



Full wwPDB X-ray Structure Validation Report

Mar 10, 2018 – 01:47 am GMT


PDB ID : 5HY8
Title : Glycation restrains allosteric transition in hemoglobin: The molecular basis of oxidative stress under hyperglycemic conditions in diabetes
Authors : Saraswathi, N.T.; Pannu, N.S.; Syakhovich, V.E.; Saurabh, A.; Bokut, S.B.; Moras, D.; Ruff, M.
Deposited on : 2016-02-01
Resolution : 2.30 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 following versions of software and data (see [references](#) ) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7.3 (157068), CSD as539be (2018)
Xtriage (Phenix) : 1.13
EDS : trunk30967
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk30967

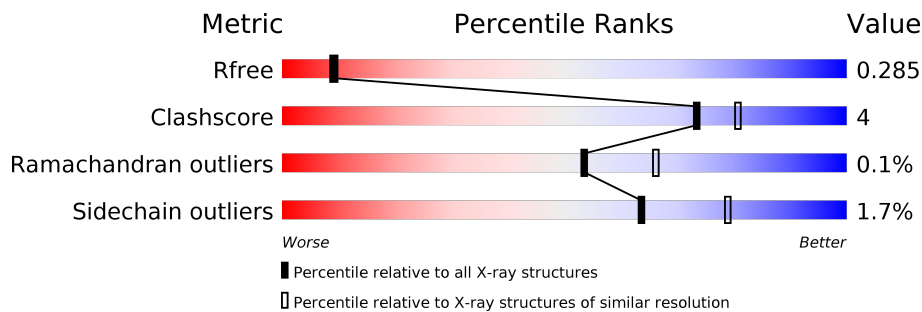
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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.





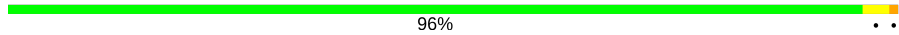
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	111664	4477 (2.30-2.30)
Clashscore	122126	5072 (2.30-2.30)
Ramachandran outliers	120053	5022 (2.30-2.30)
Sidechain outliers	120020	5021 (2.30-2.30)

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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	141	96% .
1	C	141	98% .
1	E	141	79% 13% . .
1	G	141	87% 9% . .
1	S	141	96% .
2	B	146	96% .
2	D	146	94% 6%

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Mol	Chain	Length	Quality of chain
2	F	146	 88% 8% ••
2	H	146	 89% 10% •
2	T	146	 96% ••

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 11609 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 Hemoglobin subunit alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	141	1068	685	187	193	3	0	0	0
1	C	141	1068	685	187	193	3	0	0	0
1	E	137	1030	659	180	188	3	0	0	0
1	G	138	1042	668	181	190	3	0	0	0
1	S	141	1068	685	187	193	3	0	0	0

- Molecule 2 is a protein called Hemoglobin subunit beta.

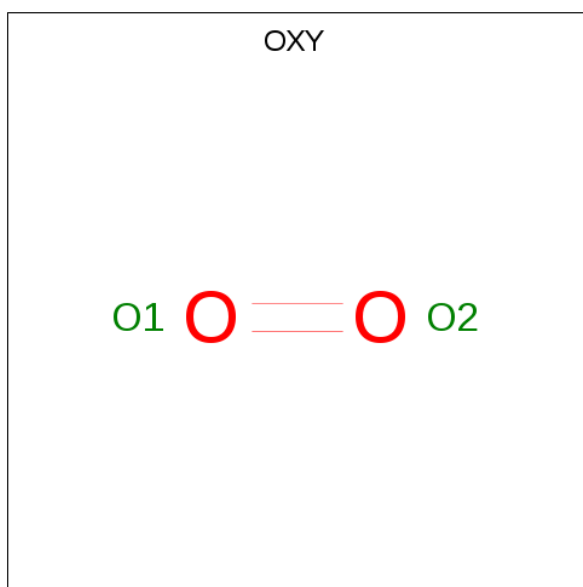
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	146	1122	724	195	200	3	0	0	0
2	D	146	1122	724	195	200	3	0	0	0
2	F	146	1122	724	195	200	3	0	0	0
2	H	146	1122	724	195	200	3	0	0	0
2	T	146	1122	724	195	200	3	0	0	0

