



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 05:20 PM UTC

PDB ID : 1RBT / pdb_00001rbt
Title : STRUCTURAL STUDY OF MUTANTS OF ESCHERICHIA COLI RIBONUCLEASE HI WITH ENHANCED THERMOSTABILITY
Authors : Ishikawa, K.; Kimura, S.; Kanaya, S.; Morikawa, K.; Nakamura, H.
Deposited on : 1993-02-16
Resolution : 1.80 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

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

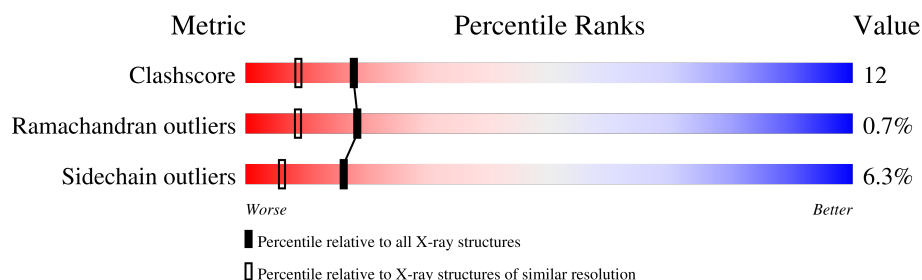
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	155	 63% 32% . .

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1354 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 H.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	155	Total	C	N	O	S	0	0	0
			1233	772	226	228	7			

There is a discrepancy between the modelled and reference sequences:

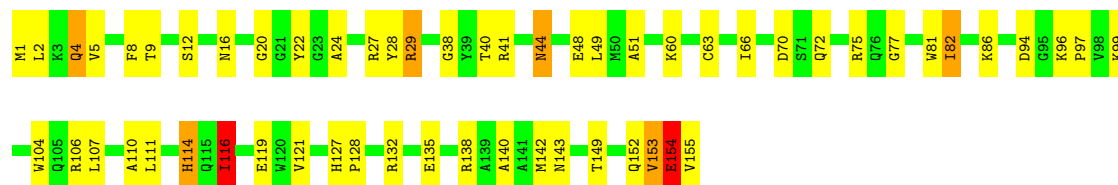
Chain	Residue	Modelled	Actual	Comment	Reference
A	95	GLY	LYS	conflict	UNP P0A7Y4

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	121	Total	O	0	0
			121	121		

Note EDS was not executed.

Chain A: 63% 32% 5%



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	44.04Å 86.63Å 35.48Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	5.00 – 1.80	Depositor
% Data completeness (in resolution range)	(Not available) (5.00-1.80)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.185 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1354	wwPDB-VP
Average B, all atoms (Å ²)	19.0	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	A	1.22	1/1261 (0.1%)	1.97	33/1704 (1.9%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	20	GLY	N-CA	6.03	1.50	1.45

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	94	ASP	CA-CB-CG	9.36	121.96	112.60
1	A	153	VAL	CA-C-N	8.98	138.69	121.54
1	A	153	VAL	C-N-CA	8.98	138.69	121.54
1	A	29	ARG	CD-NE-CZ	8.26	135.96	124.40
1	A	132	ARG	CD-NE-CZ	7.48	134.88	124.40
1	A	119	GLU	CB-CG-CD	7.32	125.03	112.60
1	A	135	GLU	CA-CB-CG	7.04	128.19	114.10
1	A	27	ARG	NE-CZ-NH1	6.99	128.49	121.50
1	A	27	ARG	CD-NE-CZ	6.98	134.17	124.40
1	A	114	HIS	N-CA-C	6.58	119.41	109.41
1	A	40	THR	N-CA-C	6.28	118.12	111.28
1	A	106	ARG	NE-CZ-NH1	-6.19	115.31	121.50
1	A	143	ASN	CB-CA-C	6.12	118.73	111.15
1	A	106	ARG	CD-NE-CZ	-5.83	116.23	124.40
1	A	116	ILE	N-CA-C	5.82	116.86	108.48
1	A	81	TRP	N-CA-C	5.75	120.31	112.04
1	A	16	ASN	OD1-CG-ND2	-5.65	116.95	122.60
1	A	29	ARG	NE-CZ-NH1	5.64	127.14	121.50
1	A	29	ARG	N-CA-C	-5.41	99.28	110.80
1	A	28	TYR	CA-CB-CG	5.35	123.54	113.90
1	A	138	ARG	CA-C-N	5.29	127.80	120.29
1	A	138	ARG	C-N-CA	5.29	127.80	120.29
1	A	41	ARG	NH1-CZ-NH2	5.27	126.15	119.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	12	SER	N-CA-CB	-5.21	102.96	111.66
1	A	110	ALA	CA-C-N	5.19	127.24	120.28
1	A	110	ALA	C-N-CA	5.19	127.24	120.28
1	A	41	ARG	NE-CZ-NH2	-5.18	114.54	119.20
1	A	5	VAL	CA-C-O	-5.14	114.99	120.85
1	A	132	ARG	NE-CZ-NH2	-5.14	114.57	119.20
1	A	82	ILE	CA-CB-CG2	5.11	119.19	110.50
1	A	114	HIS	CA-CB-CG	-5.09	108.71	113.80
1	A	75	ARG	CD-NE-CZ	-5.07	117.31	124.40
1	A	66	ILE	N-CA-C	-5.05	100.29	107.77

