



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 7, 2026 – 12:16 AM UTC

PDB ID : 6JL8 / pdb_00006jl8
Title : Crystal structure of GMP reductase C318A from Trypanosoma brucei
Authors : Mase, H.; Imamura, A.; Nishimura, S.; Inui, T.
Deposited on : 2019-03-04
Resolution : 2.80 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)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

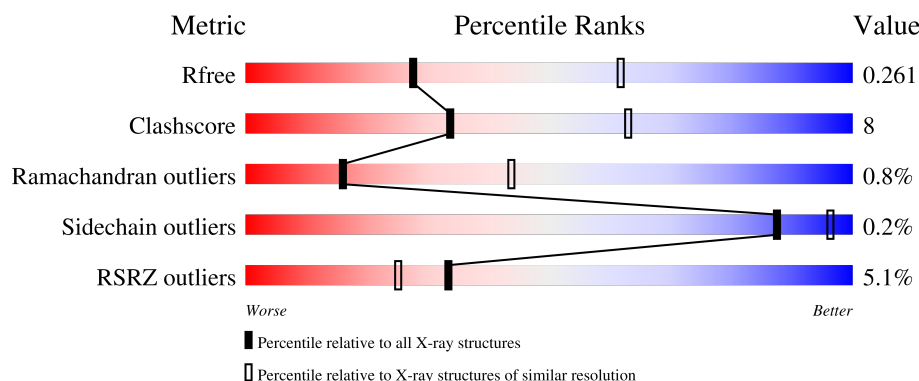
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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))
R_{free}	180053	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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 $\leq 5\%$. 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	504	4% 73% 16% 10%
1	B	504	5% 74% 14% 12%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 6134 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 GMP reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	453	Total	C	N	O	S	0	0	0
			3149	1949	581	595	24			
1	B	442	Total	C	N	O	S	0	0	0
			2966	1831	535	578	22			

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	318	ALA	CYS	engineered mutation	UNP Q57ZS7
A	492	LYS	-	expression tag	UNP Q57ZS7
A	493	LEU	-	expression tag	UNP Q57ZS7
A	494	ALA	-	expression tag	UNP Q57ZS7
A	495	ALA	-	expression tag	UNP Q57ZS7
A	496	ALA	-	expression tag	UNP Q57ZS7
A	497	LEU	-	expression tag	UNP Q57ZS7
A	498	GLU	-	expression tag	UNP Q57ZS7
A	499	HIS	-	expression tag	UNP Q57ZS7
A	500	HIS	-	expression tag	UNP Q57ZS7
A	501	HIS	-	expression tag	UNP Q57ZS7
A	502	HIS	-	expression tag	UNP Q57ZS7
A	503	HIS	-	expression tag	UNP Q57ZS7
A	504	HIS	-	expression tag	UNP Q57ZS7
B	318	ALA	CYS	engineered mutation	UNP Q57ZS7
B	492	LYS	-	expression tag	UNP Q57ZS7
B	493	LEU	-	expression tag	UNP Q57ZS7
B	494	ALA	-	expression tag	UNP Q57ZS7
B	495	ALA	-	expression tag	UNP Q57ZS7
B	496	ALA	-	expression tag	UNP Q57ZS7
B	497	LEU	-	expression tag	UNP Q57ZS7
B	498	GLU	-	expression tag	UNP Q57ZS7
B	499	HIS	-	expression tag	UNP Q57ZS7
B	500	HIS	-	expression tag	UNP Q57ZS7
B	501	HIS	-	expression tag	UNP Q57ZS7

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Chain	Residue	Modelled	Actual	Comment	Reference
B	502	HIS	-	expression tag	UNP Q57ZS7
B	503	HIS	-	expression tag	UNP Q57ZS7
B	504	HIS	-	expression tag	UNP Q57ZS7

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	16	Total	O	0	0
			16	16		
2	B	3	Total	O	0	0
			3	3		

