



Full wwPDB X-ray Structure Validation Report ⓘ

May 23, 2020 – 02:32 am BST

PDB ID : 3L87
Title : The Crystal Structure of smu.143c from Streptococcus mutans UA159
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Deposited on : 2009-12-30
Resolution : 2.00 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
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) : 2.11

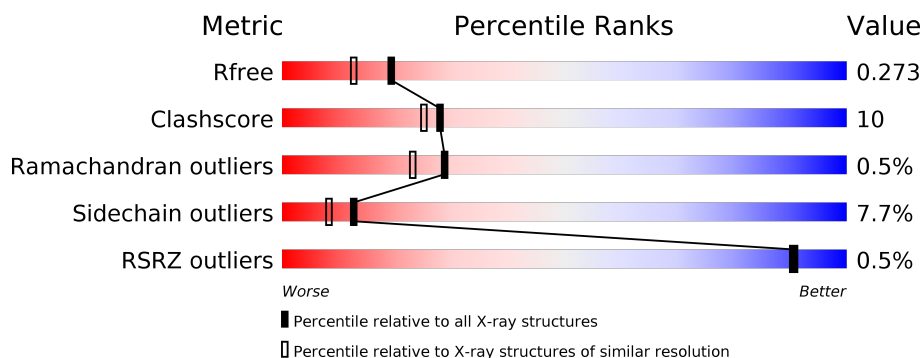
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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 on 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	238	<div> <div style="width: 66%; background-color: green;"></div> <div style="width: 16%; background-color: yellow;"></div> <div style="width: 16%; background-color: grey;"></div> <div style="display: flex; justify-content: space-between; padding: 0 10px;"> 66% 16% • 16% </div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 1661 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 Peptide deformylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	200	Total	C	N	O	S	0	0	0
			1562	989	268	298	7			

There are 34 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-33	MET	-	EXPRESSION TAG	UNP Q8DWC2
A	-32	GLY	-	EXPRESSION TAG	UNP Q8DWC2
A	-31	SER	-	EXPRESSION TAG	UNP Q8DWC2
A	-30	SER	-	EXPRESSION TAG	UNP Q8DWC2
A	-29	HIS	-	EXPRESSION TAG	UNP Q8DWC2
A	-28	HIS	-	EXPRESSION TAG	UNP Q8DWC2
A	-27	HIS	-	EXPRESSION TAG	UNP Q8DWC2
A	-26	HIS	-	EXPRESSION TAG	UNP Q8DWC2
A	-25	HIS	-	EXPRESSION TAG	UNP Q8DWC2
A	-24	HIS	-	EXPRESSION TAG	UNP Q8DWC2
A	-23	SER	-	EXPRESSION TAG	UNP Q8DWC2
A	-22	SER	-	EXPRESSION TAG	UNP Q8DWC2
A	-21	GLY	-	EXPRESSION TAG	UNP Q8DWC2
A	-20	LEU	-	EXPRESSION TAG	UNP Q8DWC2
A	-19	VAL	-	EXPRESSION TAG	UNP Q8DWC2
A	-18	PRO	-	EXPRESSION TAG	UNP Q8DWC2
A	-17	ARG	-	EXPRESSION TAG	UNP Q8DWC2
A	-16	GLY	-	EXPRESSION TAG	UNP Q8DWC2
A	-15	SER	-	EXPRESSION TAG	UNP Q8DWC2
A	-14	HIS	-	EXPRESSION TAG	UNP Q8DWC2
A	-13	MET	-	EXPRESSION TAG	UNP Q8DWC2
A	-12	ALA	-	EXPRESSION TAG	UNP Q8DWC2
A	-11	SER	-	EXPRESSION TAG	UNP Q8DWC2
A	-10	MET	-	EXPRESSION TAG	UNP Q8DWC2
A	-9	THR	-	EXPRESSION TAG	UNP Q8DWC2
A	-8	GLY	-	EXPRESSION TAG	UNP Q8DWC2
A	-7	GLY	-	EXPRESSION TAG	UNP Q8DWC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	GLN	-	EXPRESSION TAG	UNP Q8DWC2
A	-5	GLN	-	EXPRESSION TAG	UNP Q8DWC2
A	-4	MET	-	EXPRESSION TAG	UNP Q8DWC2
A	-3	GLY	-	EXPRESSION TAG	UNP Q8DWC2
A	-2	ARG	-	EXPRESSION TAG	UNP Q8DWC2
A	-1	GLY	-	EXPRESSION TAG	UNP Q8DWC2
A	0	SER	-	EXPRESSION TAG	UNP Q8DWC2

- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Fe 1 1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	98	Total O 98 98	0	0

i

- Molecule 1: Peptide deformylase

L53	L54	E63	I80	S81	K82	R83	I84	T85	A86	R87	L88	N91	D94	LYS	ASP	GLY	ASN	P99	Y111	R114	I115	I116	A117	H118	S119	V120	Q121	L122	R136	Y153	D154	K155	M156	S157	D158	L164	K165	G166	Y167	Q168	K191	N192	P193	G199	E204								
MET	GLY	SER	HIS	HIS	HIS	HIS	HIS	HIS	SER	SER	GLY	LEU	VAL	PRO	ARG	GLY	SER	HIS	HIS	MET	ALA	SER	MET	THR	GLY	GLN	GLN	MET	GLY	ARG	GLY	SER	M1	S2	K5	T6	I7	I14	R21	E22	G23	F24	H25	T26	N39	E40	D41	D42	I43	I44	L50	E51	F52

