



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 14, 2026 – 10:25 AM UTC

PDB ID : 6CL5 / pdb_00006cl5
Title : Structure of P. aeruginosa R1 pyocin fiber PALES_06171 comprising C-terminal residues 323-701
Authors : Buth, S.A.; Shneider, M.M.; Leiman, P.G.
Deposited on : 2018-03-01
Resolution : 2.32 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
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

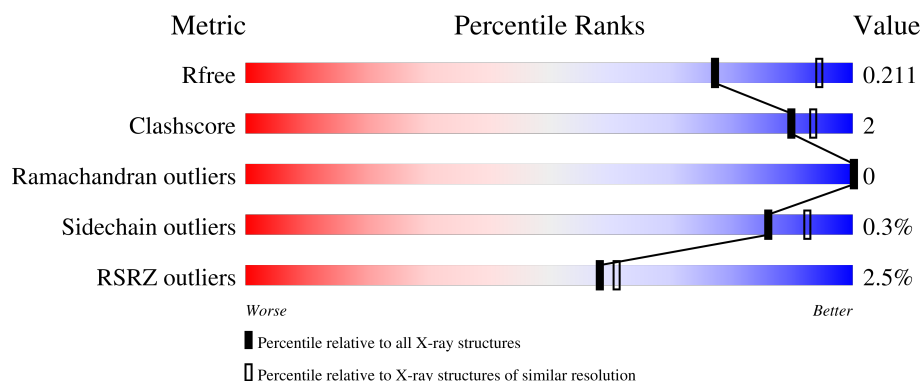
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.32 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	7754 (2.34-2.30)
Clashscore	190562	8383 (2.34-2.30)
Ramachandran outliers	187476	8303 (2.34-2.30)
Sidechain outliers	187428	8303 (2.34-2.30)
RSRZ outliers	180081	7760 (2.34-2.30)

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	2% 93% 5% . .
1	B	384	4% 94% 5% . .
1	C	384	4% 92% 5% .
1	D	384	0% 94% 5% . .
1	E	384	2% 92% 5% .

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Mol	Chain	Length	Quality of chain
1	F	384	2% 93%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 35038 atoms, of which 16152 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 Tail fiber protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	374	Total	C	H	N	O	S	0	0	0
			5500	1774	2692	491	533	10			
1	B	374	Total	C	H	N	O	S	0	0	0
			5501	1774	2693	491	533	10			
1	C	374	Total	C	H	N	O	S	0	0	0
			5499	1774	2691	491	533	10			
1	D	374	Total	C	H	N	O	S	0	0	0
			5500	1774	2692	491	533	10			
1	E	374	Total	C	H	N	O	S	0	0	0
			5500	1774	2692	491	533	10			
1	F	374	Total	C	H	N	O	S	0	0	0
			5500	1774	2692	491	533	10			

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	318	SER	-	cloning artifact	UNP Q9KW03
A	319	GLY	-	cloning artifact	UNP Q9KW03
A	320	SER	-	cloning artifact	UNP Q9KW03
A	321	GLU	-	cloning artifact	UNP Q9KW03
A	322	PHE	-	cloning artifact	UNP Q9KW03
B	318	SER	-	cloning artifact	UNP Q9KW03
B	319	GLY	-	cloning artifact	UNP Q9KW03
B	320	SER	-	cloning artifact	UNP Q9KW03
B	321	GLU	-	cloning artifact	UNP Q9KW03
B	322	PHE	-	cloning artifact	UNP Q9KW03
C	318	SER	-	cloning artifact	UNP Q9KW03
C	319	GLY	-	cloning artifact	UNP Q9KW03
C	320	SER	-	cloning artifact	UNP Q9KW03
C	321	GLU	-	cloning artifact	UNP Q9KW03
C	322	PHE	-	cloning artifact	UNP Q9KW03
D	318	SER	-	cloning artifact	UNP Q9KW03
D	319	GLY	-	cloning artifact	UNP Q9KW03