- Molecule 3 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



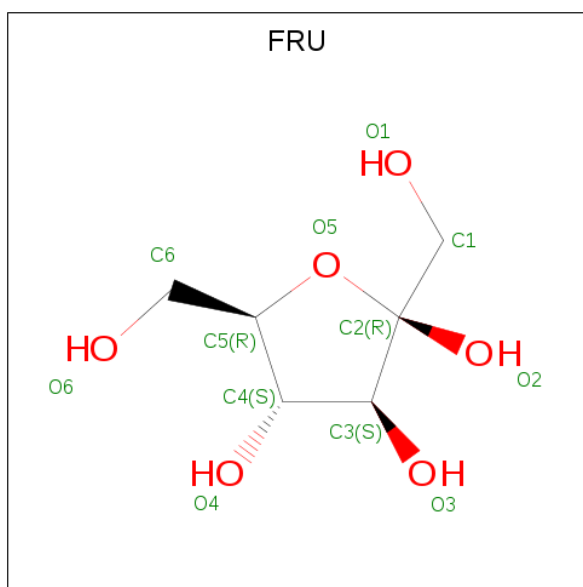
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
3	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	C	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	D	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	E	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	F	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	G	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	H	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	S	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	T	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 4 is OXYGEN MOLECULE (three-letter code: OXY) (formula: O₂).



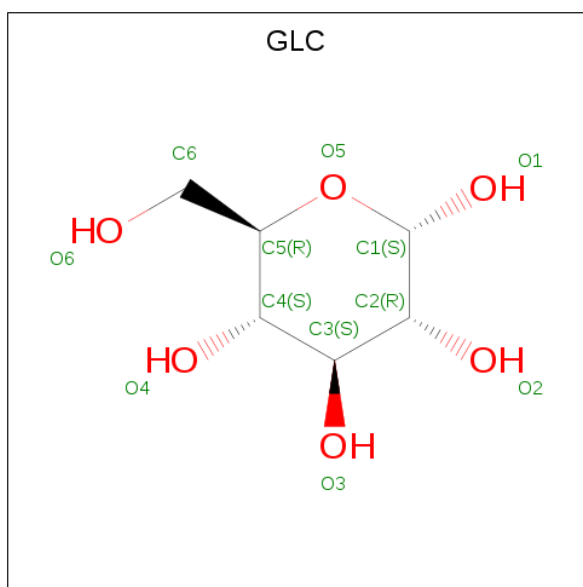
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total O 2 2	0	0
4	B	1	Total O 2 2	0	0
4	C	1	Total O 2 2	0	0
4	D	1	Total O 2 2	0	0
4	F	1	Total O 2 2	0	0
4	G	1	Total O 2 2	0	0
4	S	1	Total O 2 2	0	0
4	T	1	Total O 2 2	0	0

- Molecule 5 is FRUCTOSE (three-letter code: FRU) (formula: C₆H₁₂O₆).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			11	6	5		
5	C	1	Total	C	O	0	0
			11	6	5		
5	F	1	Total	C	O	0	0
			11	6	5		

- Molecule 6 is ALPHA-D-GLUCOSE (three-letter code: GLC) (formula: C₆H₁₂O₆).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	C	1	Total	C	O	0	0
			12	6	6		

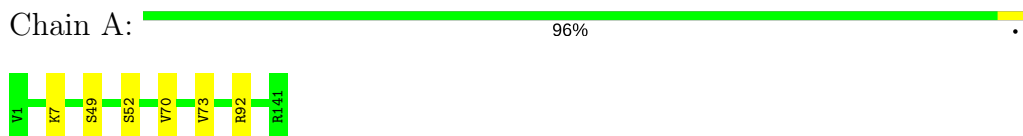
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	30	Total O 30 30	0	0
7	B	36	Total O 36 36	0	0
7	C	39	Total O 39 39	0	0
7	D	32	Total O 32 32	0	0
7	E	12	Total O 12 12	0	0
7	F	26	Total O 26 26	0	0
7	G	18	Total O 18 18	0	0
7	H	10	Total O 10 10	0	0
7	S	15	Total O 15 15	0	0
7	T	14	Total O 14 14	0	0

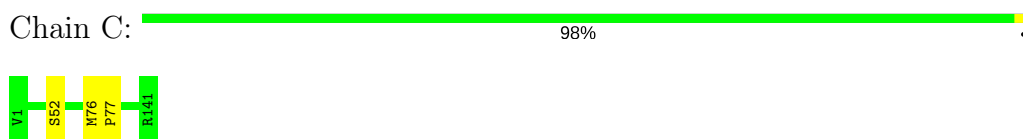
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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. 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. 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.