4 Data and refinement statistics

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, α , β , γ	124.56Å 124.56Å 540.17Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	21.81 – 2.80 21.81 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.9 (21.81-2.80) 99.6 (21.81-2.80)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.82 (at 2.81Å)	Xtriage
Refinement program	PHENIX (1.14_3260: ???)	Depositor
R, R_{free}	0.223 , 0.258 0.226 , 0.261	Depositor DCC
R_{free} test set	2642 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	62.1	Xtriage
Anisotropy	0.172	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 52.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	6134	wwPDB-VP
Average B, all atoms (Å ²)	66.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.88% 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, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.53	0/3177	0.71	0/4312
1	B	0.43	0/2991	0.55	1/4075 (0.0%)
All	All	0.48	0/6168	0.64	1/8387 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	158	THR	CB-CA-C	-5.61	102.08	110.16

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	3149	0	3090	52	0
1	B	2966	0	2786	40	0
2	A	16	0	0	0	0
2	B	3	0	0	0	0
All	All	6134	0	5876	92	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 8.

All (92) 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:102:PRO:HD2	1:B:139:ARG:HH22	1.46	0.80
1:A:84:GLN:HG2	1:A:248:LEU:HD21	1.63	0.80
1:B:95:GLN:HG3	1:B:229:LEU:HG	1.65	0.77
1:A:88:LEU:HD11	1:A:253:ALA:HB2	1.73	0.70
1:B:376:MET:HE1	1:B:447:LEU:HD21	1.76	0.67
1:B:268:CYS:O	1:B:272:VAL:HG23	1.95	0.67
1:A:134:ASN:HB3	1:A:142:LEU:HD11	1.76	0.67
1:A:217:LYS:O	1:A:219:LYS:N	2.29	0.66
1:A:51:ALA:HB2	1:A:66:MET:HG3	1.78	0.66
1:A:301:ILE:HG12	1:A:346:VAL:HG21	1.78	0.65
1:B:80:SER:HG	1:B:82:GLU:HG2	1.62	0.65
1:B:80:SER:OG	1:B:82:GLU:HG2	1.96	0.65
1:B:53:ASN:HB3	1:B:74:ILE:HG22	1.80	0.63
1:A:171:VAL:HG12	1:A:172:SER:N	2.13	0.61
1:A:34:ASN:HD21	1:A:36:THR:HG23	1.65	0.61
1:A:383:ALA:O	1:A:396:LYS:NZ	2.35	0.59
1:B:95:GLN:CG	1:B:229:LEU:HG	2.32	0.59
1:B:167:ASP:OD1	1:B:168:LYS:N	2.36	0.59
1:B:171:VAL:HG12	1:B:172:SER:N	2.16	0.58
1:A:39:LEU:HD22	1:A:72:ILE:HG21	1.84	0.58
1:A:177:ILE:HG12	1:A:181:GLU:HB3	1.85	0.58
1:B:465:GLU:OE1	1:B:469:ARG:NH2	2.37	0.57
1:B:178:SER:OG	1:B:181:GLU:N	2.20	0.57
1:A:131:LEU:HD11	1:A:206:LEU:HD13	1.86	0.56
1:A:260:ILE:HD11	1:A:268:CYS:HB2	1.88	0.56
1:B:269:ILE:HG23	1:B:303:ALA:HB2	1.88	0.56
1:B:80:SER:HG	1:B:83:GLU:H	1.53	0.55
1:A:92:LYS:NZ	1:A:254:ASP:OD2	2.34	0.55
1:A:464:GLU:OE2	1:A:468:ARG:NH2	2.40	0.55
1:B:351:ASP:HA	1:B:372:MET:HB3	1.90	0.54
1:B:217:LYS:O	1:B:219:LYS:N	2.41	0.54
