



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:34 PM UTC

PDB ID : 1D2Q / pdb_00001d2q
Title : CRYSTAL STRUCTURE OF HUMAN TRAIL
Authors : Cha, S.-S.
Deposited on : 1999-09-27
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) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

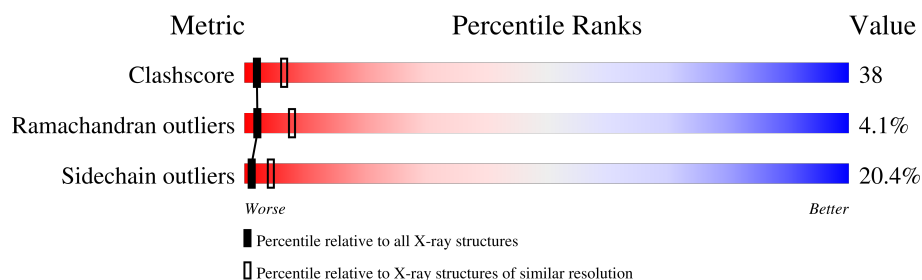
1 Overall quality at a glance

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))
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	168	
1	B	168	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 2674 atoms, of which 508 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 TNF-RELATED APOPTOSIS INDUCING LIGAND.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	134	Total	C	H	N	O	S	0	0	0
			1337	694	254	187	198	4			
1	B	134	Total	C	H	N	O	S	0	0	0
			1337	694	254	187	198	4			

4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	65.61Å 65.61Å 131.70Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	(Not available) – 2.80	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.80)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.209 , 0.282	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2674	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

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	0.37	0/1106	0.81	3/1481 (0.2%)
1	B	0.37	0/1106	0.81	3/1481 (0.2%)
All	All	0.37	0/2212	0.81	6/2962 (0.2%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	216	TYR	CA-C-N	6.01	127.35	119.84
1	A	216	TYR	C-N-CA	6.01	127.35	119.84
1	B	216	TYR	CA-C-N	5.98	127.31	119.84
1	B	216	TYR	C-N-CA	5.98	127.31	119.84
1	B	265	LEU	N-CA-C	5.19	121.86	110.80
1	A	265	LEU	N-CA-C	5.18	121.84	110.80

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	1083	254	1028	79	3
1	B	1083	254	1028	81	2
All	All	2166	508	2056	160	5

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 38.