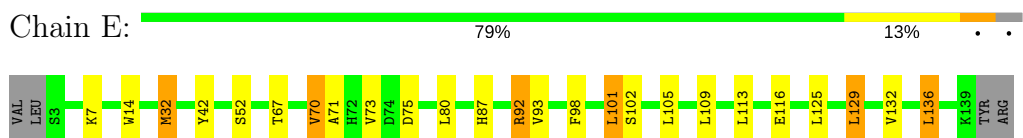
- Molecule 1: Hemoglobin subunit alpha



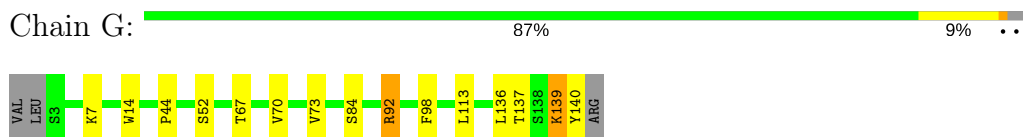
- Molecule 1: Hemoglobin subunit alpha



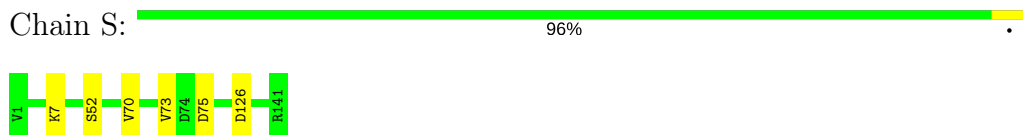
- Molecule 1: Hemoglobin subunit alpha



- Molecule 1: Hemoglobin subunit alpha

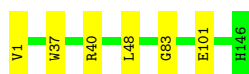


- Molecule 1: Hemoglobin subunit alpha



- Molecule 2: Hemoglobin subunit beta





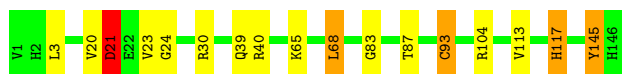
- Molecule 2: Hemoglobin subunit beta

Chain D: 94% 6%



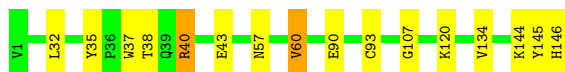
- Molecule 2: Hemoglobin subunit beta

Chain F: 88% 8% ..



- Molecule 2: Hemoglobin subunit beta

Chain H: 89% 10% .



- Molecule 2: Hemoglobin subunit beta

Chain T: 96% ..



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	237.99Å 59.27Å 137.02Å 90.00° 125.36° 90.00°	Depositor
Resolution (Å)	112.13 – 2.30 14.89 – 2.30	Depositor EDS
% Data completeness (in resolution range)	87.0 (112.13-2.30) 87.3 (14.89-2.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.64 (at 2.29Å)	Xtrriage
Refinement program	REFMAC 5.8.0107	Depositor
R, R_{free}	0.203 , 0.244 0.256 , 0.285	Depositor DCC
R_{free} test set	3020 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	41.0	Xtrriage
Anisotropy	0.351	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 42.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.014 for -h-2*1,-k,l	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	11609	wwPDB-VP
Average B, all atoms (Å ²)	109.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.95% 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

Bond lengths and bond angles in the following residue types are not validated in this section: HEM, GLC, OXY, FRU

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	1.01	1/1096 (0.1%)	0.91	1/1491 (0.1%)
1	C	0.95	0/1096	0.87	0/1491
1	E	0.77	1/1057 (0.1%)	1.13	14/1438 (1.0%)
1	G	0.90	0/1070	0.99	4/1456 (0.3%)
1	S	0.78	0/1096	0.84	1/1491 (0.1%)
2	B	1.10	2/1152 (0.2%)	0.89	1/1566 (0.1%)
2	D	1.03	1/1152 (0.1%)	0.87	2/1566 (0.1%)
2	F	0.99	2/1152 (0.2%)	1.00	9/1566 (0.6%)
2	H	0.81	0/1152	0.86	3/1566 (0.2%)
2	T	0.84	1/1152 (0.1%)	0.81	1/1566 (0.1%)
All	All	0.93	8/11175 (0.1%)	0.92	36/15197 (0.2%)

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	37	TRP	CE3-CZ3	7.08	1.50	1.38
1	A	49	SER	CA-CB	6.00	1.61	1.52
2	D	130	TYR	CE1-CZ	-5.67	1.31	1.38
1	E	116	GLU	CD-OE1	-5.59	1.19	1.25
2	B	101	GLU	CG-CD	5.36	1.59	1.51
2	T	101	GLU	CG-CD	5.26	1.59	1.51
2	F	93	CYS	CB-SG	5.25	1.91	1.82
2	F	145	TYR	CG-CD1	5.18	1.45	1.39

