



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 17, 2018 – 12:33 am GMT

PDB ID : 1AHI
Title : 7 ALPHA-HYDROXYSTEROID DEHYDROGENASE COMPLEXED
WITH NADH AND 7-OXO GLYCOCHENODEOXYCHOLIC ACID
Authors : Tanaka, N.; Nonaka, T.; Mitsui, Y.
Deposited on : 1995-08-25
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)
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk30686

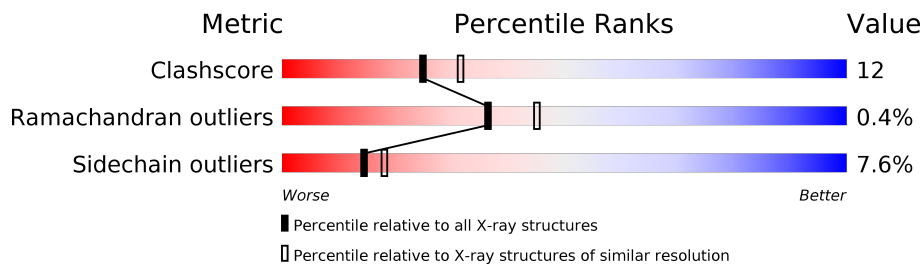
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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))
Clashscore	122078	5071 (2.30-2.30)
Ramachandran outliers	120005	5021 (2.30-2.30)
Sidechain outliers	119972	5020 (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 $\leq 5\%$. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	255	71% 26% .
1	B	255	76% 21% .

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	CHO	A	301	X	-	-	-
2	CHO	B	301	X	-	-	-

2 Entry composition [i](#)

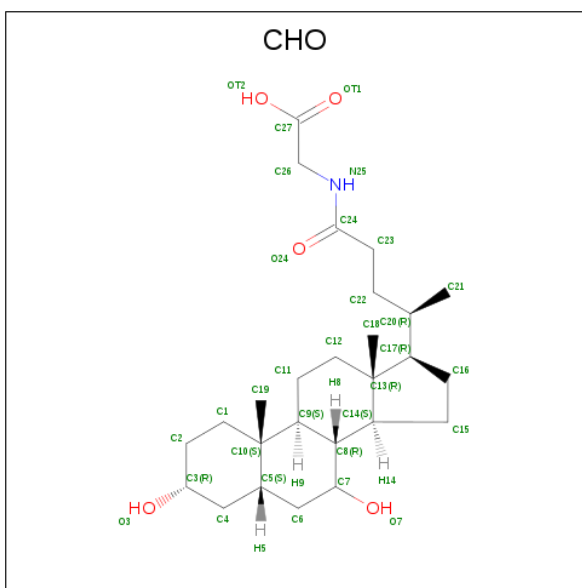
There are 4 unique types of molecules in this entry. The entry contains 4000 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 7 ALPHA-HYDROXYSTEROID DEHYDROGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	255	Total 1876	C 1174	N 326	O 364	S 12	0	0	0
1	B	255	Total 1876	C 1174	N 326	O 364	S 12	0	0	0

- Molecule 2 is GLYCOCHENODEOXYCHOLIC ACID (three-letter code: CHO) (formula: $C_{26}H_{43}NO_5$).

