



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 06:32 AM UTC

PDB ID : 7UX6 / pdb_00007ux6
Title : Crystal structure of MfnG, an L- and D-tyrosine O-methyltransferase from the marformycin biosynthesis pathway of *Streptomyces drozdowiczii*, with SAH bound at 1.35 Å resolution (P212121 - form I)
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Deposited on : 2022-05-05
Resolution : 1.35 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

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

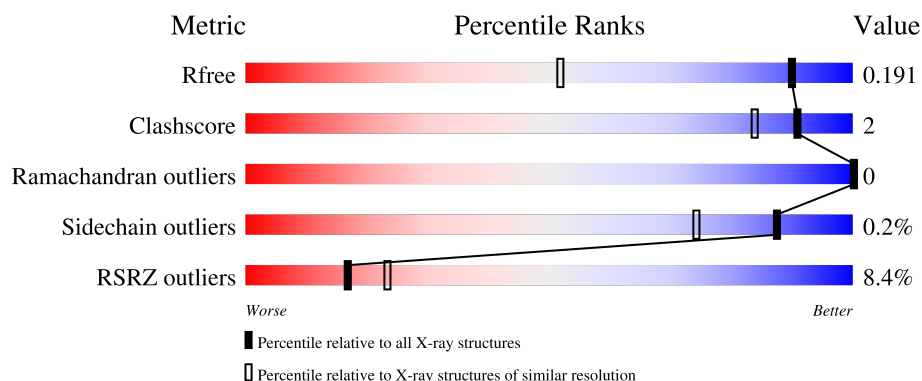
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.35 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	1216 (1.36-1.36)
Clashscore	190562	1232 (1.36-1.36)
Ramachandran outliers	187476	1220 (1.36-1.36)
Sidechain outliers	187428	1220 (1.36-1.36)
RSRZ outliers	180081	1214 (1.36-1.36)

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	384	
1	B	384	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 11874 atoms, of which 5564 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 MfnG.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	351	Total	C	H	N	O	S	0	13	0
			5568	1779	2743	507	528	11			
1	B	355	Total	C	H	N	O	S	0	13	0
			5641	1799	2783	516	532	11			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	cloning artifact	UNP A0A0D4WTP2
A	1	VAL	-	cloning artifact	UNP A0A0D4WTP2
A	376	ALA	-	expression tag	UNP A0A0D4WTP2
A	377	SER	-	expression tag	UNP A0A0D4WTP2
A	378	GLU	-	expression tag	UNP A0A0D4WTP2
A	379	ASN	-	expression tag	UNP A0A0D4WTP2
A	380	LEU	-	expression tag	UNP A0A0D4WTP2
A	381	TYR	-	expression tag	UNP A0A0D4WTP2
A	382	PHE	-	expression tag	UNP A0A0D4WTP2
A	383	GLN	-	expression tag	UNP A0A0D4WTP2
B	0	MET	-	cloning artifact	UNP A0A0D4WTP2
B	1	VAL	-	cloning artifact	UNP A0A0D4WTP2
B	376	ALA	-	expression tag	UNP A0A0D4WTP2
B	377	SER	-	expression tag	UNP A0A0D4WTP2
B	378	GLU	-	expression tag	UNP A0A0D4WTP2
B	379	ASN	-	expression tag	UNP A0A0D4WTP2
B	380	LEU	-	expression tag	UNP A0A0D4WTP2
B	381	TYR	-	expression tag	UNP A0A0D4WTP2
B	382	PHE	-	expression tag	UNP A0A0D4WTP2
B	383	GLN	-	expression tag	UNP A0A0D4WTP2

- Molecule 2 is S-ADENOSYL-L-HOMOCYSTEINE (CCD ID: SAH) (formula: $C_{14}H_{20}N_6O_5S$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	S	0	0
			45	14	19	6	5	1		
2	B	1	Total	C	H	N	O	S	0	0
			45	14	19	6	5	1		

- Molecule 3 is UNKNOWN LIGAND (CCD ID: UNL) (formula:).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	O	0	0
			9	9		
3	B	1	Total	O	0	0
			9	9		