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Chain	Residue	Modelled	Actual	Comment	Reference
D	320	SER	-	cloning artifact	UNP Q9KW03
D	321	GLU	-	cloning artifact	UNP Q9KW03
D	322	PHE	-	cloning artifact	UNP Q9KW03
E	318	SER	-	cloning artifact	UNP Q9KW03
E	319	GLY	-	cloning artifact	UNP Q9KW03
E	320	SER	-	cloning artifact	UNP Q9KW03
E	321	GLU	-	cloning artifact	UNP Q9KW03
E	322	PHE	-	cloning artifact	UNP Q9KW03
F	318	SER	-	cloning artifact	UNP Q9KW03
F	319	GLY	-	cloning artifact	UNP Q9KW03
F	320	SER	-	cloning artifact	UNP Q9KW03
F	321	GLU	-	cloning artifact	UNP Q9KW03
F	322	PHE	-	cloning artifact	UNP Q9KW03

- Molecule 2 is FE (III) ION (CCD ID: FE) (formula: Fe).

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

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Mg 1 1	0	0
3	D	1	Total Mg 1 1	0	0

- Molecule 4 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Na 1 1	0	0
4	B	1	Total Na 1 1	0	0
4	C	1	Total Na 1 1	0	0
4	D	1	Total Na 1 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	E	1	Total 1	Na 1	0	0
4	F	1	Total 1	Na 1	0	0

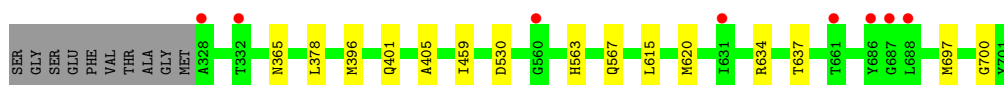
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	369	Total 369	O 369	0	0
5	B	314	Total 314	O 314	0	0
5	C	321	Total 321	O 321	0	0
5	D	395	Total 395	O 395	0	0
5	E	305	Total 305	O 305	0	0
5	F	324	Total 324	O 324	0	0

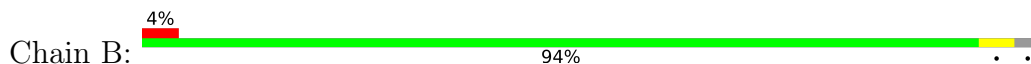
3 Residue-property plots [i](#)

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: Tail fiber protein



- Molecule 1: Tail fiber protein



- Molecule 1: Tail fiber protein



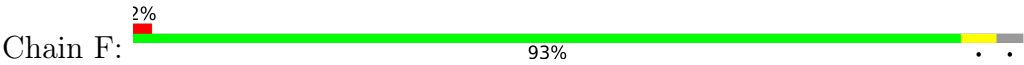
- Molecule 1: Tail fiber protein



- Molecule 1: Tail fiber protein



- Molecule 1: Tail fiber protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	144.50Å 155.03Å 200.48Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.69 – 2.32 47.69 – 2.32	Depositor EDS
% Data completeness (in resolution range)	99.1 (47.69-2.32) 99.5 (47.69-2.32)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.96 (at 2.32Å)	Xtriage
Refinement program	PHENIX (dev_3042: ???)	Depositor
R, R_{free}	0.169 , 0.206 0.173 , 0.211	Depositor DCC
R_{free} test set	9621 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	38.6	Xtriage
Anisotropy	0.893	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 62.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	35038	wwPDB-VP
Average B, all atoms (Å ²)	66.0	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 31.60 % 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 1.0781e-03. 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: FE, MG, NA

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	0.15	0/2888	0.34	0/3959
1	B	0.14	0/2888	0.34	0/3959
1	C	0.14	0/2888	0.34	0/3959
1	D	0.15	0/2888	0.36	0/3959
1	E	0.14	0/2888	0.34	0/3959
1	F	0.14	0/2888	0.34	0/3959
All	All	0.14	0/17328	0.34	0/23754

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	2808	2692	2692	12	0
1	B	2808	2693	2692	11	0
1	C	2808	2691	2692	15	0
1	D	2808	2692	2692	11	0
1	E	2808	2692	2692	14	0
1	F	2808	2692	2692	13	0
2	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	1	0	0	0	0
3	A	1	0	0	0	0
3	D	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
4	F	1	0	0	0	0
5	A	369	0	0	1	5
5	B	314	0	0	0	3
5	C	321	0	0	0	1
5	D	395	0	0	1	2
5	E	305	0	0	2	2
5	F	324	0	0	2	0
All	All	18886	16152	16152	58	7

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.

