



wwPDB X-ray Structure Validation Summary Report ⓘ

Apr 25, 2026 – 08:32 PM EDT

PDB ID : 7CMX / pdb_00007cmx
Title : Isocitrate lyase from Bacillus cereus ATCC 14579
Authors : Kim, K.; Ki, D.; Lee, S.H.
Deposited on : 2020-07-29
Resolution : 1.79 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 : 4-5-2 with Phenix2.0
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

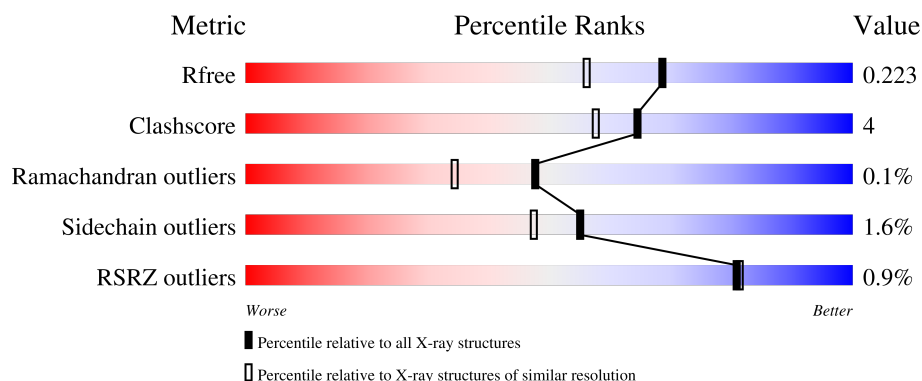
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.79 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	433	2% 91% 6% ••
1	B	433	% 90% 7% •
1	C	433	88% 9% •
1	D	433	84% 13% ••

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 14088 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 Isocitrate lyase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	422	Total	C	N	O	S	0	0	0
			3277	2060	567	639	11			
1	B	422	Total	C	N	O	S	0	0	0
			3277	2060	567	639	11			
1	C	422	Total	C	N	O	S	0	0	0
			3277	2060	567	639	11			
1	D	421	Total	C	N	O	S	0	0	0
			3268	2054	565	638	11			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	426	LEU	-	expression tag	UNP Q81GQ9
A	427	GLU	-	expression tag	UNP Q81GQ9
A	428	HIS	-	expression tag	UNP Q81GQ9
A	429	HIS	-	expression tag	UNP Q81GQ9
A	430	HIS	-	expression tag	UNP Q81GQ9
A	431	HIS	-	expression tag	UNP Q81GQ9
A	432	HIS	-	expression tag	UNP Q81GQ9
A	433	HIS	-	expression tag	UNP Q81GQ9
B	426	LEU	-	expression tag	UNP Q81GQ9
B	427	GLU	-	expression tag	UNP Q81GQ9
B	428	HIS	-	expression tag	UNP Q81GQ9
B	429	HIS	-	expression tag	UNP Q81GQ9
B	430	HIS	-	expression tag	UNP Q81GQ9
B	431	HIS	-	expression tag	UNP Q81GQ9
B	432	HIS	-	expression tag	UNP Q81GQ9
B	433	HIS	-	expression tag	UNP Q81GQ9
C	426	LEU	-	expression tag	UNP Q81GQ9
C	427	GLU	-	expression tag	UNP Q81GQ9
C	428	HIS	-	expression tag	UNP Q81GQ9
C	429	HIS	-	expression tag	UNP Q81GQ9
C	430	HIS	-	expression tag	UNP Q81GQ9

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	431	HIS	-	expression tag	UNP Q81GQ9
C	432	HIS	-	expression tag	UNP Q81GQ9
C	433	HIS	-	expression tag	UNP Q81GQ9
D	426	LEU	-	expression tag	UNP Q81GQ9
D	427	GLU	-	expression tag	UNP Q81GQ9
D	428	HIS	-	expression tag	UNP Q81GQ9
D	429	HIS	-	expression tag	UNP Q81GQ9
D	430	HIS	-	expression tag	UNP Q81GQ9
D	431	HIS	-	expression tag	UNP Q81GQ9
D	432	HIS	-	expression tag	UNP Q81GQ9
D	433	HIS	-	expression tag	UNP Q81GQ9

