



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 10:18 AM UTC

PDB ID : 6ND3 / pdb_00006nd3
Title : wild-type choline TMA lyase in complex with betaine aldehyde
Authors : Funk, M.A.; Drennan, C.L.
Deposited on : 2018-12-13
Resolution : 2.36 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) : 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

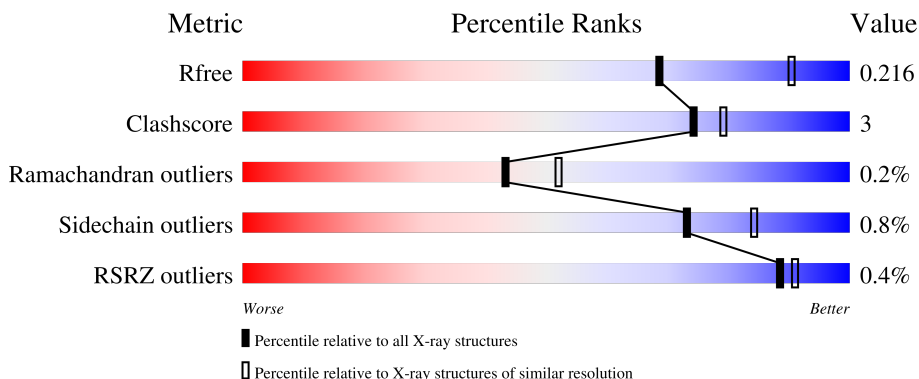
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.36 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.



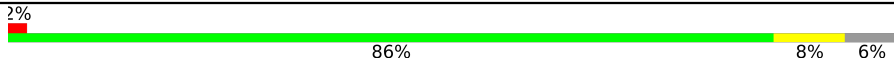


Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1596 (2.36-2.36)
Clashscore	190562	1663 (2.36-2.36)
Ramachandran outliers	187476	1646 (2.36-2.36)
Sidechain outliers	187428	1646 (2.36-2.36)
RSRZ outliers	180081	1598 (2.36-2.36)

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	849	88% 6% 6%
1	B	849	85% 8% 6%
1	C	849	87% 7% 6%
1	D	849	85% 9% 6%
1	E	849	86% 7% 6%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	F	849	 2% 86% 8% 6%
1	G	849	 85% 8% 6%
1	H	849	 87% 6% 6%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 52117 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 Choline trimethylamine-lyase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	795	6272	3975	1063	1189	45	0	1	0
1	B	794	6284	3982	1064	1192	46	0	3	0
1	C	795	6277	3978	1064	1190	45	0	1	0
1	D	796	6299	3991	1067	1195	46	0	3	0
1	E	795	6264	3971	1062	1186	45	0	0	0
1	F	794	6284	3982	1064	1192	46	0	3	0
1	G	795	6277	3978	1064	1190	45	0	1	0
1	H	796	6291	3987	1066	1192	46	0	2	0

There are 168 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	MET	-	expression tag	UNP Q30W70
A	-1	GLY	-	expression tag	UNP Q30W70
A	0	SER	-	expression tag	UNP Q30W70
A	1	SER	-	expression tag	UNP Q30W70
A	2	HIS	-	expression tag	UNP Q30W70
A	3	HIS	-	expression tag	UNP Q30W70
A	4	HIS	-	expression tag	UNP Q30W70
A	5	HIS	-	expression tag	UNP Q30W70
A	6	HIS	-	expression tag	UNP Q30W70
A	7	HIS	-	expression tag	UNP Q30W70
A	8	SER	-	expression tag	UNP Q30W70
A	9	SER	-	expression tag	UNP Q30W70
A	10	GLY	-	expression tag	UNP Q30W70