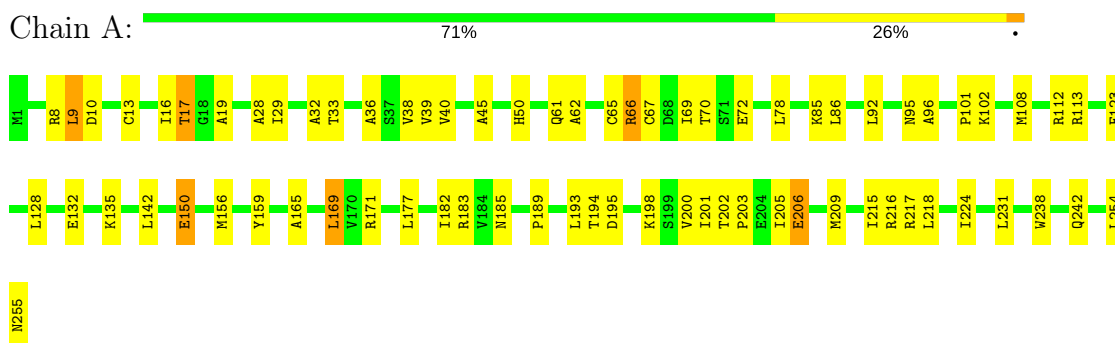


3 Residue-property plots [i](#)

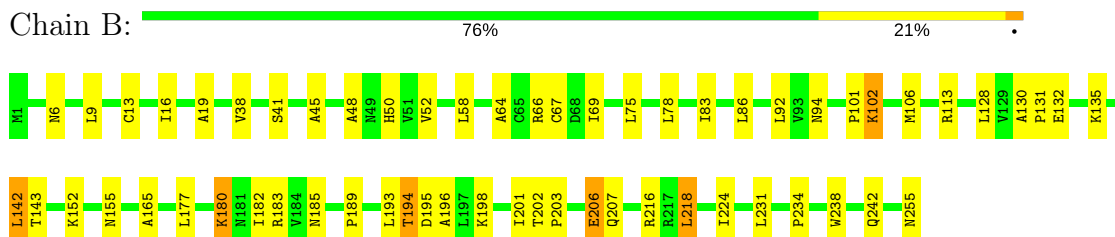
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are 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.

Note EDS was not executed.

- Molecule 1: 7 ALPHA-HYDROXYSTEROID DEHYDROGENASE



- Molecule 1: 7 ALPHA-HYDROXYSTEROID DEHYDROGENASE



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	81.59Å 81.59Å 214.65Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.30	Depositor
% Data completeness (in resolution range)	86.6 (8.00-2.30)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.180 , 0.250	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	4000	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

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: NAI, CHO

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	0.60	2/1903 (0.1%)	0.72	0/2574
1	B	0.57	0/1903	0.72	1/2574 (0.0%)
All	All	0.59	2/3806 (0.1%)	0.72	1/5148 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	150	GLU	CG-CD	9.18	1.65	1.51
1	A	72	GLU	CG-CD	5.85	1.60	1.51

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	142	LEU	CA-CB-CG	5.91	128.90	115.30

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	1876	0	1882	53	0
1	B	1876	0	1882	40	0
2	A	28	0	37	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	28	0	37	0	0
3	A	44	0	27	2	0
3	B	44	0	27	3	0
4	A	49	0	0	4	0
4	B	55	0	0	4	0
All	All	4000	0	3892	90	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 12.

