



wwPDB X-ray Structure Validation Summary Report ⓘ

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PDB ID : 2HJ0 / pdb_00002hj0
Title : Crystal Structure of the Putative Alfa Subunit of Citrate Lyase in Complex with Citrate from Streptococcus mutans, Northeast Structural Genomics Target SmR12 .
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Deposited on : 2006-06-29
Resolution : 2.70 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
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)

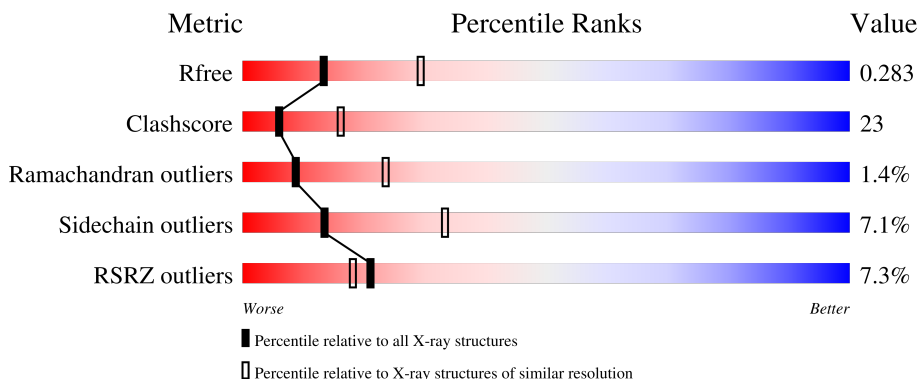
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	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	519	
1	B	519	

Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7933 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 Putative citrate lyase, alfa subunit.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	510	Total	C	N	O	S	Se	0	0	0
			3896	2458	661	762	3	12			
1	B	510	Total	C	N	O	S	Se	0	0	0
			3896	2458	661	762	3	12			

There are 42 discrepancies between the modelled and reference sequences:

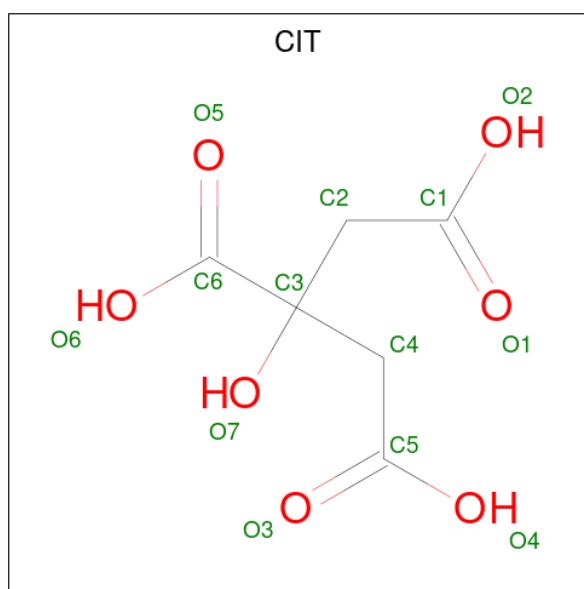
Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MSE	MET	modified residue	UNP Q8DUC1
A	65	MSE	MET	modified residue	UNP Q8DUC1
A	80	MSE	MET	modified residue	UNP Q8DUC1
A	82	MSE	MET	modified residue	UNP Q8DUC1
A	90	MSE	MET	modified residue	UNP Q8DUC1
A	139	MSE	MET	modified residue	UNP Q8DUC1
A	194	MSE	MET	modified residue	UNP Q8DUC1
A	291	MSE	MET	modified residue	UNP Q8DUC1
A	295	MSE	MET	modified residue	UNP Q8DUC1
A	313	MSE	MET	modified residue	UNP Q8DUC1
A	353	MSE	MET	modified residue	UNP Q8DUC1
A	386	MSE	MET	modified residue	UNP Q8DUC1
A	409	MSE	MET	modified residue	UNP Q8DUC1
A	512	LEU	-	cloning artifact	UNP Q8DUC1
A	513	GLU	-	cloning artifact	UNP Q8DUC1
A	514	HIS	-	expression tag	UNP Q8DUC1
A	515	HIS	-	expression tag	UNP Q8DUC1
A	516	HIS	-	expression tag	UNP Q8DUC1
A	517	HIS	-	expression tag	UNP Q8DUC1
A	518	HIS	-	expression tag	UNP Q8DUC1
A	519	HIS	-	expression tag	UNP Q8DUC1
B	1	MSE	MET	modified residue	UNP Q8DUC1
B	65	MSE	MET	modified residue	UNP Q8DUC1
B	80	MSE	MET	modified residue	UNP Q8DUC1
B	82	MSE	MET	modified residue	UNP Q8DUC1