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	11	LEU	-	expression tag	UNP Q30W70
A	12	VAL	-	expression tag	UNP Q30W70
A	13	PRO	-	expression tag	UNP Q30W70
A	14	ARG	-	expression tag	UNP Q30W70
A	15	GLY	-	expression tag	UNP Q30W70
A	16	SER	-	expression tag	UNP Q30W70
A	17	HIS	-	expression tag	UNP Q30W70
A	18	MET	-	expression tag	UNP Q30W70
B	-2	MET	-	expression tag	UNP Q30W70
B	-1	GLY	-	expression tag	UNP Q30W70
B	0	SER	-	expression tag	UNP Q30W70
B	1	SER	-	expression tag	UNP Q30W70
B	2	HIS	-	expression tag	UNP Q30W70
B	3	HIS	-	expression tag	UNP Q30W70
B	4	HIS	-	expression tag	UNP Q30W70
B	5	HIS	-	expression tag	UNP Q30W70
B	6	HIS	-	expression tag	UNP Q30W70
B	7	HIS	-	expression tag	UNP Q30W70
B	8	SER	-	expression tag	UNP Q30W70
B	9	SER	-	expression tag	UNP Q30W70
B	10	GLY	-	expression tag	UNP Q30W70
B	11	LEU	-	expression tag	UNP Q30W70
B	12	VAL	-	expression tag	UNP Q30W70
B	13	PRO	-	expression tag	UNP Q30W70
B	14	ARG	-	expression tag	UNP Q30W70
B	15	GLY	-	expression tag	UNP Q30W70
B	16	SER	-	expression tag	UNP Q30W70
B	17	HIS	-	expression tag	UNP Q30W70
B	18	MET	-	expression tag	UNP Q30W70
C	-2	MET	-	expression tag	UNP Q30W70
C	-1	GLY	-	expression tag	UNP Q30W70
C	0	SER	-	expression tag	UNP Q30W70
C	1	SER	-	expression tag	UNP Q30W70
C	2	HIS	-	expression tag	UNP Q30W70
C	3	HIS	-	expression tag	UNP Q30W70
C	4	HIS	-	expression tag	UNP Q30W70
C	5	HIS	-	expression tag	UNP Q30W70
C	6	HIS	-	expression tag	UNP Q30W70
C	7	HIS	-	expression tag	UNP Q30W70
C	8	SER	-	expression tag	UNP Q30W70
C	9	SER	-	expression tag	UNP Q30W70
C	10	GLY	-	expression tag	UNP Q30W70

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	11	LEU	-	expression tag	UNP Q30W70
C	12	VAL	-	expression tag	UNP Q30W70
C	13	PRO	-	expression tag	UNP Q30W70
C	14	ARG	-	expression tag	UNP Q30W70
C	15	GLY	-	expression tag	UNP Q30W70
C	16	SER	-	expression tag	UNP Q30W70
C	17	HIS	-	expression tag	UNP Q30W70
C	18	MET	-	expression tag	UNP Q30W70
D	-2	MET	-	expression tag	UNP Q30W70
D	-1	GLY	-	expression tag	UNP Q30W70
D	0	SER	-	expression tag	UNP Q30W70
D	1	SER	-	expression tag	UNP Q30W70
D	2	HIS	-	expression tag	UNP Q30W70
D	3	HIS	-	expression tag	UNP Q30W70
D	4	HIS	-	expression tag	UNP Q30W70
D	5	HIS	-	expression tag	UNP Q30W70
D	6	HIS	-	expression tag	UNP Q30W70
D	7	HIS	-	expression tag	UNP Q30W70
D	8	SER	-	expression tag	UNP Q30W70
D	9	SER	-	expression tag	UNP Q30W70
D	10	GLY	-	expression tag	UNP Q30W70
D	11	LEU	-	expression tag	UNP Q30W70
D	12	VAL	-	expression tag	UNP Q30W70
D	13	PRO	-	expression tag	UNP Q30W70
D	14	ARG	-	expression tag	UNP Q30W70
D	15	GLY	-	expression tag	UNP Q30W70
D	16	SER	-	expression tag	UNP Q30W70
D	17	HIS	-	expression tag	UNP Q30W70
D	18	MET	-	expression tag	UNP Q30W70
E	-2	MET	-	expression tag	UNP Q30W70
E	-1	GLY	-	expression tag	UNP Q30W70
E	0	SER	-	expression tag	UNP Q30W70
E	1	SER	-	expression tag	UNP Q30W70
E	2	HIS	-	expression tag	UNP Q30W70
E	3	HIS	-	expression tag	UNP Q30W70
E	4	HIS	-	expression tag	UNP Q30W70
E	5	HIS	-	expression tag	UNP Q30W70
E	6	HIS	-	expression tag	UNP Q30W70
E	7	HIS	-	expression tag	UNP Q30W70
E	8	SER	-	expression tag	UNP Q30W70
E	9	SER	-	expression tag	UNP Q30W70
E	10	GLY	-	expression tag	UNP Q30W70

Continued on next page...

Continued from previous page...

