



wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 2, 2023 – 02:28 pm GMT

PDB ID : 1UV6
Title : X-ray structure of acetylcholine binding protein (AChBP) in complex with carbamylcholine
Authors : Celie, P.H.N.; Van Rossum-fikkert, S.E.; Van Dijk, W.J.; Brejc, K.; Smit, A.B.; Sixma, T.K.
Deposited on : 2004-01-15
Resolution : 2.50 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

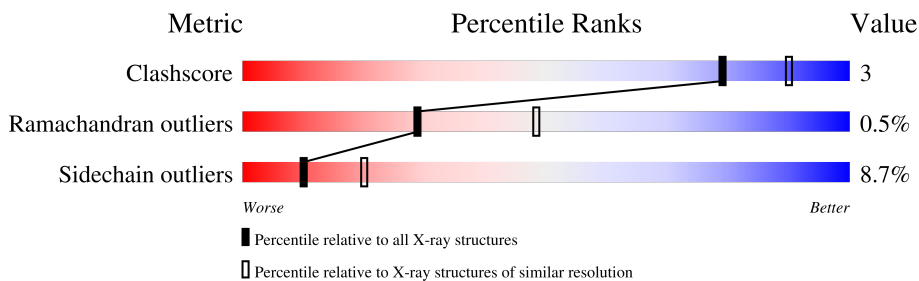
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)



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	210	
1	B	210	
1	C	210	
1	D	210	
1	E	210	
1	F	210	
1	G	210	
1	H	210	

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Mol	Chain	Length	Quality of chain
1	I	210	 80% 15% . .
1	J	210	 80% 16% . .

2 Entry composition [i](#)

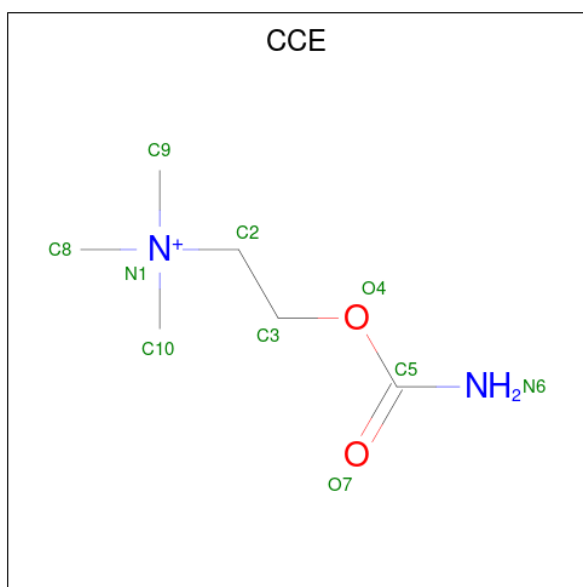
There are 3 unique types of molecules in this entry. The entry contains 16488 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 ACETYLCHOLINE-BINDING PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	B	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	C	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	D	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	E	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	F	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	G	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	H	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	I	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0
1	J	205	Total 1636	C 1023	N 280	O 328	S 5	0	0	0

- Molecule 2 is 2-[(AMINOCARBONYL)OXY]-N,N,N-TRIMETHYLETHANAMINIUM (three-letter code: CCE) (formula: C₆H₁₅N₂O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	C	1	10	6	2	2	0	0
2	D	1	10	6	2	2	0	0
2	J	1	10	6	2	2	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	13	13	13	0	0
3	B	10	10	10	0	0
3	C	12	12	12	0	0
3	D	11	11	11	0	0
3	E	7	7	7	0	0
3	F	8	8	8	0	0
3	G	11	11	11	0	0
3	H	8	8	8	0	0
3	I	10	10	10	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	J	8	Total	O	0	0
			8	8		

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. 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.


Note EDS was not executed.

- Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain A:  84% 11% ..




- Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain B:  82% 14% ..




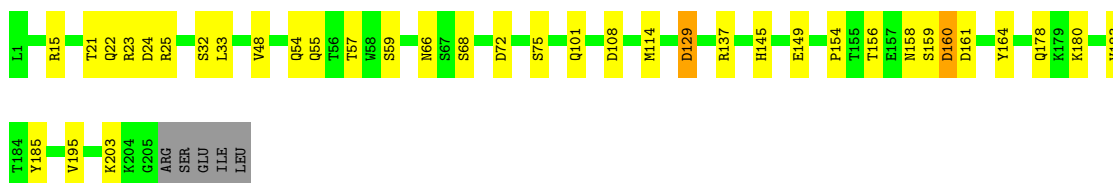
- Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain C:  84% 13% ..




- Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain D:  80% 17% ..




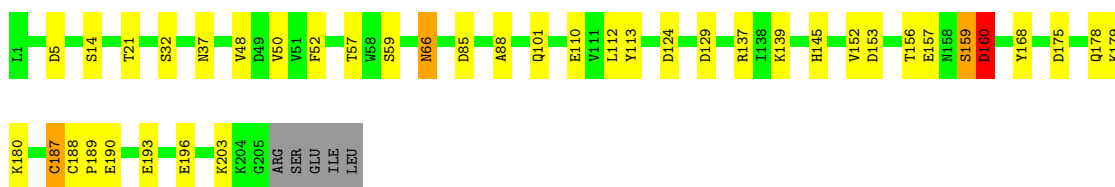
- Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain E:  81% 15% ..




