



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 12:17 AM UTC

PDB ID : 3I4E / pdb_00003i4e
Title : Crystal structure of Isocitrate Lyase from Burkholderia pseudomallei
Authors : Staker, B.L.; Arakaki, T.; Seattle Structural Genomics Center for Infectious Disease (SSGCID)
Deposited on : 2009-07-01
Resolution : 2.69 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

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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

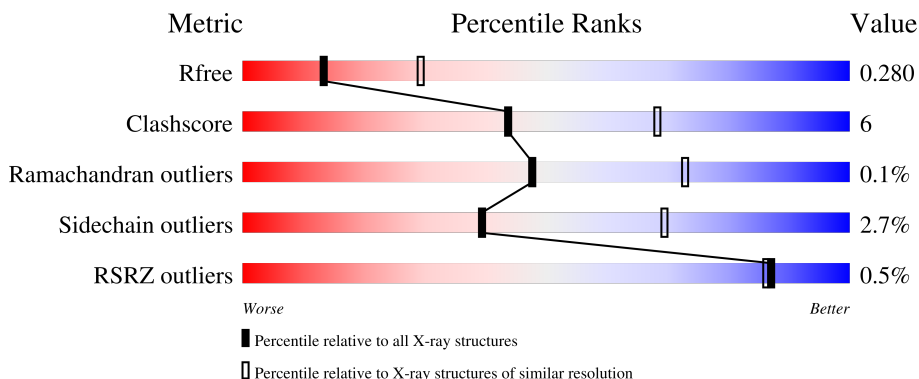
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.69 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	439	 78% 15% • 6%
1	B	439	 81% 13% 6%
1	C	439	 81% 12% 6%
1	D	439	 79% 14% • 6%

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 12730 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
			Total	C	N	O	S			
1	A	412	3131	1988	535	596	12	0	0	0
1	B	412	3145	1998	541	594	12	0	0	0
1	C	412	3157	2005	544	595	13	0	0	0
1	D	412	3147	1997	539	599	12	0	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	GLY	-	expression tag	UNP Q63SY3
A	-2	PRO	-	expression tag	UNP Q63SY3
A	-1	GLY	-	expression tag	UNP Q63SY3
A	0	SER	-	expression tag	UNP Q63SY3
B	-3	GLY	-	expression tag	UNP Q63SY3
B	-2	PRO	-	expression tag	UNP Q63SY3
B	-1	GLY	-	expression tag	UNP Q63SY3
B	0	SER	-	expression tag	UNP Q63SY3
C	-3	GLY	-	expression tag	UNP Q63SY3
C	-2	PRO	-	expression tag	UNP Q63SY3
C	-1	GLY	-	expression tag	UNP Q63SY3
C	0	SER	-	expression tag	UNP Q63SY3
D	-3	GLY	-	expression tag	UNP Q63SY3
D	-2	PRO	-	expression tag	UNP Q63SY3
D	-1	GLY	-	expression tag	UNP Q63SY3
D	0	SER	-	expression tag	UNP Q63SY3

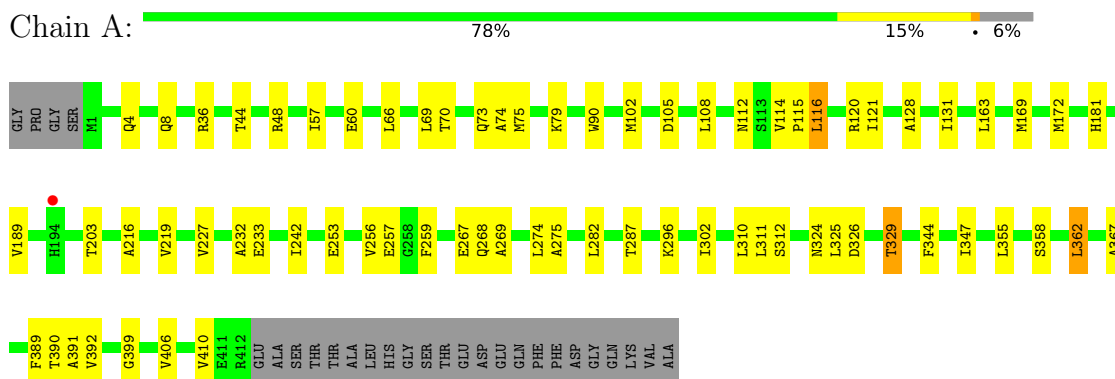
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	31	Total 31	O 31	0	0
2	B	42	Total 42	O 42	0	0
2	C	40	Total 40	O 40	0	0
2	D	37	Total 37	O 37	0	0

