



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 18, 2026 – 01:20 PM UTC

PDB ID : 2WWR / pdb_00002wvr
Title : Crystal Structure of Human Glyoxylate Reductase Hydroxypyruvate Reductase
Authors : Booth, M.P.S.; Connors, R.; Rumsby, G.; Brady, R.L.
Deposited on : 2009-10-26
Resolution : 2.82 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

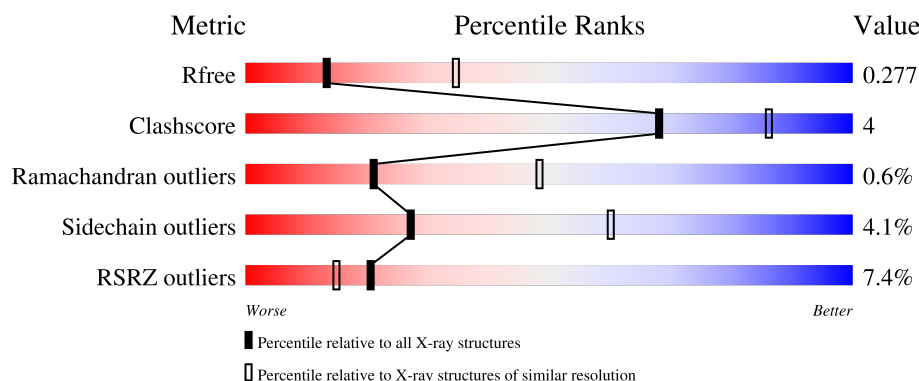
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.82 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	4591 (2.84-2.80)
Clashscore	190562	5010 (2.84-2.80)
Ramachandran outliers	187476	4916 (2.84-2.80)
Sidechain outliers	187428	4918 (2.84-2.80)
RSRZ outliers	180081	4594 (2.84-2.80)

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	330	2% 83% 12% • 5%
1	B	330	2% 79% 15% • 5%
1	C	330	8% 81% 12% • 5%
1	D	330	15% 78% 15% • 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	MG	B	1328	-	-	-	X

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 9640 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 GLYOXYLATE REDUCTASE/HYDROXYPYRUVATE REDUCTASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	315	Total	C	N	O	S	44	0	0
			2402	1518	426	446	12			
1	B	315	Total	C	N	O	S	36	0	0
			2402	1518	426	446	12			
1	C	315	Total	C	N	O	S	80	0	0
			2402	1518	426	446	12			
1	D	313	Total	C	N	O	S	170	0	0
			2385	1506	423	444	12			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	ALA	-	expression tag	UNP Q9UBQ7
A	0	SER	-	expression tag	UNP Q9UBQ7
B	-1	ALA	-	expression tag	UNP Q9UBQ7
B	0	SER	-	expression tag	UNP Q9UBQ7
C	-1	ALA	-	expression tag	UNP Q9UBQ7
C	0	SER	-	expression tag	UNP Q9UBQ7
D	-1	ALA	-	expression tag	UNP Q9UBQ7
D	0	SER	-	expression tag	UNP Q9UBQ7

- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Mg	0	0
			1	1		
2	D	1	Total	Mg	0	0
			1	1		

- Molecule 3 is water.

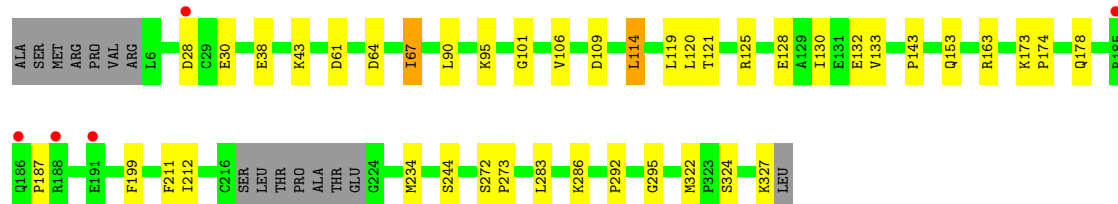
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	18	Total 18	O 18	0	0
3	B	16	Total 16	O 16	0	0
3	C	6	Total 6	O 6	0	0
3	D	7	Total 7	O 7	0	0

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.