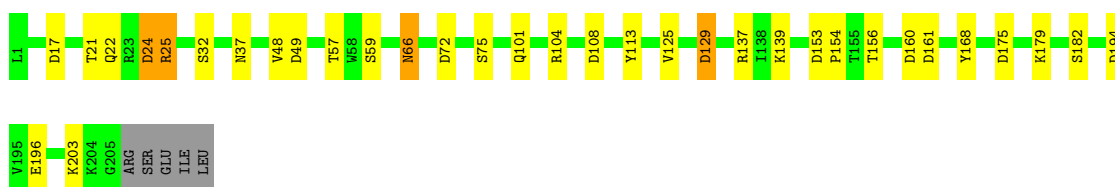
• Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain F:  79% 17% ..




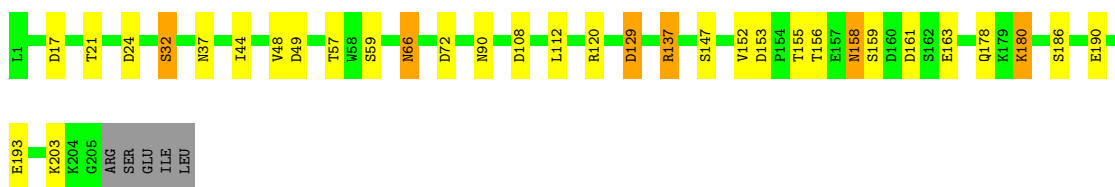
• Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain G:  81% 14% ..




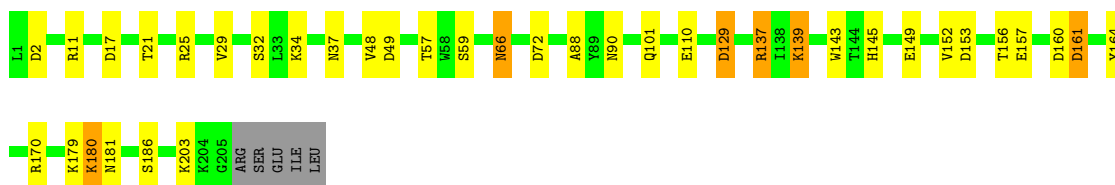
• Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain H:  82% 13% ..




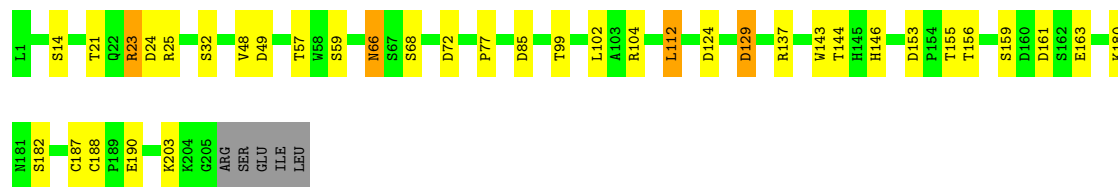
• Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain I:  80% 15% ..



• Molecule 1: ACETYLCHOLINE-BINDING PROTEIN

Chain J:  80% 16% ..



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	140.90Å 140.90Å 240.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	12.00 – 2.50	Depositor
% Data completeness (in resolution range)	96.3 (12.00-2.50)	Depositor
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.227 , 0.265	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	16488	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.77	0/1672	0.91	3/2282 (0.1%)
1	B	0.75	0/1672	0.93	9/2282 (0.4%)
1	C	0.71	0/1672	0.89	6/2282 (0.3%)
1	D	0.74	0/1672	0.91	6/2282 (0.3%)
1	E	0.71	0/1672	0.91	7/2282 (0.3%)
1	F	0.75	0/1672	0.89	4/2282 (0.2%)
1	G	0.73	0/1672	0.91	10/2282 (0.4%)
1	H	0.76	0/1672	0.92	8/2282 (0.4%)
1	I	0.73	0/1672	0.89	8/2282 (0.4%)
1	J	0.70	0/1672	0.91	9/2282 (0.4%)
All	All	0.73	0/16720	0.91	70/22820 (0.3%)

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	F	0	1

There are no bond length outliers.

