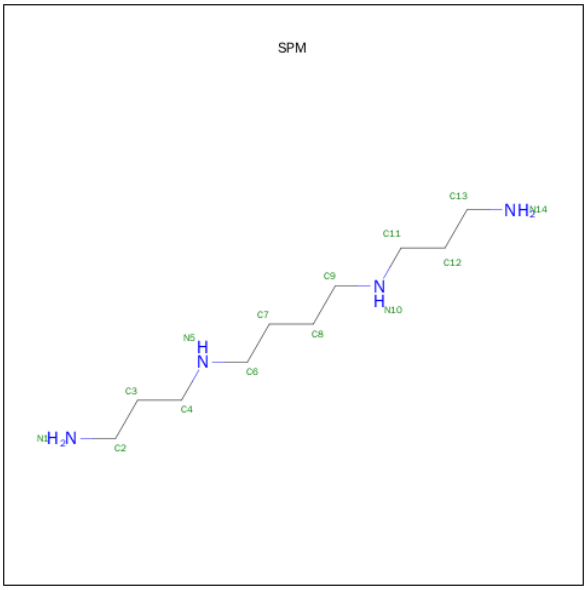
There are 5 unique types of molecules in this entry. The entry contains 1781 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 RNA chain called TRNAPHE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	A	76	1652	746	294	536	76	0	0	0

- Molecule 2 is SPERMINE (three-letter code: SPM) (formula: $C_{10}H_{26}N_4$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	N		
2	A	1	14	10	4	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	A	5	5	5	0	0

- Molecule 4 is LEAD (II) ION (three-letter code: PB) (formula: Pb).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Pb		
4	A	3	3	3	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	107	107	107	0	0

3 Residue-property plots (i)

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: TRNAPHE

Chain A:

4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	56.70Å 33.20Å 63.00Å 90.00° 89.90° 90.00°	Depositor
Resolution (Å)	(Not available) – 3.00	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-3.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	JACK-LEVITT	Depositor
R, R_{free}	0.237 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1781	wwPDB-VP
Average B, all atoms ($Å^2$)	14.0	wwPDB-VP

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: 5MU, OMC, MG, OMG, H2U, YG, PB, 2MG, 5MC, 1MA, M2G, 7MG, SPM, PSU

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	A	4.46	249/1487 (16.7%)	5.81	472/2315 (20.4%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	9

The worst 5 of 249 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	42	G	C8-N7	24.19	1.45	1.30
1	A	53	G	C8-N7	23.51	1.45	1.30
1	A	19	G	C8-N7	23.30	1.45	1.30
1	A	4	G	C8-N7	23.17	1.44	1.30
1	A	3	G	C8-N7	22.44	1.44	1.30

The worst 5 of 472 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	15	G	N3-C4-C5	-30.49	113.36	128.60
1	A	45	G	N3-C4-C5	-29.98	113.61	128.60
1	A	51	G	N3-C4-C5	-29.19	114.00	128.60
1	A	20	G	N3-C4-C5	-28.66	114.27	128.60
1	A	22	G	N3-C4-C5	-28.41	114.39	128.60

There are no chirality outliers.

5 of 9 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	19	G	Sidechain
1	A	21	A	Sidechain
1	A	24	G	Sidechain
1	A	27	C	Sidechain
1	A	38	A	Sidechain

5.2 Too-close contacts (i)

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 hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1652	0	858	64	12
2	A	14	0	25	13	0
3	A	5	0	0	0	0
4	A	3	0	0	1	0
5	A	107	0	0	40	8
All	All	1781	0	883	71	13

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 28.

The worst 5 of 71 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:77:SPM:N10	5:A:182:HOH:O	1.59	1.33
4:A:84:PB:PB	5:A:182:HOH:O	0.84	1.26
1:A:65:G:H1'	5:A:115:HOH:O	1.19	1.26
1:A:3:G:OP2	5:A:152:HOH:O	1.53	1.22
2:A:77:SPM:C8	5:A:182:HOH:O	1.91	1.16

The worst 5 of 13 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	Interatomic distance (Å)	Clash overlap (Å)
5:A:124:HOH:O	5:A:126:HOH:O[2_656]	0.90	1.30
1:A:13:C:O2'	5:A:94:HOH:O[1_545]	1.28	0.92
1:A:13:C:C2'	5:A:94:HOH:O[1_545]	1.37	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:13:C:C3'	5:A:94:HOH:O[1_545]	1.39	0.81
1:A:75:C:N4	5:A:154:HOH:O[2_646]	1.60	0.60

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

There are no protein molecules in this entry.

5.3.2 Protein sidechains (i)

There are no protein molecules in this entry.

