Full wwPDB X-ray Structure Validation Report ⓘ

Sep 10, 2024 – 04:20 PM JST

PDB ID	:	9JDQ
Title	:	Crystal structure of reductase EA
Authors	:	Tang, J.; Liuqing, C.
Deposited on	:	2024-09-01
Resolution	:	1.71 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:

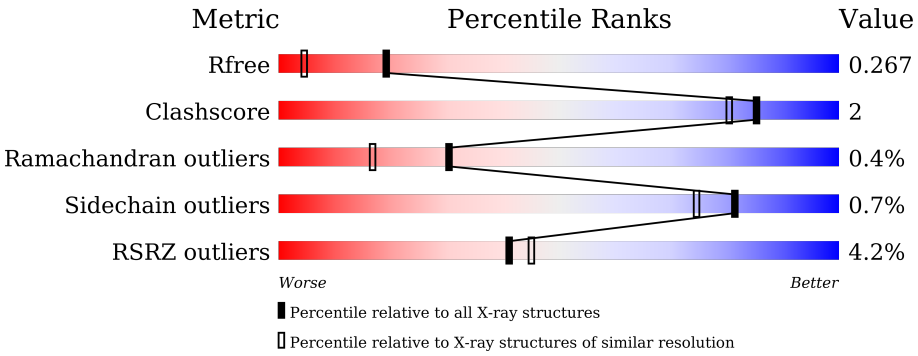
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.002 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.38.2

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 1.71 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}	164625	7106 (1.74-1.70)
Clashscore	180529	7746 (1.74-1.70)
Ramachandran outliers	177936	7654 (1.74-1.70)
Sidechain outliers	177891	7654 (1.74-1.70)
RSRZ outliers	164620	7104 (1.74-1.70)

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	A	256	5% 91% 6% ·
1	B	256	4% 91% 6% ·

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 4314 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 Oxidoreductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	249	Total	C	N	O	S	0	0	0
			1922	1218	322	378	4			
1	B	249	Total	C	N	O	S	0	0	0
			1922	1218	322	378	4			

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	MET	-	initiating methionine	UNP Q6BDS0
A	-5	HIS	-	expression tag	UNP Q6BDS0
A	-4	HIS	-	expression tag	UNP Q6BDS0
A	-3	HIS	-	expression tag	UNP Q6BDS0
A	-2	HIS	-	expression tag	UNP Q6BDS0
A	-1	HIS	-	expression tag	UNP Q6BDS0
A	0	HIS	-	expression tag	UNP Q6BDS0
A	82	LEU	TRP	conflict	UNP Q6BDS0
A	121	ALA	VAL	conflict	UNP Q6BDS0
A	138	LEU	ALA	conflict	UNP Q6BDS0
A	190	VAL	ALA	conflict	UNP Q6BDS0
A	193	ALA	SER	conflict	UNP Q6BDS0
A	206	HIS	LYS	conflict	UNP Q6BDS0
B	-6	MET	-	initiating methionine	UNP Q6BDS0
B	-5	HIS	-	expression tag	UNP Q6BDS0
B	-4	HIS	-	expression tag	UNP Q6BDS0
B	-3	HIS	-	expression tag	UNP Q6BDS0
B	-2	HIS	-	expression tag	UNP Q6BDS0
B	-1	HIS	-	expression tag	UNP Q6BDS0
B	0	HIS	-	expression tag	UNP Q6BDS0
B	82	LEU	TRP	conflict	UNP Q6BDS0
B	121	ALA	VAL	conflict	UNP Q6BDS0
B	138	LEU	ALA	conflict	UNP Q6BDS0
B	190	VAL	ALA	conflict	UNP Q6BDS0
B	193	ALA	SER	conflict	UNP Q6BDS0

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Chain	Residue	Modelled	Actual	Comment	Reference
B	206	HIS	LYS	conflict	UNP Q6BDS0

- Molecule 2 is water.

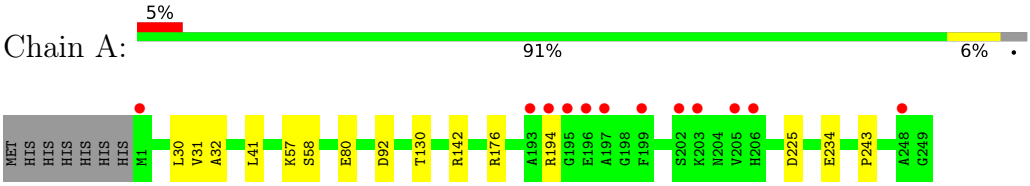
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	235	Total O 235 235	0	0
2	B	235	Total O 235 235	0	0

3 Residue-property plots (i)

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.

