



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 10:28 AM UTC

PDB ID : 8QJC / pdb_00008qjc
Title : T6SS-linked Rhs repeat protein - Salmonella bongori Rhs-core domain with toxin domain
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Deposited on : 2023-09-13
Resolution : 2.49 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 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

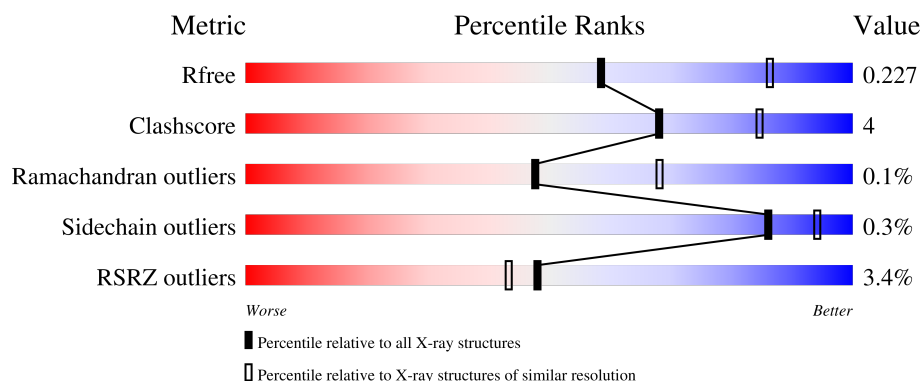
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.49 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	1530	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 9089 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 T6SS-associated Rhs core and toxin domain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	1048	Total	C	N	O	S	0	0	0
			8534	5294	1540	1676	24			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	555	Total	O	0	0
			555	555		

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	71.44Å 118.33Å 169.75Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.62 – 2.49 49.62 – 2.49	Depositor EDS
% Data completeness (in resolution range)	98.1 (49.62-2.49) 99.1 (49.62-2.49)	Depositor EDS
R_{merge}	0.23	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.39 (at 2.48Å)	Xtriage
Refinement program	PHENIX 1.18.2_3874, PHENIX 1.20.1_4487, BUSTER	Depositor
R, R_{free}	0.190 , 0.228 0.190 , 0.227	Depositor DCC
R_{free} test set	2534 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	33.1	Xtriage
Anisotropy	0.100	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 36.9	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	0.93	EDS
Total number of atoms	9089	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 2.56% 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](#)

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	0.13	0/8740	0.31	0/11869

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	8534	0	8023	60	0
2	A	555	0	0	25	2
All	All	9089	0	8023	60	2

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 4.

All (60) 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:1197:ASP:OD1	2:A:1601:HOH:O	1.88	0.90
1:A:424:HIS:ND1	2:A:1607:HOH:O	2.06	0.89
1:A:1413:SER:OG	2:A:1602:HOH:O	1.92	0.87
1:A:618:GLU:OE1	2:A:1603:HOH:O	2.00	0.80

