



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 13, 2023 – 08:43 PM JST

PDB ID : 5XZ5  
Title : Purification, crystallization and structural analysis of cytoplasmic acetoacetyl-CoA thiolase from *Saccharomyces cerevisiae*  
Authors : Zhou, P.F.; Zhu, Z.L.  
Deposited on : 2017-07-11  
Resolution : 2.20 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](mailto: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>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

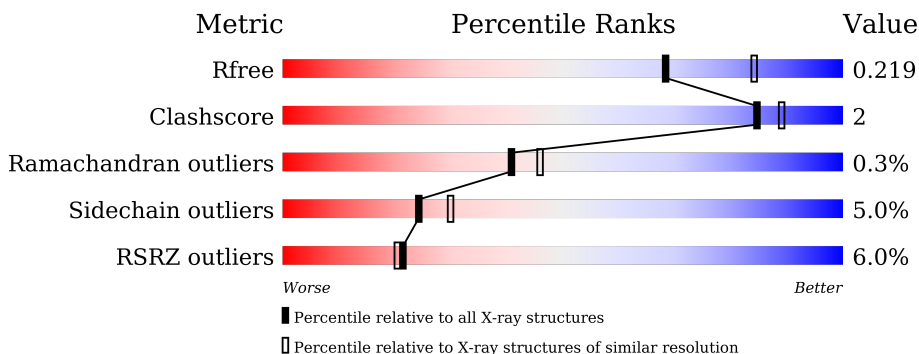
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 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))
$R_{free}$	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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  $\geq 3$ , 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	409	 5% 86% 7% • 7%
1	B	409	 6% 89% 8% •

## 2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 6087 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 Acetyl-CoA acetyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	381	2805	1768	487	540	10	0	0	0
1	B	396	2918	1837	509	562	10	0	0	0

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-10	MET	-	expression tag	UNP P41338
A	-9	GLY	-	expression tag	UNP P41338
A	-8	HIS	-	expression tag	UNP P41338
A	-7	HIS	-	expression tag	UNP P41338
A	-6	HIS	-	expression tag	UNP P41338
A	-5	HIS	-	expression tag	UNP P41338
A	-4	HIS	-	expression tag	UNP P41338
A	-3	HIS	-	expression tag	UNP P41338
A	-2	GLY	-	expression tag	UNP P41338
A	-1	SER	-	expression tag	UNP P41338
A	0	HIS	-	expression tag	UNP P41338
B	-10	MET	-	expression tag	UNP P41338
B	-9	GLY	-	expression tag	UNP P41338
B	-8	HIS	-	expression tag	UNP P41338
B	-7	HIS	-	expression tag	UNP P41338
B	-6	HIS	-	expression tag	UNP P41338
B	-5	HIS	-	expression tag	UNP P41338
B	-4	HIS	-	expression tag	UNP P41338
B	-3	HIS	-	expression tag	UNP P41338
B	-2	GLY	-	expression tag	UNP P41338
B	-1	SER	-	expression tag	UNP P41338
B	0	HIS	-	expression tag	UNP P41338

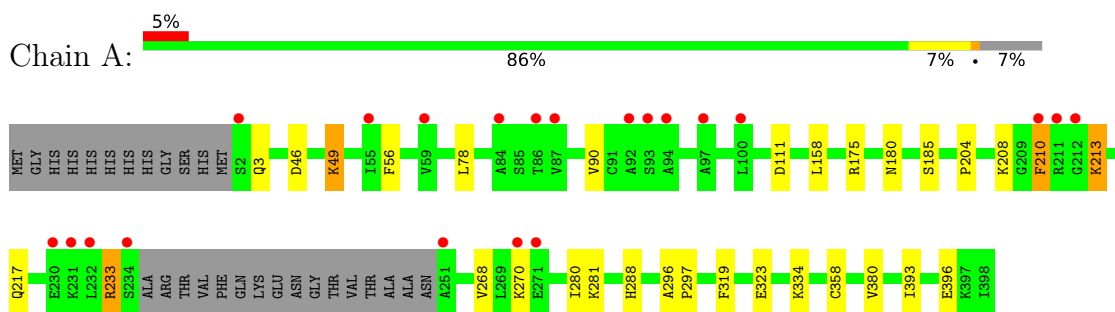
- Molecule 2 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
2	A	212	Total 212	O 212	0	0
2	B	152	Total 152	O 152	0	0

