



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 28, 2026 – 10:18 PM UTC

PDB ID : 1T3D / pdb_00001t3d
Title : Crystal structure of Serine Acetyltransferase from E.coli at 2.2Å
Authors : Pye, V.E.; Tingey, A.P.; Robson, R.L.; Moody, P.C.E.
Deposited on : 2004-04-26
Resolution : 2.20 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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

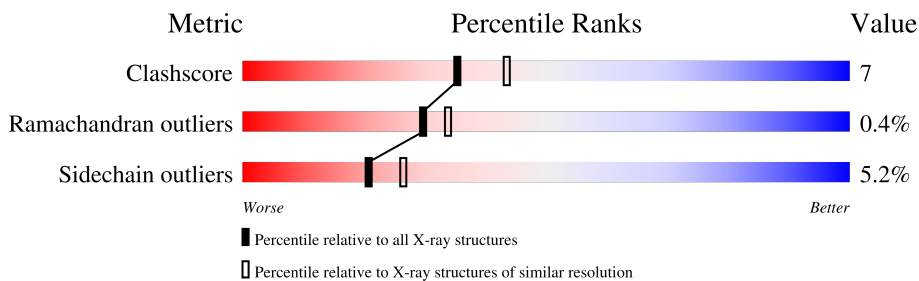
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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))
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (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 ≥ 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 $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	289	 77% 11% •• 9%
1	B	289	 75% 13% • 9%
1	C	289	 75% 14% •• 9%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6344 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 Serine acetyltransferase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	262	Total	C	N	O	S	Se	0	0	0
			1969	1242	349	366	3	9			
1	B	262	Total	C	N	O	S	Se	0	0	0
			1969	1242	349	366	3	9			
1	C	262	Total	C	N	O	S	Se	0	0	0
			1969	1242	349	366	3	9			

There are 75 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-15	HIS	-	expression tag	UNP P0A9D4
A	-14	HIS	-	expression tag	UNP P0A9D4
A	-13	HIS	-	expression tag	UNP P0A9D4
A	-12	HIS	-	expression tag	UNP P0A9D4
A	-11	HIS	-	expression tag	UNP P0A9D4
A	-10	HIS	-	expression tag	UNP P0A9D4
A	-9	SER	-	expression tag	UNP P0A9D4
A	-8	SER	-	expression tag	UNP P0A9D4
A	-7	GLY	-	expression tag	UNP P0A9D4
A	-6	LEU	-	expression tag	UNP P0A9D4
A	-5	VAL	-	expression tag	UNP P0A9D4
A	-4	PRO	-	expression tag	UNP P0A9D4
A	-3	ARG	-	expression tag	UNP P0A9D4
A	-2	GLY	-	expression tag	UNP P0A9D4
A	-1	SER	-	expression tag	UNP P0A9D4
A	0	HIS	-	expression tag	UNP P0A9D4
A	1	MSE	MET	modified residue	UNP P0A9D4
A	26	MSE	MET	modified residue	UNP P0A9D4
A	48	MSE	MET	modified residue	UNP P0A9D4
A	58	MSE	MET	modified residue	UNP P0A9D4
A	77	MSE	MET	modified residue	UNP P0A9D4
A	155	MSE	MET	modified residue	UNP P0A9D4
A	201	MSE	MET	modified residue	UNP P0A9D4