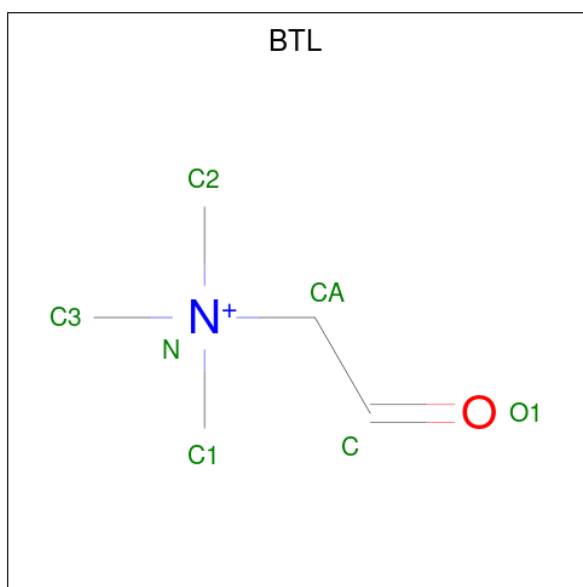
Chain	Residue	Modelled	Actual	Comment	Reference
E	11	LEU	-	expression tag	UNP Q30W70
E	12	VAL	-	expression tag	UNP Q30W70
E	13	PRO	-	expression tag	UNP Q30W70
E	14	ARG	-	expression tag	UNP Q30W70
E	15	GLY	-	expression tag	UNP Q30W70
E	16	SER	-	expression tag	UNP Q30W70
E	17	HIS	-	expression tag	UNP Q30W70
E	18	MET	-	expression tag	UNP Q30W70
F	-2	MET	-	expression tag	UNP Q30W70
F	-1	GLY	-	expression tag	UNP Q30W70
F	0	SER	-	expression tag	UNP Q30W70
F	1	SER	-	expression tag	UNP Q30W70
F	2	HIS	-	expression tag	UNP Q30W70
F	3	HIS	-	expression tag	UNP Q30W70
F	4	HIS	-	expression tag	UNP Q30W70
F	5	HIS	-	expression tag	UNP Q30W70
F	6	HIS	-	expression tag	UNP Q30W70
F	7	HIS	-	expression tag	UNP Q30W70
F	8	SER	-	expression tag	UNP Q30W70
F	9	SER	-	expression tag	UNP Q30W70
F	10	GLY	-	expression tag	UNP Q30W70
F	11	LEU	-	expression tag	UNP Q30W70
F	12	VAL	-	expression tag	UNP Q30W70
F	13	PRO	-	expression tag	UNP Q30W70
F	14	ARG	-	expression tag	UNP Q30W70
F	15	GLY	-	expression tag	UNP Q30W70
F	16	SER	-	expression tag	UNP Q30W70
F	17	HIS	-	expression tag	UNP Q30W70
F	18	MET	-	expression tag	UNP Q30W70
G	-2	MET	-	expression tag	UNP Q30W70
G	-1	GLY	-	expression tag	UNP Q30W70
G	0	SER	-	expression tag	UNP Q30W70
G	1	SER	-	expression tag	UNP Q30W70
G	2	HIS	-	expression tag	UNP Q30W70
G	3	HIS	-	expression tag	UNP Q30W70
G	4	HIS	-	expression tag	UNP Q30W70
G	5	HIS	-	expression tag	UNP Q30W70
G	6	HIS	-	expression tag	UNP Q30W70
G	7	HIS	-	expression tag	UNP Q30W70
G	8	SER	-	expression tag	UNP Q30W70
G	9	SER	-	expression tag	UNP Q30W70
G	10	GLY	-	expression tag	UNP Q30W70

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
G	11	LEU	-	expression tag	UNP Q30W70
G	12	VAL	-	expression tag	UNP Q30W70
G	13	PRO	-	expression tag	UNP Q30W70
G	14	ARG	-	expression tag	UNP Q30W70
G	15	GLY	-	expression tag	UNP Q30W70
G	16	SER	-	expression tag	UNP Q30W70
G	17	HIS	-	expression tag	UNP Q30W70
G	18	MET	-	expression tag	UNP Q30W70
H	-2	MET	-	expression tag	UNP Q30W70
H	-1	GLY	-	expression tag	UNP Q30W70
H	0	SER	-	expression tag	UNP Q30W70
H	1	SER	-	expression tag	UNP Q30W70
H	2	HIS	-	expression tag	UNP Q30W70
H	3	HIS	-	expression tag	UNP Q30W70
H	4	HIS	-	expression tag	UNP Q30W70
H	5	HIS	-	expression tag	UNP Q30W70
H	6	HIS	-	expression tag	UNP Q30W70
H	7	HIS	-	expression tag	UNP Q30W70
H	8	SER	-	expression tag	UNP Q30W70
H	9	SER	-	expression tag	UNP Q30W70
H	10	GLY	-	expression tag	UNP Q30W70
H	11	LEU	-	expression tag	UNP Q30W70
H	12	VAL	-	expression tag	UNP Q30W70
H	13	PRO	-	expression tag	UNP Q30W70
H	14	ARG	-	expression tag	UNP Q30W70
H	15	GLY	-	expression tag	UNP Q30W70
H	16	SER	-	expression tag	UNP Q30W70
H	17	HIS	-	expression tag	UNP Q30W70
H	18	MET	-	expression tag	UNP Q30W70

