



wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 10, 2024 – 07:39 PM EST

PDB ID : 3ALP
Title : Cell adhesion protein
Authors : Narita, H.; Nakagawa, A.; Suzuki, M.
Deposited on : 2010-08-05
Resolution : 2.80 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	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

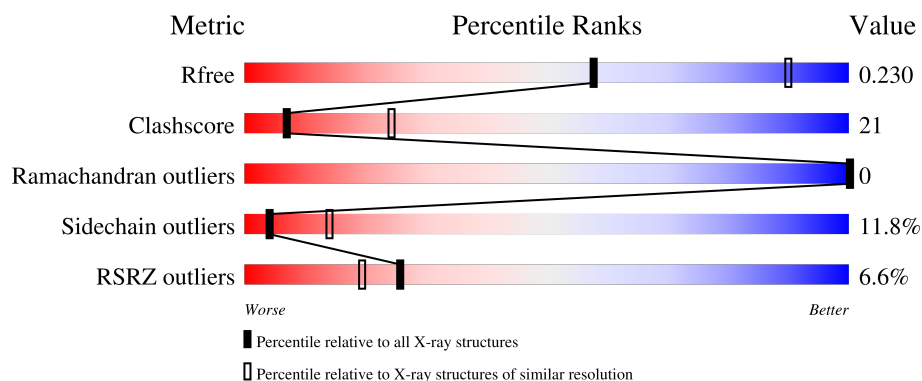
1 Overall quality at a glance

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))
R_{free}	164625	3657 (2.80-2.80)
Clashscore	180529	4123 (2.80-2.80)
Ramachandran outliers	177936	4071 (2.80-2.80)
Sidechain outliers	177891	4073 (2.80-2.80)
RSRZ outliers	164620	3659 (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 $\leq 5\%$. 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	331	<div> <div>9%</div> <div>60% 24% 6% 9%</div> </div>
1	B	331	<div> <div>3%</div> <div>70% 16% 6% 8%</div> </div>

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4727 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 Poliovirus receptor-related protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	301	Total	C	N	O	S	0	0	0
			2299	1442	399	447	11			
1	B	304	Total	C	N	O	S	0	1	0
			2357	1479	409	458	11			

There are 50 discrepancies between the modelled and reference sequences:

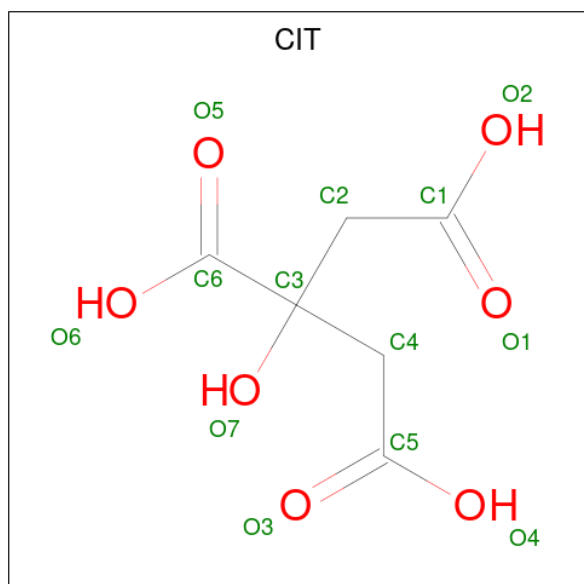
Chain	Residue	Modelled	Actual	Comment	Reference
A	16	MET	-	expression tag	UNP Q15223
A	17	ALA	-	expression tag	UNP Q15223
A	18	SER	-	expression tag	UNP Q15223
A	19	MET	-	expression tag	UNP Q15223
A	20	THR	-	expression tag	UNP Q15223
A	21	GLY	-	expression tag	UNP Q15223
A	22	GLY	-	expression tag	UNP Q15223
A	23	GLN	-	expression tag	UNP Q15223
A	24	GLN	-	expression tag	UNP Q15223
A	25	MET	-	expression tag	UNP Q15223
A	26	GLY	-	expression tag	UNP Q15223
A	27	ARG	-	expression tag	UNP Q15223
A	28	ASP	-	expression tag	UNP Q15223
A	29	PRO	-	expression tag	UNP Q15223
A	336	ALA	-	expression tag	UNP Q15223
A	337	ALA	-	expression tag	UNP Q15223
A	338	ALA	-	expression tag	UNP Q15223
A	339	LEU	-	expression tag	UNP Q15223
A	340	GLU	-	expression tag	UNP Q15223
A	341	HIS	-	expression tag	UNP Q15223
A	342	HIS	-	expression tag	UNP Q15223
A	343	HIS	-	expression tag	UNP Q15223
A	344	HIS	-	expression tag	UNP Q15223
A	345	HIS	-	expression tag	UNP Q15223
A	346	HIS	-	expression tag	UNP Q15223