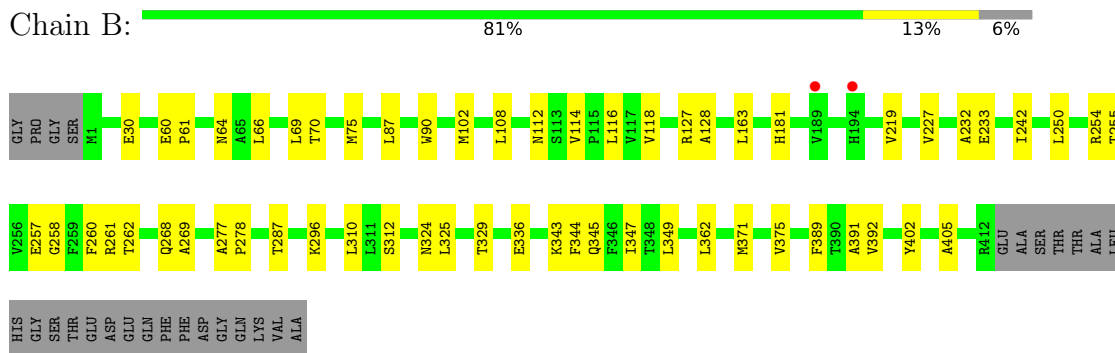
3 Residue-property plots [i](#)

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 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.

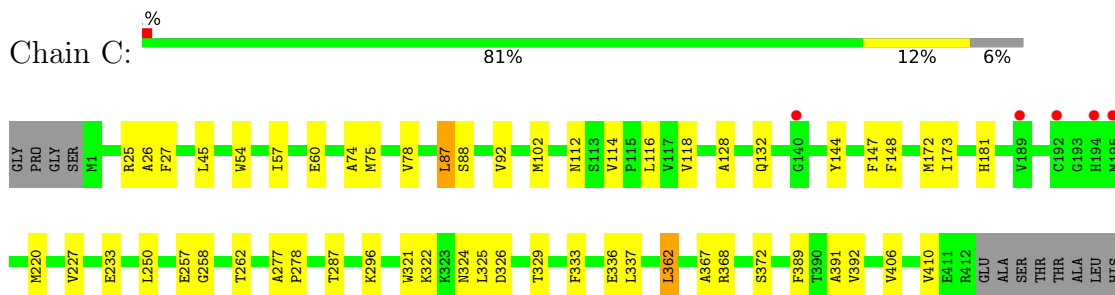
- Molecule 1: Isocitrate lyase



- Molecule 1: Isocitrate lyase




- Molecule 1: Isocitrate lyase



GLY
SER
THR
GLU
ASP
GLU
GLN
PHE
PHE
ASP
GLY
GLN
LYS
VAL
ALA

• Molecule 1: Isocitrate lyase

Chain D:  79% 14% • 6%

GLY
PRO
GLY
SER
MI
I57
E60
N64
A65
L66
A74
M75
K79
I85
Y86
L87
W90
G100
D105
M112
L116
R127
I131
H181
V189
V227
A228
R229
A232
E233
S240
D241
I242
L250
T262
A269
A277
P278