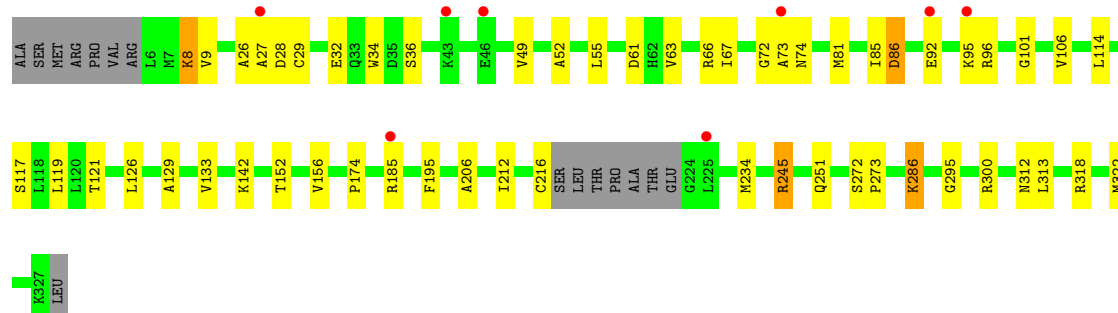
• Molecule 1: GLYOXYLATE REDUCTASE/HYDROXYPYRUVATE REDUCTASE

Chain A: 



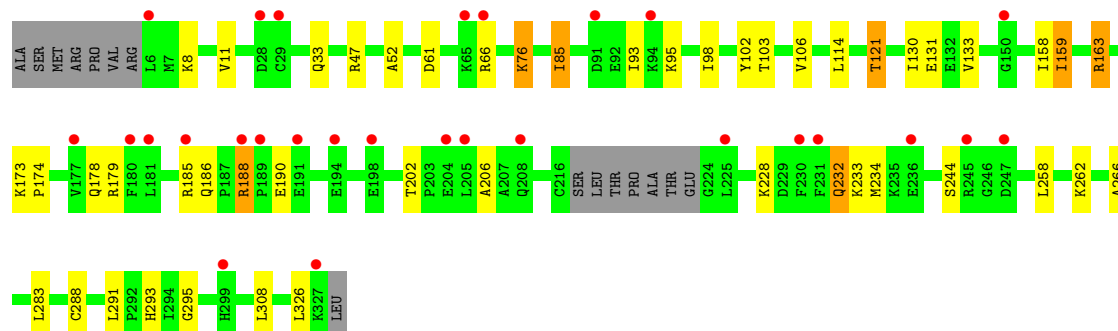
• Molecule 1: GLYOXYLATE REDUCTASE/HYDROXYPYRUVATE REDUCTASE

Chain B: 