- Molecule 2 is BETAINE ALDEHYDE (CCD ID: BTL) (formula: C₅H₁₂NO).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			7	5	1	1		
2	B	1	Total	C	N	O	0	0
			7	5	1	1		
2	C	1	Total	C	N	O	0	0
			7	5	1	1		
2	D	1	Total	C	N	O	0	0
			7	5	1	1		
2	E	1	Total	C	N	O	0	0
			7	5	1	1		
2	F	1	Total	C	N	O	0	0
			7	5	1	1		
2	G	1	Total	C	N	O	0	0
			7	5	1	1		
2	H	1	Total	C	N	O	0	0
			7	5	1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	308	Total	O	0	0
			308	308		
3	B	118	Total	O	0	0
			118	118		
3	C	305	Total	O	0	0
			305	305		
3	D	273	Total	O	0	0
			273	273		

Continued on next page...

Continued from previous page...

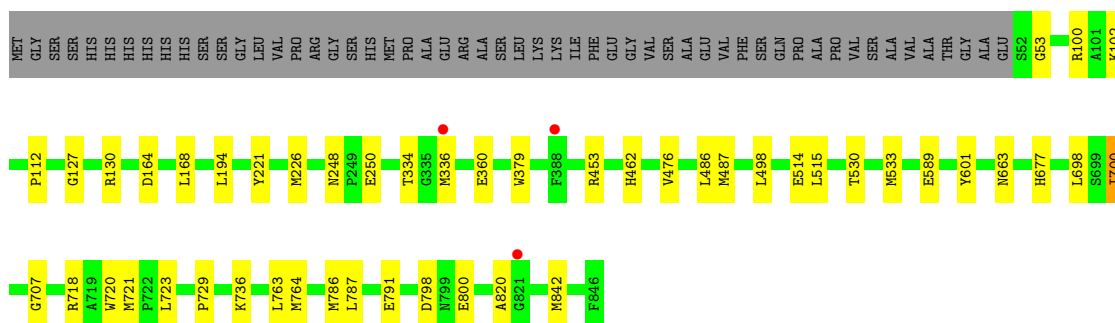
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	E	264	Total 264	O 264	0	0
3	F	81	Total 81	O 81	0	0
3	G	258	Total 258	O 258	0	0
3	H	206	Total 206	O 206	0	0

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.

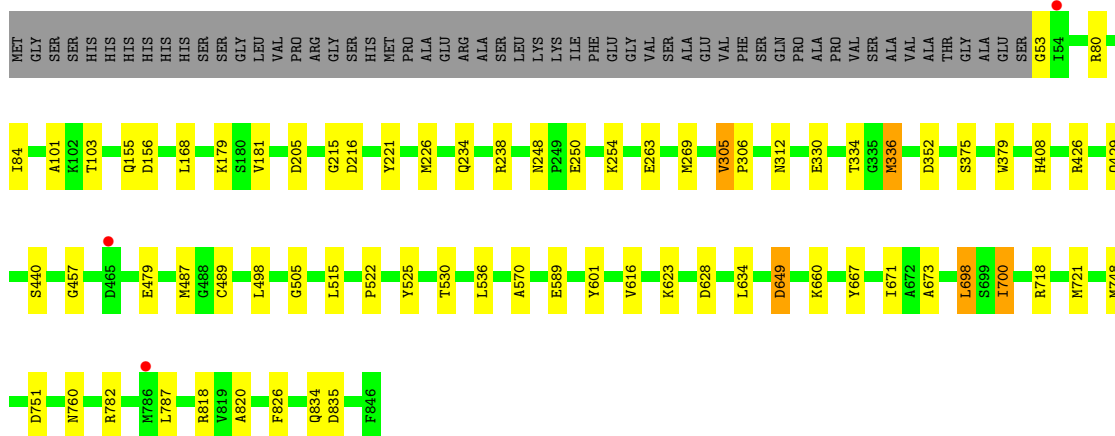
- Molecule 1: Choline trimethylamine-lyase

