



# Full wwPDB X-ray Structure Validation Report

May 15, 2020 – 08:36 am BST

PDB ID : 6FPN  
Title : Lytic transglycosylase in action  
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Deposited on : 2018-02-11  
Resolution : 1.44 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](mailto: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.

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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

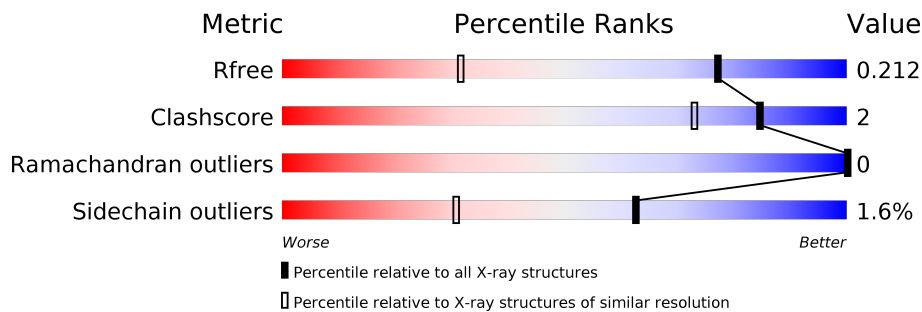
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.44 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	2021 (1.46-1.42)
Clashscore	141614	2086 (1.46-1.42)
Ramachandran outliers	138981	2047 (1.46-1.42)
Sidechain outliers	138945	2047 (1.46-1.42)

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  $\geq 3$ , 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	B	586	

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 5318 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 soluble lytic murein transglycosylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	586	4562	2837	844	866	15	0	2	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
2	B	1	5	4	1	0	0
2	B	1	5	4	1	0	0
2	B	1	5	4	1	0	0
2	B	1	5	4	1	0	0
2	B	1	5	4	1	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		


- Molecule 3 is water.

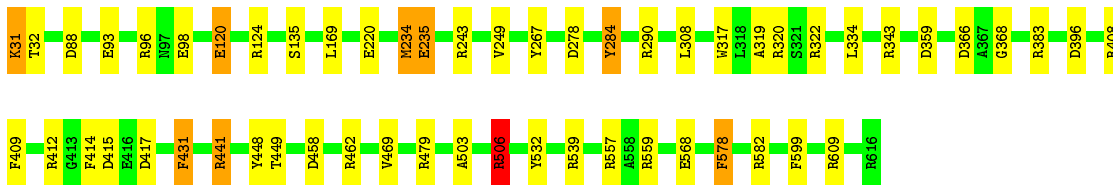
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	721	Total	O	0	0
			721	721		

### 3 Residue-property plots [i](#)

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. 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.

- Molecule 1: Putative soluble lytic murein transglycosylase

Chain B:  90% 8%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	67.05Å 72.97Å 124.61Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	62.96 – 1.44 47.38 – 1.40	Depositor EDS
% Data completeness (in resolution range)	97.4 (62.96-1.44) 97.4 (47.38-1.40)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.45 (at 1.40Å)	Xtriage
Refinement program	PHENIX	Depositor
R, $R_{free}$	(Not available) , (Not available) 0.185 , 0.212	Depositor DCC
$R_{free}$ test set	11813 reflections (10.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	14.9	Xtriage
Anisotropy	0.103	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 41.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	5318	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	17.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.72% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: SO4

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	B	1.39	20/4653 (0.4%)	1.22	33/6299 (0.5%)

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	120	GLU	CD-OE1	15.96	1.43	1.25
1	B	98	GLU	CD-OE2	-10.87	1.13	1.25
1	B	120	GLU	CG-CD	10.83	1.68	1.51
1	B	120	GLU	CD-OE2	9.70	1.36	1.25
1	B	267	TYR	CD1-CE1	7.62	1.50	1.39
1	B	568	GLU	CB-CG	-7.25	1.38	1.52
1	B	408	ARG	CZ-NH1	7.14	1.42	1.33
1	B	135	SER	CB-OG	-6.39	1.33	1.42
1	B	98	GLU	CD-OE1	-6.15	1.18	1.25
1	B	414	PHE	CE2-CZ	5.82	1.48	1.37
1	B	93	GLU	CD-OE1	5.79	1.32	1.25
1	B	235	GLU	CB-CG	-5.66	1.41	1.52
1	B	249	VAL	CB-CG1	5.63	1.64	1.52
1	B	506	ARG	CB-CG	-5.47	1.37	1.52
1	B	317	TRP	CG-CD1	5.42	1.44	1.36
1	B	409	PHE	CE2-CZ	5.40	1.47	1.37
1	B	441	ARG	CZ-NH2	5.35	1.40	1.33
1	B	532	TYR	CZ-OH	5.14	1.46	1.37
1	B	469	VAL	CB-CG2	-5.01	1.42	1.52
1	B	448	TYR	CE2-CZ	5.00	1.45	1.38