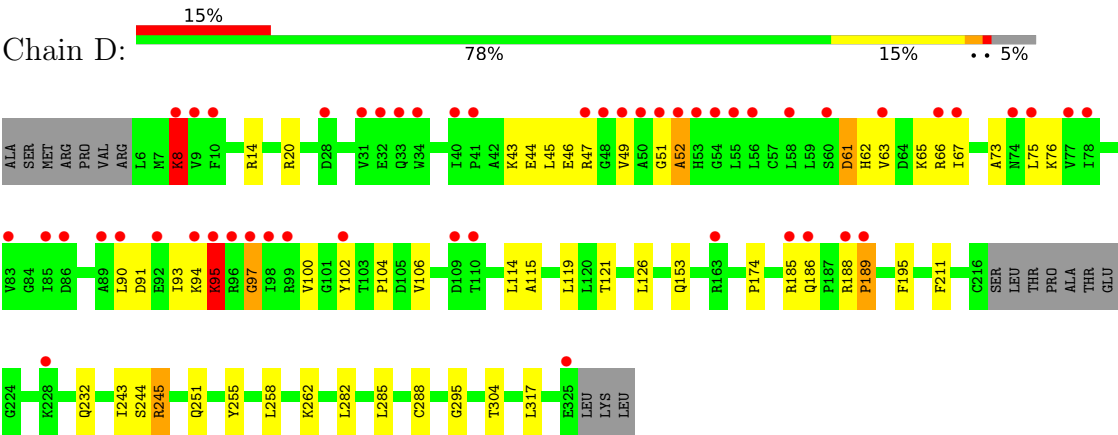


• Molecule 1: GLYOXYLATE REDUCTASE/HYDROXYPYRUVATE REDUCTASE

Chain C: 



● Molecule 1: GLYOXYLATE REDUCTASE/HYDROXYPYRUVATE REDUCTASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	67.36Å 116.08Å 198.23Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	100.00 – 2.82 100.00 – 2.83	Depositor EDS
% Data completeness (in resolution range)	90.6 (100.00-2.82) 90.6 (100.00-2.83)	Depositor EDS
R_{merge}	0.18	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.65 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.217 , 0.279 0.219 , 0.277	Depositor DCC
R_{free} test set	1737 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	50.8	Xtriage
Anisotropy	0.413	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 35.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	9640	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 46.18 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.1874e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG

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	0.72	3/2444 (0.1%)	0.94	6/3316 (0.2%)
1	B	0.80	5/2444 (0.2%)	0.98	6/3316 (0.2%)
1	C	1.17	14/2444 (0.6%)	1.41	22/3316 (0.7%)
1	D	2.36	24/2427 (1.0%)	1.82	43/3294 (1.3%)
All	All	1.42	46/9759 (0.5%)	1.34	77/13242 (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	B	0	1
1	C	0	2
1	D	1	4
All	All	1	7

All (46) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	245	ARG	CD-NE	-56.67	0.67	1.46
1	D	66	ARG	CA-C	46.38	2.15	1.52
1	D	95	LYS	CA-C	33.35	1.97	1.52
1	D	46	GLU	C-N	30.53	1.77	1.33
1	D	91	ASP	C-N	28.20	1.71	1.34
1	D	49	VAL	CA-CB	26.94	1.85	1.54
1	D	95	LYS	N-CA	26.74	1.80	1.46
1	D	67	ILE	N-CA	-24.44	1.13	1.46
1	B	66	ARG	CB-CG	-23.05	0.83	1.52
1	D	317	LEU	CB-CG	-22.06	1.09	1.53
1	C	163	ARG	CD-NE	-21.45	1.16	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	66	ARG	NE-CZ	-20.68	1.10	1.33
1	D	97	GLY	C-O	20.64	1.54	1.24
1	C	188	ARG	NE-CZ	-20.60	1.10	1.33
1	A	178	GLN	CG-CD	-19.91	1.02	1.52
1	D	90	LEU	CA-C	-19.52	1.21	1.52
1	C	185	ARG	CB-CG	-18.17	0.97	1.52
1	C	178	GLN	CB-CG	-17.65	0.99	1.52
1	D	63	VAL	C-N	-16.66	1.10	1.33
1	D	73	ALA	C-N	-13.72	1.15	1.34
1	C	179	ARG	CB-CG	-13.40	1.12	1.52
1	D	43	LYS	CB-CG	-13.19	1.12	1.52
1	B	245	ARG	CD-NE	-12.71	1.28	1.46
1	D	185	ARG	CB-CG	-11.55	1.17	1.52
1	A	153	GLN	CB-CG	-11.20	1.18	1.52
1	C	190	GLU	CB-CG	-11.20	1.18	1.52
1	C	228	LYS	CB-CG	-10.59	1.20	1.52
1	C	158	ILE	CG1-CD1	-10.46	1.10	1.51
1	D	14	ARG	CG-CD	9.63	1.81	1.52
1	B	300	ARG	CB-CG	-9.56	1.23	1.52
1	B	185	ARG	CG-CD	-9.42	1.24	1.52
1	D	75	LEU	CB-CG	-9.39	1.34	1.53
1	D	61	ASP	C-N	-9.16	1.21	1.33
1	D	52	ALA	N-CA	8.29	1.55	1.46
1	C	95	LYS	CG-CD	-7.94	1.28	1.52
1	D	51	GLY	C-N	7.91	1.44	1.33
1	C	131	GLU	CG-CD	-7.85	1.32	1.52
1	C	76	LYS	CB-CG	-7.73	1.29	1.52
1	D	90	LEU	CB-CG	-7.60	1.38	1.53
1	B	95	LYS	CB-CG	-7.59	1.29	1.52
1	A	327	LYS	CB-CG	7.09	1.73	1.52
1	D	153	GLN	CG-CD	-7.00	1.34	1.52
1	D	93	ILE	CB-CG1	6.79	1.67	1.53
1	C	159	ILE	CG1-CD1	-6.74	1.25	1.51
1	D	45	LEU	C-N	6.12	1.42	1.33
1	C	47	ARG	CB-CG	5.59	1.69	1.52