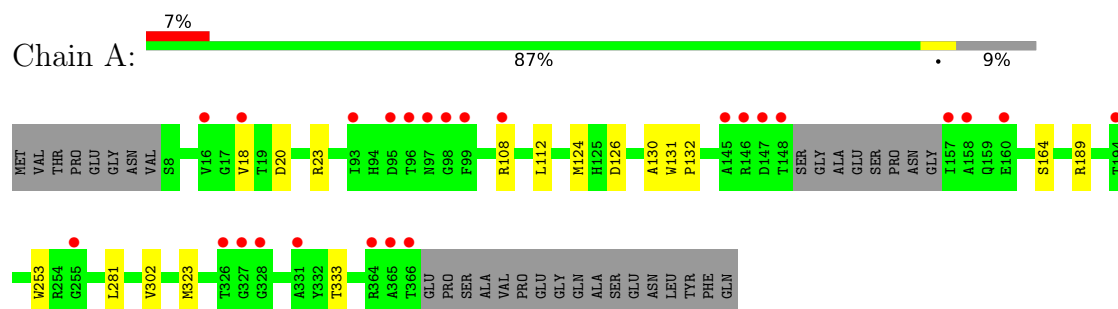
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	278	Total	O	0	6
			281	281		
4	B	273	Total	O	0	5
			276	276		

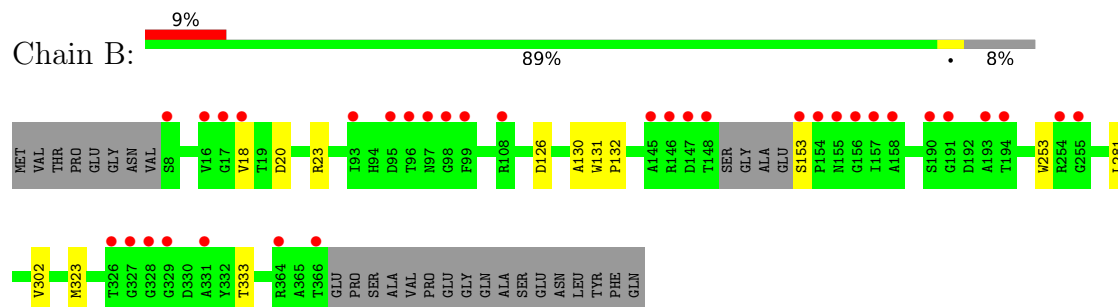
3 Residue-property plots [i](#)

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: MfnG



• Molecule 1: MfnG



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	64.06Å 78.23Å 131.68Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.63 – 1.35 33.63 – 1.35	Depositor EDS
% Data completeness (in resolution range)	69.1 (33.63-1.35) 69.1 (33.63-1.35)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.03 (at 1.35Å)	Xtriage
Refinement program	PHENIX 1.19.2	Depositor
R, R_{free}	0.166 , 0.190 0.167 , 0.191	Depositor DCC
R_{free} test set	4933 reflections (3.39%)	wwPDB-VP
Wilson B-factor (Å ²)	15.4	Xtriage
Anisotropy	0.068	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.42 , 43.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	11874	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 49.14 % 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 7.7816e-05. 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

5.1 Standard geometry

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

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	0.26	0/2890	0.47	0/3931
1	B	0.27	0/2924	0.46	0/3977
All	All	0.27	0/5814	0.46	0/7908

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

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	2825	2743	2728	11	0
1	B	2858	2783	2768	8	0
2	A	26	19	19	0	0
2	B	26	19	19	0	0
3	A	9	0	0	0	0
3	B	9	0	0	0	0
4	A	281	0	0	1	0
4	B	276	0	0	1	0
All	All	6310	5564	5534	19	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 (19) 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:B:18:VAL:O	1:B:23:ARG:NH1	2.39	0.56
1:A:18:VAL:O	1:A:23:ARG:NH1	2.39	0.56
1:A:20:ASP:OD1	1:A:23:ARG:NH2	2.39	0.56
1:B:20:ASP:OD1	1:B:23:ARG:NH2	2.40	0.55
1:B:18:VAL:HG22	4:B:567:HOH:O	2.12	0.50
1:A:302:VAL:O	1:A:333:THR:HA	2.13	0.48
1:A:124[B]:MET:HE3	1:A:164:SER:CB	2.45	0.46
1:A:126:ASP:HA	1:A:130:ALA:HB3	1.97	0.46
1:A:323:MET:HE2	1:A:323:MET:HA	1.96	0.46
1:A:124[B]:MET:HE3	1:A:164:SER:HB3	1.99	0.45
1:B:131[A]:TRP:HB3	1:B:132:PRO:HD3	1.99	0.44
1:B:302:VAL:O	1:B:333:THR:HA	2.18	0.44
1:A:189:ARG:NE	4:A:505:HOH:O	2.38	0.43
1:B:323:MET:HE2	1:B:323:MET:HA	2.00	0.43
1:B:126:ASP:HA	1:B:130:ALA:HB3	2.01	0.43
1:A:108[B]:ARG:HG2	1:A:112:LEU:HD22	2.01	0.43
1:A:253:TRP:CH2	1:A:281:LEU:HG	2.54	0.42
1:A:131[B]:TRP:HB3	1:A:132:PRO:HD3	2.03	0.41
1:B:253:TRP:CH2	1:B:281:LEU:HG	2.56	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	360/384 (94%)	356 (99%)	4 (1%)	0	100	100
1	B	364/384 (95%)	361 (99%)	3 (1%)	0	100	100
All	All	724/768 (94%)	717 (99%)	7 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	283/299 (95%)	283 (100%)	0	100	100
1	B	287/299 (96%)	286 (100%)	1 (0%)	86	72
All	All	570/598 (95%)	569 (100%)	1 (0%)	87	74

