wwPDB X-ray Structure Validation Summary Report (i)

Feb 16, 2023 – 12:16 pm GMT

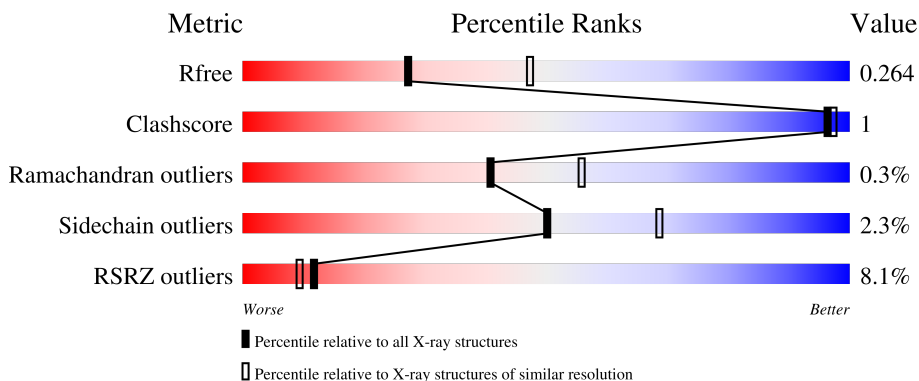|		
PDB ID	:	7ZG8
Title	:	Crystal structure of A. baumannii penicillin-binding protein 2
Authors	:	Micelli, C.; Crow, A.; Roper, D.I.
Deposited on	:	2022-04-02
Resolution	:	2.65 Å(reported)

1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
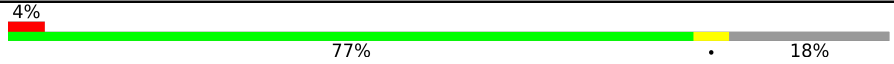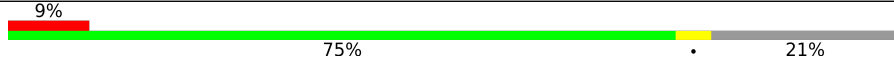*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.65 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	Percentile Ranks	Value
Rfree		0.264
Clashscore		1
Ramachandran outliers		0.3%
Sidechain outliers		2.3%
RSRZ outliers		8.1%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1332 (2.68-2.64)
Clashscore	141614	1374 (2.68-2.64)
Ramachandran outliers	138981	1349 (2.68-2.64)
Sidechain outliers	138945	1349 (2.68-2.64)
RSRZ outliers	127900	1318 (2.68-2.64)

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 <=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	AAA	642	4% — 77% · 18%
1	BBB	642	9% — 75% · 21%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 8194 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 Peptidoglycan D,D-transpeptidase MrdA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	AAA	525	Total	C	N	O	S	0	1	0
			4128	2625	725	763	15			
1	BBB	504	Total	C	N	O	S	0	0	0
			3951	2515	690	732	14			

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AAA	31	MET	-	initiating methionine	UNP G1C6X4
AAA	32	ALA	-	expression tag	UNP G1C6X4
AAA	33	HIS	-	expression tag	UNP G1C6X4
AAA	34	HIS	-	expression tag	UNP G1C6X4
AAA	35	HIS	-	expression tag	UNP G1C6X4
AAA	36	HIS	-	expression tag	UNP G1C6X4
AAA	37	HIS	-	expression tag	UNP G1C6X4
AAA	38	HIS	-	expression tag	UNP G1C6X4
AAA	39	SER	-	expression tag	UNP G1C6X4
AAA	40	ALA	-	expression tag	UNP G1C6X4
AAA	41	ALA	-	expression tag	UNP G1C6X4
AAA	42	LEU	-	expression tag	UNP G1C6X4
AAA	43	GLU	-	expression tag	UNP G1C6X4
AAA	44	VAL	-	expression tag	UNP G1C6X4
AAA	45	LEU	-	expression tag	UNP G1C6X4
AAA	46	PHE	-	expression tag	UNP G1C6X4
AAA	47	GLN	-	expression tag	UNP G1C6X4
AAA	48	GLY	-	expression tag	UNP G1C6X4
AAA	49	PRO	-	expression tag	UNP G1C6X4
AAA	50	GLY	-	expression tag	UNP G1C6X4
AAA	51	TYR	-	expression tag	UNP G1C6X4
AAA	52	GLN	-	expression tag	UNP G1C6X4
BBB	31	MET	-	initiating methionine	UNP G1C6X4
BBB	32	ALA	-	expression tag	UNP G1C6X4
BBB	33	HIS	-	expression tag	UNP G1C6X4