All (90) 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:13:CYS:HB3	1:B:86:LEU:HD13	1.53	0.91
1:A:17:THR:HG22	1:A:96:ALA:H	1.35	0.89
1:B:193:LEU:HD13	1:B:218:LEU:HD23	1.54	0.87
1:A:202:THR:HG22	1:A:205:ILE:HG13	1.57	0.87
1:B:206:GLU:HA	4:B:411:HOH:O	1.88	0.73
1:B:67:CYS:HB2	4:B:433:HOH:O	1.89	0.73
1:B:52:VAL:HG21	1:B:64:ALA:HB2	1.73	0.70
1:A:193:LEU:HD13	1:A:218:LEU:HD23	1.73	0.70
1:B:189:PRO:HG2	3:B:302:NAI:C5N	2.22	0.69
1:B:83:ILE:HD11	1:B:132:GLU:HG3	1.76	0.68
1:A:16:ILE:HD12	1:A:28:ALA:HA	1.77	0.67
1:A:185:ASN:ND2	1:A:242:GLN:H	1.93	0.66
1:A:17:THR:HG21	4:A:424:HOH:O	1.95	0.65
1:A:189:PRO:HG2	3:A:302:NAI:C5N	2.27	0.64
1:A:202:THR:HG22	1:A:205:ILE:CG1	2.28	0.64
1:A:65:CYS:SG	4:A:442:HOH:O	2.56	0.62
1:B:203:PRO:O	1:B:207:GLN:HG2	2.00	0.61
1:A:205:ILE:O	1:A:209:MET:HG3	2.01	0.61
1:A:198:LYS:HA	1:A:201:ILE:HG22	1.83	0.60
1:B:201:ILE:HD11	4:B:411:HOH:O	2.02	0.59
1:A:165:ALA:HB2	1:B:165:ALA:HB2	1.86	0.58
1:A:45:ALA:HB2	1:A:66:ARG:HG3	1.86	0.58
1:B:16:ILE:HG22	1:B:19:ALA:HB2	1.86	0.57
1:A:13:CYS:HB3	1:A:86:LEU:HD13	1.86	0.56
1:A:177:LEU:HB3	1:A:182:ILE:HB	1.88	0.56
1:B:189:PRO:HB3	1:B:224:ILE:CD1	2.35	0.55
1:A:29:ILE:O	1:A:33:THR:HB	2.07	0.54
1:B:202:THR:O	1:B:206:GLU:HB2	2.06	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:185:ASN:HD22	1:A:242:GLN:H	1.56	0.53
1:A:194:THR:HG22	1:A:195:ASP:N	2.24	0.53
1:B:194:THR:HG22	1:B:196:ALA:H	1.73	0.53
1:B:194:THR:HG21	3:B:302:NAI:O1N	2.08	0.53
1:A:113:ARG:HG2	1:A:113:ARG:HH11	1.74	0.52
1:B:6:ASN:O	1:B:234:PRO:HD2	2.10	0.52
1:A:85:LYS:N	1:A:85:LYS:HD2	2.24	0.52
1:A:17:THR:CG2	1:A:96:ALA:H	2.17	0.51
1:B:50:HIS:CD2	4:B:429:HOH:O	2.64	0.51
1:A:189:PRO:HB3	1:A:224:ILE:CD1	2.41	0.51
1:A:183:ARG:NH2	1:A:231:LEU:O	2.41	0.50
1:A:108:MET:O	1:A:112:ARG:HG3	2.11	0.50
1:B:185:ASN:ND2	1:B:242:GLN:H	2.10	0.50
1:A:189:PRO:HG2	3:A:302:NAI:C6N	2.42	0.50
1:A:101:PRO:O	1:A:102:LYS:HD2	2.12	0.49
1:A:9:LEU:HB3	1:A:36:ALA:HB2	1.94	0.49
1:A:32:ALA:HA	1:A:36:ALA:O	2.12	0.49
1:B:195:ASP:HA	1:B:198:LYS:HB2	1.94	0.49
1:B:185:ASN:HD22	1:B:242:GLN:H	1.60	0.49
1:B:202:THR:HB	1:B:203:PRO:HD2	1.93	0.49
1:B:183:ARG:NH2	1:B:231:LEU:O	2.46	0.48
1:B:193:LEU:HD12	1:B:193:LEU:HA	1.63	0.48
1:A:16:ILE:HG22	1:A:19:ALA:HB2	1.94	0.48
1:A:39:VAL:HG23	1:A:86:LEU:HD11	1.95	0.48
1:A:202:THR:OG1	1:A:203:PRO:HD2	2.14	0.48
1:A:206:GLU:O	1:A:209:MET:HB2	2.13	0.48
1:B:189:PRO:HB3	1:B:224:ILE:HD11	1.95	0.47
1:B:52:VAL:CG2	1:B:64:ALA:HB2	2.44	0.47
1:B:41:SER:OG	1:B:67:CYS:HB3	2.14	0.47
1:A:185:ASN:ND2	1:A:242:GLN:HB2	2.30	0.47
1:A:17:THR:O	1:A:95:ASN:HB3	2.14	0.47
1:A:8:ARG:NH1	1:A:10:ASP:OD1	2.47	0.47
1:A:202:THR:CG2	1:A:205:ILE:HG13	2.37	0.47
1:A:19:ALA:HB3	1:A:40:VAL:HG13	1.97	0.46
1:A:200:VAL:HG11	2:A:301:CHO:H121	1.96	0.46
1:B:101:PRO:HA	1:B:155:ASN:O	2.16	0.46
1:B:130:ALA:HB3	1:B:131:PRO:HD3	1.98	0.46
1:A:189:PRO:HB3	1:A:224:ILE:HD12	1.98	0.46
1:A:38:VAL:O	1:A:62:ALA:HA	2.16	0.45
1:B:132:GLU:O	1:B:135:LYS:HG2	2.17	0.45
1:B:16:ILE:HD12	1:B:38:VAL:HG11	1.98	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:156:MET:HE1	1:A:159:TYR:HD2	1.82	0.44
1:A:67:CYS:HB2	4:A:442:HOH:O	2.18	0.44
1:B:48:ALA:O	1:B:52:VAL:HG23	2.18	0.44
1:A:132:GLU:O	1:A:135:LYS:HB3	2.17	0.43
1:A:171:ARG:HD3	1:B:152:LYS:HE3	2.00	0.43
1:A:156:MET:CE	1:A:159:TYR:HD2	2.32	0.43
1:A:171:ARG:HB3	1:B:152:LYS:HG2	2.00	0.43
1:B:180:LYS:HB2	1:B:182:ILE:HG13	2.00	0.42
1:A:254:LEU:HD11	2:A:301:CHO:H112	2.01	0.42
1:B:102:LYS:HB3	1:B:106:MET:CE	2.49	0.42
1:B:189:PRO:HB3	1:B:224:ILE:HD12	2.01	0.41
1:A:123:PHE:HB2	1:A:169:LEU:HD11	2.03	0.41
1:B:69:ILE:HA	1:B:75:LEU:HD21	2.02	0.41
1:A:156:MET:HE3	1:A:159:TYR:HB3	2.03	0.41
1:A:215:ILE:O	1:A:217:ARG:N	2.53	0.41
1:A:69:ILE:HG13	1:A:70:THR:N	2.36	0.41
1:A:195:ASP:HA	1:A:198:LYS:HE2	2.02	0.41
1:B:194:THR:HG23	3:B:302:NAI:O2A	2.20	0.41
1:A:50:HIS:HB2	4:A:435:HOH:O	2.21	0.41
1:B:102:LYS:HB3	1:B:106:MET:HE2	2.03	0.41
1:B:45:ALA:HB2	1:B:66:ARG:HB2	2.03	0.41