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	153	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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](#)

Of 4 ligands modelled in this entry, 2 are unknown - leaving 2 for Mogul analysis.

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	SAH	B	401	-	27,28,28	0.17	0	36,40,40	0.40	0
2	SAH	A	401	-	27,28,28	0.17	0	36,40,40	0.37	0

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	SAH	B	401	-	-	0/15/31/31	0/3/3/3
2	SAH	A	401	-	-	0/15/31/31	0/3/3/3

There are no bond length outliers.

There are no bond angle outliers.

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

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, 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	351/384 (91%)	0.21	25 (7%)	22 30	9, 22, 52, 94	12 (3%)
1	B	355/384 (92%)	0.23	34 (9%)	13 19	11, 21, 58, 99	12 (3%)
All	All	706/768 (91%)	0.22	59 (8%)	17 23	9, 22, 57, 99	24 (3%)

All (59) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	157	ILE	7.4
1	B	331	ALA	6.6
1	A	331	ALA	6.1
1	A	16	VAL	5.9
1	B	327	GLY	5.7
1	B	16	VAL	5.7
1	B	148	THR	5.6
1	A	148	THR	5.5
1	B	18	VAL	5.4
1	A	327	GLY	5.4
1	B	191	GLY	5.0
1	B	157	ILE	4.5
1	B	193	ALA	4.4
1	A	96	THR	4.4
1	A	158	ALA	4.3
1	A	97	ASN	4.2
1	A	366	THR	4.1
1	A	328	GLY	4.1
1	A	99	PHE	4.1
1	B	145	ALA	4.1
1	B	156	GLY	4.0
1	B	96	THR	3.9
1	A	145	ALA	3.8
1	B	328	GLY	3.7

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Mol	Chain	Res	Type	RSRZ
1	B	97	ASN	3.6
1	B	147	ASP	3.4
1	A	147	ASP	3.3
1	A	98	GLY	3.3
1	B	99	PHE	3.2
1	A	108[A]	ARG	3.2
1	B	255	GLY	3.2
1	A	364[A]	ARG	3.1
1	B	154	PRO	3.1
1	B	366	THR	3.1
1	B	194	THR	3.0
1	A	326	THR	2.9
1	A	18	VAL	2.8
1	A	95	ASP	2.8
1	B	93	ILE	2.7
1	B	158	ALA	2.6
1	B	326	THR	2.6
1	B	254[A]	ARG	2.6
1	B	155	ASN	2.6
1	A	255	GLY	2.6
1	B	146	ARG	2.5
1	B	364[A]	ARG	2.5
1	B	17	GLY	2.4
1	B	98	GLY	2.4
1	A	194	THR	2.4
1	B	95	ASP	2.3
1	A	365[A]	ALA	2.3
1	B	190	SER	2.3
1	A	146	ARG	2.3
1	B	108[A]	ARG	2.3
1	A	93	ILE	2.3
1	B	8	SER	2.2
1	B	329	GLY	2.1
1	A	160[A]	GLU	2.0
1	B	153	SER	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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
3	UNL	A	402	9/-	0.90	0.13	14,25,32,39	9
3	UNL	B	402	9/-	0.92	0.10	15,23,30,33	9
2	SAH	A	401	26/26	0.99	0.04	13,16,21,23	0
2	SAH	B	401	26/26	0.99	0.03	10,13,20,24	0

6.5 Other polymers [i](#)

There are no such residues in this entry.