



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 09:20 PM GMT

PDB ID : 1OID
Title : 5'-NUCLEOTIDASE (E. COLI) WITH AN ENGINEERED DISULFIDE BRIDGE (S228C, P513C)
Authors : Schultz-Heienbrok, R.; Maier, T.; Straeter, N.
Deposited on : 2003-06-13
Resolution : 2.10 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 ⓘ 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

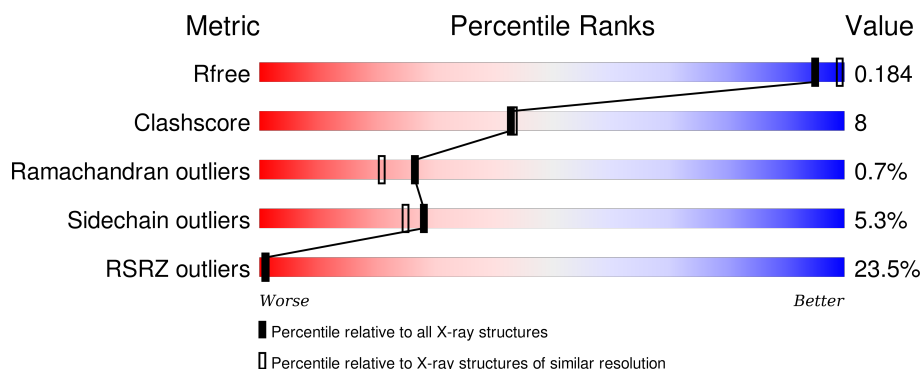
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	3939 (2.10-2.10)
Clashscore	102246	4460 (2.10-2.10)
Ramachandran outliers	100387	4413 (2.10-2.10)
Sidechain outliers	100360	4414 (2.10-2.10)
RSRZ outliers	91569	3948 (2.10-2.10)

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	532	<div> <div>15%</div> <div>77%</div> <div>19%</div> <div>..</div> </div>
1	B	532	<div> <div>32%</div> <div>76%</div> <div>19%</div> <div>..</div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8920 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 PROTEIN USHA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	525	Total	C	N	O	S	0	0	0
			4098	2588	703	788	19			
1	B	523	Total	C	N	O	S	0	0	0
			4075	2572	699	785	19			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	228	CYS	SER	ENGINEERED MUTATION	UNP P07024
A	513	CYS	PRO	ENGINEERED MUTATION	UNP P07024
B	228	CYS	SER	ENGINEERED MUTATION	UNP P07024
B	513	CYS	PRO	ENGINEERED MUTATION	UNP P07024

- Molecule 2 is NICKEL (II) ION (three-letter code: NI) (formula: Ni).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Ni	0	0
			1	1		