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:642:GLU:OE1	2:A:1606:HOH:O	2.04	0.76
1:A:916:ASP:OD2	2:A:1605:HOH:O	2.04	0.75
1:A:1077:ARG:O	2:A:1608:HOH:O	2.09	0.70
1:A:1083:ARG:NH2	1:A:1329:GLU:OE2	2.26	0.69
1:A:1276:ASP:OD1	2:A:1610:HOH:O	2.12	0.67
1:A:753:ALA:O	2:A:1611:HOH:O	2.14	0.65
1:A:1246:ARG:HG3	1:A:1372:GLU:HG3	1.79	0.64
1:A:1333:GLU:OE2	2:A:1613:HOH:O	2.14	0.64
1:A:391:ARG:HB3	1:A:394:ALA:HB2	1.81	0.63
1:A:965:ALA:HB2	1:A:1257:ILE:HD13	1.83	0.60
1:A:1272:HIS:HB3	1:A:1280:GLU:HB2	1.82	0.60
1:A:748:ARG:NH1	2:A:1619:HOH:O	2.24	0.58
1:A:1173:ARG:NH1	2:A:1622:HOH:O	2.27	0.57
1:A:1384:ASP:OD2	2:A:1615:HOH:O	2.17	0.57
1:A:1127:MET:HG3	1:A:1128:ARG:HG3	1.86	0.57
1:A:498:ARG:NH1	2:A:1612:HOH:O	2.14	0.56
1:A:1043:GLN:NE2	2:A:1638:HOH:O	2.38	0.56
1:A:1281:GLU:HG3	1:A:1296:ILE:HB	1.88	0.55
1:A:702:ASN:HB3	2:A:1771:HOH:O	2.06	0.55
1:A:1261:CYS:SG	1:A:1264:ARG:HB2	2.50	0.52
1:A:527:ASP:OD1	1:A:535:ARG:NE	2.40	0.52
1:A:429:LEU:HD11	1:A:447:GLN:HB2	1.91	0.52
1:A:770:THR:HG22	1:A:781:VAL:HG22	1.92	0.52
1:A:1322:ASP:O	2:A:1616:HOH:O	2.19	0.51
1:A:1280:GLU:HG2	1:A:1297:ARG:HG2	1.93	0.51
1:A:722:GLN:NE2	2:A:1652:HOH:O	2.45	0.49
1:A:1379:ARG:NE	2:A:1610:HOH:O	2.39	0.49
1:A:790:GLN:NE2	2:A:1657:HOH:O	2.46	0.49
1:A:1249:LYS:HE2	2:A:2080:HOH:O	2.14	0.48
1:A:1052:GLN:HG2	1:A:1063:GLN:HG2	1.96	0.48
1:A:922:ARG:HG2	1:A:933:GLU:HG2	1.94	0.48
1:A:1083:ARG:HH22	1:A:1329:GLU:CD	2.19	0.47
1:A:743:ASN:HB3	1:A:994:ASP:HB3	1.98	0.46
1:A:1170:LYS:HD2	1:A:1172:TRP:CZ2	2.50	0.46
1:A:1168:GLU:OE2	1:A:1199:GLN:NE2	2.44	0.46
1:A:364:ILE:HG23	1:A:612:THR:HB	1.98	0.46
1:A:1173:ARG:HB2	1:A:1195:ILE:HD13	1.96	0.46
1:A:1140:ILE:HD11	1:A:1346:TRP:CE2	2.51	0.45
1:A:553:ILE:HG23	1:A:554:GLN:HG3	2.00	0.44
1:A:837:ARG:NH1	2:A:1628:HOH:O	2.32	0.44
1:A:413:THR:HG22	1:A:480:ILE:HG12	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:581:ILE:O	2:A:1617:HOH:O	2.21	0.44
1:A:446:ARG:NE	2:A:1671:HOH:O	2.52	0.43
1:A:651:ARG:HD3	1:A:667:TYR:CG	2.54	0.42
1:A:1114:ILE:HD12	1:A:1345:LEU:HD11	2.01	0.42
1:A:376:LEU:HD11	1:A:536:LEU:HD13	2.02	0.42
1:A:750:SER:OG	1:A:759:ALA:HB3	2.20	0.41
1:A:1342:LYS:HD2	1:A:1342:LYS:HA	1.89	0.41
1:A:451:ARG:HA	1:A:451:ARG:HD3	1.88	0.41
1:A:1259:LYS:HD2	1:A:1372:GLU:OE2	2.20	0.41
1:A:860:ARG:HD3	1:A:869:GLU:OE1	2.21	0.41
1:A:869:GLU:OE2	1:A:879:ARG:NH1	2.54	0.41
1:A:1198:GLU:HB3	1:A:1217:LYS:HA	2.03	0.40
1:A:1021:TRP:CZ2	1:A:1299:ILE:HG21	2.56	0.40
1:A:689:ASN:ND2	1:A:693:GLN:HB2	2.36	0.40
1:A:1313:LYS:NZ	2:A:1650:HOH:O	2.44	0.40

All (2) 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)
2:A:2060:HOH:O	2:A:2109:HOH:O[3_454]	1.97	0.23
2:A:2114:HOH:O	2:A:2115:HOH:O[3_554]	2.08	0.12

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	1044/1530 (68%)	1017 (97%)	26 (2%)	1 (0%)	48 68

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1379	ARG

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	909/1293 (70%)	906 (100%)	3 (0%)	86	94

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	532	GLN
1	A	741	MET
1	A	1069	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	478	ASN
1	A	669	ASN
1	A	703	GLN
1	A	722	GLN
1	A	772	GLN
1	A	819	GLN
1	A	1020	GLN
1	A	1137	ASN
1	A	1328	GLN
1	A	1343	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

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

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(Å ²)	Q<0.9
1	A	1048/1530 (68%)	-0.12	36 (3%) 48 43	24, 34, 59, 125	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1125	ILE	6.5
1	A	1176	THR	5.1
1	A	1175	THR	4.4
1	A	477	ASP	4.0
1	A	1191	PHE	4.0
1	A	1190	GLN	3.7
1	A	798	ALA	3.6
1	A	427	VAL	3.6
1	A	1124	ASP	3.3
1	A	1263	ASN	3.2
1	A	1174	HIS	3.1
1	A	1123	SER	3.1
1	A	1121	GLY	2.9
1	A	1265	ASP	2.9
1	A	774	ILE	2.8
1	A	1264	ARG	2.6
1	A	1126	PRO	2.5
1	A	941	ASP	2.5
1	A	799	GLY	2.5
1	A	1070	GLU	2.5
1	A	1128	ARG	2.5
1	A	360	GLU	2.4
1	A	1127	MET	2.3
1	A	801	GLN	2.2
1	A	1266	ARG	2.2
1	A	478	ASN	2.2
1	A	702	ASN	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	1192	VAL	2.1
1	A	1261	CYS	2.1
1	A	1338	VAL	2.1
1	A	1297	ARG	2.1
1	A	939	ASP	2.1
1	A	532	GLN	2.1
1	A	1218	GLY	2.1
1	A	607	ASP	2.1
1	A	1122	SER	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 oligosaccharides 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.