All (77) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	95	LYS	CA-C-O	-50.12	48.84	120.51
1	D	90	LEU	N-CA-C	33.56	148.55	112.97
1	C	188	ARG	NE-CZ-NH1	-28.36	93.14	121.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	188	ARG	NE-CZ-NH2	26.92	143.42	119.20
1	D	245	ARG	CG-CD-NE	22.90	162.37	112.00
1	D	90	LEU	CB-CA-C	-22.18	77.24	111.17
1	C	66	ARG	CD-NE-CZ	21.08	153.92	124.40
1	C	188	ARG	CD-NE-CZ	19.51	151.71	124.40
1	C	66	ARG	NE-CZ-NH2	19.25	136.52	119.20
1	C	186	GLN	CB-CG-CD	18.75	144.47	112.60
1	D	97	GLY	O-C-N	-18.41	102.52	122.41
1	C	66	ARG	NE-CZ-NH1	-17.75	103.75	121.50
1	D	95	LYS	N-CA-C	16.82	146.62	110.80
1	D	63	VAL	O-C-N	-16.24	100.01	122.59
1	B	66	ARG	CA-CB-CG	15.90	145.91	114.10
1	D	90	LEU	CA-C-O	15.82	141.00	119.80
1	D	66	ARG	CA-C-O	14.90	136.25	119.41
1	D	90	LEU	CA-CB-CG	14.68	167.66	116.30
1	D	67	ILE	N-CA-C	14.46	130.82	111.44
1	D	95	LYS	N-CA-CB	-13.41	87.82	110.49
1	C	186	GLN	CA-CB-CG	13.38	140.86	114.10
1	D	63	VAL	CA-C-N	13.17	144.95	122.82
1	D	63	VAL	C-N-CA	13.17	144.95	122.82
1	D	8	LYS	CB-CG-CD	-13.05	81.28	111.30
1	D	61	ASP	O-C-N	-12.60	108.15	123.01
1	B	300	ARG	CA-CB-CG	12.56	139.21	114.10
1	B	286	LYS	CG-CD-CE	-12.31	82.99	111.30
1	D	43	LYS	CA-CB-CG	12.19	138.48	114.10
1	C	185	ARG	CA-CB-CG	11.13	136.36	114.10
1	D	62	HIS	CA-C-O	10.62	131.66	120.30
1	A	43	LYS	CA-CB-CG	-9.86	94.38	114.10
1	C	233	LYS	CA-CB-CG	9.74	133.59	114.10
1	C	232	GLN	CA-CB-CG	-9.34	95.41	114.10
1	B	245	ARG	CG-CD-NE	9.24	132.32	112.00
1	A	43	LYS	CB-CG-CD	-9.15	90.25	111.30
1	D	91	ASP	O-C-N	-8.69	113.24	122.19
1	D	186	GLN	CA-CB-CG	-8.55	97.01	114.10
1	D	52	ALA	N-CA-C	-8.02	96.68	109.59
1	D	100	VAL	CA-CB-CG1	7.69	123.48	110.40
1	C	76	LYS	CA-CB-CG	7.66	129.42	114.10
1	D	153	GLN	CG-CD-NE2	-7.59	105.01	116.40
1	D	66	ARG	CA-C-N	7.39	132.99	120.29
1	D	66	ARG	C-N-CA	7.39	132.99	120.29
1	C	232	GLN	CB-CG-CD	7.26	124.94	112.60
1	C	95	LYS	CB-CG-CD	7.24	127.95	111.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	131	GLU	CG-CD-OE1	7.14	134.83	118.40
1	D	66	ARG	N-CA-C	7.14	122.12	113.41
1	C	178	GLN	CA-CB-CG	7.13	128.35	114.10
1	C	131	GLU	CG-CD-OE2	-7.05	102.18	118.40
1	B	300	ARG	CB-CG-CD	6.98	127.35	111.30
1	D	97	GLY	CA-C-O	-6.96	111.22	119.72
1	D	91	ASP	CA-C-N	6.70	129.92	120.28
1	D	91	ASP	C-N-CA	6.70	129.92	120.28
1	D	75	LEU	CB-CG-CD1	6.63	130.60	110.70
1	A	95	LYS	CA-CB-CG	6.61	127.31	114.10
1	C	190	GLU	CA-CB-CG	6.57	127.25	114.10
1	D	8	LYS	CA-CB-CG	6.32	126.73	114.10
1	C	233	LYS	CB-CG-CD	6.29	125.76	111.30
1	D	14	ARG	CG-CD-NE	6.21	125.67	112.00
1	C	190	GLU	CB-CG-CD	6.20	123.14	112.60
1	A	30	GLU	CA-CB-CG	-6.12	101.85	114.10
1	D	90	LEU	CB-CG-CD1	5.90	128.40	110.70
1	D	61	ASP	CA-C-N	5.87	131.27	123.00
1	D	61	ASP	C-N-CA	5.87	131.27	123.00
1	C	163	ARG	CD-NE-CZ	5.80	132.53	124.40
1	D	95	LYS	CB-CA-C	-5.79	98.89	110.42
1	D	153	GLN	CG-CD-OE1	5.77	132.34	120.80
1	C	185	ARG	CB-CG-CD	5.76	124.55	111.30
1	D	51	GLY	O-C-N	-5.56	116.40	122.41
1	D	186	GLN	CB-CG-CD	-5.54	103.19	112.60
1	D	62	HIS	N-CA-C	-5.37	99.65	108.41
1	D	317	LEU	CA-CB-CG	5.29	134.80	116.30
1	D	47	ARG	CA-CB-CG	-5.24	103.62	114.10
1	A	178	GLN	CG-CD-OE1	-5.13	110.55	120.80
1	B	95	LYS	CA-CB-CG	5.12	124.34	114.10
1	A	30	GLU	CB-CG-CD	-5.11	103.92	112.60
1	D	20	ARG	CA-CB-CG	5.10	124.30	114.10