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	80	LEU	CB-CG-CD2	10.33	128.56	111.00
1	E	129	LEU	CB-CG-CD2	9.12	126.50	111.00
2	F	68	LEU	CB-CG-CD2	8.13	124.83	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	92	ARG	NE-CZ-NH1	7.84	124.22	120.30
1	E	92	ARG	NE-CZ-NH2	-7.82	116.39	120.30
1	E	101	LEU	CB-CG-CD2	-7.53	98.20	111.00
1	G	113	LEU	CA-CB-CG	7.22	131.90	115.30
1	E	32	MET	CG-SD-CE	-7.17	88.72	100.20
2	F	3	LEU	CA-CB-CG	7.11	131.65	115.30
1	G	44	PRO	C-N-CA	-7.10	103.96	121.70
1	E	80	LEU	CB-CG-CD1	-6.68	99.65	111.00
1	E	113	LEU	CA-CB-CG	6.66	130.62	115.30
2	B	40	ARG	NE-CZ-NH1	6.63	123.61	120.30
1	G	98	PHE	CB-CG-CD1	-6.58	116.19	120.80
1	E	101	LEU	CB-CG-CD1	6.52	122.08	111.00
1	E	80	LEU	CA-CB-CG	6.51	130.28	115.30
2	F	68	LEU	CB-CG-CD1	-6.47	99.99	111.00
2	F	117	HIS	CB-CA-C	-6.17	98.05	110.40
1	E	116	GLU	CG-CD-OE2	6.12	130.54	118.30
1	E	129	LEU	CA-CB-CG	6.00	129.09	115.30
2	T	90	GLU	N-CA-CB	5.97	121.35	110.60
1	E	116	GLU	CG-CD-OE1	-5.84	106.61	118.30
1	G	136	LEU	CB-CG-CD1	5.80	120.86	111.00
2	D	9	SER	N-CA-CB	-5.74	101.89	110.50
1	E	136	LEU	CB-CG-CD1	5.60	120.53	111.00
2	F	68	LEU	CB-CA-C	5.58	120.80	110.20
1	A	92	ARG	NE-CZ-NH1	5.58	123.09	120.30
2	H	43	GLU	CG-CD-OE1	-5.56	107.17	118.30
1	S	126	ASP	CB-CG-OD1	5.38	123.14	118.30
2	H	40	ARG	NE-CZ-NH2	5.37	122.99	120.30
2	D	30	ARG	NE-CZ-NH1	5.20	122.90	120.30
2	F	30	ARG	NE-CZ-NH1	5.13	122.86	120.30
2	H	43	GLU	CG-CD-OE2	5.11	128.52	118.30
2	F	104	ARG	NE-CZ-NH1	5.09	122.85	120.30
2	F	113	VAL	N-CA-CB	5.08	122.67	111.50
2	F	21	ASP	N-CA-C	-5.05	97.36	111.00

There are no chirality outliers.

There are no planarity outliers.