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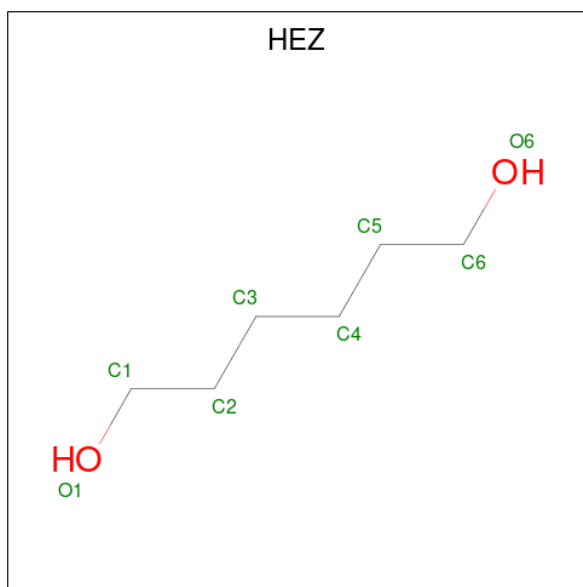
Chain	Residue	Modelled	Actual	Comment	Reference
B	16	MET	-	expression tag	UNP Q15223
B	17	ALA	-	expression tag	UNP Q15223
B	18	SER	-	expression tag	UNP Q15223
B	19	MET	-	expression tag	UNP Q15223
B	20	THR	-	expression tag	UNP Q15223
B	21	GLY	-	expression tag	UNP Q15223
B	22	GLY	-	expression tag	UNP Q15223
B	23	GLN	-	expression tag	UNP Q15223
B	24	GLN	-	expression tag	UNP Q15223
B	25	MET	-	expression tag	UNP Q15223
B	26	GLY	-	expression tag	UNP Q15223
B	27	ARG	-	expression tag	UNP Q15223
B	28	ASP	-	expression tag	UNP Q15223
B	29	PRO	-	expression tag	UNP Q15223
B	336	ALA	-	expression tag	UNP Q15223
B	337	ALA	-	expression tag	UNP Q15223
B	338	ALA	-	expression tag	UNP Q15223
B	339	LEU	-	expression tag	UNP Q15223
B	340	GLU	-	expression tag	UNP Q15223
B	341	HIS	-	expression tag	UNP Q15223
B	342	HIS	-	expression tag	UNP Q15223
B	343	HIS	-	expression tag	UNP Q15223
B	344	HIS	-	expression tag	UNP Q15223
B	345	HIS	-	expression tag	UNP Q15223
B	346	HIS	-	expression tag	UNP Q15223

- Molecule 2 is CITRIC ACID (three-letter code: CIT) (formula: C₆H₈O₇).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			13	6	7		
2	B	1	Total	C	O	0	0
			13	6	7		

- Molecule 3 is HEXANE-1,6-DIOL (three-letter code: HEZ) (formula: $C_6H_{14}O_2$).

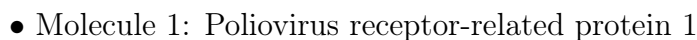


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			8	6	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	15	Total	O	0	0
			15	15		
4	B	22	Total	O	0	0
			22	22		

- Molecule 1: Poliovirus receptor-related protein 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 3	Depositor
Cell constants a, b, c, α , β , γ	164.92Å 164.92Å 164.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	35.99 – 2.80 35.99 – 2.80	Depositor EDS
% Data completeness (in resolution range)	94.2 (35.99-2.80) 97.9 (35.99-2.80)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.30 (at 2.81Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.1_357)	Depositor
R, R_{free}	0.190 , 0.226 0.191 , 0.230	Depositor DCC
R_{free} test set	1812 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	71.3	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 66.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.022 for l,-k,h	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4727	wwPDB-VP
Average B, all atoms (Å ²)	80.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.25% 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