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	D	95	LYS	CA

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	245	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	C	163	ARG	Sidechain
1	C	188	ARG	Sidechain
1	D	245	ARG	Sidechain
1	D	94	LYS	Peptide
1	D	95	LYS	Mainchain
1	D	97	GLY	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	2402	0	2455	17	0
1	B	2402	0	2455	29	0
1	C	2402	0	2455	15	0
1	D	2385	0	2428	14	0
2	B	1	0	0	0	0
2	D	1	0	0	0	0
3	A	18	0	0	0	0
3	B	16	0	0	0	0
3	C	6	0	0	0	0
3	D	7	0	0	0	0
All	All	9640	0	9793	66	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 4.

All (66) 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:27:ALA:HA	1:B:29:CYS:H	1.32	0.94
1:B:27:ALA:HA	1:B:29:CYS:N	2.01	0.76
1:C:85:ILE:HD13	1:C:326:LEU:HD22	1.79	0.64
1:B:27:ALA:CA	1:B:29:CYS:H	2.09	0.62
1:A:121:THR:HG21	1:B:126:LEU:HD23	1.81	0.61
1:B:72:GLY:C	1:B:74:ASN:H	2.09	0.61
1:B:114:LEU:HD22	1:B:295:GLY:HA2	1.85	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:251:GLN:HG2	1:D:282:LEU:HD11	1.84	0.58
1:B:49:VAL:HG12	1:B:55:LEU:HD13	1.86	0.57
1:A:174:PRO:HG2	1:B:174:PRO:HG3	1.86	0.56
1:B:26:ALA:HB1	1:B:318:ARG:NH2	2.21	0.56
1:A:64:ASP:O	1:A:67:ILE:HG22	2.06	0.55
1:C:11:VAL:HB	1:C:33:GLN:HG3	1.89	0.55
1:C:174:PRO:HG3	1:D:174:PRO:HG2	1.87	0.55
1:A:143:PRO:HB3	1:B:81:MET:HE1	1.88	0.54
1:A:130:ILE:O	1:A:133:VAL:HG22	2.09	0.52
1:D:114:LEU:HD22	1:D:295:GLY:HA2	1.91	0.52
1:A:212:ILE:HD12	1:A:234:MET:HE3	1.94	0.50
1:B:8:LYS:HB3	1:B:52:ALA:HA	1.93	0.50
1:A:114:LEU:HD22	1:A:295:GLY:HA2	1.94	0.50
1:C:130:ILE:O	1:C:133:VAL:HG22	2.11	0.50
1:C:114:LEU:HD22	1:C:295:GLY:HA2	1.93	0.50
1:B:63:VAL:HG13	1:B:67:ILE:HD11	1.93	0.49
1:A:38:GLU:OE2	1:B:142:LYS:NZ	2.45	0.49
1:A:120:LEU:HB3	1:B:117:SER:OG	2.13	0.48
1:B:206:ALA:O	1:B:234:MET:HA	2.12	0.48
1:C:291:LEU:HD21	1:D:126:LEU:HG	1.95	0.48
1:A:125:ARG:HH21	1:A:128:GLU:CD	2.22	0.48
1:D:104:PRO:C	1:D:106:VAL:H	2.23	0.47