1:B:84:GLN:HG2	1:B:248:LEU:HD21	1.90	0.54
1:B:127:VAL:O	1:B:147:ARG:NH2	2.42	0.53
1:A:257:VAL:HG22	1:A:287:ILE:HB	1.91	0.52
1:A:40:SER:C	1:A:347:PRO:HG2	2.34	0.51
1:B:302:ASP:OD1	1:B:344:ARG:NH2	2.43	0.51
1:B:287:ILE:HD13	1:B:349:ILE:HD11	1.92	0.51
1:A:52:SER:HA	1:A:372:MET:HE2	1.94	0.50
1:A:54:MET:HE3	1:A:317:ILE:HD11	1.93	0.50
1:A:34:ASN:ND2	1:A:36:THR:HG23	2.25	0.50
1:A:119:ASN:ND2	1:A:147:ARG:HH22	2.10	0.49
1:A:171:VAL:CG1	1:A:172:SER:N	2.75	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:242:MET:CG	1:A:274:ARG:HD2	2.42	0.49
1:B:274:ARG:HH11	1:B:274:ARG:HB2	1.77	0.49
1:B:297:ALA:O	1:B:301:ILE:HG13	2.13	0.49
1:B:58:CYS:HA	1:B:62:MET:HB3	1.94	0.48
1:A:84:GLN:CG	1:A:248:LEU:HD21	2.41	0.48
1:B:171:VAL:CG1	1:B:172:SER:N	2.76	0.48
1:B:145:ILE:HD11	1:B:150:LEU:HD21	1.95	0.48
1:A:451:LEU:O	1:A:455:MET:HG3	2.14	0.47
1:B:301:ILE:HG23	1:B:346:VAL:HG21	1.95	0.47
1:A:396:LYS:O	1:A:433:SER:HA	2.15	0.46
1:A:29:SER:O	1:A:32:GLU:HG2	2.15	0.46
1:A:390:LYS:HE3	1:A:390:LYS:HB3	1.88	0.46
1:A:291:ILE:HD11	1:A:308:LEU:HD13	1.98	0.46
1:A:99:ILE:HB	1:A:206:LEU:O	2.16	0.45
1:B:184:HIS:NE2	1:B:188:LYS:HD3	2.31	0.45
1:B:360:ILE:HD12	1:B:447:LEU:HD22	1.98	0.45
1:A:60:GLN:O	1:A:64:VAL:HG23	2.17	0.45
1:A:105:ILE:O	1:A:132:VAL:HA	2.16	0.45
1:A:360:ILE:HG12	1:A:371:VAL:HG21	1.98	0.45
1:A:55:ASP:HA	1:A:76:HIS:CD2	2.51	0.45
1:A:40:SER:CA	1:A:347:PRO:HG2	2.47	0.45
1:B:97:PHE:H	1:B:97:PHE:HD2	1.64	0.45
1:B:315:GLY:H	1:B:318:ALA:HB2	1.82	0.45
1:B:51:ALA:HB2	1:B:66:MET:SD	2.57	0.44
1:B:257:VAL:HG22	1:B:287:ILE:HB	1.98	0.44
1:B:77:ARG:HB3	1:B:234:ALA:O	2.17	0.44
1:A:92:LYS:HE2	1:A:252:GLY:O	2.17	0.44
1:A:330:GLN:HA	1:A:330:GLN:OE1	2.17	0.44
1:A:40:SER:OG	1:A:285:ASP:OD2	2.30	0.44
1:A:13:LEU:HD22	1:A:17:ASP:HB3	2.00	0.43
1:A:193:ASN:OD1	1:A:208:THR:HG23	2.18	0.43
1:A:179:LEU:O	1:A:183:THR:OG1	2.29	0.43
1:A:37:THR:HG21	1:A:48:PRO:HB3	2.00	0.43
1:A:242:MET:HG2	1:A:274:ARG:HD2	2.00	0.43
1:A:401:MET:HE2	1:A:401:MET:HB3	1.72	0.42
1:A:131:LEU:HD13	1:A:203:LEU:HD11	2.02	0.42
1:B:475:MET:HE3	1:B:475:MET:HB2	1.86	0.42
1:A:302:ASP:OD1	1:A:344:ARG:NH2	2.50	0.42
1:A:341:ALA:HB1	1:A:346:VAL:O	2.20	0.42
1:A:463:ILE:HD13	1:A:463:ILE:HA	1.96	0.42
1:B:258:VAL:HG22	1:B:288:ALA:HA	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:131:LEU:HD13	1:B:203:LEU:HD11	2.01	0.41
1:B:262:HIS:CE1	1:B:264:HIS:HB3	2.55	0.41
1:A:73:GLY:O	1:A:74:ILE:HD13	2.20	0.41
1:B:441:GLY:O	1:B:445:ARG:HG3	2.20	0.41
1:A:18:VAL:HG23	1:A:362:LYS:HD3	2.02	0.41
1:B:269:ILE:HG12	1:B:300:LEU:HD23	2.03	0.41
1:A:51:ALA:HB3	1:A:73:GLY:HA2	2.03	0.41
1:A:330:GLN:O	1:A:334:VAL:HG23	2.21	0.40
1:B:120:TRP:C	1:B:122:GLY:H	2.30	0.40