I283
E286
T287
Y284
A295
K296
L310
L325
T329
F333
L337
F344
Q345
F346
L349
A350
A354
L355
S358
L362
T369
Q370
M371
S372
V375
Q378
F382
F389
T390
A391
G399
Y402
A405
V406
R412
GLU
ALA
SER

THR
THR
ALA
LEU
HIS
GLY
SER
THR
GLU
ASP
GLU
GLN
PHE
PHE
ASP
GLY
GLN
LYS
VAL
ALA

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	77.67Å 137.03Å 160.16Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.91 – 2.69 48.91 – 2.69	Depositor EDS
% Data completeness (in resolution range)	(Not available) (48.91-2.69) 99.6 (48.91-2.69)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.19 (at 2.69Å)	Xtrriage
Refinement program	REFMAC 5.5.0088	Depositor
R, R_{free}	0.213 , 0.277 0.218 , 0.280	Depositor DCC
R_{free} test set	2426 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	41.3	Xtrriage
Anisotropy	0.061	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 32.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	12730	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.21% 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 [i](#)

5.1 Standard geometry [i](#)

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	0.55	0/3199	0.81	0/4343
1	B	0.52	0/3213	0.78	0/4357
1	C	0.53	0/3226	0.78	0/4373
1	D	0.56	0/3215	0.78	0/4362
All	All	0.54	0/12853	0.78	0/17435

There are no bond length outliers.

There are no bond angle outliers.

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	3131	0	3011	50	0
1	B	3145	0	3051	45	0
1	C	3157	0	3069	36	0
1	D	3147	0	3040	44	0
2	A	31	0	0	0	0
2	B	42	0	0	1	0
2	C	40	0	0	2	0
2	D	37	0	0	4	0
All	All	12730	0	12171	151	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 6.

The worst 5 of 151 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:392:VAL:HG22	2:C:462:HOH:O	1.58	1.02
1:B:87:LEU:HD22	1:B:114:VAL:HG13	1.56	0.85
1:D:74:ALA:HB1	1:D:85:ILE:HD13	1.58	0.83
1:D:57:ILE:CG2	1:D:310:LEU:HD13	2.14	0.78
1:A:324:ASN:C	1:A:325:LEU:HD22	2.09	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	410/439 (93%)	397 (97%)	13 (3%)	0	100	100
1	B	410/439 (93%)	401 (98%)	9 (2%)	0	100	100
1	C	410/439 (93%)	397 (97%)	12 (3%)	1 (0%)	43	68
1	D	410/439 (93%)	396 (97%)	14 (3%)	0	100	100
All	All	1640/1756 (93%)	1591 (97%)	48 (3%)	1 (0%)	48	73

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	26	ALA

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	308/343 (90%)	296 (96%)	12 (4%)	28	57
1	B	311/343 (91%)	306 (98%)	5 (2%)	55	80
1	C	314/343 (92%)	308 (98%)	6 (2%)	50	77
1	D	312/343 (91%)	302 (97%)	10 (3%)	34	64
All	All	1245/1372 (91%)	1212 (97%)	33 (3%)	39	69

5 of 33 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	358	SER
1	D	362	LEU
1	D	372	SER
1	B	219	VAL
1	A	392	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 27 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	324	ASN
1	C	64	ASN
1	D	268	GLN
1	C	59	ASN
1	C	314	ASN

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	412/439 (93%)	0.14	1 (0%) 91 90	24, 38, 52, 58	0
1	B	412/439 (93%)	0.06	2 (0%) 87 86	24, 38, 52, 58	0
1	C	412/439 (93%)	0.07	5 (1%) 76 75	24, 37, 52, 58	0
1	D	412/439 (93%)	0.10	1 (0%) 91 90	24, 38, 51, 58	0
All	All	1648/1756 (93%)	0.09	9 (0%) 87 86	24, 38, 52, 58	0

The worst 5 of 9 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	194	HIS	3.3
1	B	189	VAL	3.2
1	C	192	CYS	3.0
1	C	194	HIS	2.9
1	D	294	TYR	2.8

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.