Chain A: 88% 6% 6%



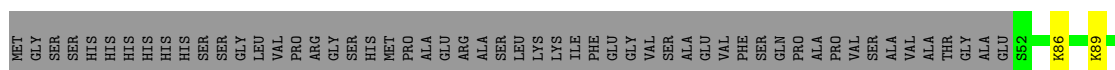
- Molecule 1: Choline trimethylamine-lyase

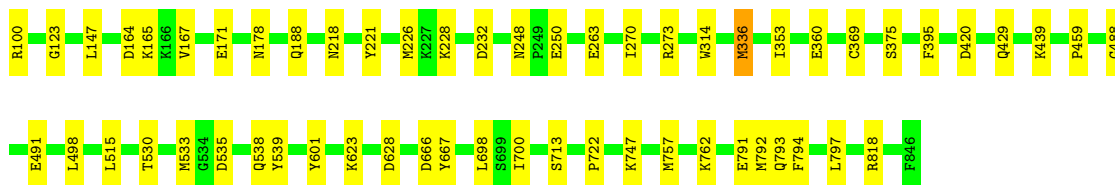
Chain B: 85% 8% 6%



- Molecule 1: Choline trimethylamine-lyase

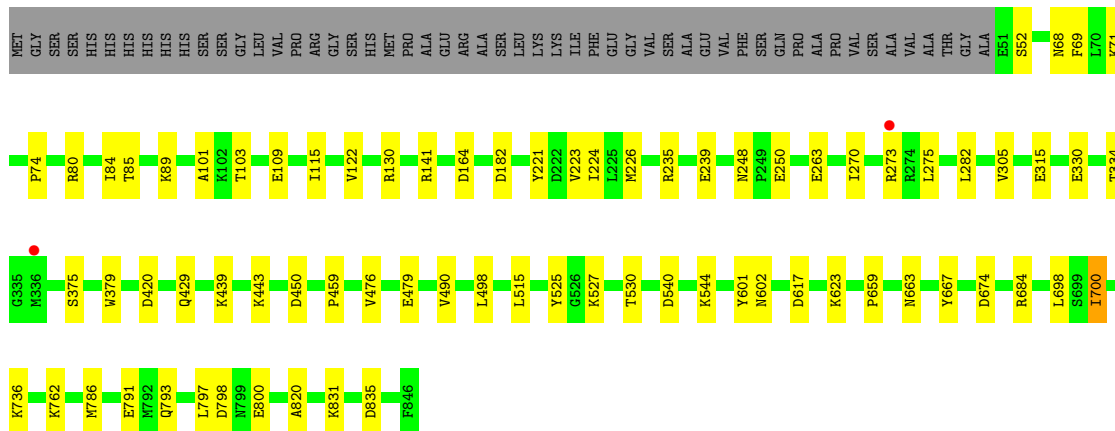
Chain C: 87% 7% 6%





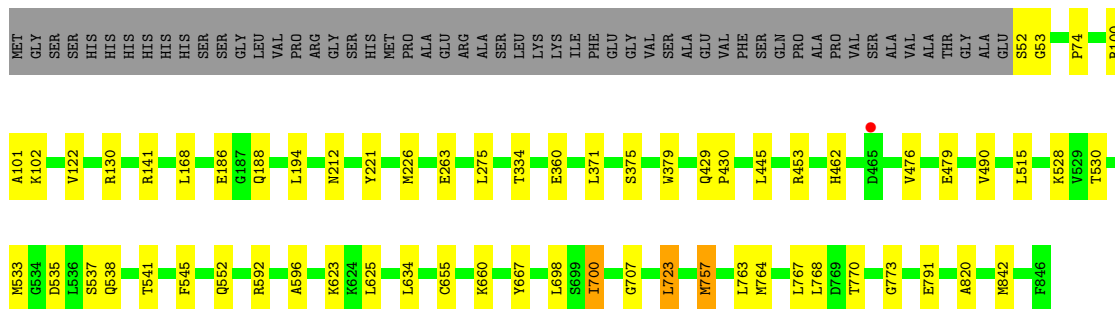
- Molecule 1: Choline trimethylamine-lyase