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	1068	0	1071	2	0
1	C	1068	0	1070	1	0
1	E	1030	0	1028	24	0
1	G	1042	0	1037	7	0
1	S	1068	0	1073	2	0
2	B	1122	0	1118	2	0
2	D	1122	0	1118	3	0
2	F	1122	0	1116	17	0
2	H	1122	0	1118	16	0
2	T	1122	0	1118	2	0
3	A	43	0	30	0	0
3	B	43	0	30	1	0
3	C	43	0	30	1	0
3	D	43	0	30	1	0
3	E	43	0	30	3	0
3	F	43	0	30	2	0
3	G	43	0	30	0	0
3	H	43	0	30	1	0
3	S	43	0	30	1	0
3	T	43	0	30	2	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0
4	C	2	0	0	0	0
4	D	2	0	0	0	0
4	F	2	0	0	0	0
4	G	2	0	0	0	0
4	S	2	0	0	0	0
4	T	2	0	0	0	0
5	A	11	0	9	1	0
5	C	11	0	9	1	0
5	F	11	0	9	2	0
6	C	12	0	12	0	0
7	A	30	0	0	0	0
7	B	36	0	0	0	0
7	C	39	0	0	0	0
7	D	32	0	0	1	0
7	E	12	0	0	0	0
7	F	26	0	0	1	0
7	G	18	0	0	0	0
7	H	10	0	0	0	0
7	S	15	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	T	14	0	0	0	0
All	All	11609	0	11206	82	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 (82) 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)
2:H:93:CYS:SG	2:H:145:TYR:HE1	1.78	1.05
2:H:93:CYS:SG	2:H:145:TYR:CE1	2.49	1.04
2:H:35:TYR:O	2:H:38:THR:HG22	1.64	0.96
1:E:32:MET:HE1	1:E:101:LEU:HB2	1.50	0.92
2:F:24:GLY:N	2:F:68:LEU:HD12	1.97	0.80
1:G:139:LYS:HD2	1:G:139:LYS:O	1.85	0.77
1:E:32:MET:CE	1:E:101:LEU:HB2	2.14	0.77
2:H:32:LEU:HD23	2:H:38:THR:HG23	1.71	0.73
1:E:92:ARG:CG	2:H:37:TRP:HA	2.20	0.72
1:E:67:THR:O	1:E:70:VAL:HG12	1.91	0.70
1:E:92:ARG:HG2	2:H:37:TRP:HA	1.72	0.70
2:F:24:GLY:CA	2:F:68:LEU:HD12	2.22	0.70
1:E:102:SER:HA	1:E:129:LEU:HD23	1.74	0.69
2:H:93:CYS:SG	2:H:145:TYR:CD1	2.83	0.68
2:H:107:GLY:HA3	2:H:134:VAL:HG13	1.75	0.67
1:G:14:TRP:HE1	1:G:67:THR:HG22	1.61	0.65
1:E:14:TRP:HE1	1:E:67:THR:HG22	1.63	0.64
1:E:32:MET:CE	1:E:101:LEU:CB	2.77	0.63
3:E:201:HEM:HBB2	3:E:201:HEM:HMB2	1.81	0.62
2:F:24:GLY:HA2	2:F:68:LEU:CD1	2.30	0.61
2:H:57:ASN:HB3	2:H:60:VAL:HG13	1.81	0.61
1:E:14:TRP:HE1	1:E:67:THR:CG2	2.15	0.60
1:G:70:VAL:O	1:G:73:VAL:HG23	2.02	0.60
1:G:14:TRP:HE1	1:G:67:THR:CG2	2.15	0.60
1:E:32:MET:HE1	1:E:101:LEU:CB	2.28	0.59
1:S:70:VAL:O	1:S:73:VAL:HG23	2.03	0.59
1:A:70:VAL:O	1:A:73:VAL:HG23	2.03	0.59
2:F:93:CYS:HB2	2:F:145:TYR:CE1	2.38	0.58
1:E:70:VAL:O	1:E:73:VAL:HG23	2.03	0.58
2:F:40:ARG:NH2	7:F:302:HOH:O	2.35	0.58
2:F:24:GLY:CA	2:F:68:LEU:CD1	2.82	0.58
2:B:48:LEU:O	5:C:203:FRU:O3	2.22	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:S:201:HEM:HMB1	3:S:201:HEM:HBB2	1.84	0.57
1:E:101:LEU:HD23	1:E:101:LEU:O	2.05	0.56
1:E:93:VAL:HG23	1:E:98:PHE:HE1	1.71	0.56
1:A:7:LYS:HG2	1:A:73:VAL:HG11	1.87	0.56
2:F:21:ASP:HA	2:F:65:LYS:HG3	1.88	0.56
3:T:201:HEM:HMC2	3:T:201:HEM:HBC2	1.87	0.56
3:H:201:HEM:HBB2	3:H:201:HEM:HHC	1.89	0.54
2:F:20:VAL:HG23	2:F:20:VAL:O	2.07	0.54
3:C:201:HEM:HMB1	3:C:201:HEM:HBB2	1.90	0.52
1:G:7:LYS:HG2	1:G:73:VAL:HG11	1.90	0.52
2:H:107:GLY:HA3	2:H:134:VAL:CG1	2.39	0.52
1:E:7:LYS:HG2	1:E:73:VAL:HG11	1.90	0.52
2:H:35:TYR:O	2:H:38:THR:CG2	2.47	0.52
2:D:26:GLU:OE1	2:D:117:HIS:NE2	2.39	0.51
1:S:7:LYS:HG2	1:S:73:VAL:HG11	1.92	0.51
5:F:203:FRU:C6	2:H:146:HIS:HD2	2.24	0.50
2:T:87:THR:O	2:T:90:GLU:HG3	2.11	0.49
1:E:101:LEU:HD23	1:E:101:LEU:C	2.32	0.49
5:A:203:FRU:H61	2:D:33:VAL:HG13	1.94	0.49
2:F:93:CYS:HB2	2:F:145:TYR:CZ	2.47	0.49
5:F:203:FRU:H62	2:H:146:HIS:HD2	1.78	0.49
2:H:32:LEU:HA	2:H:38:THR:CG2	2.44	0.48
2:F:24:GLY:N	2:F:68:LEU:CD1	2.75	0.48
3:D:201:HEM:HMC1	3:D:201:HEM:HBC2	1.96	0.47
2:H:93:CYS:CB	2:H:145:TYR:CE1	2.96	0.47
1:E:125:LEU:O	1:E:129:LEU:HD13	2.13	0.47
1:E:87:HIS:HE1	3:E:201:HEM:C4C	2.16	0.47
1:E:105:LEU:O	1:E:109:LEU:HD13	2.15	0.47
1:E:42:TYR:CD2	3:E:201:HEM:HBC1	2.50	0.46
2:H:90:GLU:HG3	2:H:144:LYS:HE2	1.96	0.46
1:E:93:VAL:CG2	1:E:98:PHE:HE1	2.28	0.46
1:E:125:LEU:O	1:E:129:LEU:CD1	2.63	0.46
1:E:32:MET:HE3	1:E:101:LEU:HA	1.98	0.45
2:F:20:VAL:O	2:F:21:ASP:CB	2.64	0.45
2:F:20:VAL:O	2:F:21:ASP:CG	2.56	0.44
2:D:87:THR:HG22	7:D:314:HOH:O	2.16	0.44
3:T:201:HEM:HBB2	3:T:201:HEM:HHC	2.00	0.44
2:T:18:VAL:HG13	2:T:23:VAL:HG21	2.00	0.43
1:E:70:VAL:CG1	1:E:71:ALA:N	2.80	0.43
1:G:137:THR:O	1:G:140:TYR:CD2	2.72	0.43
2:F:24:GLY:HA2	2:F:68:LEU:CG	2.48	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:39:GLN:OE1	1:G:92:ARG:NH2	2.52	0.42
3:F:201:HEM:HHC	3:F:201:HEM:HBB2	2.03	0.41
2:B:83:GLY:O	2:F:83:GLY:HA3	2.21	0.41
3:F:201:HEM:HBC2	3:F:201:HEM:HMC1	2.02	0.41
2:F:20:VAL:CG2	2:F:20:VAL:O	2.68	0.41
3:B:201:HEM:HMC1	3:B:201:HEM:HBC2	2.03	0.41
1:E:132:VAL:HG12	1:E:136:LEU:HD12	2.02	0.41
2:F:23:VAL:HG12	2:F:68:LEU:HD11	2.03	0.40
1:C:76:MET:N	1:C:77:PRO:CD	2.84	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	139/141 (99%)	138 (99%)	1 (1%)	0	100	100
1	C	139/141 (99%)	136 (98%)	3 (2%)	0	100	100
1	E	135/141 (96%)	133 (98%)	2 (2%)	0	100	100
1	G	136/141 (96%)	134 (98%)	2 (2%)	0	100	100
1	S	139/141 (99%)	137 (99%)	2 (1%)	0	100	100
2	B	144/146 (99%)	142 (99%)	2 (1%)	0	100	100
2	D	144/146 (99%)	140 (97%)	4 (3%)	0	100	100
2	F	144/146 (99%)	137 (95%)	6 (4%)	1 (1%)	24	29
2	H	144/146 (99%)	140 (97%)	4 (3%)	0	100	100
2	T	144/146 (99%)	142 (99%)	2 (1%)	0	100	100
All	All	1408/1435 (98%)	1379 (98%)	28 (2%)	1 (0%)	53	66