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	253/255 (99%)	243 (96%)	9 (4%)	1 (0%)	36	45
1	B	253/255 (99%)	248 (98%)	4 (2%)	1 (0%)	36	45
All	All	506/510 (99%)	491 (97%)	13 (3%)	2 (0%)	36	45

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	216	ARG
1	B	216	ARG

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	197/197 (100%)	184 (93%)	13 (7%)	18	24
1	B	197/197 (100%)	180 (91%)	17 (9%)	11	14
All	All	394/394 (100%)	364 (92%)	30 (8%)	14	18

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	LEU
1	A	17	THR
1	A	61	GLN
1	A	66	ARG
1	A	78	LEU
1	A	92	LEU
1	A	128	LEU
1	A	142	LEU
1	A	150	GLU
1	A	169	LEU
1	A	206	GLU
1	A	238	TRP
1	A	255	ASN
1	B	9	LEU
1	B	58	LEU
1	B	78	LEU
1	B	92	LEU
1	B	94	ASN
1	B	102	LYS
1	B	113	ARG
1	B	128	LEU

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Mol	Chain	Res	Type
1	B	142	LEU
1	B	143	THR
1	B	177	LEU
1	B	180	LYS
1	B	194	THR
1	B	206	GLU
1	B	218	LEU
1	B	238	TRP
1	B	255	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	6	ASN
1	A	56	GLN
1	A	61	GLN
1	A	185	ASN
1	A	212	HIS
1	B	6	ASN
1	B	181	ASN
1	B	185	ASN
1	B	220	GLN

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](#)