Chain D: 85% 9% 6%



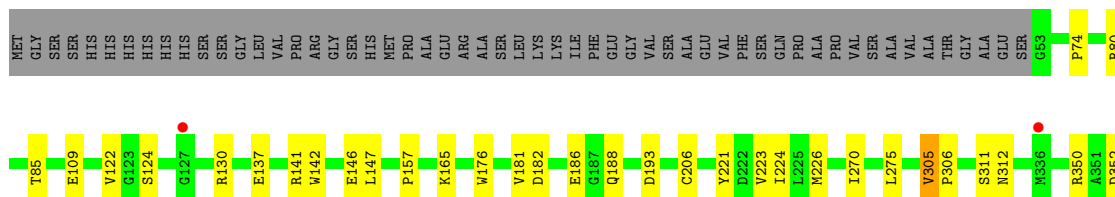
- Molecule 1: Choline trimethylamine-lyase

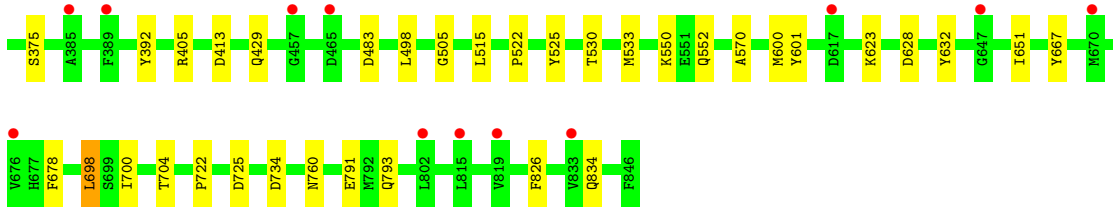
Chain E: 86% 7% 6%



- Molecule 1: Choline trimethylamine-lyase

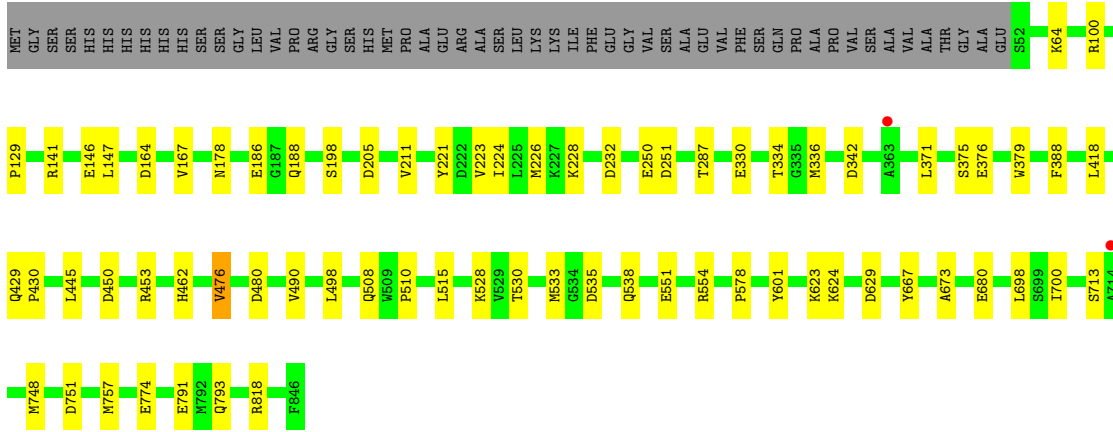
Chain F: 86% 8% 6%





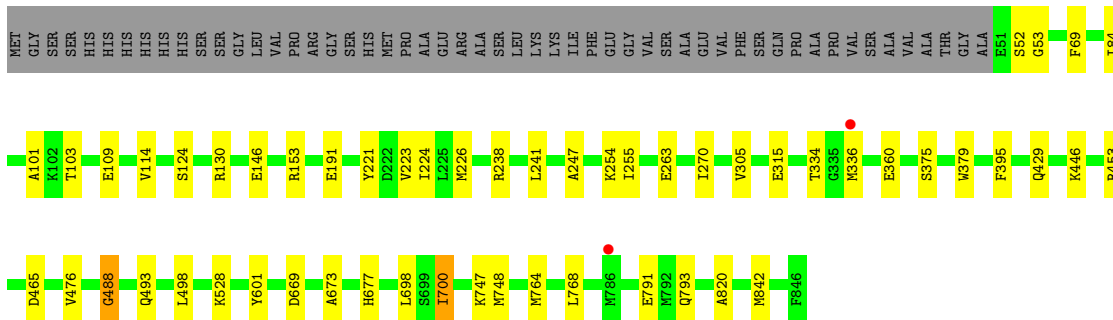
● Molecule 1: Choline trimethylamine-lyase

