



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 24, 2026 – 02:35 AM UTC

PDB ID : 4CLL / pdb_00004cll
Title : Crystal structure of human soluble Adenylyl Cyclase in complex with bicarbonate
Authors : Kleinboelting, S.; Weyand, M.; Steegborn, C.
Deposited on : 2014-01-15
Resolution : 1.70 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	:	FAILED
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

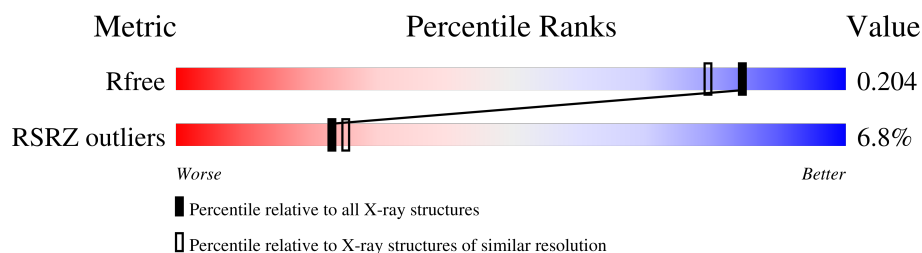
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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}	180053	5551 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

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
4	GOL	A	1481	-	X	-	-

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 4142 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.

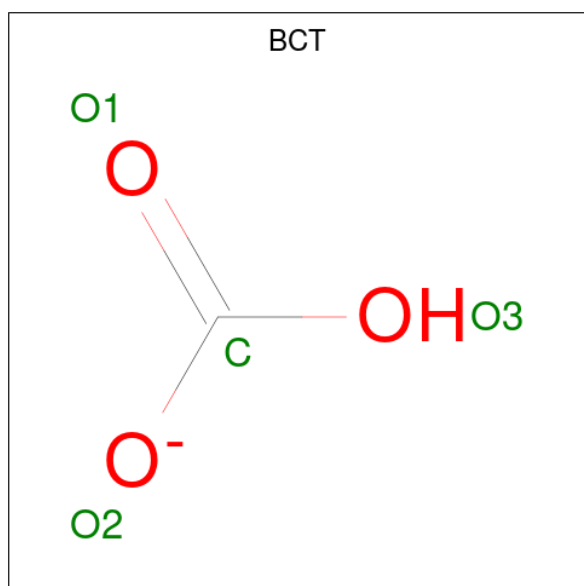
- Molecule 1 is a protein called ADENYLATE CYCLASE TYPE 10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	459	3761	2443	599	679	40	0	24	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	470	HIS	-	expression tag	UNP Q96PN6
A	471	HIS	-	expression tag	UNP Q96PN6
A	472	HIS	-	expression tag	UNP Q96PN6
A	473	HIS	-	expression tag	UNP Q96PN6
A	474	HIS	-	expression tag	UNP Q96PN6
A	475	HIS	-	expression tag	UNP Q96PN6

- Molecule 2 is BICARBONATE ION (CCD ID: BCT) (formula: CHO_3).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			4	1	3		

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	319	Total O 319 319	0	0

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3 Data and refinement statistics

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	99.83Å 99.83Å 98.06Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	86.46 – 1.70 86.45 – 1.70	Depositor EDS
% Data completeness (in resolution range)	99.9 (86.46-1.70) 100.0 (86.45-1.70)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.63 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.162 , 0.198 0.172 , 0.204	Depositor DCC
R_{free} test set	3096 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	17.3	Xtriage
Anisotropy	0.088	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 33.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.043 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4142	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.68% 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.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

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4.2 Too-close contacts [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

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4.3.2 Protein sidechains [i](#)

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4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

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

1 non-standard protein/DNA/RNA residue is 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	$\# Z > 2$
1	CME	A	253	1	8,9,10	0.78	0	6,9,11	1.11	1 (16%)

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
1	CME	A	253	1	-	2/5/8/10	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	253	CME	OH-CZ-CE	2.39	120.16	110.82

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	253	CME	SD-CE-CZ-OH
1	A	253	CME	CZ-CE-SD-SG

There are no ring outliers.

No monomer is involved in short contacts.