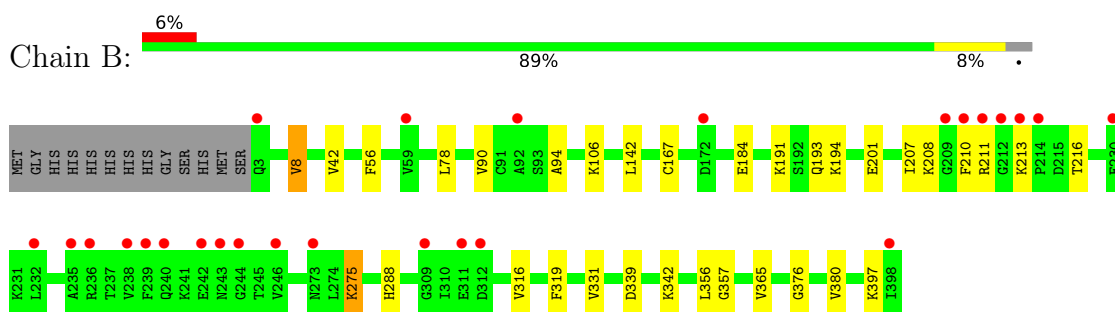
### 3 Residue-property plots [i](#)

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: Acetyl-CoA acetyltransferase



- Molecule 1: Acetyl-CoA acetyltransferase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	77.25Å 88.65Å 123.42Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.20 38.63 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.4 (50.00-2.20) 99.4 (38.63-2.20)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.84 (at 2.20Å)	Xtrriage
Refinement program	REFMAC 5.8.0155	Depositor
R, $R_{free}$	0.187 , 0.224 0.188 , 0.219	Depositor DCC
$R_{free}$ test set	2212 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	36.0	Xtrriage
Anisotropy	0.087	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 41.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	6087	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	44.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.15% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	0.36	0/2848	0.64	1/3855 (0.0%)
1	B	0.36	0/2963	0.64	0/4013
All	All	0.36	0/5811	0.64	1/7868 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	233	ARG	NE-CZ-NH2	5.58	123.09	120.30

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	2805	0	2848	16	0
1	B	2918	0	2962	11	0
2	A	212	0	0	1	0
2	B	152	0	0	0	0
All	All	6087	0	5810	27	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 2.

All (27) 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:180:ASN:OD1	1:A:233:ARG:NH1	2.11	0.83
1:A:46:ASP:OD2	1:A:49:LYS:HE3	1.77	0.82
1:A:46:ASP:OD2	1:A:49:LYS:CE	2.45	0.63
1:B:201:GLU:HG2	1:B:365:VAL:HG12	1.82	0.62
1:A:3:GLN:HG3	2:A:401:HOH:O	2.07	0.54
1:A:323:GLU:O	1:A:323:GLU:HG2	2.06	0.54
1:B:207:ILE:HB	1:B:216:THR:HG23	1.90	0.54
1:B:201:GLU:HG2	1:B:365:VAL:CG1	2.38	0.54
1:B:8:VAL:HG13	1:B:42:VAL:HG11	1.91	0.52
1:A:46:ASP:CB	1:A:49:LYS:HE3	2.42	0.49
1:B:376:GLY:O	1:B:397:LYS:NZ	2.45	0.48
1:A:210:PHE:CZ	1:A:213:LYS:HG3	2.48	0.48
1:A:281:LYS:HD2	1:A:396:GLU:HB2	1.97	0.47
1:A:213:LYS:N	1:A:213:LYS:HD3	2.28	0.47
1:B:316:VAL:HG21	1:B:319:PHE:CZ	2.50	0.46
1:A:46:ASP:CG	1:A:49:LYS:HE3	2.35	0.46
1:A:111:ASP:HB3	1:A:268:VAL:HG21	1.98	0.45
1:A:319:PHE:CD2	1:A:380:VAL:HG22	2.51	0.45
1:B:339:ASP:HB3	1:B:342:LYS:HD2	1.98	0.45
1:B:275:LYS:O	1:B:275:LYS:HG3	2.16	0.45
1:B:316:VAL:CG2	1:B:319:PHE:CZ	3.01	0.43
1:B:94:ALA:HB2	1:B:357:GLY:O	2.19	0.43
1:A:296:ALA:N	1:A:297:PRO:CD	2.82	0.42
1:A:111:ASP:HB3	1:A:268:VAL:CG2	2.50	0.42
1:B:167:CYS:SG	1:B:331:VAL:HG21	2.59	0.42
1:A:204:PRO:HB2	1:A:217:GLN:HE21	1.86	0.41
1:A:280:ILE:HD13	1:A:393:ILE:HD11	2.04	0.40