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	408	ARG	NE-CZ-NH2	-11.39	114.61	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	441	ARG	NE-CZ-NH1	-10.76	114.92	120.30
1	B	290	ARG	NE-CZ-NH2	-10.30	115.15	120.30
1	B	290	ARG	NE-CZ-NH1	8.86	124.73	120.30
1	B	412	ARG	NE-CZ-NH2	-8.52	116.04	120.30
1	B	322	ARG	NE-CZ-NH1	8.42	124.51	120.30
1	B	383	ARG	NE-CZ-NH1	8.16	124.38	120.30
1	B	479	ARG	NE-CZ-NH1	8.02	124.31	120.30
1	B	582	ARG	NE-CZ-NH1	8.01	124.30	120.30
1	B	124	ARG	NE-CZ-NH2	-7.85	116.38	120.30
1	B	359	ASP	CB-CG-OD1	7.71	125.24	118.30
1	B	284	TYR	CB-CG-CD2	-7.34	116.59	121.00
1	B	506	ARG	NE-CZ-NH1	-7.07	116.77	120.30
1	B	396	ASP	CB-CG-OD1	6.95	124.55	118.30
1	B	278	ASP	CB-CG-OD1	6.79	124.41	118.30
1	B	120	GLU	CG-CD-OE2	-6.69	104.91	118.30
1	B	96	ARG	NE-CZ-NH1	6.60	123.60	120.30
1	B	366	ASP	CB-CG-OD1	6.43	124.08	118.30
1	B	320	ARG	NE-CZ-NH2	-6.30	117.15	120.30
1	B	408	ARG	NE-CZ-NH1	6.27	123.43	120.30
1	B	278	ASP	CB-CG-OD2	-6.11	112.80	118.30
1	B	578	PHE	CB-CG-CD1	6.03	125.02	120.80
1	B	88	ASP	CB-CG-OD1	6.00	123.70	118.30
1	B	599	PHE	CB-CG-CD2	-5.90	116.67	120.80
1	B	441	ARG	NE-CZ-NH2	5.87	123.23	120.30
1	B	431	PHE	CB-CG-CD2	5.56	124.69	120.80
1	B	31	LYS	C-N-CA	5.45	135.33	121.70
1	B	609	ARG	NE-CZ-NH2	-5.38	117.61	120.30
1	B	366	ASP	CB-CG-OD2	-5.37	113.47	118.30
1	B	417	ASP	CB-CG-OD1	5.35	123.11	118.30
1	B	322	ARG	NE-CZ-NH2	-5.29	117.65	120.30
1	B	169	LEU	CB-CG-CD1	-5.06	102.40	111.00
1	B	415	ASP	CB-CG-OD1	5.00	122.80	118.30

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	B	4562	0	4481	20	0
2	B	35	0	0	1	0
3	B	721	0	0	3	1
All	All	5318	0	4481	20	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 2.

All (20) 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:31:LYS:HB3	1:B:32:THR:HG23	1.14	1.11
1:B:31:LYS:HB3	1:B:32:THR:CG2	2.03	0.89
1:B:31:LYS:CB	1:B:32:THR:HG23	2.06	0.82
1:B:557:ARG:HD3	1:B:578:PHE:CE2	2.32	0.65
1:B:557:ARG:CD	1:B:578:PHE:CE2	2.84	0.61
1:B:557:ARG:HD3	1:B:578:PHE:CZ	2.38	0.58
1:B:235:GLU:O	1:B:243:ARG:HD3	2.09	0.52
1:B:539:ARG:NH2	3:B:808:HOH:O	2.45	0.49
1:B:458:ASP:O	1:B:462:ARG:NH1	2.46	0.48
1:B:220:GLU:CD	1:B:220:GLU:H	2.15	0.48
1:B:31:LYS:HZ2	1:B:32:THR:HG22	1.81	0.45
1:B:503:ALA:O	1:B:506:ARG:HG3	2.17	0.44
1:B:506:ARG:NH1	1:B:506:ARG:CG	2.80	0.44
1:B:319:ALA:HB2	1:B:334:LEU:HB3	2.01	0.43
1:B:234:MET:HE2	1:B:234:MET:HB3	1.67	0.43
1:B:441:ARG:CZ	3:B:908:HOH:O	2.67	0.42
1:B:368:GLY:HA3	2:B:702:SO4:S	2.60	0.42
1:B:557:ARG:CD	1:B:578:PHE:CZ	3.04	0.41
1:B:559:ARG:NE	3:B:824:HOH:O	2.53	0.40
1:B:120:GLU:CD	1:B:120:GLU:H	2.24	0.40

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:1073:HOH:O	3:B:1100:HOH:O[3_454]	1.99	0.21

## 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	B	586/586 (100%)	581 (99%)	5 (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	B	451/450 (100%)	443 (98%)	8 (2%)	59	25

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	234	MET
1	B	284	TYR
1	B	308	LEU
1	B	343	ARG
1	B	431	PHE
1	B	449[A]	THR
1	B	449[B]	THR
1	B	506	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	215	ASN
1	B	303	HIS
1	B	337	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](#)

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

### 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

7 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	SO4	B	705	-	4,4,4	0.38	0	6,6,6	0.35	0
2	SO4	B	701	-	4,4,4	0.40	0	6,6,6	0.55	0
2	SO4	B	706	-	4,4,4	0.53	0	6,6,6	0.60	0
2	SO4	B	702	-	4,4,4	0.56	0	6,6,6	0.77	0
2	SO4	B	703	-	4,4,4	0.55	0	6,6,6	0.92	0
2	SO4	B	704	1	4,4,4	1.05	0	6,6,6	1.35	1 (16%)
2	SO4	B	707	-	4,4,4	0.30	0	6,6,6	0.57	0

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
2	B	704	SO4	O3-S-O1	-2.83	94.52	109.31

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	702	SO4	1	0

## 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

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.