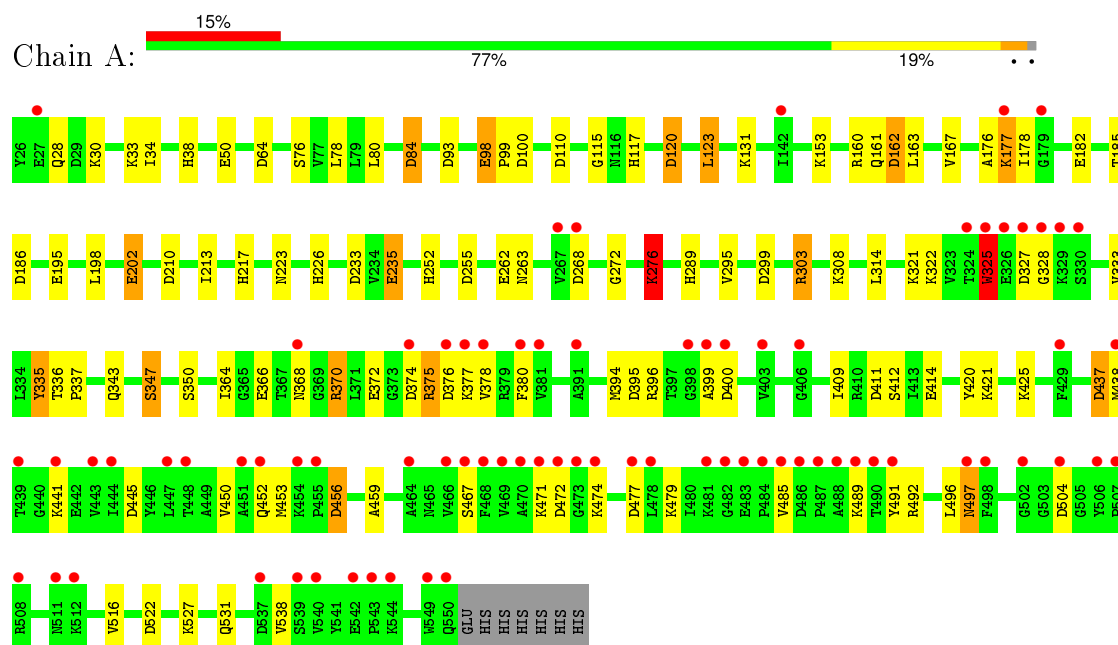
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	408	Total	O	0	0
			408	408		
3	B	338	Total	O	0	0
			338	338		

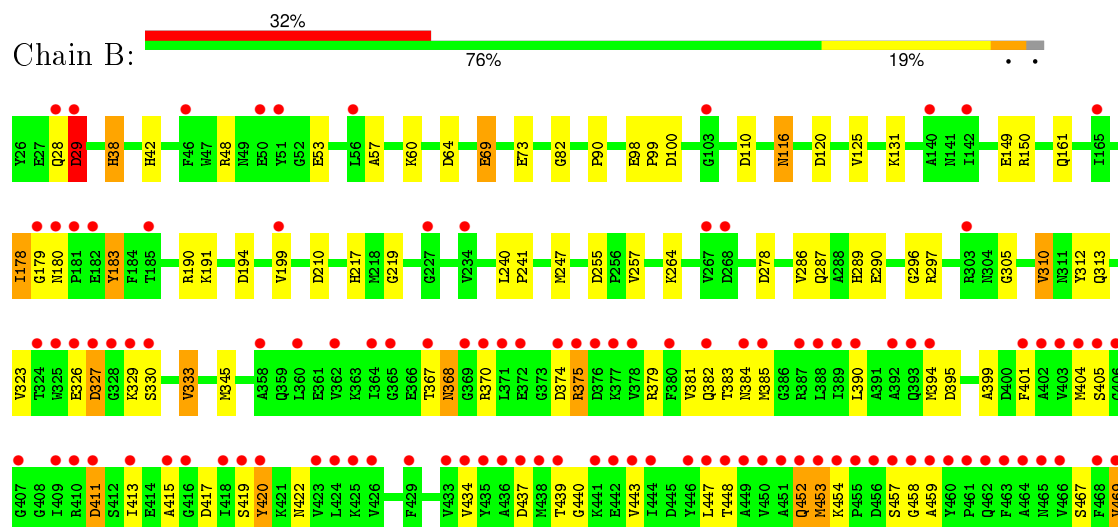
3 Residue-property plots

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.

• Molecule 1: PROTEIN USHA



• Molecule 1: PROTEIN USHA





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	80.50Å 93.71Å 82.90Å 90.00° 97.71° 90.00°	Depositor
Resolution (Å)	30.00 – 2.10 19.94 – 2.10	Depositor EDS
% Data completeness (in resolution range)	98.3 (30.00-2.10) 98.4 (19.94-2.10)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.49 (at 2.09Å)	Xtriage
Refinement program	REFMAC 5.1.19	Depositor
R, R_{free}	0.166 , 0.215 0.192 , 0.184	Depositor DCC
R_{free} test set	3529 reflections (5.04%)	DCC
Wilson B-factor (Å ²)	32.3	Xtriage
Anisotropy	0.061	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 66.4	EDS
Estimated twinning fraction	0.019 for l,-k,h	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 70046 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8920	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.29% 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: NI