All (160) 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:269:ASP:HB2	1:A:272:ALA:HB3	1.59	0.84
1:B:269:ASP:HB2	1:B:272:ALA:HB3	1.59	0.83
1:B:145:LYS:HG3	1:B:146:ALA:N	1.93	0.82
1:A:145:LYS:HG3	1:A:146:ALA:N	1.93	0.81
1:B:145:LYS:HG3	1:B:146:ALA:H	1.49	0.77
1:A:145:LYS:HG3	1:A:146:ALA:H	1.49	0.77
1:B:136:LEU:C	1:B:265:LEU:HA	2.10	0.76
1:A:136:LEU:C	1:A:265:LEU:HA	2.10	0.76
1:A:136:LEU:O	1:A:265:LEU:HA	1.86	0.76
1:B:136:LEU:O	1:B:265:LEU:HA	1.86	0.75
1:B:126:ILE:HD11	1:B:275:PHE:HD2	1.54	0.72
1:A:206:MET:HG2	1:A:263:GLU:O	1.89	0.72
1:A:126:ILE:HD11	1:A:275:PHE:HD2	1.54	0.72
1:B:134:ASN:C	1:B:134:ASN:OD1	2.33	0.71
1:B:206:MET:HG2	1:B:263:GLU:O	1.89	0.71
1:A:263:GLU:O	1:A:264:HIS:HB2	1.91	0.71
1:A:134:ASN:OD1	1:A:134:ASN:C	2.33	0.70
1:A:173:GLU:HG2	1:A:257:PHE:HB3	1.75	0.68
1:B:173:GLU:HG2	1:B:257:PHE:HB3	1.75	0.68
1:B:263:GLU:O	1:B:264:HIS:HB2	1.91	0.67
1:B:252:GLU:O	1:B:253:ASN:HB2	1.97	0.65
1:A:252:GLU:O	1:A:253:ASN:HB2	1.97	0.64
1:A:186:SER:HB3	1:A:210:ILE:HD11	1.81	0.62
1:A:208:GLN:HE21	1:A:244:GLN:HE21	1.48	0.62
1:B:206:MET:CE	1:B:229:SER:HB3	2.30	0.62
1:A:238:GLY:O	1:A:239:LEU:HD23	2.00	0.62
1:B:186:SER:HB3	1:B:210:ILE:HD11	1.81	0.62
1:B:238:GLY:O	1:B:239:LEU:HD23	2.00	0.61
1:A:206:MET:CE	1:A:229:SER:HB3	2.30	0.61
1:B:208:GLN:HE21	1:B:244:GLN:HE21	1.48	0.60
1:A:181:PHE:O	1:A:279:LEU:HD12	2.01	0.60
1:B:181:PHE:O	1:B:279:LEU:HD12	2.01	0.59
1:B:130:ARG:CZ	1:B:269:ASP:OD1	2.51	0.59
1:A:130:ARG:CZ	1:A:269:ASP:OD1	2.51	0.59
1:B:187:GLN:O	1:B:273:SER:HA	2.04	0.58
1:A:127:THR:CG2	1:A:270:HIS:HB2	2.34	0.58
1:B:127:THR:CG2	1:B:270:HIS:HB2	2.34	0.57
1:A:130:ARG:O	1:A:130:ARG:HG3	2.03	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:187:GLN:O	1:A:273:SER:HA	2.04	0.57
1:B:130:ARG:O	1:B:130:ARG:HG3	2.03	0.57
1:A:209:TYR:HB2	1:A:259:SER:HB3	1.87	0.56
1:B:175:VAL:HG22	1:B:255:ARG:HG2	1.88	0.56
1:B:209:TYR:HB2	1:B:259:SER:HB3	1.87	0.56
1:B:150:LYS:HD2	1:B:257:PHE:CG	2.40	0.56
1:A:175:VAL:HG22	1:A:255:ARG:HG2	1.88	0.55
1:A:150:LYS:HD2	1:A:257:PHE:CG	2.40	0.55
1:B:182:TYR:CD2	1:B:250:LEU:HD12	2.42	0.55
1:A:182:TYR:CD2	1:A:250:LEU:HD12	2.42	0.55
1:B:190:PHE:CE1	1:B:242:ILE:HD12	2.42	0.55
1:A:190:PHE:CE1	1:A:242:ILE:HD12	2.42	0.54
1:B:134:ASN:O	1:B:136:LEU:N	2.41	0.54
1:A:134:ASN:O	1:A:136:LEU:N	2.41	0.53
1:A:208:GLN:NE2	1:A:244:GLN:HE21	2.07	0.53
1:B:164:LEU:HD13	1:B:168:HIS:HA	1.91	0.53
1:A:222:LEU:HD22	1:A:248:PHE:CD2	2.45	0.52
1:B:214:THR:HG22	1:B:220:ILE:CD1	2.39	0.52
1:A:143:ASN:O	1:A:144:GLU:C	2.53	0.52
1:B:127:THR:N	1:B:162:SER:HB3	2.25	0.52
1:B:142:LYS:HB2	1:B:147:LEU:HD23	1.91	0.52
1:B:222:LEU:HD22	1:B:248:PHE:CD2	2.45	0.52
1:B:181:PHE:HB2	1:B:280:VAL:HG22	1.90	0.52
1:A:164:LEU:HD13	1:A:168:HIS:HA	1.91	0.52
1:A:181:PHE:HB2	1:A:280:VAL:HG22	1.90	0.52
1:A:214:THR:HG22	1:A:220:ILE:CD1	2.39	0.52
1:A:127:THR:N	1:A:162:SER:HB3	2.25	0.52
1:A:179:LYS:HD2	1:A:251:LYS:HA	1.92	0.52
1:B:208:GLN:NE2	1:B:244:GLN:HE21	2.07	0.52
1:B:160:GLY:O	1:B:161:HIS:HB2	2.10	0.51
1:A:142:LYS:HB2	1:A:147:LEU:HD23	1.91	0.51
1:A:179:LYS:HE3	1:A:251:LYS:HG2	1.92	0.51
1:B:143:ASN:O	1:B:144:GLU:C	2.53	0.51
1:B:142:LYS:HB3	1:B:147:LEU:HB3	1.93	0.51
1:B:212:LYS:HD2	1:B:250:LEU:CD2	2.41	0.51
1:B:179:LYS:HE3	1:B:251:LYS:HG2	1.92	0.50
1:B:179:LYS:HD2	1:B:251:LYS:HA	1.92	0.50
1:A:160:GLY:O	1:A:161:HIS:HB2	2.10	0.50
1:B:150:LYS:HD2	1:B:257:PHE:CD1	2.47	0.50
1:A:269:ASP:HB2	1:A:272:ALA:CB	2.38	0.50