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	377/409 (92%)	368 (98%)	8 (2%)	1 (0%)	41	46
1	B	394/409 (96%)	384 (98%)	9 (2%)	1 (0%)	41	46
All	All	771/818 (94%)	752 (98%)	17 (2%)	2 (0%)	41	46

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	90	VAL
1	B	90	VAL

### 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	294/316 (93%)	281 (96%)	13 (4%)	28	35
1	B	305/316 (96%)	288 (94%)	17 (6%)	21	25
All	All	599/632 (95%)	569 (95%)	30 (5%)	24	30

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	49	LYS
1	A	56	PHE
1	A	78	LEU
1	A	158	LEU
1	A	175	ARG
1	A	185	SER
1	A	208	LYS
1	A	210	PHE
1	A	213	LYS
1	A	270	LYS
1	A	288	HIS
1	A	334	LYS
1	A	358	CYS
1	B	8	VAL

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Mol	Chain	Res	Type
1	B	56	PHE
1	B	78	LEU
1	B	106	LYS
1	B	142	LEU
1	B	184	GLU
1	B	191	LYS
1	B	193	GLN
1	B	194	LYS
1	B	208	LYS
1	B	210	PHE
1	B	211	ARG
1	B	213	LYS
1	B	275	LYS
1	B	288	HIS
1	B	356	LEU
1	B	380	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	217	GLN
1	B	193	GLN

### 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 monosaccharides 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

### 6.1 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	381/409 (93%)	0.02	21 (5%) 25 24	23, 36, 61, 98	0
1	B	396/409 (96%)	0.25	26 (6%) 18 17	27, 46, 70, 94	0
All	All	777/818 (94%)	0.14	47 (6%) 21 20	23, 40, 69, 98	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	210	PHE	7.8
1	A	210	PHE	6.8
1	A	211	ARG	5.1
1	B	211	ARG	4.8
1	B	212	GLY	4.8
1	B	238	VAL	3.9
1	A	87	VAL	3.9
1	B	209	GLY	3.8
1	A	234	SER	3.7
1	A	2	SER	3.7
1	A	251	ALA	3.4
1	B	3	GLN	3.4
1	A	230	GLU	3.4
1	A	212	GLY	3.2
1	A	86	THR	3.1
1	B	243	ASN	3.1
1	B	230	GLU	3.1
1	B	242	GLU	2.9
1	B	246	VAL	2.9
1	B	240	GLN	2.8
1	B	232	LEU	2.8
1	B	213	LYS	2.7
1	B	59	VAL	2.7
1	B	214	PRO	2.6

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Mol	Chain	Res	Type	RSRZ
1	B	309	GLY	2.6
1	B	273	ASN	2.6
1	A	232	LEU	2.5
1	A	97	ALA	2.5
1	B	236	ARG	2.5
1	A	231	LYS	2.5
1	B	311	GLU	2.5
1	B	172	ASP	2.5
1	A	270	LYS	2.5
1	B	398	ILE	2.4
1	A	93	SER	2.3
1	A	92	ALA	2.3
1	B	92	ALA	2.3
1	A	271	GLU	2.2
1	A	59	VAL	2.2
1	B	312	ASP	2.2
1	A	55	ILE	2.2
1	A	100	LEU	2.2
1	B	235	ALA	2.1
1	A	84	ALA	2.1
1	A	94	ALA	2.1
1	B	244	GLY	2.1
1	B	239	PHE	2.0

## 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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.