1:C:8:LYS:HB3	1:C:52:ALA:HA	1.95	0.47
1:B:26:ALA:HB1	1:B:318:ARG:HH22	1.79	0.47
1:B:212:ILE:HD12	1:B:234:MET:HE3	1.96	0.46
1:B:92:GLU:HG3	1:B:96:ARG:NH1	2.31	0.46
1:C:93:ILE:HG23	1:C:98:ILE:HB	1.97	0.46
1:D:115:ALA:HB2	1:D:243:ILE:HD13	1.98	0.46
1:C:103:THR:HG22	1:C:308:LEU:HD23	1.99	0.45
1:B:9:VAL:CG1	1:B:313:LEU:HD21	2.47	0.44
1:B:9:VAL:HG13	1:B:313:LEU:HD21	1.99	0.44
1:C:173:LYS:N	1:C:174:PRO:HD2	2.33	0.44
1:C:121:THR:HG21	1:D:126:LEU:HD23	1.99	0.43
1:B:63:VAL:HG22	1:B:67:ILE:HD11	1.99	0.43
1:A:119:LEU:HD11	1:A:211:PHE:CD1	2.54	0.43
1:B:34:TRP:NE1	1:B:36:SER:HB3	2.33	0.43
1:A:187:PRO:HB3	1:A:199:PHE:CG	2.54	0.43
1:B:86:ASP:OD1	1:B:86:ASP:N	2.51	0.43
1:B:272:SER:HA	1:B:273:PRO:HA	1.83	0.43
1:B:312:ASN:HB3	1:B:322:MET:HE3	2.01	0.43
1:B:27:ALA:HA	1:B:28:ASP:HB3	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:266:ALA:O	1:C:288:CYS:HA	2.19	0.42
1:D:119:LEU:HD21	1:D:211:PHE:CD1	2.54	0.42
1:A:173:LYS:HB3	1:A:174:PRO:HD3	2.01	0.42
1:B:8:LYS:NZ	1:B:32:GLU:OE1	2.52	0.42
1:D:255:TYR:CD1	1:D:285:LEU:HD11	2.55	0.42
1:A:128:GLU:O	1:A:132:GLU:HG2	2.20	0.42
1:A:272:SER:HA	1:A:273:PRO:HA	1.77	0.41
1:D:8:LYS:HB2	1:D:52:ALA:HA	2.02	0.41
1:C:232:GLN:HA	1:C:262:LYS:HD3	2.02	0.41
1:D:232:GLN:NE2	1:D:262:LYS:HE3	2.35	0.41
1:A:101:GLY:CA	1:A:322:MET:HE1	2.50	0.41
1:D:102:TYR:CE2	1:D:104:PRO:HG3	2.56	0.41
1:D:258:LEU:HD13	1:D:288:CYS:HB2	2.03	0.41
1:B:101:GLY:CA	1:B:322:MET:HE1	2.51	0.41
1:C:258:LEU:HD13	1:C:288:CYS:HB2	2.02	0.41
1:D:188:ARG:HA	1:D:189:PRO:HD3	1.91	0.40
1:A:292:PRO:HD2	1:B:129:ALA:HB1	2.04	0.40
1:C:206:ALA:O	1:C:234:MET:HA	2.22	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	311/330 (94%)	299 (96%)	11 (4%)	1 (0%)	36	64
1	B	311/330 (94%)	295 (95%)	15 (5%)	1 (0%)	36	64
1	C	311/330 (94%)	296 (95%)	13 (4%)	2 (1%)	21	48
1	D	309/330 (94%)	290 (94%)	15 (5%)	4 (1%)	9	29
All	All	1242/1320 (94%)	1180 (95%)	54 (4%)	8 (1%)	21	48