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	1233	0	1207	30	1
2	A	121	0	0	6	1
All	All	1354	0	1207	30	1

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 12.

All (30) 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:63:CYS:H	1:A:114:HIS:HD2	1.38	0.70
1:A:127:HIS:HB3	1:A:128:PRO:HD2	1.79	0.65
1:A:152:GLN:HE22	1:A:155:VAL:HB	1.62	0.63
1:A:127:HIS:HB3	1:A:128:PRO:CD	2.30	0.62
1:A:4:GLN:NE2	2:A:332:HOH:O	2.37	0.56
1:A:86:LYS:O	2:A:240:HOH:O	2.18	0.54
1:A:44:ASN:ND2	1:A:48:GLU:OE2	2.40	0.54
1:A:9:THR:HB	1:A:51:ALA:HB1	1.89	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:152:GLN:NE2	1:A:155:VAL:HB	2.22	0.53
1:A:111:LEU:HD23	1:A:116:ILE:HD12	1.93	0.49
1:A:72:GLN:HB2	2:A:163:HOH:O	2.14	0.48
1:A:22:TYR:C	1:A:22:TYR:CD1	2.91	0.48
1:A:111:LEU:CD2	1:A:116:ILE:HD12	2.43	0.48
1:A:127:HIS:CB	1:A:128:PRO:CD	2.92	0.48
1:A:96:LYS:HB3	1:A:97:PRO:HD2	1.97	0.47
1:A:77:GLY:HA3	1:A:104:TRP:CH2	2.49	0.47
1:A:9:THR:HB	1:A:51:ALA:CB	2.46	0.46
1:A:114:HIS:HE1	2:A:236:HOH:O	1.99	0.45
1:A:8:PHE:O	1:A:24:ALA:HA	2.17	0.45
1:A:96:LYS:HB3	1:A:97:PRO:CD	2.47	0.45
1:A:2:LEU:HD23	1:A:2:LEU:HA	1.79	0.43
1:A:70:ASP:HB3	1:A:121:VAL:HG23	2.00	0.43
1:A:1:MET:HA	2:A:302:HOH:O	2.18	0.43
1:A:142:MET:HB3	1:A:142:MET:HE3	1.73	0.42
1:A:38:GLY:HA3	1:A:140:ALA:O	2.20	0.41
1:A:60:LYS:HA	1:A:60:LYS:HD2	1.85	0.41
1:A:154:GLU:H	1:A:154:GLU:CD	2.29	0.41
1:A:49:LEU:CD2	1:A:107:LEU:HD22	2.51	0.40
1:A:44:ASN:HB3	2:A:251:HOH:O	2.20	0.40
1:A:63:CYS:H	1:A:114:HIS:CD2	2.28	0.40

All (1) 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)
1:A:29:ARG:NH1	2:A:314:HOH:O[2_454]	2.16	0.04

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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	153/155 (99%)	147 (96%)	5 (3%)	1 (1%)	18 8

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	154	GLU

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	126/126 (100%)	118 (94%)	8 (6%)	16 6

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	GLN
1	A	44	ASN
1	A	82	ILE
1	A	99	LYS
1	A	116	ILE
1	A	149	THR
1	A	153	VAL
1	A	154	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	45	ASN
1	A	105	GLN
1	A	113	GLN
1	A	114	HIS
1	A	152	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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 ⓘ

6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.