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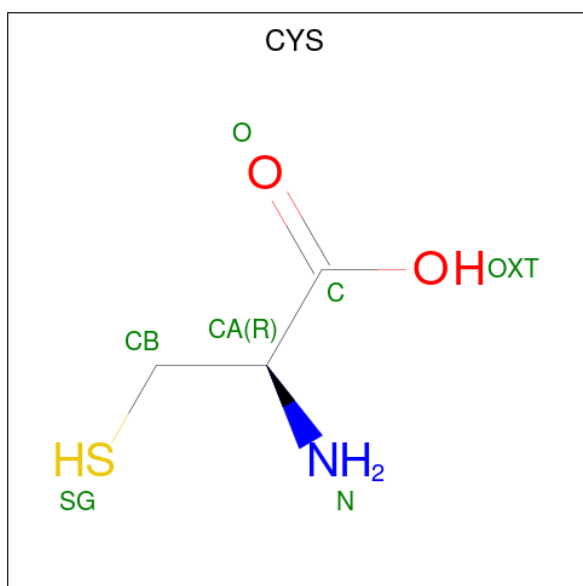
Chain	Residue	Modelled	Actual	Comment	Reference
A	254	MSE	MET	modified residue	UNP P0A9D4
A	256	MSE	MET	modified residue	UNP P0A9D4
B	-15	HIS	-	expression tag	UNP P0A9D4
B	-14	HIS	-	expression tag	UNP P0A9D4
B	-13	HIS	-	expression tag	UNP P0A9D4
B	-12	HIS	-	expression tag	UNP P0A9D4
B	-11	HIS	-	expression tag	UNP P0A9D4
B	-10	HIS	-	expression tag	UNP P0A9D4
B	-9	SER	-	expression tag	UNP P0A9D4
B	-8	SER	-	expression tag	UNP P0A9D4
B	-7	GLY	-	expression tag	UNP P0A9D4
B	-6	LEU	-	expression tag	UNP P0A9D4
B	-5	VAL	-	expression tag	UNP P0A9D4
B	-4	PRO	-	expression tag	UNP P0A9D4
B	-3	ARG	-	expression tag	UNP P0A9D4
B	-2	GLY	-	expression tag	UNP P0A9D4
B	-1	SER	-	expression tag	UNP P0A9D4
B	0	HIS	-	expression tag	UNP P0A9D4
B	1	MSE	MET	modified residue	UNP P0A9D4
B	26	MSE	MET	modified residue	UNP P0A9D4
B	48	MSE	MET	modified residue	UNP P0A9D4
B	58	MSE	MET	modified residue	UNP P0A9D4
B	77	MSE	MET	modified residue	UNP P0A9D4
B	155	MSE	MET	modified residue	UNP P0A9D4
B	201	MSE	MET	modified residue	UNP P0A9D4
B	254	MSE	MET	modified residue	UNP P0A9D4
B	256	MSE	MET	modified residue	UNP P0A9D4
C	-15	HIS	-	expression tag	UNP P0A9D4
C	-14	HIS	-	expression tag	UNP P0A9D4
C	-13	HIS	-	expression tag	UNP P0A9D4
C	-12	HIS	-	expression tag	UNP P0A9D4
C	-11	HIS	-	expression tag	UNP P0A9D4
C	-10	HIS	-	expression tag	UNP P0A9D4
C	-9	SER	-	expression tag	UNP P0A9D4
C	-8	SER	-	expression tag	UNP P0A9D4
C	-7	GLY	-	expression tag	UNP P0A9D4
C	-6	LEU	-	expression tag	UNP P0A9D4
C	-5	VAL	-	expression tag	UNP P0A9D4
C	-4	PRO	-	expression tag	UNP P0A9D4
C	-3	ARG	-	expression tag	UNP P0A9D4
C	-2	GLY	-	expression tag	UNP P0A9D4
C	-1	SER	-	expression tag	UNP P0A9D4

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Chain	Residue	Modelled	Actual	Comment	Reference
C	0	HIS	-	expression tag	UNP P0A9D4
C	1	MSE	MET	modified residue	UNP P0A9D4
C	26	MSE	MET	modified residue	UNP P0A9D4
C	48	MSE	MET	modified residue	UNP P0A9D4
C	58	MSE	MET	modified residue	UNP P0A9D4
C	77	MSE	MET	modified residue	UNP P0A9D4
C	155	MSE	MET	modified residue	UNP P0A9D4
C	201	MSE	MET	modified residue	UNP P0A9D4
C	254	MSE	MET	modified residue	UNP P0A9D4
C	256	MSE	MET	modified residue	UNP P0A9D4

- Molecule 2 is CYSTEINE (CCD ID: CYS) (formula: $C_3H_7NO_2S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	S	0	0
			7	3	1	2	1		
2	B	1	Total	C	N	O	S	0	0
			7	3	1	2	1		
2	B	1	Total	C	N	O	S	0	0
			7	3	1	2	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	163	Total	O	0	0
			163	163		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	140	Total 140	O 140	0	0
3	C	113	Total 113	O 113	0	0

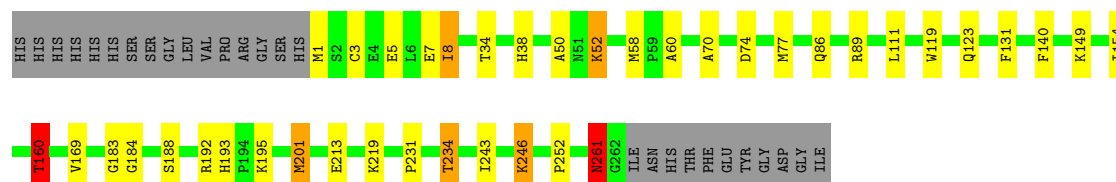
3 Residue-property plots [i](#)

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. 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. 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.

Note EDS was not executed.

