



wwPDB X-ray Structure Validation Summary Report ⓘ

May 21, 2020 – 02:04 pm BST

PDB ID : 3L9D
Title : The Crystal Structure of smu.1046c from Streptococcus mutans UA159
Authors : Su, X.-D.; Huang, Y.H.; Liu, X.
Deposited on : 2010-01-05
Resolution : 2.48 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 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	:	2.11
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

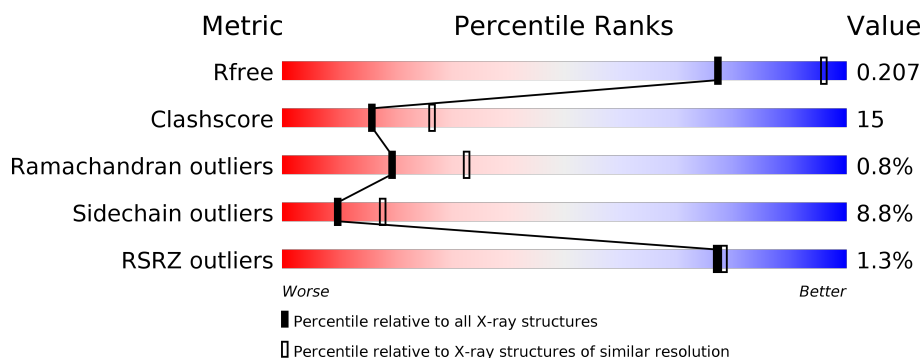
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.48 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	5857 (2.50-2.46)
Clashscore	141614	6594 (2.50-2.46)
Ramachandran outliers	138981	6469 (2.50-2.46)
Sidechain outliers	138945	6471 (2.50-2.46)
RSRZ outliers	127900	5738 (2.50-2.46)

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	255	<div> <div>55%</div> <div>19%</div> <div>•</div> <div>22%</div> </div>
1	B	255	<div> <div>2%</div> <div>52%</div> <div>21%</div> <div>•</div> <div>24%</div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3344 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 Putative GTP pyrophosphokinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	198	Total	C	N	O	S	0	0	0
			1633	1045	287	293	8			
1	B	193	Total	C	N	O	S	0	0	0
			1583	1010	281	285	7			

There are 68 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-33	MET	-	EXPRESSION TAG	UNP Q8DU97
A	-32	GLY	-	EXPRESSION TAG	UNP Q8DU97
A	-31	SER	-	EXPRESSION TAG	UNP Q8DU97
A	-30	SER	-	EXPRESSION TAG	UNP Q8DU97
A	-29	HIS	-	EXPRESSION TAG	UNP Q8DU97
A	-28	HIS	-	EXPRESSION TAG	UNP Q8DU97
A	-27	HIS	-	EXPRESSION TAG	UNP Q8DU97
A	-26	HIS	-	EXPRESSION TAG	UNP Q8DU97
A	-25	HIS	-	EXPRESSION TAG	UNP Q8DU97
A	-24	HIS	-	EXPRESSION TAG	UNP Q8DU97
A	-23	SER	-	EXPRESSION TAG	UNP Q8DU97
A	-22	SER	-	EXPRESSION TAG	UNP Q8DU97
A	-21	GLY	-	EXPRESSION TAG	UNP Q8DU97
A	-20	LEU	-	EXPRESSION TAG	UNP Q8DU97
A	-19	VAL	-	EXPRESSION TAG	UNP Q8DU97
A	-18	PRO	-	EXPRESSION TAG	UNP Q8DU97
A	-17	ARG	-	EXPRESSION TAG	UNP Q8DU97
A	-16	GLY	-	EXPRESSION TAG	UNP Q8DU97
A	-15	SER	-	EXPRESSION TAG	UNP Q8DU97
A	-14	HIS	-	EXPRESSION TAG	UNP Q8DU97
A	-13	MET	-	EXPRESSION TAG	UNP Q8DU97
A	-12	ALA	-	EXPRESSION TAG	UNP Q8DU97
A	-11	SER	-	EXPRESSION TAG	UNP Q8DU97
A	-10	MET	-	EXPRESSION TAG	UNP Q8DU97
A	-9	THR	-	EXPRESSION TAG	UNP Q8DU97

