WORLDWIDE PDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Oct 24, 2023 – 07:59 pm BST

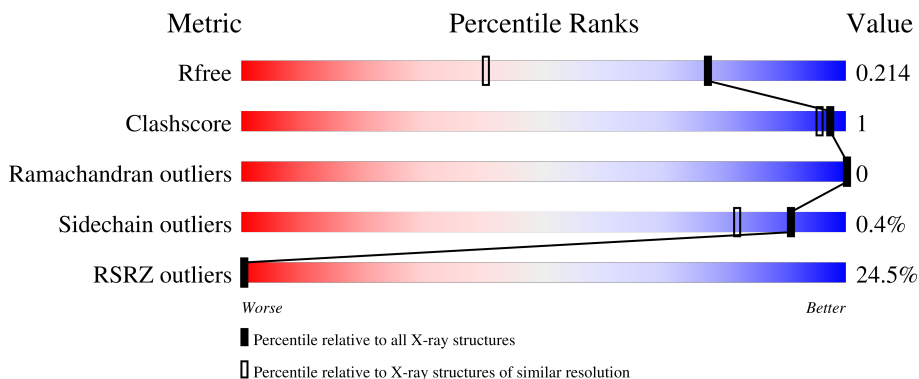|		
PDB ID	:	8BT3
Title	:	Ribonucleotide Reductase class Ie R2 from Mesoplasma florum, catalytically active radical state solved by XFEL
Authors	:	Lebrette, H.; Srinivas, V.; Hogbom, M.
Deposited on	:	2022-11-27
Resolution	:	1.50 Å(reported)

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 1.50 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		0.214
Clashscore		1
Ramachandran outliers		0
Sidechain outliers		0.4%
RSRZ outliers		24.5%

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)

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	345	22% ... 87% ... • ... 11%

W O R L D W I D E
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2 Entry composition ⓘ

There are 2 unique types of molecules in this entry. The entry contains 2714 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 Ribonucleoside-diphosphate reductase beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	307	Total 2580	C 1666	N 416	O 491	S 7	0	8	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	GLY	-	expression tag	UNP Q6F0T5
A	-3	HIS	-	expression tag	UNP Q6F0T5
A	-2	MET	-	expression tag	UNP Q6F0T5
A	-1	ALA	-	expression tag	UNP Q6F0T5
A	0	SER	-	expression tag	UNP Q6F0T5
A	126	DAH	TYR	conflict	UNP Q6F0T5

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	134	Total 134	O 134	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: Ribonucleoside-diphosphate reductase beta chain
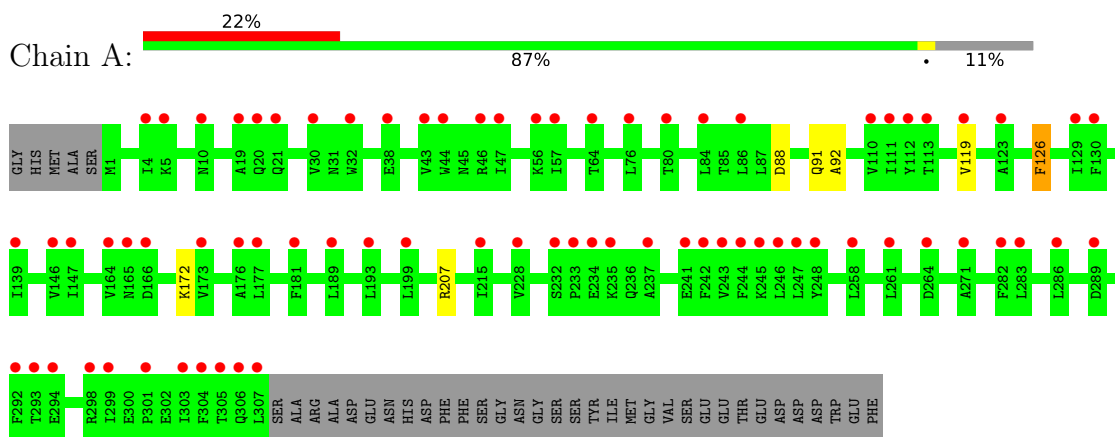
4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	142.99Å 46.31Å 58.51Å 90.00° 112.59° 90.00°	Depositor
Resolution (Å)	23.82 – 1.50 23.82 – 1.50	Depositor EDS
% Data completeness (in resolution range)	99.9 (23.82-1.50) 90.8 (23.82-1.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.16 (at 1.50Å)	Xtriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, R_{free}	0.177 , 0.214 0.177 , 0.214	Depositor DCC
R_{free} test set	2845 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	18.3	Xtriage
Anisotropy	0.300	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 52.4	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	0.025 for -h-2*l,-k,l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	2714	wwPDB-VP
Average B, all atoms (Å^2)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.39% 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: DAH

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	0.34	0/2627	0.49	0/3562

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	A	2580	0	2530	4	0
2	A	134	0	0	1	0
All	All	2714	0	2530	4	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 1.