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	247	Total O 247 247	0	0
2	B	251	Total O 251 251	0	0
2	C	254	Total O 254 254	0	0
2	D	237	Total O 237 237	0	0



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	73.92Å 123.54Å 170.69Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.17 – 1.79 33.17 – 1.79	Depositor EDS
% Data completeness (in resolution range)	95.9 (33.17-1.79) 95.9 (33.17-1.79)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.61 (at 1.79Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.175 , 0.217 0.184 , 0.223	Depositor DCC
R_{free} test set	7221 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	10.0	Xtriage
Anisotropy	0.119	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 38.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.43$, $\langle L^2 \rangle = 0.25$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	14088	wwPDB-VP
Average B, all atoms (Å ²)	14.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.16% 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

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	1.07	0/3345	1.34	1/4527 (0.0%)
1	B	1.06	0/3345	1.34	3/4527 (0.1%)
1	C	1.04	0/3345	1.36	2/4527 (0.0%)
1	D	1.06	0/3336	1.41	4/4516 (0.1%)
All	All	1.06	0/13371	1.36	10/18097 (0.1%)

There are no bond length outliers.

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	386	THR	CB-CA-C	6.22	122.14	110.63
1	B	175	HIS	CA-CB-CG	6.12	119.92	113.80
1	D	148	ASP	CA-CB-CG	5.87	118.47	112.60
1	D	94	ASP	CA-CB-CG	5.65	118.25	112.60
1	D	320	ASP	CA-CB-CG	5.47	118.08	112.60

There are no chirality outliers.

There are no planarity outliers.

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	3277	0	3172	16	0
1	B	3277	0	3172	17	0
1	C	3277	0	3172	29	0
1	D	3268	0	3159	47	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	247	0	0	2	0
2	B	251	0	0	2	0
2	C	254	0	0	4	0
2	D	237	0	0	8	0
All	All	14088	0	12675	100	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 4.

The worst 5 of 100 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:C:168:GLU:HG2	2:C:505:HOH:O	1.36	1.22
1:D:375:GLU:HB3	1:D:386:THR:HG22	1.49	0.94
1:D:386:THR:HB	2:D:718:HOH:O	1.79	0.83
1:D:316:LYS:HE3	1:D:321:GLU:OE1	1.82	0.79
1:C:355:GLU:OE2	1:D:381:HIS:HE1	1.69	0.76

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	420/433 (97%)	414 (99%)	6 (1%)	0	100	100
1	B	420/433 (97%)	413 (98%)	6 (1%)	1 (0%)	43	31
1	C	420/433 (97%)	411 (98%)	9 (2%)	0	100	100
1	D	419/433 (97%)	411 (98%)	8 (2%)	0	100	100
All	All	1679/1732 (97%)	1649 (98%)	29 (2%)	1 (0%)	48	34

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	138	ASP

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	335/346 (97%)	331 (99%)	4 (1%)	63	57
1	B	335/346 (97%)	329 (98%)	6 (2%)	51	43
1	C	335/346 (97%)	328 (98%)	7 (2%)	47	36
1	D	334/346 (96%)	329 (98%)	5 (2%)	57	49
All	All	1339/1384 (97%)	1317 (98%)	22 (2%)	55	47

5 of 22 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	136	SER
1	D	32	ILE
1	C	415	LYS
1	D	68	LEU
1	B	23	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 35 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	131	GLN
1	D	132	HIS
1	D	381	HIS
1	B	300	HIS
1	B	188	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 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 [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	422/433 (97%)	-0.32	9 (2%) 63 64	5, 11, 26, 72	0
1	B	422/433 (97%)	-0.37	3 (0%) 84 85	5, 11, 25, 43	0
1	C	422/433 (97%)	-0.30	2 (0%) 87 88	5, 12, 26, 66	0
1	D	421/433 (97%)	-0.27	1 (0%) 91 91	6, 12, 28, 50	0
All	All	1687/1732 (97%)	-0.31	15 (0%) 81 81	5, 12, 26, 72	0

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	2	LYS	4.3
1	A	2	LYS	4.1
1	C	3	ASN	3.4
1	A	3	ASN	3.3
1	A	4	GLU	2.9

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 oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.