Chain G: 85% 8% 6%



● Molecule 1: Choline trimethylamine-lyase

Chain H: 87% 6% 6%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	105.22Å 234.70Å 159.02Å 90.00° 109.04° 90.00°	Depositor
Resolution (Å)	49.73 – 2.36 49.73 – 2.36	Depositor EDS
% Data completeness (in resolution range)	98.8 (49.73-2.36) 98.8 (49.73-2.36)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.29 (at 2.37Å)	Xtrriage
Refinement program	PHENIX (1.13_2998: ???)	Depositor
R, R_{free}	0.186 , 0.216 0.187 , 0.216	Depositor DCC
R_{free} test set	8792 reflections (2.91%)	wwPDB-VP
Wilson B-factor (Å ²)	43.6	Xtrriage
Anisotropy	0.407	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 43.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.000 for h,-k,-h-l	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	52117	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 46.94 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.0658e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: BTL

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	0.14	0/6417	0.35	0/8692
1	B	0.12	0/6429	0.30	0/8707
1	C	0.14	0/6422	0.33	0/8697
1	D	0.13	0/6444	0.32	0/8726
1	E	0.14	0/6409	0.33	0/8681
1	F	0.12	0/6429	0.30	0/8707
1	G	0.13	0/6422	0.32	0/8697
1	H	0.13	0/6436	0.32	0/8715
All	All	0.13	0/51408	0.32	0/69622

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	6272	0	6130	30	0
1	B	6284	0	6141	44	0
1	C	6277	0	6144	39	0
1	D	6299	0	6159	49	0
1	E	6264	0	6127	37	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	F	6284	0	6141	41	0
1	G	6277	0	6144	42	0
1	H	6291	0	6156	33	0
2	A	7	0	11	0	0
2	B	7	0	11	0	0
2	C	7	0	11	0	0
2	D	7	0	11	0	0
2	E	7	0	11	0	0
2	F	7	0	11	0	0
2	G	7	0	11	0	0
2	H	7	0	11	0	0
3	A	308	0	0	8	0
3	B	118	0	0	10	0
3	C	305	0	0	13	0
3	D	273	0	0	16	0
3	E	264	0	0	13	0
3	F	81	0	0	5	0
3	G	258	0	0	13	0
3	H	206	0	0	9	0
All	All	52117	0	49230	308	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 3.

The worst 5 of 308 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:F:193:ASP:O	3:F:1001:HOH:O	1.80	1.00
1:C:250:GLU:O	3:C:1001:HOH:O	1.80	1.00
1:D:420:ASP:OD2	3:D:1001:HOH:O	1.86	0.94
1:C:420:ASP:OD2	3:C:1002:HOH:O	1.85	0.93
1:D:602:ASN:O	3:D:1003:HOH:O	1.93	0.86

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	794/849 (94%)	769 (97%)	24 (3%)	1 (0%)	48	59
1	B	795/849 (94%)	762 (96%)	31 (4%)	2 (0%)	36	43
1	C	794/849 (94%)	766 (96%)	27 (3%)	1 (0%)	48	59
1	D	797/849 (94%)	771 (97%)	23 (3%)	3 (0%)	30	34
1	E	793/849 (93%)	772 (97%)	19 (2%)	2 (0%)	36	43
1	F	795/849 (94%)	767 (96%)	27 (3%)	1 (0%)	48	59
1	G	794/849 (94%)	769 (97%)	23 (3%)	2 (0%)	36	43
1	H	796/849 (94%)	771 (97%)	22 (3%)	3 (0%)	30	34
All	All	6358/6792 (94%)	6147 (97%)	196 (3%)	15 (0%)	43	52

5 of 15 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	700	ILE
1	H	700	ILE
1	A	700	ILE
1	B	700	ILE
1	C	700	ILE

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	669/712 (94%)	663 (99%)	6 (1%)	70	82

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	671/712 (94%)	665 (99%)	6 (1%)	70	82
1	C	671/712 (94%)	664 (99%)	7 (1%)	68	81
1	D	673/712 (94%)	671 (100%)	2 (0%)	86	92
1	E	668/712 (94%)	658 (98%)	10 (2%)	57	72
1	F	671/712 (94%)	668 (100%)	3 (0%)	84	91
1	G	671/712 (94%)	663 (99%)	8 (1%)	63	77
1	H	672/712 (94%)	670 (100%)	2 (0%)	86	92
All	All	5366/5696 (94%)	5322 (99%)	44 (1%)	73	84

5 of 44 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	723	LEU
1	G	178	ASN
1	E	757	MET
1	F	305	VAL
1	G	445	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 42 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	308	HIS
1	G	808	HIS
1	E	806	GLN
1	F	308	HIS
1	H	248	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](#)