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	F	21	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	113/113 (100%)	112 (99%)	1 (1%)	81	90
1	C	113/113 (100%)	112 (99%)	1 (1%)	81	90
1	E	109/113 (96%)	106 (97%)	3 (3%)	47	63
1	G	110/113 (97%)	106 (96%)	4 (4%)	38	52
1	S	113/113 (100%)	111 (98%)	2 (2%)	62	77
2	B	118/118 (100%)	117 (99%)	1 (1%)	83	92
2	D	118/118 (100%)	116 (98%)	2 (2%)	63	79
2	F	118/118 (100%)	116 (98%)	2 (2%)	63	79
2	H	118/118 (100%)	115 (98%)	3 (2%)	50	68
2	T	118/118 (100%)	117 (99%)	1 (1%)	83	92
All	All	1148/1155 (99%)	1128 (98%)	20 (2%)	63	79

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	SER
2	B	1	VAL
1	C	52	SER
2	D	1	VAL
2	D	61	LYS
1	E	52	SER
1	E	70	VAL
1	E	75	ASP
2	F	87	THR
2	F	117	HIS
1	G	52	SER
1	G	84	SER
1	G	92	ARG

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Mol	Chain	Res	Type
1	G	139	LYS
2	H	40	ARG
2	H	60	VAL
2	H	120	LYS
1	S	52	SER
1	S	75	ASP
2	T	50	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	E	87	HIS
2	H	63	HIS
2	H	143	HIS
2	H	146	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

