Full wwPDB X-ray Structure Validation Report ⓘ

Jun 22, 2024 – 04:14 PM EDT

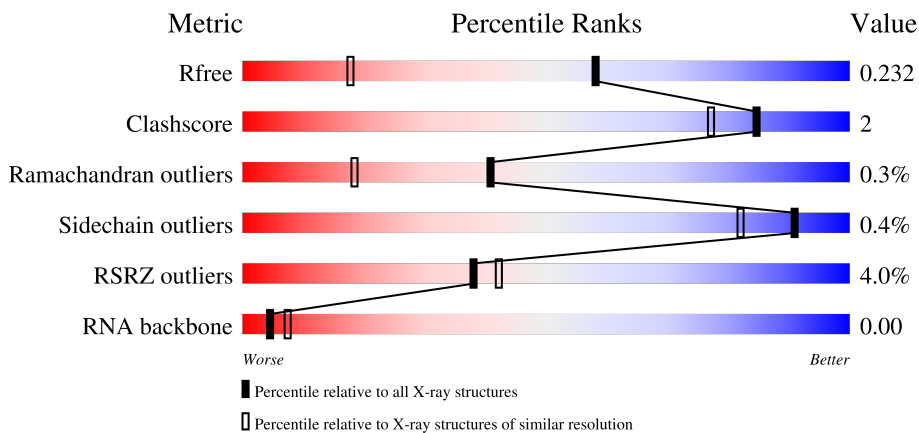|		
PDB ID	:	6RT4
Title	:	The YTH domain of YTHDC1 protein in complex with m6ACU oligonucleotide
Authors	:	Bedi, R.; Sledz, P.; Caflisch, A.
Deposited on	:	2019-05-22
Resolution	:	1.49 Å(reported)

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1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 1.49 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	Percentile Ranks	Value
Rfree		0.232
Clashscore		2
Ramachandran outliers		0.3%
Sidechain outliers		0.4%
RSRZ outliers		4.0%
RNA backbone		0.00

Worse — *Better*

■ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2936 (1.50-1.50)
Clashscore	141614	3144 (1.50-1.50)
Ramachandran outliers	138981	3066 (1.50-1.50)
Sidechain outliers	138945	3064 (1.50-1.50)
RSRZ outliers	127900	2884 (1.50-1.50)
RNA backbone	3102	1015 (2.36-0.86)

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 of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. 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.

Mol	Chain	Length	Quality of chain
1	C	3	33% 33% 33%
1	D	3	33% 67%
2	A	166	4% / 95% ••
2	B	166	4% / 90% 6% •

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 2983 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 RNA (5'-R(*(6MZ)P*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	2	Total	C	N	O	P	0	0	0
			24	11	5	7	1			
1	D	3	Total	C	N	O	P	0	0	0
			60	29	10	19	2			

- Molecule 2 is a protein called YTH domain-containing protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	160	Total	C	N	O	S	0	2	0
			1267	819	220	222	6			
2	A	164	Total	C	N	O	S	0	2	0
			1274	823	220	225	6			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	344	GLY	-	expression tag	UNP Q96MU7
A	344	GLY	-	expression tag	UNP Q96MU7

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total 5	O 4	S 1	0	0
3	B	1	Total 5	O 4	S 1	0	0
3	A	1	Total 5	O 4	S 1	0	0
3	A	1	Total 5	O 4	S 1	0	0
3	A	1	Total 5	O 4	S 1	0	0
3	A	1	Total 5	O 4	S 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	2	Total 2	O 2	0	0
4	B	135	Total 135	O 135	0	0
4	A	185	Total 185	O 185	0	0
4	D	6	Total 6	O 6	0	0

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes 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.

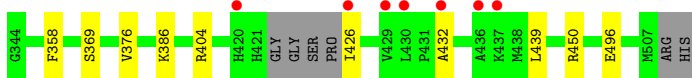- Molecule 1: RNA (5'-R(*(6MZ)P*C)-3')

Chain C:
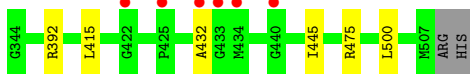

- Molecule 1: RNA (5'-R(*(6MZ)P*C)-3')

Chain D:

- Molecule 2: YTH domain-containing protein 1

Chain B:

- Molecule 2: YTH domain-containing protein 1

Chain A:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	40.10Å 103.50Å 41.95Å 90.00° 104.69° 90.00°	Depositor
Resolution (Å)	38.79 – 1.49 38.79 – 1.49	Depositor EDS
% Data completeness (in resolution range)	97.8 (38.79-1.49) 97.9 (38.79-1.49)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.47 (at 1.48Å)	Xtriage
Refinement program	PHENIX (1.14_3260: ???)	Depositor
R, R_{free}	0.204 , 0.230 0.205 , 0.232	Depositor DCC
R_{free} test set	2009 reflections (3.77%)	wwPDB-VP
Wilson B-factor (Å^2)	24.4	Xtriage
Anisotropy	0.428	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 40.9	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.027 for l,-k,h	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	2983	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.14% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

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: SO4, 6MZ

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	C	0.52	0/3	0.94	0/3
1	D	0.46	0/43	1.18	0/64
2	A	0.34	0/1315	0.54	0/1775
2	B	0.33	0/1299	0.52	0/1754
All	All	0.34	0/2660	0.55	0/3596

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	C	24	0	13	0	0
1	D	60	0	35	1	0
2	A	1274	0	1262	5	0
2	B	1267	0	1263	6	0
3	A	20	0	0	0	0
3	B	10	0	0	1	0
4	A	185	0	0	2	2
4	B	135	0	0	4	2
4	C	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	6	0	0	0	0
All	All	2983	0	2573	12	2

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 2.

