



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 03:58 PM GMT

PDB ID : 4E19
Title : Crystal structure of RNase H1 from halophilic archaeon Halobacterium salinarum NRC-1
Authors : You, D.J.; Angkawidjaja, C.; Koga, Y.; Kanaya, S.
Deposited on : 2012-03-06
Resolution : 1.41 Å(reported)

This is a Full wwPDB X-ray Structure 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/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

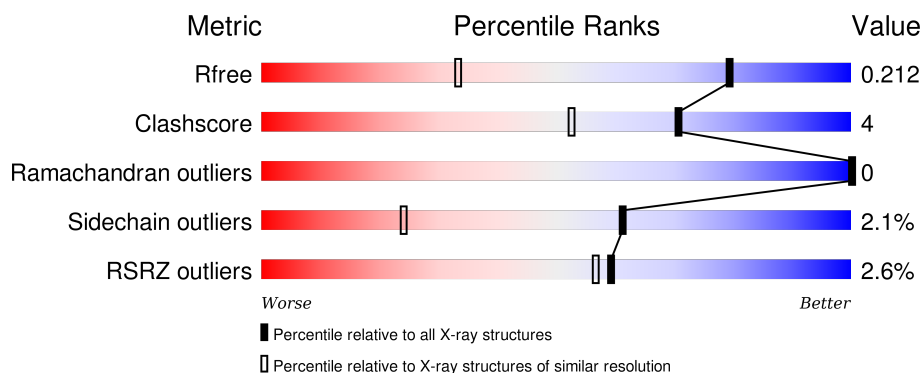
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.41 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))
R_{free}	91344	1632 (1.44-1.40)
Clashscore	102246	1743 (1.44-1.40)
Ramachandran outliers	100387	1698 (1.44-1.40)
Sidechain outliers	100360	1697 (1.44-1.40)
RSRZ outliers	91569	1632 (1.44-1.40)

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 $\leq 5\%$. 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	A	199	 2% 55% 11% • 33%
1	B	199	 2% 61% 5% • 34%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2302 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 protein called ribonuclease H1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
1	A	133	Total	C	N	O	0	0	0
			999	611	184	204			
1	B	132	Total	C	N	O	0	0	0
			995	609	183	203			

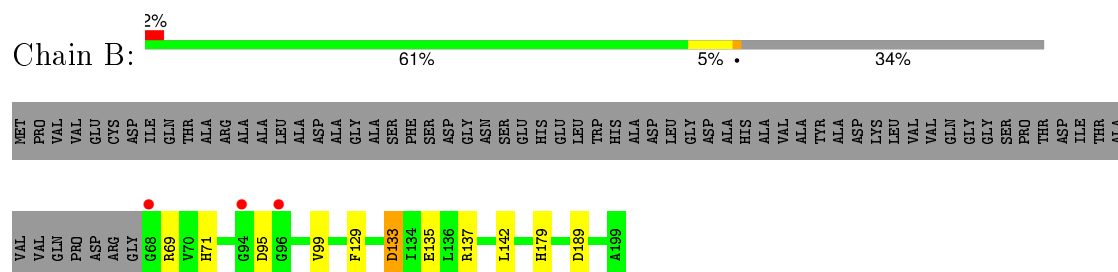
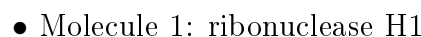
- Molecule 2 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	3	Total	Mn	0	0
			3	3		
2	A	2	Total	Mn	0	0
			2	2		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	150	Total	O	0	0
			150	150		
3	B	153	Total	O	0	0
			153	153		

- Molecule 1: ribonuclease H1



4 Data and refinement statistics

Property	Value	Source
Space group	I 41	Depositor
Cell constants a, b, c, α , β , γ	115.80Å 115.80Å 38.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.94 – 1.41 40.94 – 1.41	Depositor EDS
% Data completeness (in resolution range)	99.6 (40.94-1.41) 99.6 (40.94-1.41)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.01 (at 1.41Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.172 , 0.207 0.179 , 0.212	Depositor DCC
R_{free} test set	2477 reflections (5.34%)	DCC
Wilson B-factor (Å ²)	14.2	Xtriage
Anisotropy	0.512	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 40.8	EDS
Estimated twinning fraction	0.019 for -k,-h,-l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 48988 reflections	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	2302	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.72% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MN

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	1.28	3/1016 (0.3%)	1.23	6/1379 (0.4%)
1	B	1.30	1/1012 (0.1%)	1.18	5/1374 (0.4%)
All	All	1.29	4/2028 (0.2%)	1.20	11/2753 (0.4%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	151	TRP	CE3-CZ3	5.46	1.47	1.38
1	B	99	VAL	CB-CG2	-5.43	1.41	1.52
1	A	132	ASP	CB-CG	-5.15	1.41	1.51
1	A	92	VAL	C-O	-5.03	1.13	1.23