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	47.59Å 55.62Å 85.78Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.67 – 2.00 55.62 – 2.00	Depositor EDS
% Data completeness (in resolution range)	68.0 (46.67-2.00) 68.1 (55.62-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.71 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.215 , 0.285 0.216 , 0.273	Depositor DCC
R_{free} test set	537 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	20.0	Xtriage
Anisotropy	0.498	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 45.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	1661	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.79% 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 [i](#)

5.1 Standard geometry [i](#)

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

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	0.97	0/1579	0.87	2/2135 (0.1%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	136	ARG	NE-CZ-NH1	9.25	124.92	120.30
1	A	136	ARG	NE-CZ-NH2	-7.31	116.65	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	1562	0	1572	31	0
2	A	1	0	0	0	0
3	A	98	0	0	8	0
All	All	1661	0	1572	31	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 10.

All (31) 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:7:ILE:HD12	3:A:251:HOH:O	1.45	1.16
1:A:54:LYS:HD2	1:A:88:LEU:HD21	1.56	0.86
1:A:50:LEU:HD23	1:A:86:ALA:HB1	1.55	0.86
1:A:80:ILE:CD1	3:A:251:HOH:O	2.27	0.82
1:A:2:SER:H	1:A:5:LYS:HE2	1.48	0.77
1:A:80:ILE:HD11	3:A:251:HOH:O	1.84	0.75
1:A:118:HIS:HE1	3:A:215:HOH:O	1.68	0.75
1:A:50:LEU:CD2	1:A:86:ALA:HB1	2.16	0.75
1:A:24:HIS:HD2	1:A:26:THR:H	1.35	0.73
1:A:54:LYS:HD2	1:A:88:LEU:CD2	2.19	0.73
1:A:118:HIS:HD2	1:A:119:SER:O	1.86	0.58
1:A:54:LYS:NZ	3:A:216:HOH:O	2.37	0.57
1:A:1:MET:HB2	1:A:5:LYS:CE	2.36	0.56
1:A:80:ILE:HD12	3:A:251:HOH:O	1.97	0.55
1:A:164:LEU:HD22	1:A:168:GLN:HG3	1.92	0.51
1:A:42:ASP:OD1	1:A:82:LYS:NZ	2.41	0.50
1:A:1:MET:HB2	1:A:5:LYS:HE2	1.94	0.48
1:A:50:LEU:HD13	1:A:88:LEU:HD13	1.97	0.47
1:A:114:ARG:NH1	3:A:262:HOH:O	2.45	0.45
1:A:114:ARG:NH1	1:A:116:ILE:HG22	2.32	0.45
1:A:167:TYR:HE2	3:A:301:HOH:O	1.98	0.45
1:A:40:GLU:O	1:A:44:ILE:HD12	2.17	0.44
1:A:84:ILE:HG12	1:A:111:TYR:CD2	2.52	0.44
1:A:54:LYS:CD	1:A:88:LEU:CD2	2.93	0.44
1:A:121:GLN:NE2	1:A:199:GLY:O	2.49	0.44
1:A:153:TYR:HA	1:A:158:ASP:O	2.18	0.43
1:A:14:ILE:HB	1:A:52:PHE:HB2	2.01	0.43
1:A:155:LYS:HE2	1:A:155:LYS:HB2	1.74	0.42
1:A:192:ASN:HA	1:A:193:PRO:HD2	1.86	0.41
1:A:21:ARG:O	1:A:22:GLU:C	2.58	0.41
1:A:1:MET:HB2	1:A:5:LYS:HE3	2.03	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	195/238 (82%)	190 (97%)	4 (2%)	1 (0%)	29	23

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	191	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	169/203 (83%)	156 (92%)	13 (8%)	13	8

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	39	ASN
1	A	50	LEU
1	A	54	LYS
1	A	63	GLU
1	A	91	ASN
1	A	94	ASP
1	A	132	LEU
1	A	136	ARG
1	A	155	LYS
1	A	157	SER
1	A	165	LYS
1	A	168	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	24	HIS
1	A	91	ASN
1	A	118	HIS
1	A	168	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](#)

1 non-standard protein/DNA/RNA residue is 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	$\# Z > 2$
1	CSD	A	131	1,2	3,7,8	1.43	1 (33%)	1,8,10	0.97	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
1	CSD	A	131	1,2	-	1/2/6/8	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	131	CSD	CB-SG	-2.02	1.67	1.79

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	131	CSD	CA-CB-SG-OD1

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

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 [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	199/238 (83%)	-0.20	1 (0%) 91 90	7, 20, 37, 45	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	MET	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	CSD	A	131	8/9	0.96	0.12	12,14,18,21	0

6.3 Carbohydrates [i](#)

There are no carbohydrates 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	FE	A	205	1/1	0.99	0.05	34,34,34,34	0

6.5 Other polymers

There are no such residues in this entry.