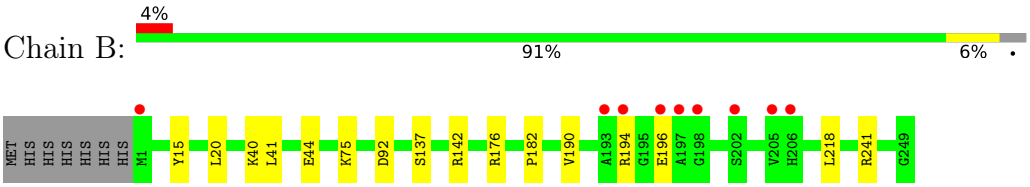
• Molecule 1: Oxidoreductase

Chain A:



• Molecule 1: Oxidoreductase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	142.75Å 67.67Å 74.55Å 90.00° 117.88° 90.00°	Depositor
Resolution (Å)	19.92 – 1.71 19.92 – 1.71	Depositor EDS
% Data completeness (in resolution range)	99.0 (19.92-1.71) 98.4 (19.92-1.71)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.29 (at 1.71Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.230 , 0.250 0.238 , 0.267	Depositor DCC
R_{free} test set	3338 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å^2)	20.7	Xtriage
Anisotropy	0.044	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.44 , 43.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	4314	wwPDB-VP
Average B, all atoms (Å^2)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.14% of the height of the origin peak. No significant pseudotranslation is detected.*

[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

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	0.47	0/1951	0.82	0/2635
1	B	0.48	0/1951	0.80	0/2635
All	All	0.48	0/3902	0.81	0/5270

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
1	B	0	2
All	All	0	3

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	176	ARG	Sidechain
1	B	176	ARG	Sidechain
1	B	241	ARG	Sidechain

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	1922	0	1923	7	0
1	B	1922	0	1923	9	0
2	A	235	0	0	2	0
2	B	235	0	0	1	0
All	All	4314	0	3846	16	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 2.

All (16) 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:234:GLU:HG2	2:A:675:HOH:O	2.00	0.61
1:B:137:SER:HA	1:B:182:PRO:HD2	1.89	0.55
1:B:75:LYS:HB2	2:B:571:HOH:O	2.06	0.54
1:B:190:VAL:O	1:B:194:ARG:HG2	2.07	0.54
1:A:225:ASP:HA	2:A:512:HOH:O	2.12	0.50
1:B:40:LYS:NZ	1:B:44:GLU:OE2	2.39	0.49
1:B:194:ARG:NE	1:B:196:GLU:HG3	2.27	0.49
1:A:32:ALA:O	1:A:58:SER:HA	2.16	0.46
1:A:30:LEU:HD13	1:A:41:LEU:HD23	1.99	0.44
1:B:20:LEU:HD23	1:B:20:LEU:C	2.38	0.44
1:A:80:GLU:O	1:A:130:THR:HA	2.19	0.43
1:A:31:VAL:HG22	1:A:57:LYS:HB2	2.00	0.43
1:B:194:ARG:HG3	1:B:196:GLU:HG2	2.01	0.42
1:A:194:ARG:HE	1:A:194:ARG:HB2	1.74	0.41
1:B:15:TYR:CE2	1:B:41:LEU:HB2	2.56	0.41
1:B:218:LEU:HD23	1:B:218:LEU:C	2.42	0.40

There are no symmetry-related clashes.

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	247/256 (96%)	238 (96%)	8 (3%)	1 (0%)	30 17
1	B	247/256 (96%)	238 (96%)	8 (3%)	1 (0%)	30 17
All	All	494/512 (96%)	476 (96%)	16 (3%)	2 (0%)	30 17

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	92	ASP
1	B	92	ASP

5.3.2 Protein sidechains (i)

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	203/210 (97%)	201 (99%)	2 (1%)	73 63
1	B	203/210 (97%)	202 (100%)	1 (0%)	86 82
All	All	406/420 (97%)	403 (99%)	3 (1%)	81 74

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	142	ARG
1	A	243	PRO
1	B	142	ARG

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

Mol	Chain	Res	Type
1	B	204	ASN

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

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, 95^{th} 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	249/256 (97%)	0.28	12 (4%) 36 40	11, 19, 37, 53	0
1	B	249/256 (97%)	0.26	9 (3%) 46 50	11, 19, 36, 54	0
All	All	498/512 (97%)	0.27	21 (4%) 41 45	11, 19, 37, 54	0

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	MET	3.6
1	B	1	MET	3.4
1	A	205	VAL	3.1
1	B	202	SER	2.8
1	A	194	ARG	2.8
1	A	202	SER	2.8
1	A	203	LYS	2.8
1	A	195	GLY	2.7
1	B	193	ALA	2.6
1	A	197	ALA	2.5
1	B	206	HIS	2.4
1	B	194	ARG	2.4
1	B	205	VAL	2.3
1	A	199	PHE	2.3
1	B	198	GLY	2.3
1	B	196	GLU	2.2
1	A	196	GLU	2.2
1	A	248	ALA	2.1
1	A	206	HIS	2.0
1	A	193	ALA	2.0
1	B	197	ALA	2.0

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 monosaccharides in this entry.

6.4 Ligands (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.