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	1.44	15/4185 (0.4%)	1.24	39/5662 (0.7%)
1	B	1.28	17/4160 (0.4%)	1.16	27/5627 (0.5%)
All	All	1.36	32/8345 (0.4%)	1.20	66/11289 (0.6%)

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	1

The worst 5 of 32 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	333	VAL	CB-CG2	-10.24	1.31	1.52
1	B	333	VAL	CB-CG2	-9.18	1.33	1.52
1	A	347	SER	CB-OG	-8.95	1.30	1.42
1	A	235	GLU	CD-OE2	-8.45	1.16	1.25
1	B	69	GLU	CD-OE1	8.01	1.34	1.25

The worst 5 of 66 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	235	GLU	OE1-CD-OE2	-13.50	107.11	123.30
1	B	48	ARG	NE-CZ-NH1	13.28	126.94	120.30
1	B	64	ASP	CB-CG-OD1	11.16	128.34	118.30
1	B	210	ASP	CB-CG-OD2	10.76	127.99	118.30
1	A	162	ASP	CB-CG-OD2	10.71	127.94	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	437	ASP	Mainchain

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	4098	0	4015	58	1
1	B	4075	0	3997	74	0
2	A	1	0	0	0	0
3	A	408	0	0	13	1
3	B	338	0	0	9	0
All	All	8920	0	8012	132	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 8.

The worst 5 of 132 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:B:38:HIS:CE1	1:B:296:GLY:HA3	1.80	1.15
1:B:401:PHE:CE2	1:B:493:MET:HG3	1.83	1.14
1:B:73:GLU:HG2	3:B:2058:HOH:O	1.59	1.02
1:A:84:ASP:CG	1:A:217:HIS:HE1	1.67	0.98
1:B:217:HIS:HE1	3:B:2099:HOH:O	1.51	0.94

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:414:GLU:OE2	3:A:2286:HOH:O[2_945]	1.99	0.21

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	523/532 (98%)	495 (95%)	25 (5%)	3 (1%)	30	24
1	B	521/532 (98%)	496 (95%)	21 (4%)	4 (1%)	24	17
All	All	1044/1064 (98%)	991 (95%)	46 (4%)	7 (1%)	26	21

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	328	GLY
1	B	183	TYR
1	B	503	GLY
1	A	289	HIS
1	B	29	ASP

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	433/440 (98%)	409 (94%)	24 (6%)	27	23
1	B	431/440 (98%)	409 (95%)	22 (5%)	29	26
All	All	864/880 (98%)	818 (95%)	46 (5%)	28	25

5 of 46 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	471	LYS

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Mol	Chain	Res	Type
1	B	116	ASN
1	B	477	ASP
1	A	474	LYS
1	A	496	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	531	GLN
1	B	38	HIS
1	B	353	GLN
1	A	289	HIS
1	B	422	ASN

5.3.3 RNA ⓘ

There are no RNA molecules 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 ⓘ

Of 1 ligands modelled in this entry, 1 is 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	525/532 (98%)	0.61	78 (14%) 3 5	18, 32, 63, 82	0
1	B	523/532 (98%)	1.62	168 (32%) 1 1	22, 38, 80, 94	0
All	All	1048/1064 (98%)	1.11	246 (23%) 1 1	18, 35, 75, 94	0

The worst 5 of 246 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	401	PHE	10.2
1	B	491	TYR	9.8
1	B	463	PHE	9.8
1	B	454	LYS	9.5
1	B	403	VAL	9.2

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	NI	A	1551	1/1	0.97	0.12	0.47	66,66,66,66	0

6.5 Other polymers ⓘ

There are no such residues in this entry.