22 ligands are 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
3	HEM	A	201	1,4	27,50,50	0.82	1 (3%)	17,82,82	1.62	4 (23%)
4	OXY	A	202	3	1,1,1	0.09	0	0,0,0	0.00	-
5	FRU	A	203	1	11,11,12	0.79	0	12,17,18	1.00	0
3	HEM	B	201	2,4	27,50,50	1.18	2 (7%)	17,82,82	1.55	3 (17%)
4	OXY	B	202	3	1,1,1	0.28	0	0,0,0	0.00	-
3	HEM	C	201	1,4	27,50,50	0.97	1 (3%)	17,82,82	1.79	3 (17%)
4	OXY	C	202	3	1,1,1	0.08	0	0,0,0	0.00	-
5	FRU	C	203	1	11,11,12	0.88	1 (9%)	12,17,18	1.24	3 (25%)
6	GLC	C	204	-	12,12,12	1.63	3 (25%)	17,17,17	1.77	5 (29%)
3	HEM	D	201	2,4	27,50,50	0.73	0	17,82,82	1.62	4 (23%)
4	OXY	D	202	3	1,1,1	0.20	0	0,0,0	0.00	-
3	HEM	E	201	1	27,50,50	1.09	1 (3%)	17,82,82	1.65	4 (23%)
3	HEM	F	201	2,4	27,50,50	1.07	2 (7%)	17,82,82	1.86	5 (29%)
4	OXY	F	202	3	1,1,1	0.16	0	0,0,0	0.00	-
5	FRU	F	203	2	11,11,12	0.72	0	12,17,18	1.30	3 (25%)
3	HEM	G	201	1,4	27,50,50	0.86	1 (3%)	17,82,82	1.68	2 (11%)
4	OXY	G	202	3	1,1,1	0.13	0	0,0,0	0.00	-
3	HEM	H	201	2	27,50,50	1.01	2 (7%)	17,82,82	1.38	2 (11%)
3	HEM	S	201	1,4	27,50,50	0.98	1 (3%)	17,82,82	1.57	4 (23%)
4	OXY	S	202	3	1,1,1	0.10	0	0,0,0	0.00	-
3	HEM	T	201	2,4	27,50,50	0.83	1 (3%)	17,82,82	1.25	2 (11%)
4	OXY	T	202	3	1,1,1	0.20	0	0,0,0	0.00	-

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
3	HEM	A	201	1,4	-	0/6/54/54	0/0/8/8
4	OXY	A	202	3	-	0/0/0/0	0/0/0/0
5	FRU	A	203	1	-	0/2/21/24	0/1/1/1
3	HEM	B	201	2,4	-	0/6/54/54	0/0/8/8
4	OXY	B	202	3	-	0/0/0/0	0/0/0/0
3	HEM	C	201	1,4	-	0/6/54/54	0/0/8/8
4	OXY	C	202	3	-	0/0/0/0	0/0/0/0
5	FRU	C	203	1	-	0/2/21/24	0/1/1/1
6	GLC	C	204	-	-	0/2/22/22	0/1/1/1
3	HEM	D	201	2,4	-	0/6/54/54	0/0/8/8
4	OXY	D	202	3	-	0/0/0/0	0/0/0/0

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	HEM	E	201	1	-	0/6/54/54	0/0/8/8
3	HEM	F	201	2,4	-	0/6/54/54	0/0/8/8
4	OXY	F	202	3	-	0/0/0/0	0/0/0/0
5	FRU	F	203	2	-	0/2/21/24	0/1/1/1
3	HEM	G	201	1,4	-	0/6/54/54	0/0/8/8
4	OXY	G	202	3	-	0/0/0/0	0/0/0/0
3	HEM	H	201	2	-	0/6/54/54	0/0/8/8
3	HEM	S	201	1,4	-	0/6/54/54	0/0/8/8
4	OXY	S	202	3	-	0/0/0/0	0/0/0/0
3	HEM	T	201	2,4	-	0/6/54/54	0/0/8/8
4	OXY	T	202	3	-	0/0/0/0	0/0/0/0

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	201	HEM	C3B-C2B	-3.35	1.35	1.40
3	E	201	HEM	C3C-C2C	-2.71	1.36	1.40
3	A	201	HEM	C3B-C2B	-2.68	1.36	1.40
3	C	201	HEM	C3B-C2B	-2.65	1.36	1.40
3	H	201	HEM	C3B-C2B	-2.34	1.37	1.40
3	F	201	HEM	C1D-ND	-2.11	1.31	1.36
6	C	204	GLC	O2-C2	2.08	1.48	1.43
5	C	203	FRU	C1-C2	2.08	1.55	1.52
3	S	201	HEM	C4D-C3D	2.32	1.48	1.42
6	C	204	GLC	O4-C4	2.41	1.48	1.43
3	F	201	HEM	C4D-C3D	2.42	1.48	1.42
3	T	201	HEM	C4D-C3D	2.56	1.48	1.42
6	C	204	GLC	O5-C1	2.57	1.49	1.42
3	H	201	HEM	C4D-C3D	2.59	1.48	1.42
3	G	201	HEM	C4D-C3D	3.01	1.49	1.42
3	B	201	HEM	C4D-C3D	3.09	1.49	1.42