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Chain	Residue	Modelled	Actual	Comment	Reference
BBB	34	HIS	-	expression tag	UNP G1C6X4
BBB	35	HIS	-	expression tag	UNP G1C6X4
BBB	36	HIS	-	expression tag	UNP G1C6X4
BBB	37	HIS	-	expression tag	UNP G1C6X4
BBB	38	HIS	-	expression tag	UNP G1C6X4
BBB	39	SER	-	expression tag	UNP G1C6X4
BBB	40	ALA	-	expression tag	UNP G1C6X4
BBB	41	ALA	-	expression tag	UNP G1C6X4
BBB	42	LEU	-	expression tag	UNP G1C6X4
BBB	43	GLU	-	expression tag	UNP G1C6X4
BBB	44	VAL	-	expression tag	UNP G1C6X4
BBB	45	LEU	-	expression tag	UNP G1C6X4
BBB	46	PHE	-	expression tag	UNP G1C6X4
BBB	47	GLN	-	expression tag	UNP G1C6X4
BBB	48	GLY	-	expression tag	UNP G1C6X4
BBB	49	PRO	-	expression tag	UNP G1C6X4
BBB	50	GLY	-	expression tag	UNP G1C6X4
BBB	51	TYR	-	expression tag	UNP G1C6X4
BBB	52	GLN	-	expression tag	UNP G1C6X4

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	AAA	1	Total 1	Zn 1	0	0
2	BBB	1	Total 1	Zn 1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	AAA	67	Total 67	O 67	0	0
3	BBB	46	Total 46	O 46	0	0

3 Residue-property plots ⓘ

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: Peptidoglycan D,D-transpeptidase MrdA

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4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α, β, γ	121.25Å 151.03Å 177.37Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.33 – 2.65 43.46 – 2.65	Depositor EDS
% Data completeness (in resolution range)	98.4 (44.33-2.65) 98.4 (43.46-2.65)	Depositor EDS
R_{merge}	0.20	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.06 (at 2.65Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.211 , 0.252 0.224 , 0.264	Depositor DCC
R_{free} test set	2395 reflections (5.12%)	wwPDB-VP
Wilson B-factor (Å^2)	44.8	Xtriage
Anisotropy	0.276	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 42.8	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	8194	wwPDB-VP
Average B, all atoms (Å^2)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.64% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: ZN

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	AAA	0.68	0/4227	0.90	0/5731
1	BBB	0.67	0/4044	0.89	0/5484
All	All	0.67	0/8271	0.90	0/11215

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	AAA	4128	0	4099	10	0
1	BBB	3951	0	3914	6	0
2	AAA	1	0	0	0	0
2	BBB	1	0	0	0	0
3	AAA	67	0	0	0	0
3	BBB	46	0	0	0	0
All	All	8194	0	8013	16	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 1.

The worst 5 of 16 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:BBB:365:ASP:HA	1:BBB:385:ASP:HB2	1.95	0.49
1:AAA:62:GLN:HA	1:AAA:129:THR:HB	1.95	0.49
1:AAA:120:LYS:HA	1:AAA:123:ILE:HG22	1.98	0.45
1:AAA:529:THR:HG22	1:AAA:598:LYS:CE	2.45	0.45
1:AAA:562:LEU:HD13	1:AAA:588:ARG:HD2	1.99	0.45

There are no symmetry-related clashes.

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	AAA	520/642 (81%)	494 (95%)	24 (5%)	2 (0%)	34	48
1	BBB	494/642 (77%)	474 (96%)	19 (4%)	1 (0%)	47	64
All	All	1014/1284 (79%)	968 (96%)	43 (4%)	3 (0%)	41	56

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	AAA	116	VAL
1	BBB	116	VAL
1	AAA	357	PRO

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	AAA	439/527 (83%)	429 (98%)	10 (2%)	50	68
1	BBB	419/527 (80%)	409 (98%)	10 (2%)	49	67
All	All	858/1054 (81%)	838 (98%)	20 (2%)	50	68

5 of 20 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	BBB	190	ILE
1	BBB	446	SER
1	BBB	533	GLN
1	BBB	529	THR
1	AAA	435	ARG

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

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 2 ligands modelled in this entry, 2 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 ⓘ

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(Å²)	Q<0.9
1	AAA	525/642 (81%)	0.14	27 (5%)	28	25	30, 52, 110, 147	0
1	BBB	504/642 (78%)	0.42	56 (11%)	5	3	31, 61, 125, 166	0
All	All	1029/1284 (80%)	0.28	83 (8%)	12	9	30, 56, 118, 166	0

The worst 5 of 83 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	BBB	363	PHE	5.2
1	BBB	134	ILE	5.0
1	BBB	90	LEU	4.5
1	BBB	93	ALA	4.5
1	AAA	356	LEU	4.2

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 ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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	ZN	BBB	700	1/1	0.86	0.04	118,118,118,118	0
2	ZN	AAA	700	1/1	0.99	0.09	55,55,55,55	0

6.5   Other polymers ⓘ

There are no such residues in this entry.