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	GLY	-	EXPRESSION TAG	UNP Q8DU97
A	-7	GLY	-	EXPRESSION TAG	UNP Q8DU97
A	-6	GLN	-	EXPRESSION TAG	UNP Q8DU97
A	-5	GLN	-	EXPRESSION TAG	UNP Q8DU97
A	-4	MET	-	EXPRESSION TAG	UNP Q8DU97
A	-3	GLY	-	EXPRESSION TAG	UNP Q8DU97
A	-2	ARG	-	EXPRESSION TAG	UNP Q8DU97
A	-1	GLY	-	EXPRESSION TAG	UNP Q8DU97
A	0	SER	-	EXPRESSION TAG	UNP Q8DU97
B	-33	MET	-	EXPRESSION TAG	UNP Q8DU97
B	-32	GLY	-	EXPRESSION TAG	UNP Q8DU97
B	-31	SER	-	EXPRESSION TAG	UNP Q8DU97
B	-30	SER	-	EXPRESSION TAG	UNP Q8DU97
B	-29	HIS	-	EXPRESSION TAG	UNP Q8DU97
B	-28	HIS	-	EXPRESSION TAG	UNP Q8DU97
B	-27	HIS	-	EXPRESSION TAG	UNP Q8DU97
B	-26	HIS	-	EXPRESSION TAG	UNP Q8DU97
B	-25	HIS	-	EXPRESSION TAG	UNP Q8DU97
B	-24	HIS	-	EXPRESSION TAG	UNP Q8DU97
B	-23	SER	-	EXPRESSION TAG	UNP Q8DU97
B	-22	SER	-	EXPRESSION TAG	UNP Q8DU97
B	-21	GLY	-	EXPRESSION TAG	UNP Q8DU97
B	-20	LEU	-	EXPRESSION TAG	UNP Q8DU97
B	-19	VAL	-	EXPRESSION TAG	UNP Q8DU97
B	-18	PRO	-	EXPRESSION TAG	UNP Q8DU97
B	-17	ARG	-	EXPRESSION TAG	UNP Q8DU97
B	-16	GLY	-	EXPRESSION TAG	UNP Q8DU97
B	-15	SER	-	EXPRESSION TAG	UNP Q8DU97
B	-14	HIS	-	EXPRESSION TAG	UNP Q8DU97
B	-13	MET	-	EXPRESSION TAG	UNP Q8DU97
B	-12	ALA	-	EXPRESSION TAG	UNP Q8DU97
B	-11	SER	-	EXPRESSION TAG	UNP Q8DU97
B	-10	MET	-	EXPRESSION TAG	UNP Q8DU97
B	-9	THR	-	EXPRESSION TAG	UNP Q8DU97
B	-8	GLY	-	EXPRESSION TAG	UNP Q8DU97
B	-7	GLY	-	EXPRESSION TAG	UNP Q8DU97
B	-6	GLN	-	EXPRESSION TAG	UNP Q8DU97
B	-5	GLN	-	EXPRESSION TAG	UNP Q8DU97
B	-4	MET	-	EXPRESSION TAG	UNP Q8DU97
B	-3	GLY	-	EXPRESSION TAG	UNP Q8DU97
B	-2	ARG	-	EXPRESSION TAG	UNP Q8DU97
B	-1	GLY	-	EXPRESSION TAG	UNP Q8DU97

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Chain	Residue	Modelled	Actual	Comment	Reference
B	0	SER	-	EXPRESSION TAG	UNP Q8DU97

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	82	Total O 82 82	0	0
2	B	46	Total O 46 46	0	0

These plots are drawn for all protein, RNA and DNA 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 ($\text{RSRZ} > 2$). 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.