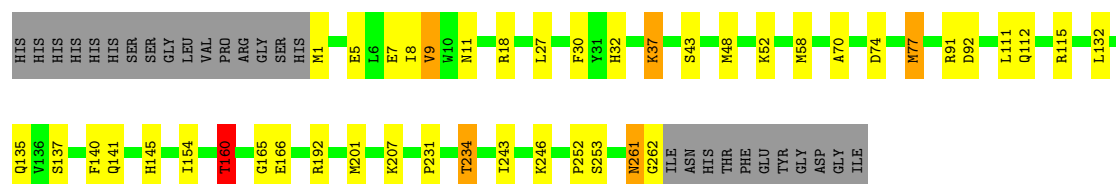
• Molecule 1: Serine acetyltransferase

Chain A: 



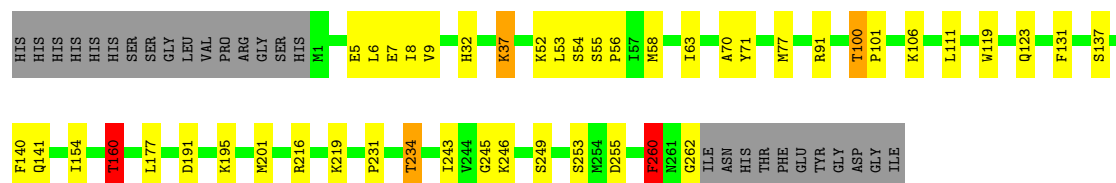
• Molecule 1: Serine acetyltransferase

Chain B: 



• Molecule 1: Serine acetyltransferase

Chain C: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	121.98Å 121.98Å 127.52Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.96 – 2.20	Depositor
% Data completeness (in resolution range)	100.0 (19.96-2.20)	Depositor
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC 5.1.19	Depositor
R, R_{free}	0.151 , 0.177	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	6344	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

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	1.12	0/2000	1.05	3/2701 (0.1%)
1	B	1.04	1/2000 (0.1%)	1.02	4/2701 (0.1%)
1	C	1.03	2/2000 (0.1%)	1.05	2/2701 (0.1%)
All	All	1.06	3/6000 (0.1%)	1.04	9/8103 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	0	1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	100	THR	CA-C	5.22	1.58	1.52
1	C	195	LYS	CA-C	-5.05	1.46	1.52
1	B	77	MSE	SE-CE	-5.02	1.80	1.95

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	261	ASN	N-CA-C	-7.67	101.86	112.30
1	A	160	THR	CB-CA-C	5.53	118.52	109.90
1	B	9	VAL	N-CA-CB	5.23	117.65	110.54
1	C	260	PHE	N-CA-C	5.21	117.52	110.06
1	B	160	THR	CB-CA-C	5.15	117.94	109.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	260	PHE	Peptide

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	1969	0	1988	32	0
1	B	1969	0	1988	27	0
1	C	1969	0	1988	29	0
2	B	21	0	12	0	0
3	A	163	0	0	10	0
3	B	140	0	0	6	1
3	C	113	0	0	6	1
All	All	6344	0	5976	88	1

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 7.

The worst 5 of 88 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:261:ASN:HA	3:A:353:HOH:O	1.72	0.88
1:A:261:ASN:CA	3:A:353:HOH:O	2.30	0.76
1:C:70:ALA:HB1	1:C:77:MSE:HE1	1.68	0.74
1:A:231:PRO:HD2	1:A:234:THR:HG21	1.73	0.70
1:B:261:ASN:ND2	1:B:262:GLY:H	1.89	0.70

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:B:798:HOH:O	3:C:383:HOH:O[4_555]	2.05	0.15

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	260/289 (90%)	257 (99%)	3 (1%)	0	100	100
1	B	260/289 (90%)	254 (98%)	4 (2%)	2 (1%)	16	16
1	C	260/289 (90%)	253 (97%)	6 (2%)	1 (0%)	30	34
All	All	780/867 (90%)	764 (98%)	13 (2%)	3 (0%)	30	34

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	54	SER
1	B	261	ASN
1	B	192	ARG

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	206/220 (94%)	194 (94%)	12 (6%)	18	22
1	B	206/220 (94%)	197 (96%)	9 (4%)	25	34
1	C	206/220 (94%)	195 (95%)	11 (5%)	20	26
All	All	618/660 (94%)	586 (95%)	32 (5%)	21	26

5 of 32 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	191	ASP
1	C	216	ARG
1	B	9	VAL
1	A	261	ASN
1	C	234	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	135	GLN
1	C	258	GLN
1	B	112	GLN
1	B	133	GLN
1	B	134	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](#)

3 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	CYS	B	501	-	5,6,6	1.32	1 (20%)	3,7,7	1.26	1 (33%)
2	CYS	B	701	-	5,6,6	0.92	0	3,7,7	1.13	0
2	CYS	B	601	-	5,6,6	1.50	1 (20%)	3,7,7	2.42	1 (33%)

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	CYS	B	501	-	-	0/6/6/6	-
2	CYS	B	701	-	-	0/6/6/6	-
2	CYS	B	601	-	-	0/6/6/6	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	CYS	OXT-C	-3.13	1.20	1.30
2	B	501	CYS	OXT-C	-2.36	1.23	1.30

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	601	CYS	OXT-C-O	-3.96	115.08	124.08
2	B	501	CYS	OXT-C-O	-2.04	119.44	124.08

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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](#)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.