The worst 5 of 70 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	194	ASP	CB-CG-OD2	7.92	125.42	118.30
1	H	49	ASP	CB-CG-OD2	7.17	124.76	118.30
1	B	72	ASP	CB-CG-OD2	6.80	124.42	118.30
1	I	17	ASP	CB-CG-OD2	6.68	124.32	118.30
1	D	160	ASP	CB-CG-OD2	6.68	124.31	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	F	187	CYS	Peptide

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	1636	0	1581	11	0
1	B	1636	0	1581	6	0
1	C	1636	0	1581	8	0
1	D	1636	0	1581	10	0
1	E	1636	0	1581	12	0
1	F	1636	0	1581	19	0
1	G	1636	0	1581	7	0
1	H	1636	0	1581	7	0
1	I	1636	0	1581	12	0
1	J	1636	0	1581	13	0
2	C	10	0	15	0	0
2	D	10	0	15	1	0
2	J	10	0	15	3	0
3	A	13	0	0	1	0
3	B	10	0	0	1	0
3	C	12	0	0	1	0
3	D	11	0	0	0	0
3	E	7	0	0	1	0
3	F	8	0	0	2	0
3	G	11	0	0	0	0
3	H	8	0	0	1	0
3	I	10	0	0	1	0
3	J	8	0	0	1	0
All	All	16488	0	15855	91	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 3.

The worst 5 of 91 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:F:179:LYS:NZ	1:F:196:GLU:OE1	1.89	1.05
1:C:145:HIS:HE1	1:D:75:SER:HB2	1.52	0.75
1:A:145:HIS:HD2	1:A:149:GLU:OE1	1.71	0.73
1:I:11:ARG:HD3	3:I:2001:HOH:O	1.93	0.67
1:E:155:THR:HG22	1:E:156:THR:HG22	1.75	0.66

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	203/210 (97%)	192 (95%)	11 (5%)	0	100	100
1	B	203/210 (97%)	199 (98%)	3 (2%)	1 (0%)	29	48
1	C	203/210 (97%)	196 (97%)	6 (3%)	1 (0%)	29	48
1	D	203/210 (97%)	200 (98%)	3 (2%)	0	100	100
1	E	203/210 (97%)	196 (97%)	7 (3%)	0	100	100
1	F	203/210 (97%)	193 (95%)	6 (3%)	4 (2%)	7	12
1	G	203/210 (97%)	195 (96%)	7 (3%)	1 (0%)	29	48
1	H	203/210 (97%)	194 (96%)	7 (3%)	2 (1%)	15	28
1	I	203/210 (97%)	198 (98%)	5 (2%)	0	100	100
1	J	203/210 (97%)	199 (98%)	3 (2%)	1 (0%)	29	48
All	All	2030/2100 (97%)	1962 (97%)	58 (3%)	10 (0%)	29	48

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	159	SER
1	F	160	ASP
1	H	159	SER

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Mol	Chain	Res	Type
1	F	189	PRO
1	J	23	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	191/196 (97%)	175 (92%)	16 (8%)	11	21
1	B	191/196 (97%)	173 (91%)	18 (9%)	8	17
1	C	191/196 (97%)	177 (93%)	14 (7%)	14	27
1	D	191/196 (97%)	172 (90%)	19 (10%)	8	15
1	E	191/196 (97%)	175 (92%)	16 (8%)	11	21
1	F	191/196 (97%)	178 (93%)	13 (7%)	16	30
1	G	191/196 (97%)	174 (91%)	17 (9%)	9	19
1	H	191/196 (97%)	173 (91%)	18 (9%)	8	17
1	I	191/196 (97%)	172 (90%)	19 (10%)	8	15
1	J	191/196 (97%)	175 (92%)	16 (8%)	11	21
All	All	1910/1960 (97%)	1744 (91%)	166 (9%)	10	20

5 of 166 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	37	ASN
1	I	139	LYS
1	H	66	ASN
1	H	203	LYS
1	J	21	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 26 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	66	ASN

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Mol	Chain	Res	Type
1	G	101	GLN
1	J	66	ASN
1	G	66	ASN
1	G	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 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	CCE	C	1206	-	9,9,9	2.94	1 (11%)	11,12,12	3.16	3 (27%)
2	CCE	J	1206	-	9,9,9	2.58	1 (11%)	11,12,12	3.43	2 (18%)
2	CCE	D	1206	-	9,9,9	2.68	1 (11%)	11,12,12	2.79	3 (27%)

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	CCE	C	1206	-	-	3/7/7/7	-
2	CCE	J	1206	-	-	3/7/7/7	-
2	CCE	D	1206	-	-	3/7/7/7	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1206	CCE	O4-C5	8.67	1.47	1.35
2	D	1206	CCE	O4-C5	7.87	1.46	1.35
2	J	1206	CCE	O4-C5	7.52	1.46	1.35

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	J	1206	CCE	O4-C5-O7	-8.04	115.47	123.07
2	C	1206	CCE	O4-C5-N6	7.96	120.96	111.08
2	J	1206	CCE	O4-C5-N6	7.88	120.86	111.08
2	D	1206	CCE	O4-C5-N6	7.27	120.11	111.08
2	C	1206	CCE	O4-C5-O7	-6.29	117.12	123.07

There are no chirality outliers.

5 of 9 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1206	CCE	O7-C5-O4-C3
2	C	1206	CCE	N6-C5-O4-C3
2	D	1206	CCE	O7-C5-O4-C3
2	D	1206	CCE	N6-C5-O4-C3
2	J	1206	CCE	O7-C5-O4-C3

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	J	1206	CCE	3	0
2	D	1206	CCE	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.