1:B:212:LYS:HD2	1:B:250:LEU:HD23	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:153:SER:OG	1:A:268:MET:HE2	2.12	0.49
1:A:212:LYS:HD2	1:A:250:LEU:CD2	2.41	0.49
1:A:135:THR:HA	1:A:265:LEU:CB	2.42	0.49
1:A:267:ASP:OD1	1:A:267:ASP:C	2.55	0.49
1:A:184:ILE:O	1:A:245:GLY:HA2	2.12	0.49
1:B:153:SER:OG	1:B:268:MET:HE2	2.11	0.49
1:A:150:LYS:HD2	1:A:257:PHE:CD1	2.47	0.49
1:A:142:LYS:HB3	1:A:147:LEU:HB3	1.93	0.49
1:B:142:LYS:HB2	1:B:147:LEU:CD2	2.43	0.49
1:A:142:LYS:HB2	1:A:147:LEU:CD2	2.43	0.48
1:B:127:THR:H	1:B:162:SER:HB3	1.78	0.48
1:B:135:THR:HA	1:B:265:LEU:CB	2.42	0.48
1:A:126:ILE:HG12	1:A:275:PHE:O	2.13	0.48
1:A:127:THR:H	1:A:162:SER:HB3	1.78	0.48
1:B:126:ILE:HG12	1:B:275:PHE:O	2.13	0.48
1:B:184:ILE:O	1:B:245:GLY:HA2	2.12	0.48
1:A:261:THR:C	1:A:263:GLU:H	2.22	0.48
1:B:134:ASN:OD1	1:B:135:THR:N	2.46	0.48
1:A:212:LYS:HD2	1:A:250:LEU:HD23	1.94	0.48
1:A:134:ASN:OD1	1:A:135:THR:N	2.46	0.48
1:B:187:GLN:HA	1:B:242:ILE:O	2.15	0.47
1:B:261:THR:C	1:B:263:GLU:H	2.22	0.47
1:B:267:ASP:OD1	1:B:267:ASP:C	2.55	0.47
1:A:243:TYR:C	1:A:243:TYR:CD1	2.93	0.47
1:B:127:THR:HG21	1:B:270:HIS:HB2	1.96	0.47
1:B:238:GLY:C	1:B:239:LEU:HD23	2.40	0.47
1:A:136:LEU:H	1:A:265:LEU:CB	2.28	0.47
1:B:130:ARG:HB3	1:B:268:MET:HB2	1.97	0.47
1:B:252:GLU:O	1:B:253:ASN:CB	2.63	0.47
1:B:136:LEU:O	1:B:266:ILE:N	2.48	0.46
1:B:141:SER:HB3	1:B:142:LYS:H	1.54	0.46
1:B:136:LEU:H	1:B:265:LEU:CB	2.28	0.46
1:A:127:THR:HG21	1:A:270:HIS:HB2	1.96	0.46
1:A:238:GLY:C	1:A:239:LEU:HD23	2.40	0.46
1:A:130:ARG:HB3	1:A:268:MET:HB2	1.97	0.46
1:B:227:ARG:HA	1:B:227:ARG:HD2	1.52	0.46
1:A:136:LEU:O	1:A:266:ILE:N	2.48	0.46
1:B:182:TYR:CZ	1:B:279:LEU:HD13	2.50	0.46
1:B:243:TYR:C	1:B:243:TYR:CD1	2.93	0.46
1:A:187:GLN:HA	1:A:242:ILE:O	2.15	0.46
1:A:128:GLY:O	1:A:268:MET:O	2.34	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:156:SER:HB3	1:A:164:LEU:HD12	1.98	0.46
1:B:128:GLY:O	1:B:268:MET:O	2.34	0.46
1:B:184:ILE:HD11	1:B:250:LEU:HD11	1.98	0.46
1:A:184:ILE:HD11	1:A:250:LEU:HD11	1.98	0.45
1:A:184:ILE:O	1:A:223:MET:HE1	2.17	0.45
1:B:264:HIS:O	1:B:265:LEU:O	2.35	0.45
1:B:156:SER:HB3	1:B:164:LEU:HD12	1.98	0.45
1:A:182:TYR:CZ	1:A:279:LEU:HD13	2.50	0.45
1:B:184:ILE:O	1:B:223:MET:HE1	2.17	0.45
1:A:264:HIS:O	1:A:265:LEU:O	2.35	0.45
1:B:190:PHE:CZ	1:B:266:ILE:HD11	2.53	0.44
1:A:190:PHE:CZ	1:A:266:ILE:HD11	2.53	0.44
1:A:126:ILE:HD11	1:A:275:PHE:CD2	2.44	0.44
1:A:227:ARG:HA	1:A:227:ARG:HD2	1.52	0.43
1:A:144:GLU:HB3	1:A:145:LYS:H	1.68	0.43
1:B:164:LEU:HD11	1:B:169:LEU:HB2	2.00	0.43
1:B:269:ASP:HB2	1:B:272:ALA:CB	2.38	0.43
1:A:252:GLU:O	1:A:253:ASN:CB	2.63	0.42
1:A:206:MET:HE2	1:A:229:SER:HB3	2.00	0.42
1:B:214:THR:C	1:B:216:TYR:H	2.27	0.42
1:A:191:ARG:O	1:A:265:LEU:CB	2.68	0.42
1:B:191:ARG:O	1:B:265:LEU:CB	2.68	0.42
1:A:214:THR:C	1:A:216:TYR:H	2.27	0.42
1:B:126:ILE:HD11	1:B:275:PHE:CD2	2.44	0.42
1:B:143:ASN:HD22	1:B:143:ASN:HA	1.58	0.42
1:B:206:MET:HE2	1:B:229:SER:HB3	2.00	0.42
1:A:164:LEU:HD11	1:A:169:LEU:HB2	2.00	0.41
1:B:130:ARG:HB3	1:B:268:MET:C	2.45	0.41
1:B:226:ALA:O	1:B:227:ARG:HD2	2.20	0.41
1:B:144:GLU:HB3	1:B:145:LYS:H	1.68	0.41
1:A:130:ARG:HB3	1:A:268:MET:C	2.45	0.41
1:A:142:LYS:HA	1:A:147:LEU:HA	2.03	0.41
1:B:145:LYS:CG	1:B:146:ALA:N	2.74	0.41
1:B:142:LYS:HA	1:B:147:LEU:HA	2.03	0.41
1:A:226:ALA:O	1:A:227:ARG:CD	2.69	0.41
1:A:224:LYS:O	1:A:224:LYS:HG2	2.21	0.41
1:A:226:ALA:O	1:A:227:ARG:HD2	2.20	0.41
1:B:226:ALA:O	1:B:227:ARG:CD	2.69	0.41
1:B:128:GLY:CA	1:B:268:MET:HE3	2.52	0.40
1:A:262:ASN:HD22	1:A:262:ASN:HA	1.68	0.40