- Chain A:
-
- 55% 19% 22%
- Met Gly Ser His His His His Ser Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg Gly Ser M1 F6 L7 V14 K18 I19 K20 G23 Q27 F28 R29 K30 Q31 K32 K33 P36 L37 E38 P42 P46 L56 K60 K61 E62 N63 L64 T65 Q66 D67 M68 I71 L74 R75 V78 L88 L91 R92 R93 Q94 K95 K98 N108 K110 P111 S112 G113 Y114 R115 S116 Y117 Y123 Q139 T140 R141 T142 L143 A144 M145 W148 E152 N156 Q161

- Chain B:
-
- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R89 | K93 | L97 | L98 | F99 | ASP | ALA | GLU | THR | ARG | LYS | LEU | ASN | ASP | ASP | THR | ASP | GLU | LEU | TYR | ARG |
| M54 | V55 | L56 | R57 | Q58 | I59 | E62 | N63 | L64 | T65 | Q66 | M68 | I68 | R | | | | | | | | | | | | | | | | | | | | |

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	86.01Å 103.33Å 64.01Å 90.00° 115.51° 90.00°	Depositor
Resolution (Å)	38.81 – 2.48 62.06 – 2.48	Depositor EDS
% Data completeness (in resolution range)	86.6 (38.81-2.48) 92.7 (62.06-2.48)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.20 (at 2.48Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.189 , 0.264 0.203 , 0.207	Depositor DCC
R_{free} test set	842 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	34.7	Xtriage
Anisotropy	0.620	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 50.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.52$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	3344	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.70% 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

5.1 Standard geometry

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	0.46	0/1661	0.57	0/2232
1	B	0.61	0/1608	0.60	0/2159
All	All	0.54	0/3269	0.58	0/4391

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	1633	0	1638	36	0
1	B	1583	0	1589	59	0
2	A	82	0	0	3	0
2	B	46	0	0	2	0
All	All	3344	0	3227	94	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 15.

The worst 5 of 94 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:107:ASN:O	1:B:108:ASN:HB2	1.46	1.10

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:106:ILE:C	1:B:108:ASN:H	1.73	0.90
1:B:54:MET:HE3	1:B:64:LEU:HD11	1.56	0.86
1:A:148:TRP:CD1	1:A:174:THR:HG22	2.13	0.83
1:B:54:MET:CE	1:B:64:LEU:HD21	2.09	0.83

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	194/255 (76%)	184 (95%)	9 (5%)	1 (0%)	29	46
1	B	189/255 (74%)	180 (95%)	7 (4%)	2 (1%)	14	23
All	All	383/510 (75%)	364 (95%)	16 (4%)	3 (1%)	19	33

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	107	ASN
1	B	67	ASP
1	A	164	PRO

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	173/229 (76%)	156 (90%)	17 (10%)	8	14
1	B	168/229 (73%)	155 (92%)	13 (8%)	13	23
All	All	341/458 (74%)	311 (91%)	30 (9%)	10	18

5 of 30 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	143	LEU
1	A	189	ARG
1	B	187	GLN
1	A	175	SER
1	B	33	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 8 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	156	ASN
1	B	93	GLN
1	B	12	GLN
1	A	93	GLN
1	A	196	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

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 [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	198/255 (77%)	-0.27	0 100 100	15, 30, 55, 68	0
1	B	193/255 (75%)	-0.09	5 (2%) 56 58	19, 36, 88, 98	0
All	All	391/510 (76%)	-0.18	5 (1%) 77 78	15, 34, 68, 98	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	65	THR	4.2
1	B	54	MET	2.6
1	B	55	VAL	2.1
1	B	59	ILE	2.1
1	B	48	GLU	2.1

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 carbohydrates 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.