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	201	HEM	CAA-CBA-CGA	-4.69	104.64	112.66
3	D	201	HEM	CBD-CAD-C3D	-4.51	103.87	112.47
3	A	201	HEM	CBD-CAD-C3D	-3.88	105.07	112.47
3	H	201	HEM	CAA-CBA-CGA	-3.55	106.59	112.66
3	F	201	HEM	CBD-CAD-C3D	-3.54	105.72	112.47
3	F	201	HEM	C4C-C3C-C2C	-3.27	104.62	106.90
3	S	201	HEM	C1D-C2D-C3D	-2.81	105.04	107.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	201	HEM	CMA-C3A-C4A	-2.75	124.23	128.46
6	C	204	GLC	C4-C3-C2	-2.71	106.08	110.83
3	F	201	HEM	C3B-C4B-NB	-2.62	105.82	109.21
3	A	201	HEM	CBA-CAA-C2A	-2.62	107.48	112.48
3	F	201	HEM	CMA-C3A-C4A	-2.61	124.45	128.46
3	B	201	HEM	CBD-CAD-C3D	-2.59	107.52	112.47
3	A	201	HEM	CAD-CBD-CGD	-2.52	108.35	112.66
3	T	201	HEM	C3B-C4B-NB	-2.52	105.95	109.21
3	F	201	HEM	C1D-C2D-C3D	-2.49	105.27	107.00
3	B	201	HEM	C3B-C4B-NB	-2.49	106.00	109.21
3	S	201	HEM	CAD-CBD-CGD	-2.37	108.61	112.66
3	E	201	HEM	CMA-C3A-C4A	-2.35	124.85	128.46
5	C	203	FRU	O2-C2-C1	-2.24	107.53	111.60
3	S	201	HEM	CAA-C2A-C3A	-2.24	122.62	129.00
3	T	201	HEM	CMA-C3A-C4A	-2.20	125.08	128.46
5	C	203	FRU	O2-C2-C3	-2.16	104.25	109.18
3	C	201	HEM	CBD-CAD-C3D	-2.15	108.37	112.47
3	G	201	HEM	C3B-C4B-NB	-2.11	106.48	109.21
3	H	201	HEM	C4C-C3C-C2C	-2.10	105.43	106.90
5	F	203	FRU	C2-O5-C5	-2.10	105.90	109.54
3	A	201	HEM	C1D-C2D-C3D	-2.08	105.55	107.00
3	B	201	HEM	CAD-C3D-C2D	-2.08	123.06	129.00
3	D	201	HEM	CBA-CAA-C2A	-2.07	108.52	112.48
3	D	201	HEM	CMA-C3A-C4A	-2.03	125.35	128.46
3	D	201	HEM	CAA-CBA-CGA	-2.02	109.20	112.66
5	C	203	FRU	O3-C3-C4	-2.02	106.34	113.39
3	S	201	HEM	CMB-C2B-C3B	2.12	128.75	124.88
3	E	201	HEM	C4A-C3A-C2A	2.16	108.50	107.00
6	C	204	GLC	C1-O5-C5	2.17	117.86	113.69
5	F	203	FRU	O5-C5-C6	2.28	115.31	108.77
5	F	203	FRU	O2-C2-C3	2.31	114.46	109.18
3	E	201	HEM	CBA-CAA-C2A	2.53	117.32	112.48
6	C	204	GLC	O4-C4-C5	2.68	116.02	109.31
6	C	204	GLC	O2-C2-C1	3.28	116.83	109.14
6	C	204	GLC	O5-C1-C2	3.30	116.24	110.31
3	E	201	HEM	CAD-CBD-CGD	3.55	118.73	112.66
3	C	201	HEM	CBA-CAA-C2A	4.78	121.63	112.48

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

11 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	203	FRU	1	0
3	B	201	HEM	1	0
3	C	201	HEM	1	0
5	C	203	FRU	1	0
3	D	201	HEM	1	0
3	E	201	HEM	3	0
3	F	201	HEM	2	0
5	F	203	FRU	2	0
3	H	201	HEM	1	0
3	S	201	HEM	1	0
3	T	201	HEM	2	0

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

Unable to reproduce the depositors R factor - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.