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Chain	Residue	Modelled	Actual	Comment	Reference
B	90	MSE	MET	modified residue	UNP Q8DUC1
B	139	MSE	MET	modified residue	UNP Q8DUC1
B	194	MSE	MET	modified residue	UNP Q8DUC1
B	291	MSE	MET	modified residue	UNP Q8DUC1
B	295	MSE	MET	modified residue	UNP Q8DUC1
B	313	MSE	MET	modified residue	UNP Q8DUC1
B	353	MSE	MET	modified residue	UNP Q8DUC1
B	386	MSE	MET	modified residue	UNP Q8DUC1
B	409	MSE	MET	modified residue	UNP Q8DUC1
B	512	LEU	-	cloning artifact	UNP Q8DUC1
B	513	GLU	-	cloning artifact	UNP Q8DUC1
B	514	HIS	-	expression tag	UNP Q8DUC1
B	515	HIS	-	expression tag	UNP Q8DUC1
B	516	HIS	-	expression tag	UNP Q8DUC1
B	517	HIS	-	expression tag	UNP Q8DUC1
B	518	HIS	-	expression tag	UNP Q8DUC1
B	519	HIS	-	expression tag	UNP Q8DUC1

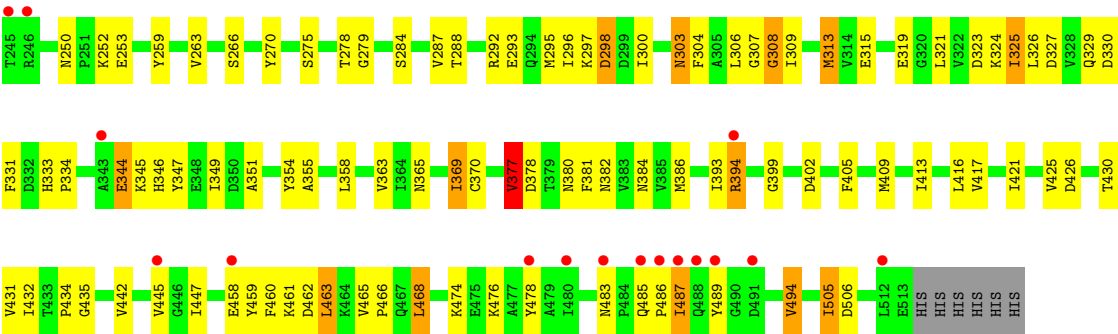
- Molecule 2 is CITRIC ACID (CCD ID: CIT) (formula: $C_6H_8O_7$).



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 water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	54	Total 54	O 54	0	0
3	B	61	Total 61	O 61	0	0



4 Data and refinement statistics

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, α , β , γ	130.87Å 130.87Å 57.80Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	26.44 – 2.70 26.44 – 2.70	Depositor EDS
% Data completeness (in resolution range)	89.3 (26.44-2.70) 95.1 (26.44-2.70)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	0.15	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.43 (at 2.69Å)	Xtriage
Refinement program	CNS 1.1, XTALVIEW	Depositor
R, R_{free}	0.224 , 0.266 0.239 , 0.283	Depositor DCC
R_{free} test set	5989 reflections (9.84%)	wwPDB-VP
Wilson B-factor (Å ²)	22.2	Xtriage
Anisotropy	0.311	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 33.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.025 for -h,-k,l 0.028 for h,-h-k,-l 0.022 for -k,-h,-l	Xtriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	7933	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.43% 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: 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	0.52	0/3950	0.93	7/5338 (0.1%)
1	B	0.51	1/3950 (0.0%)	0.93	7/5338 (0.1%)
All	All	0.52	1/7900 (0.0%)	0.93	14/10676 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	205	ILE	CA-CB	5.27	1.60	1.54