All (4) 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:91:GLN:HB2	1:A:119[A]:VAL:HG11	1.91	0.52
1:A:207:ARG:NH1	2:A:408:HOH:O	2.45	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:92:ALA:HB2	1:A:119[B]:VAL:HG13	1.96	0.47
1:A:88:ASP:OD2	1:A:126:DAH:OE2	2.39	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	312/345 (90%)	307 (98%)	5 (2%)	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	281/304 (92%)	280 (100%)	1 (0%)	91	82

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

Mol	Chain	Res	Type
1	A	172	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is 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	DAH	A	126	1	12,13,14	0.85	0	14,17,19	1.28	2 (14%)

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	DAH	A	126	1	-	0/5/6/8	0/1/1/1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	126	DAH	CG-CB-CA	-2.67	108.70	114.10
1	A	126	DAH	CE2-CD2-CG	-2.14	118.56	120.83

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
1	A	126	DAH	1	0

5.5 Carbohydrates (i)

There are no monosaccharides 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, 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(Å²)	Q<0.9
1	A	306/345 (88%)	1.42	75 (24%)	0	0	16, 26, 45, 55	0

All (75) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	164	VAL	6.7
1	A	304	PHE	6.0
1	A	305	THR	5.8
1	A	166	ASP	5.6
1	A	189	LEU	5.1
1	A	233	PRO	4.8
1	A	307	LEU	4.5
1	A	165	ASN	4.3
1	A	294	GLU	4.0
1	A	301	PRO	4.0
1	A	306	GLN	3.9
1	A	56	LYS	3.8
1	A	303	ILE	3.7
1	A	243	VAL	3.5
1	A	30	VAL	3.5
1	A	234	GLU	3.5
1	A	298	ARG	3.4
1	A	237	ALA	3.4
1	A	299	ILE	3.3
1	A	173	VAL	3.3
1	A	289	ASP	3.3
1	A	111	ILE	3.2
1	A	193	LEU	3.0
1	A	292	PHE	3.0
1	A	4	ILE	3.0
1	A	84	LEU	3.0
1	A	139	ILE	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	199	LEU	2.8
1	A	261	LEU	2.8
1	A	21	GLN	2.7
1	A	32	TRP	2.7
1	A	232	SER	2.7
1	A	47	ILE	2.7
1	A	146	VAL	2.6
1	A	242	PHE	2.6
1	A	130	PHE	2.6
1	A	176	ALA	2.6
1	A	46	ARG	2.6
1	A	264	ASP	2.6
1	A	293	THR	2.6
1	A	20	GLN	2.5
1	A	235	LYS	2.5
1	A	86	LEU	2.4
1	A	5	LYS	2.4
1	A	76	LEU	2.4
1	A	112	TYR	2.4
1	A	247	LEU	2.4
1	A	181	PHE	2.4
1	A	129	ILE	2.4
1	A	110	VAL	2.3
1	A	282	PHE	2.3
1	A	241	GLU	2.3
1	A	177	LEU	2.3
1	A	283	LEU	2.3
1	A	43	VAL	2.3
1	A	271	ALA	2.2
1	A	64	THR	2.2
1	A	57	ILE	2.2
1	A	248	TYR	2.2
1	A	10	ASN	2.1
1	A	119[A]	VAL	2.1
1	A	38	GLU	2.1
1	A	80	THR	2.1
1	A	113	THR	2.1
1	A	245	LYS	2.1
1	A	244	PHE	2.1
1	A	246	LEU	2.1
1	A	19	ALA	2.1
1	A	147	ILE	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	215	ILE	2.1
1	A	258	LEU	2.1
1	A	286	LEU	2.1
1	A	228	VAL	2.0
1	A	123	ALA	2.0
1	A	44	TRP	2.0

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	DAH	A	126	13/14	0.96	0.10	17,19,22,23	0

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.