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	75/76 (98%)	17 (22%)	2 (2%)

5 of 17 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	9	A
1	A	13	C
1	A	16	H2U
1	A	17	H2U
1	A	18	G

All (2) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	18	G
1	A	46	7MG

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

14 non-standard protein/DNA/RNA residues are 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	$\#\|Z\| > 2$
1	2MG	A	10	1	17,26,27	1.66	2 (11%)	21,38,41	2.29	6 (28%)
1	H2U	A	16	1	17,21,22	1.27	3 (17%)	23,30,33	1.59	4 (17%)
1	H2U	A	17	1	17,21,22	0.92	0	23,30,33	1.86	5 (21%)
1	M2G	A	26	1	17,27,28	1.64	3 (17%)	22,40,43	2.51	10 (45%)
1	OMC	A	32	1	13,22,23	1.15	1 (7%)	20,31,34	1.55	3 (15%)
1	OMG	A	34	1	17,26,27	1.36	2 (11%)	21,38,41	1.90	5 (23%)
1	YG	A	37	1	27,42,43	2.05	7 (25%)	29,62,65	2.54	13 (44%)
1	PSU	A	39	1	13,21,22	1.00	0	18,30,33	4.23	7 (38%)
1	5MC	A	40	1	13,22,23	1.04	1 (7%)	15,32,35	0.85	0
1	7MG	A	46	1	19,26,27	1.29	2 (10%)	24,39,42	2.86	8 (33%)
1	5MC	A	49	1	13,22,23	2.04	4 (30%)	15,32,35	1.12	0
1	5MU	A	54	1	12,22,23	1.07	1 (8%)	14,32,35	2.86	2 (14%)
1	PSU	A	55	1	13,21,22	0.99	1 (7%)	18,30,33	3.71	5 (27%)
1	1MA	A	58	1	14,25,26	1.52	2 (14%)	15,37,40	2.75	3 (20%)

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
1	2MG	A	10	1	-	0/5/27/28	0/3/3/3
1	H2U	A	16	1	-	0/7/38/39	0/2/2/2
1	H2U	A	17	1	-	0/7/38/39	0/2/2/2
1	M2G	A	26	1	-	0/7/29/30	0/3/3/3
1	OMC	A	32	1	-	0/5/27/28	0/2/2/2
1	OMG	A	34	1	-	0/5/27/28	0/3/3/3
1	YG	A	37	1	-	0/20/42/43	0/4/4/4
1	PSU	A	39	1	-	0/7/25/26	0/2/2/2
1	5MC	A	40	1	-	0/3/25/26	0/2/2/2
1	7MG	A	46	1	-	0/7/37/38	0/3/3/3
1	5MC	A	49	1	-	0/3/25/26	0/2/2/2
1	5MU	A	54	1	-	0/3/25/26	0/2/2/2
1	PSU	A	55	1	-	0/7/25/26	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	1MA	A	58	1	-	0/3/25/26	0/3/3/3

The worst 5 of 29 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	37	YG	O23-C21	-6.48	1.25	1.34
1	A	37	YG	C6-N1	-4.73	1.29	1.37
1	A	46	7MG	C8-N9	-4.25	1.39	1.45
1	A	10	2MG	C2-N2	-4.24	1.29	1.34
1	A	49	5MC	C4-N3	-4.22	1.28	1.35

The worst 5 of 71 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	39	PSU	N1-C2-N3	-14.10	119.34	128.33
1	A	55	PSU	N1-C2-N3	-12.31	120.48	128.33
1	A	46	7MG	C5-C4-N3	-10.52	116.57	126.82
1	A	54	5MU	C5-C4-N3	-6.10	118.35	125.14
1	A	26	M2G	C2'-C1'-N9	-5.37	106.09	114.29

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

8 monomers are involved in 17 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	16	H2U	3	0
1	A	17	H2U	1	0
1	A	26	M2G	2	0
1	A	32	OMC	1	0
1	A	34	OMG	1	0
1	A	37	YG	8	0
1	A	46	7MG	1	0
1	A	55	PSU	0	1

5.5 Carbohydrates (i)

There are no carbohydrates in this entry.

5.6 Ligand geometry (i)

Of 9 ligands modelled in this entry, 8 are monoatomic - leaving 1 for Mogul analysis.

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	SPM	A	77	-	13,13,13	0.64	0	12,12,12	1.05	1 (8%)

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	SPM	A	77	-	-	0/11/11/11	0/0/0/0

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	77	SPM	C11-N10-C9	-2.10	105.90	113.35

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	77	SPM	13	0

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data (i)

6.1 Protein, DNA and RNA chains (i)

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

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

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

6.3 Carbohydrates (i)

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

6.4 Ligands (i)

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

6.5 Other polymers (i)

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