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	449/504 (89%)	412 (92%)	33 (7%)	4 (1%)	14	41
1	B	436/504 (86%)	402 (92%)	31 (7%)	3 (1%)	18	47
All	All	885/1008 (88%)	814 (92%)	64 (7%)	7 (1%)	16	44

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	217	LYS
1	A	218	ASN
1	B	218	ASN
1	B	314	PRO
1	A	292	ALA
1	B	121	LYS
1	A	400	GLY

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	303/403 (75%)	303 (100%)	0	100	100
1	B	272/403 (68%)	271 (100%)	1 (0%)	84	94
All	All	575/806 (71%)	574 (100%)	1 (0%)	87	96

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

Mol	Chain	Res	Type
1	B	158	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	23	GLN
1	A	34	ASN
1	A	119	ASN
1	A	375	ASN
1	B	148	HIS
1	B	193	ASN
1	B	262	HIS

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 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, 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	453/504 (89%)	-0.04	19 (4%) 40 32	29, 46, 92, 129	0
1	B	442/504 (87%)	0.40	27 (6%) 27 20	54, 80, 98, 135	0
All	All	895/1008 (88%)	0.18	46 (5%) 33 25	29, 72, 97, 135	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	398	ILE	5.2
1	A	483	SER	4.7
1	B	480	LEU	4.7
1	B	482	GLU	4.6
1	B	317	ILE	4.4
1	B	30	ARG	4.3
1	B	316	SER	4.0
1	A	393	GLN	3.9
1	A	122	GLY	3.8
1	B	121	LYS	3.8
1	A	402	ALA	3.3
1	B	243	ASN	3.3
1	A	431	GLU	3.3
1	A	400	GLY	3.2
1	A	124	VAL	3.1
1	A	3	PHE	3.1
1	B	120	TRP	3.0
1	A	401	MET	3.0
1	A	154	ASP	3.0
1	B	124	VAL	2.9
1	B	312	VAL	2.9
1	B	318	ALA	2.8
1	B	315	GLY	2.8
1	B	125	GLY	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	116	GLU	2.6
1	A	394	LYS	2.5
1	B	479	GLY	2.5
1	A	137	ASN	2.5
1	A	123	ARG	2.4
1	B	375	ASN	2.4
1	A	390	LYS	2.4
1	B	154	ASP	2.4
1	A	115	TRP	2.3
1	B	126	GLY	2.3
1	B	250	GLU	2.3
1	B	436	CYS	2.3
1	B	387	VAL	2.2
1	A	30	ARG	2.2
1	A	391	ASP	2.2
1	B	314	PRO	2.2
1	B	5	GLU	2.2
1	A	113	GLU	2.1
1	B	385	GLY	2.1
1	B	123	ARG	2.1
1	B	104	ILE	2.0
1	B	27	VAL	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 oligosaccharides 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.