All (5) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:185:TYR:HH	1:A:247:ILE:H[2_665]	1.11	0.49
1:B:228:ASN:HD21	1:B:239:LEU:H[2_765]	1.12	0.48
1:B:185:TYR:HH	1:B:247:ILE:H[3_675]	1.15	0.45
1:A:226:ALA:H	1:A:241:SER:HG[3_565]	1.26	0.34
1:A:228:ASN:HD21	1:A:239:LEU:H[3_565]	1.29	0.31

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	122/168 (73%)	103 (84%)	14 (12%)	5 (4%)	2	8
1	B	122/168 (73%)	103 (84%)	14 (12%)	5 (4%)	2	8
All	All	244/336 (73%)	206 (84%)	28 (12%)	10 (4%)	2	8

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	135	THR
1	A	144	GLU
1	A	265	LEU
1	B	135	THR
1	B	144	GLU
1	B	265	LEU
1	A	217	PRO
1	B	217	PRO
1	A	253	ASN
1	B	253	ASN

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	113/149 (76%)	90 (80%)	23 (20%)	1	4
1	B	113/149 (76%)	90 (80%)	23 (20%)	1	4
All	All	226/298 (76%)	180 (80%)	46 (20%)	1	4

All (46) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	121	ARG
1	A	127	THR
1	A	130	ARG
1	A	134	ASN
1	A	141	SER
1	A	142	LYS
1	A	143	ASN
1	A	144	GLU
1	A	145	LYS
1	A	147	LEU
1	A	156	SER
1	A	162	SER
1	A	167	LEU
1	A	178	GLU
1	A	191	ARG
1	A	205	GLN
1	A	210	ILE
1	A	224	LYS
1	A	227	ARG
1	A	230	CYS
1	A	241	SER
1	A	256	ILE
1	A	266	ILE
1	B	121	ARG
1	B	127	THR
1	B	130	ARG
1	B	134	ASN

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Mol	Chain	Res	Type
1	B	141	SER
1	B	142	LYS
1	B	143	ASN
1	B	144	GLU
1	B	145	LYS
1	B	147	LEU
1	B	156	SER
1	B	162	SER
1	B	167	LEU
1	B	178	GLU
1	B	191	ARG
1	B	205	GLN
1	B	210	ILE
1	B	224	LYS
1	B	227	ARG
1	B	230	CYS
1	B	241	SER
1	B	256	ILE
1	B	266	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	143	ASN
1	A	171	ASN
1	A	208	GLN
1	A	262	ASN
1	A	270	HIS
1	B	143	ASN
1	B	171	ASN
1	B	208	GLN
1	B	262	ASN
1	B	270	HIS

5.3.3 RNA ⓘ

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.