4 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
2	CHO	A	301	-	31,31,35	1.98	3 (9%)	49,49,54	1.64	6 (12%)
3	NAI	A	302	-	41,48,48	1.30	4 (9%)	45,73,73	1.75	4 (8%)
2	CHO	B	301	-	31,31,35	2.15	5 (16%)	49,49,54	1.67	7 (14%)
3	NAI	B	302	-	41,48,48	1.38	6 (14%)	45,73,73	1.63	6 (13%)

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
2	CHO	A	301	-	1/1/11/13	0/9/70/75	0/4/4/4
3	NAI	A	302	-	-	0/25/72/72	0/5/5/5
2	CHO	B	301	-	1/1/11/13	0/9/70/75	0/4/4/4
3	NAI	B	302	-	-	0/25/72/72	0/5/5/5

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	CHO	O7-C7	-9.18	1.23	1.43
2	B	301	CHO	O7-C7	-9.05	1.23	1.43
3	B	302	NAI	C4N-C5N	-4.29	1.39	1.49
3	A	302	NAI	C4N-C5N	-4.08	1.40	1.49
2	B	301	CHO	C24-N25	-2.38	1.24	1.32
3	B	302	NAI	O2D-C2D	2.08	1.48	1.43
3	A	302	NAI	C2N-C3N	2.21	1.41	1.34
3	B	302	NAI	O3D-C3D	2.33	1.48	1.43
2	A	301	CHO	C8-C14	2.43	1.58	1.53
2	A	301	CHO	C10-C9	2.44	1.60	1.56
2	B	301	CHO	C13-C17	2.52	1.59	1.55
3	A	302	NAI	C7N-C3N	2.68	1.54	1.48
3	B	302	NAI	O4B-C1B	2.74	1.45	1.41
3	B	302	NAI	C7N-C3N	2.93	1.55	1.48
3	B	302	NAI	C6N-C5N	3.01	1.38	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	301	CHO	C10-C9	3.60	1.63	1.56
3	A	302	NAI	C6N-C5N	3.82	1.40	1.33
2	B	301	CHO	C10-C5	4.16	1.62	1.55

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	302	NAI	N3A-C2A-N1A	-8.79	121.34	128.86
3	B	302	NAI	N3A-C2A-N1A	-5.37	124.27	128.86
2	A	301	CHO	C9-C8-C7	-3.52	107.78	111.92
3	B	302	NAI	C3N-C2N-N1N	-3.27	118.38	123.09
2	B	301	CHO	C19-C10-C1	-3.11	103.20	108.25
3	B	302	NAI	C1D-N1N-C6N	-3.01	114.24	120.80
2	B	301	CHO	C9-C8-C7	-2.87	108.54	111.92
2	A	301	CHO	C19-C10-C1	-2.70	103.86	108.25
3	A	302	NAI	O4B-C4B-C5B	-2.43	101.30	109.39
3	B	302	NAI	C3D-C2D-C1D	-2.36	96.94	101.44
2	B	301	CHO	C17-C13-C14	-2.35	97.29	100.07
2	B	301	CHO	C5-C6-C7	-2.08	112.14	114.44
2	A	301	CHO	C16-C15-C14	-2.06	101.02	105.13
2	A	301	CHO	C22-C20-C17	-2.06	105.98	110.28
2	B	301	CHO	C13-C17-C20	2.46	123.44	119.47
3	B	302	NAI	N6A-C6A-N1A	2.54	123.84	118.57
3	A	302	NAI	N6A-C6A-N1A	2.55	123.86	118.57
3	A	302	NAI	C4A-C5A-N7A	3.38	112.68	109.41
3	B	302	NAI	C4A-C5A-N7A	3.75	113.03	109.41
2	A	301	CHO	O7-C7-C6	5.45	123.59	109.95
2	B	301	CHO	O7-C7-C6	5.51	123.74	109.95
2	B	301	CHO	O7-C7-C8	6.21	123.17	109.33
2	A	301	CHO	O7-C7-C8	6.46	123.73	109.33

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	301	CHO	C7
2	B	301	CHO	C7

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	301	CHO	2	0
3	A	302	NAI	2	0
3	B	302	NAI	3	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

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.