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	95	LYS
1	D	244	SER
1	A	244	SER
1	C	106	VAL
1	D	65	LYS
1	B	73	ALA
1	C	244	SER
1	D	189	PRO

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	257/270 (95%)	246 (96%)	11 (4%)	26	58
1	B	257/270 (95%)	243 (95%)	14 (5%)	20	50
1	C	257/270 (95%)	248 (96%)	9 (4%)	32	65
1	D	255/270 (94%)	247 (97%)	8 (3%)	35	69
All	All	1026/1080 (95%)	984 (96%)	42 (4%)	27	60

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	ASP
1	A	61	ASP
1	A	67	ILE
1	A	90	LEU
1	A	106	VAL
1	A	109	ASP
1	A	114	LEU
1	A	163	ARG
1	A	283	LEU
1	A	286	LYS
1	A	324	SER
1	B	8	LYS
1	B	61	ASP
1	B	85	ILE

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Mol	Chain	Res	Type
1	B	86	ASP
1	B	106	VAL
1	B	119	LEU
1	B	121	THR
1	B	133	VAL
1	B	152	THR
1	B	156	VAL
1	B	195	PHE
1	B	216	CYS
1	B	251	GLN
1	B	286	LYS
1	C	61	ASP
1	C	76	LYS
1	C	85	ILE
1	C	102	TYR
1	C	121	THR
1	C	159	ILE
1	C	202	THR
1	C	283	LEU
1	C	293	HIS
1	D	8	LYS
1	D	44	GLU
1	D	61	ASP
1	D	76	LYS
1	D	95	LYS
1	D	121	THR
1	D	195	PHE
1	D	304	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	33	GLN
1	B	33	GLN
1	B	178	GLN
1	B	303	ASN
1	C	74	ASN
1	C	166	GLN
1	C	293	HIS

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](#)

Of 2 ligands modelled in this entry, 2 are 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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	D	4

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	D	46:GLU	C	47:ARG	N	1.77
1	D	91:ASP	C	92:GLU	N	1.71

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Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	D	73:ALA	C	74:ASN	N	1.15
1	D	63:VAL	C	64:ASP	N	1.10