All (12) 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:B:439:LEU:O	4:B:701:HOH:O	1.88	0.92
2:A:432:ALA:O	4:A:701:HOH:O	2.01	0.79
2:A:392:ARG:NH2	4:A:702:HOH:O	2.01	0.75
2:B:369:SER:OG	4:B:702:HOH:O	2.06	0.73
2:B:404:ARG:HG3	1:D:2:C:H5'	1.91	0.53
2:B:450:ARG:HD2	4:B:717:HOH:O	2.09	0.51
2:B:376:VAL:HG21	2:B:426:ILE:HD12	1.94	0.50
3:B:601:SO4:O2	4:B:703:HOH:O	2.19	0.50
2:A:475:ARG:N	2:A:475:ARG:C	2.65	0.49
2:B:358:PHE:CE2	2:B:386[B]:LYS:HD3	2.47	0.48
2:A:415:LEU:HD23	2:A:445:ILE:HG22	2.00	0.44

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	Interatomic distance (Å)	Clash overlap (Å)
4:B:811:HOH:O	4:A:884:HOH:O[2_646]	2.10	0.10
4:B:804:HOH:O	4:A:720:HOH:O[2_545]	2.18	0.02

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	
2	A	163/166 (98%)	160 (98%)	3 (2%)	0	100	100
2	B	158/166 (95%)	154 (98%)	3 (2%)	1 (1%)	25	7
All	All	321/332 (97%)	314 (98%)	6 (2%)	1 (0%)	41	18

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	432	ALA

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	
2	A	136/145 (94%)	136 (100%)	0	100	100
2	B	134/145 (92%)	133 (99%)	1 (1%)	84	69
All	All	270/290 (93%)	269 (100%)	1 (0%)	91	82

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	496	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	A	468	HIS

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	C	0/3	-	-
1	D	1/3 (33%)	0	0
All	All	1/6 (16%)	0	0

There are no RNA backbone outliers to report.

There are no RNA pucker outliers to report.

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

2 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	6MZ	D	1	1	17,22,26	1.64	3 (17%)	16,32,39	2.33	4 (25%)
1	6MZ	C	1	1	17,22,26	1.66	3 (17%)	16,32,39	2.31	4 (25%)

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	6MZ	D	1	1	-	0/4/24/28	0/3/3/3
1	6MZ	C	1	1	-	0/4/24/28	0/3/3/3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	1	6MZ	C2-N3	4.36	1.38	1.32
1	D	1	6MZ	C6-C5	-3.94	1.38	1.44
1	D	1	6MZ	C2-N3	3.46	1.37	1.32
1	C	1	6MZ	C9-N6	3.29	1.50	1.45
1	C	1	6MZ	C6-C5	-3.19	1.40	1.44
1	D	1	6MZ	C9-N6	3.04	1.50	1.45

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	1	6MZ	N3-C2-N1	-6.34	120.06	128.67

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	1	6MZ	N3-C2-N1	-5.96	120.58	128.67
1	D	1	6MZ	C9-N6-C6	-4.10	119.05	122.85
1	C	1	6MZ	C2-N1-C6	4.04	119.73	116.60
1	D	1	6MZ	C1'-N9-C4	-3.84	119.90	126.64
1	C	1	6MZ	C1'-N9-C4	-3.75	120.05	126.64
1	D	1	6MZ	C2-N1-C6	3.36	119.20	116.60
1	C	1	6MZ	C9-N6-C6	-2.24	120.78	122.85

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

6 ligands 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	$\#|Z| > 2$
3	SO4	A	604	-	4,4,4	0.24	0	6,6,6	0.08	0
3	SO4	A	601	-	4,4,4	0.25	0	6,6,6	0.20	0
3	SO4	A	603	-	4,4,4	0.24	0	6,6,6	0.15	0
3	SO4	B	601	-	4,4,4	0.25	0	6,6,6	0.56	0
3	SO4	A	602	-	4,4,4	0.20	0	6,6,6	0.19	0
3	SO4	B	602	-	4,4,4	0.23	0	6,6,6	0.19	0

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	601	SO4	1	0

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 ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	C	1/3 (33%)	1.27	0	100	100	41, 41, 41, 41	0
1	D	2/3 (66%)	0.75	0	100	100	35, 35, 35, 37	0
2	A	164/166 (98%)	0.04	6 (3%)	41	46	18, 28, 48, 56	0
2	B	160/166 (96%)	0.22	7 (4%)	34	38	20, 29, 56, 64	0
All	All	327/338 (96%)	0.13	13 (3%)	38	42	18, 29, 51, 64	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	426	ILE	5.3
2	B	430	LEU	3.9
2	B	436	ALA	3.6
2	A	422	GLY	3.5
2	B	420	HIS	3.2
2	A	425	PRO	3.2
2	A	432	ALA	2.6
2	B	432	ALA	2.5
2	A	433	GLY	2.5
2	A	440	GLY	2.4
2	B	437	LYS	2.4
2	A	434	MET	2.2
2	B	429	VAL	2.1

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
1	6MZ	D	1	20/24	0.89	0.11	33,37,50,55	0
1	6MZ	C	1	20/24	0.91	0.09	22,26,54,54	0

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	SO4	B	602	5/5	0.85	0.15	49,56,58,61	0
3	SO4	B	601	5/5	0.91	0.15	31,35,41,42	0
3	SO4	A	604	5/5	0.93	0.28	49,53,56,61	0
3	SO4	A	603	5/5	0.95	0.19	46,50,50,51	0
3	SO4	A	602	5/5	0.95	0.23	29,33,38,41	0
3	SO4	A	601	5/5	0.98	0.06	31,31,33,36	0

6.5 Other polymers (i)

There are no such residues in this entry.