The worst 5 of 58 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:697:MET:HE1	1:C:697:MET:HE1	1.61	0.82
1:D:697:MET:HE1	1:E:697:MET:HE1	1.62	0.82
1:A:697:MET:HE1	1:B:697:MET:HE1	1.63	0.81
1:D:697:MET:HE1	1:F:697:MET:HE1	1.64	0.78
1:A:697:MET:HE1	1:C:697:MET:HE1	1.65	0.78

The worst 5 of 7 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)
5:D:1227:HOH:O	5:E:1162:HOH:O[4_465]	1.99	0.21
5:A:1173:HOH:O	5:B:1184:HOH:O[4_455]	2.00	0.20
5:A:1173:HOH:O	5:B:1176:HOH:O[4_455]	2.01	0.19
5:A:963:HOH:O	5:B:1032:HOH:O[4_455]	2.06	0.14
5:A:988:HOH:O	5:C:1160:HOH:O[4_455]	2.06	0.14

5.3 Torsion angles

5.3.1 Protein backbone

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	372/384 (97%)	364 (98%)	8 (2%)	0	100	100
1	B	372/384 (97%)	365 (98%)	7 (2%)	0	100	100
1	C	372/384 (97%)	357 (96%)	15 (4%)	0	100	100
1	D	372/384 (97%)	366 (98%)	6 (2%)	0	100	100
1	E	372/384 (97%)	365 (98%)	7 (2%)	0	100	100
1	F	372/384 (97%)	359 (96%)	13 (4%)	0	100	100
All	All	2232/2304 (97%)	2176 (98%)	56 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	291/298 (98%)	291 (100%)	0	100	100
1	B	291/298 (98%)	289 (99%)	2 (1%)	76	86
1	C	291/298 (98%)	290 (100%)	1 (0%)	86	92
1	D	291/298 (98%)	291 (100%)	0	100	100
1	E	291/298 (98%)	289 (99%)	2 (1%)	76	86
1	F	291/298 (98%)	291 (100%)	0	100	100
All	All	1746/1788 (98%)	1741 (100%)	5 (0%)	86	92

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	364	SER
1	B	618	GLN
1	C	364	SER
1	E	364	SER
1	E	525	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	499	HIS
1	E	611	ASN
1	F	437	GLN
1	E	623	ASN
1	F	402	ASN

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 10 ligands modelled in this entry, 10 are 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	374/384 (97%)	-0.13	8 (2%) 63 66	40, 58, 106, 134	0
1	B	374/384 (97%)	0.05	14 (3%) 45 48	41, 60, 120, 136	0
1	C	374/384 (97%)	0.05	16 (4%) 40 42	36, 60, 120, 162	0
1	D	374/384 (97%)	-0.28	3 (0%) 82 84	38, 56, 87, 110	0
1	E	374/384 (97%)	-0.04	9 (2%) 59 62	38, 62, 110, 141	0
1	F	374/384 (97%)	-0.15	7 (1%) 66 68	37, 61, 107, 136	0
All	All	2244/2304 (97%)	-0.08	57 (2%) 58 61	36, 60, 113, 162	0

The worst 5 of 57 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	328	ALA	6.6
1	A	328	ALA	6.5
1	C	686	TYR	6.3
1	E	328	ALA	6.1
1	E	687	GLY	5.6

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
4	NA	C	801	1/1	0.87	0.10	77,77,77,77	0
4	NA	D	803	1/1	0.93	0.17	84,84,84,84	0
3	MG	A	802	1/1	0.95	0.17	153,153,153,153	0
3	MG	D	802	1/1	0.96	0.17	89,89,89,89	0
4	NA	E	801	1/1	0.96	0.12	138,138,138,138	0
4	NA	F	801	1/1	0.97	0.05	75,75,75,75	0
4	NA	B	801	1/1	0.98	0.06	75,75,75,75	0
4	NA	A	803	1/1	0.99	0.04	65,65,65,65	0
2	FE	A	801	1/1	0.99	0.04	80,80,80,80	0
2	FE	D	801	1/1	1.00	0.03	68,68,68,68	0

6.5 Other polymers [i](#)

There are no such residues in this entry.