4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

4.6 Ligand geometry [i](#)

14 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	EDO	A	1474	-	3,3,3	0.30	0	2,2,2	1.02	0
2	BCT	A	1470	-	3,3,3	0.78	0	2,3,3	1.33	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	EDO	A	1473	-	3,3,3	0.89	0	2,2,2	0.28	0
3	EDO	A	1471	-	3,3,3	0.40	0	2,2,2	0.62	0
4	GOL	A	1481	-	5,5,5	1.52	1 (20%)	5,5,5	1.47	1 (20%)
3	EDO	A	1477	-	3,3,3	0.69	0	2,2,2	0.25	0
4	GOL	A	1483	-	5,5,5	0.44	0	5,5,5	0.64	0
3	EDO	A	1480	-	3,3,3	0.45	0	2,2,2	0.33	0
3	EDO	A	1472	-	3,3,3	0.48	0	2,2,2	0.66	0
3	EDO	A	1479	-	3,3,3	0.54	0	2,2,2	0.37	0
4	GOL	A	1482	-	5,5,5	0.50	0	5,5,5	0.98	0
3	EDO	A	1475	-	3,3,3	0.60	0	2,2,2	0.29	0
3	EDO	A	1476	-	3,3,3	0.35	0	2,2,2	1.00	0
3	EDO	A	1478	-	3,3,3	0.41	0	2,2,2	0.48	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
3	EDO	A	1474	-	-	1/1/1/1	-
3	EDO	A	1473	-	-	1/1/1/1	-
3	EDO	A	1471	-	-	0/1/1/1	-
4	GOL	A	1481	-	-	4/4/4/4	-
3	EDO	A	1477	-	-	1/1/1/1	-
4	GOL	A	1483	-	-	2/4/4/4	-
3	EDO	A	1480	-	-	1/1/1/1	-
3	EDO	A	1472	-	-	0/1/1/1	-
3	EDO	A	1479	-	-	0/1/1/1	-
4	GOL	A	1482	-	-	0/4/4/4	-
3	EDO	A	1475	-	-	0/1/1/1	-
3	EDO	A	1476	-	-	0/1/1/1	-
3	EDO	A	1478	-	-	1/1/1/1	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1481	GOL	O2-C2	2.38	1.50	1.43

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1481	GOL	O1-C1-C2	2.72	122.61	110.38

There are no chirality outliers.

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1481	GOL	O1-C1-C2-C3
4	A	1481	GOL	C1-C2-C3-O3
4	A	1483	GOL	O1-C1-C2-O2
4	A	1483	GOL	O1-C1-C2-C3
4	A	1481	GOL	O1-C1-C2-O2
4	A	1481	GOL	O2-C2-C3-O3
3	A	1473	EDO	O1-C1-C2-O2
3	A	1474	EDO	O1-C1-C2-O2
3	A	1477	EDO	O1-C1-C2-O2
3	A	1480	EDO	O1-C1-C2-O2
3	A	1478	EDO	O1-C1-C2-O2

There are no ring outliers.

No monomer is involved in short contacts.

4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

5 Fit of model and data ⓘ

5.1 Protein, DNA and RNA chains ⓘ

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	458/475 (96%)	0.13	31 (6%) 23 25	8, 19, 45, 74	24 (5%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	8	PHE	5.4
1	A	132	THR	4.9
1	A	453	VAL	4.9
1	A	454	ALA	4.6
1	A	328	PHE	4.5
1	A	31	PRO	4.4
1	A	350	PHE	4.1
1	A	7	GLU	3.5
1	A	351	PRO	3.5
1	A	457	GLY	3.5
1	A	354	LYS	3.4
1	A	355	VAL	3.4
1	A	356	PRO	3.3
1	A	352	GLY	3.3
1	A	449	VAL	3.3
1	A	468	LYS	3.3
1	A	338	PHE	3.2
1	A	455[A]	ASP	2.9
1	A	9	GLN	2.8
1	A	357	ASP	2.8
1	A	437	LEU	2.5
1	A	451	LYS	2.5
1	A	29	PHE	2.4
1	A	349	GLY	2.3
1	A	456	SER	2.3
1	A	211	ARG	2.2
1	A	340	LYS	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	339	ASP	2.2
1	A	327	ILE	2.2
1	A	307	ALA	2.1
1	A	329	GLN	2.0

5.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
1	CME	A	253	10/11	0.98	0.07	11,16,24,24	0

5.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.4 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(Å ²)	Q<0.9
3	EDO	A	1473	4/4	0.75	0.20	44,47,49,52	0
3	EDO	A	1476	4/4	0.76	0.19	37,42,42,43	0
4	GOL	A	1482	6/6	0.76	0.17	41,45,46,48	0
4	GOL	A	1483	6/6	0.76	0.20	46,53,56,56	0
4	GOL	A	1481	6/6	0.78	0.16	34,35,37,41	0
3	EDO	A	1471	4/4	0.82	0.21	37,37,37,43	0
3	EDO	A	1475	4/4	0.82	0.23	34,37,39,47	0
3	EDO	A	1480	4/4	0.85	0.16	40,49,49,53	0
3	EDO	A	1479	4/4	0.85	0.16	57,60,61,61	0
3	EDO	A	1478	4/4	0.86	0.13	30,30,33,36	0
3	EDO	A	1474	4/4	0.86	0.18	34,38,40,41	0
3	EDO	A	1477	4/4	0.87	0.14	42,44,46,50	0
3	EDO	A	1472	4/4	0.88	0.21	20,32,33,34	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	BCT	A	1470	4/4	0.98	0.04	15,17,17,19	0

5.5 Other polymers [i](#)

There are no such residues in this entry.