8 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	BTL	A	901	1	6,6,6	2.20	3 (50%)	8,8,8	1.22	1 (12%)
2	BTL	C	901	1	6,6,6	2.28	3 (50%)	8,8,8	1.13	1 (12%)
2	BTL	E	901	1	6,6,6	2.25	3 (50%)	8,8,8	1.20	1 (12%)
2	BTL	G	901	1	6,6,6	2.23	3 (50%)	8,8,8	1.19	1 (12%)
2	BTL	D	901	1	6,6,6	2.21	3 (50%)	8,8,8	1.16	1 (12%)
2	BTL	F	901	1	6,6,6	2.25	3 (50%)	8,8,8	1.21	1 (12%)
2	BTL	B	901	1	6,6,6	2.27	3 (50%)	8,8,8	1.20	1 (12%)
2	BTL	H	901	1	6,6,6	2.24	3 (50%)	8,8,8	1.18	1 (12%)

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	BTL	A	901	1	-	3/3/4/4	-
2	BTL	C	901	1	-	3/3/4/4	-
2	BTL	E	901	1	-	3/3/4/4	-
2	BTL	G	901	1	-	3/3/4/4	-
2	BTL	D	901	1	-	3/3/4/4	-
2	BTL	F	901	1	-	3/3/4/4	-
2	BTL	B	901	1	-	3/3/4/4	-
2	BTL	H	901	1	-	3/3/4/4	-

The worst 5 of 24 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	901	BTL	O1-C	3.89	1.42	1.20
2	B	901	BTL	O1-C	3.88	1.42	1.20
2	D	901	BTL	O1-C	3.84	1.41	1.20
2	H	901	BTL	O1-C	3.84	1.41	1.20
2	E	901	BTL	O1-C	3.84	1.41	1.20

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	901	BTL	O1-C-CA	-3.28	110.69	125.47
2	B	901	BTL	O1-C-CA	-3.26	110.81	125.47
2	A	901	BTL	O1-C-CA	-3.23	110.92	125.47
2	H	901	BTL	O1-C-CA	-3.18	111.16	125.47
2	G	901	BTL	O1-C-CA	-3.17	111.19	125.47

There are no chirality outliers.

5 of 24 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	901	BTL	C-CA-N-C2
2	B	901	BTL	C-CA-N-C2
2	C	901	BTL	C-CA-N-C2
2	D	901	BTL	C-CA-N-C2
2	E	901	BTL	C-CA-N-C2

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](#)

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	795/849 (93%)	-0.33	3 (0%) 88 91	19, 43, 68, 95	1 (0%)
1	B	794/849 (93%)	0.02	3 (0%) 88 91	26, 63, 89, 116	3 (0%)
1	C	795/849 (93%)	-0.33	0 100 100	25, 45, 68, 95	1 (0%)
1	D	796/849 (93%)	-0.27	2 (0%) 90 92	18, 48, 73, 99	3 (0%)
1	E	795/849 (93%)	-0.16	1 (0%) 92 92	30, 49, 67, 101	0
1	F	794/849 (93%)	0.49	14 (1%) 67 72	32, 75, 109, 130	3 (0%)
1	G	795/849 (93%)	-0.11	2 (0%) 90 92	29, 53, 79, 100	1 (0%)
1	H	796/849 (93%)	-0.10	2 (0%) 90 92	21, 55, 76, 102	2 (0%)
All	All	6360/6792 (93%)	-0.10	27 (0%) 88 91	18, 53, 86, 130	14 (0%)

The worst 5 of 27 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	336	MET	3.9
1	F	385	ALA	3.3
1	F	389	PHE	3.0
1	F	465[A]	ASP	3.0
1	H	786	MET	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](#)

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(Å ²)	Q<0.9
2	BTL	B	901	7/7	0.93	0.13	49,51,54,55	0
2	BTL	F	901	7/7	0.94	0.12	57,60,61,61	0
2	BTL	D	901	7/7	0.95	0.10	37,41,42,43	0
2	BTL	H	901	7/7	0.95	0.09	45,47,48,49	0
2	BTL	A	901	7/7	0.96	0.07	30,32,37,38	0
2	BTL	G	901	7/7	0.96	0.08	34,38,42,42	0
2	BTL	E	901	7/7	0.96	0.09	41,42,45,48	0
2	BTL	C	901	7/7	0.97	0.06	35,36,37,39	0

6.5 Other polymers [i](#)

There are no such residues in this entry.