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	298	ASP	N-CA-C	-5.98	102.09	110.35
1	B	298	ASP	N-CA-C	-5.82	102.31	110.35
1	A	176	GLY	N-CA-C	5.79	121.37	114.48
1	B	308	GLY	N-CA-C	-5.67	99.75	113.18
1	A	159	ASP	N-CA-C	-5.58	106.79	113.21

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	3896	0	3917	174	0
1	B	3896	0	3917	188	0
2	A	13	0	5	2	0
2	B	13	0	5	2	0
3	A	54	0	0	2	0
3	B	61	0	0	5	0
All	All	7933	0	7844	356	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 23.

The worst 5 of 356 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:A:5:LYS:HD2	1:A:21:PHE:HB2	1.51	0.93
1:B:295:MSE:HG2	1:B:300:ILE:HD11	1.49	0.92
1:A:295:MSE:HG2	1:A:300:ILE:HD11	1.50	0.91
1:B:413:ILE:HG22	1:B:442:VAL:HB	1.53	0.90
1:A:413:ILE:HG22	1:A:442:VAL:HB	1.56	0.88

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	506/519 (98%)	465 (92%)	34 (7%)	7 (1%)	9	23
1	B	506/519 (98%)	465 (92%)	34 (7%)	7 (1%)	9	23
All	All	1012/1038 (98%)	930 (92%)	68 (7%)	14 (1%)	9	23

5 of 14 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	240	ILE
1	A	242	LYS
1	B	6	LEU
1	B	240	ILE
1	B	242	LYS

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	429/423 (101%)	398 (93%)	31 (7%)	13	32
1	B	429/423 (101%)	399 (93%)	30 (7%)	14	34
All	All	858/846 (101%)	797 (93%)	61 (7%)	13	33

5 of 61 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	487	ILE
1	B	377	VAL
1	B	32	LYS
1	B	369	ILE
1	B	494	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 29 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	485	GLN
1	B	429	ASN
1	B	72	HIS
1	B	329	GLN
1	B	70	HIS

5.3.3 RNA ⓘ

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](#)

2 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	601	-	12,12,12	2.69	6 (50%)	17,17,17	2.08	7 (41%)
2	CIT	A	601	-	12,12,12	2.50	7 (58%)	17,17,17	2.09	7 (41%)

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	601	-	-	0/16/16/16	-
2	CIT	A	601	-	-	0/16/16/16	-

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	CIT	C3-C6	5.92	1.59	1.53
2	A	601	CIT	C3-C6	4.65	1.58	1.53
2	A	601	CIT	O3-C5	3.43	1.33	1.22
2	B	601	CIT	O3-C5	3.42	1.33	1.22
2	A	601	CIT	O5-C6	3.39	1.32	1.22

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	601	CIT	O5-C6-C3	-4.11	114.14	122.09
2	A	601	CIT	O5-C6-C3	-4.04	114.26	122.09
2	B	601	CIT	O7-C3-C2	-3.50	101.40	109.38
2	A	601	CIT	C3-C4-C5	3.42	123.27	113.92
2	A	601	CIT	O7-C3-C2	-3.03	102.47	109.38

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	601	CIT	2	0
2	A	601	CIT	2	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	498/519 (95%)	0.49	30 (6%) 27 24	3, 18, 55, 72	0
1	B	498/519 (95%)	0.51	43 (8%) 16 13	3, 19, 56, 72	0
All	All	996/1038 (95%)	0.50	73 (7%) 21 18	3, 18, 55, 72	0

The worst 5 of 73 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	20	VAL	9.5
1	A	22	GLU	6.8
1	A	27	HIS	6.7
1	B	240	ILE	6.2
1	A	240	ILE	5.9

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](#)

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($\text{\AA}^2$)	Q<0.9
2	CIT	B	601	13/13	0.72	0.37	5,6,8,11	13
2	CIT	A	601	13/13	0.73	0.34	4,6,7,8	13

6.5 Other polymers [i](#)

There are no such residues in this entry.