5.1 Standard geometry

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

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	0.48	0/2350	0.64	0/3212
1	B	0.48	0/2409	0.63	0/3289
All	All	0.48	0/4759	0.63	0/6501

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	A	0	9
1	B	0	3
All	All	0	12

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 12 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	259	TYR	Peptide
1	A	263	MET	Peptide
1	A	296	GLN	Peptide
1	A	59	SER	Peptide
1	A	71	THR	Peptide

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	2299	0	2185	121	0
1	B	2357	0	2260	68	0
2	A	13	0	5	1	0
2	B	13	0	5	0	0
3	B	8	0	14	0	0
4	A	15	0	0	1	0
4	B	22	0	0	1	0
All	All	4727	0	4469	190	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 21.

The worst 5 of 190 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:158:ARG:HH11	1:B:158:ARG:HG3	1.07	1.12
1:A:261:GLN:O	1:A:261:GLN:HG3	1.42	1.11
1:B:278:THR:HG22	1:B:279:GLU:HG3	1.36	1.07
1:A:263:MET:SD	1:A:263:MET:N	2.30	1.02
1:A:56:PRO:C	1:A:57:LEU:HD23	1.82	0.98

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	299/331 (90%)	286 (96%)	13 (4%)	0	100	100
1	B	303/331 (92%)	293 (97%)	10 (3%)	0	100	100
All	All	602/662 (91%)	579 (96%)	23 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	246/286 (86%)	214 (87%)	32 (13%)	3	11
1	B	256/286 (90%)	229 (90%)	27 (10%)	5	18
All	All	502/572 (88%)	443 (88%)	59 (12%)	4	14

5 of 59 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	319	THR
1	B	298	ARG
1	B	111	LEU
1	B	267	LEU
1	B	232	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	220	HIS
1	B	221	GLN
1	B	307	ASN
1	A	261	GLN
1	A	307	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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	CIT	B	2	-	12,12,12	1.05	0	17,17,17	1.45	3 (17%)
2	CIT	A	1	-	12,12,12	1.08	0	17,17,17	1.61	3 (17%)
3	HEZ	B	1	-	7,7,7	0.26	0	6,6,6	0.75	0

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	CIT	B	2	-	-	4/16/16/16	-
2	CIT	A	1	-	-	9/16/16/16	-
3	HEZ	B	1	-	-	3/5/5/5	-

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1	CIT	O6-C6-C3	3.81	120.44	113.14
2	B	2	CIT	O6-C6-C3	3.49	119.84	113.14
2	A	1	CIT	O2-C1-C2	2.77	123.14	114.35
2	B	2	CIT	O4-C5-C4	2.45	122.10	114.35
2	A	1	CIT	O2-C1-O1	-2.18	117.73	123.33

There are no chirality outliers.

5 of 16 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1	CIT	C1-C2-C3-O7
2	A	1	CIT	C1-C2-C3-C6
2	A	1	CIT	O7-C3-C6-O5
2	A	1	CIT	O7-C3-C6-O6
2	A	1	CIT	C4-C3-C6-O5

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1	CIT	1	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 [i](#)

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

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	301/331 (90%)	0.14	31 (10%)	13 10	38, 76, 168, 230	0
1	B	304/331 (91%)	-0.28	9 (2%)	52 44	29, 66, 123, 164	1 (0%)
All	All	605/662 (91%)	-0.07	40 (6%)	26 19	29, 69, 153, 230	1 (0%)

The worst 5 of 40 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	335	GLU	5.1
1	A	304	GLY	5.0
1	A	294	GLU	5.0
1	A	263	MET	4.5
1	B	71	THR	4.4

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 monosaccharides 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(\AA^2)	Q<0.9
2	CIT	B	2	13/13	0.91	0.12	88,100,128,131	0
2	CIT	A	1	13/13	0.94	0.10	91,114,124,125	0
3	HEZ	B	1	8/8	0.95	0.12	55,57,69,78	0

6.5 Other polymers [i](#)

There are no such residues in this entry.