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	315/330 (95%)	-0.01	5 (1%) 70 61	15, 30, 43, 46	30 (9%)
1	B	315/330 (95%)	0.07	8 (2%) 58 48	12, 29, 51, 54	30 (9%)
1	C	315/330 (95%)	0.63	28 (8%) 15 11	19, 42, 59, 65	57 (18%)
1	D	303/330 (91%)	0.91	51 (16%) 4 3	1, 36, 51, 57	61 (20%)
All	All	1248/1320 (94%)	0.40	92 (7%) 20 15	1, 34, 51, 65	178 (14%)

All (92) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	90	LEU	14.4
1	D	67	ILE	10.1
1	D	89	ALA	9.2
1	D	98	ILE	8.8
1	D	97	GLY	8.3
1	D	99	ARG	7.0
1	D	48	GLY	6.8
1	D	185	ARG	5.8
1	D	63	VAL	5.8
1	D	186	GLN	5.6
1	D	94	LYS	4.7
1	B	73	ALA	4.7
1	D	66	ARG	4.5
1	D	34	TRP	4.4
1	A	188	ARG	4.1
1	D	50	ALA	3.9
1	B	185	ARG	3.9
1	C	180	PHE	3.8
1	D	96	ARG	3.7
1	D	47	ARG	3.7
1	C	225	LEU	3.7

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Mol	Chain	Res	Type	RSRZ
1	D	51	GLY	3.7
1	C	29	CYS	3.6
1	C	194	GLU	3.5
1	D	49	VAL	3.4
1	D	52	ALA	3.4
1	D	10	PHE	3.4
1	D	85	ILE	3.3
1	B	225	LEU	3.2
1	C	231	PHE	3.2
1	C	198	GLU	3.0
1	A	186	GLN	3.0
1	D	53	HIS	2.9
1	B	43	LYS	2.9
1	D	55	LEU	2.9
1	D	74	ASN	2.9
1	D	28	ASP	2.9
1	C	236	GLU	2.8
1	D	188	ARG	2.7
1	D	95	LYS	2.7
1	A	28	ASP	2.7
1	C	188	ARG	2.7
1	C	204	GLU	2.7
1	D	8	LYS	2.6
1	D	60	SER	2.6
1	D	86	ASP	2.6
1	D	41	PRO	2.5
1	D	92	GLU	2.5
1	C	66	ARG	2.5
1	C	28	ASP	2.5
1	C	247	ASP	2.5
1	C	327	LYS	2.5
1	D	83	VAL	2.4
1	C	181	LEU	2.4
1	A	191	GLU	2.4
1	D	32	GLU	2.4
1	D	189	PRO	2.4
1	D	163	ARG	2.4
1	C	6	LEU	2.4
1	C	205	LEU	2.4
1	D	75	LEU	2.4
1	C	185	ARG	2.3
1	D	325	GLU	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	27	ALA	2.3
1	C	299	HIS	2.3
1	D	54	GLY	2.3
1	D	228	LYS	2.2
1	C	230	PHE	2.2
1	D	58	LEU	2.2
1	D	40	ILE	2.2
1	D	102	TYR	2.2
1	C	65	LYS	2.2
1	B	92	GLU	2.2
1	A	185	ARG	2.2
1	D	33	GLN	2.2
1	D	31	VAL	2.2
1	D	78	ILE	2.1
1	C	91	ASP	2.1
1	B	95	LYS	2.1
1	B	46	GLU	2.1
1	C	245	ARG	2.1
1	C	208	GLN	2.1
1	C	94	LYS	2.1
1	C	191	GLU	2.1
1	C	150	GLY	2.1
1	D	56	LEU	2.1
1	D	109	ASP	2.1
1	D	77	VAL	2.1
1	C	189	PRO	2.0
1	D	110	THR	2.0
1	C	177	VAL	2.0
1	D	9	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](#)

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($\text{\AA}^2$)	Q<0.9
2	MG	B	1328	1/1	0.73	0.44	54,54,54,54	0
2	MG	D	1328	1/1	0.82	0.50	50,50,50,50	0

6.5 Other polymers [i](#)

There are no such residues in this entry.