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	137	ARG	NE-CZ-NH2	-5.89	117.36	120.30
1	A	132	ASP	CB-CG-OD1	5.88	123.59	118.30
1	B	133	ASP	CB-CG-OD1	5.87	123.58	118.30
1	B	133	ASP	CB-CG-OD2	-5.76	113.12	118.30
1	B	189	ASP	CB-CG-OD2	5.51	123.26	118.30
1	A	75	ASP	CB-CG-OD1	5.49	123.24	118.30
1	A	117	ASP	CB-CG-OD2	-5.47	113.38	118.30
1	A	189	ASP	CB-CG-OD1	5.32	123.09	118.30
1	A	155	ASP	CB-CG-OD1	5.13	122.92	118.30
1	A	100	ALA	N-CA-CB	5.06	117.18	110.10
1	B	129	PHE	CB-CG-CD2	5.04	124.33	120.80

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-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 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	999	0	936	13	0
1	B	995	0	933	7	0
2	A	2	0	0	0	0
2	B	3	0	0	0	0
3	A	150	0	0	2	0
3	B	153	0	0	2	0
All	All	2302	0	1869	17	0

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 4.

All (17) 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)
1:A:95:ASP:OD1	1:A:95:ASP:N	2.09	0.86
1:A:93:SER:HB3	3:A:514:HOH:O	1.79	0.83
1:A:90:VAL:HG21	1:A:187:ARG:HG2	1.75	0.69
1:A:166:ARG:O	1:A:170:THR:HG23	1.95	0.67
1:B:71:HIS:NE2	3:B:452:HOH:O	2.26	0.67
1:B:179:HIS:HE1	3:B:376:HOH:O	1.86	0.58
1:A:92:VAL:HG12	1:A:93:SER:O	2.03	0.57
1:A:191:LEU:HD21	1:B:142:LEU:HD12	1.91	0.53
1:A:179:HIS:HD2	3:A:538:HOH:O	1.95	0.50
1:A:191:LEU:HD21	1:B:142:LEU:CD1	2.42	0.49
1:A:79:ARG:HG2	1:A:196:LEU:HD21	1.96	0.48
1:A:90:VAL:CG2	1:A:187:ARG:HG2	2.42	0.47
1:A:191:LEU:CD2	1:B:142:LEU:HD12	2.47	0.45
1:A:67:GLY:N	1:A:130:GLY:O	2.51	0.44
1:B:69:ARG:HD2	1:B:133:ASP:CG	2.37	0.43
1:B:69:ARG:HH21	1:B:135:GLU:HB2	1.85	0.42
1:A:73:TYR:HA	1:A:137:ARG:O	2.19	0.41

There are no symmetry-related clashes.

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	A	131/199 (66%)	130 (99%)	1 (1%)	0	100	100
1	B	130/199 (65%)	129 (99%)	1 (1%)	0	100	100
All	All	261/398 (66%)	259 (99%)	2 (1%)	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	A	96/145 (66%)	93 (97%)	3 (3%)	47	12
1	B	96/145 (66%)	95 (99%)	1 (1%)	82	58
All	All	192/290 (66%)	188 (98%)	4 (2%)	61	24

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	95	ASP
1	A	116	TYR
1	A	167	GLU
1	B	95	ASP

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

Mol	Chain	Res	Type
1	A	179	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 5 ligands modelled in this entry, 5 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

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](#)

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	A	133/199 (66%)	-0.07	4 (3%) 54 50	10, 15, 26, 40	0
1	B	132/199 (66%)	-0.23	3 (2%) 64 61	11, 16, 28, 45	0
All	All	265/398 (66%)	-0.15	7 (2%) 59 57	10, 15, 27, 45	0

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	94	GLY	5.7
1	A	93	SER	4.2
1	A	94	GLY	3.9
1	B	96	GLY	2.8
1	B	68	GLY	2.7
1	A	95	ASP	2.6
1	A	199	ALA	2.3

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

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

6.3 Carbohydrates [i](#)

There are no carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(\AA^2)	Q<0.9
2	MN	A	302	1/1	1.00	0.07	0.26	11,11,11,11	0
2	MN	A	301	1/1	1.00	0.05	-0.90	11,11,11,11	0
2	MN	B	202	1/1	0.99	0.05	-1.16	12,12,12,12	0
2	MN	B	201	1/1	1.00	0.04	-1.99	11,11,11,11	0
2	MN	B	203	1/1	0.99	0.03	-	15,15,15,15	0

6.5 Other polymers [i](#)

There are no such residues in this entry.