



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 01:03 PM UTC

PDB ID : 6R1J / pdb_00006r1j
Title : Structure of the soluble AhlC triple head mutant of the tripartite alpha-pore forming toxin, AHL, from *Aeromonas hydrophila*.
Authors : Churchill-Angus, A.M.; Wilson, J.S.; Baker, P.J.
Deposited on : 2019-03-14
Resolution : 1.92 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

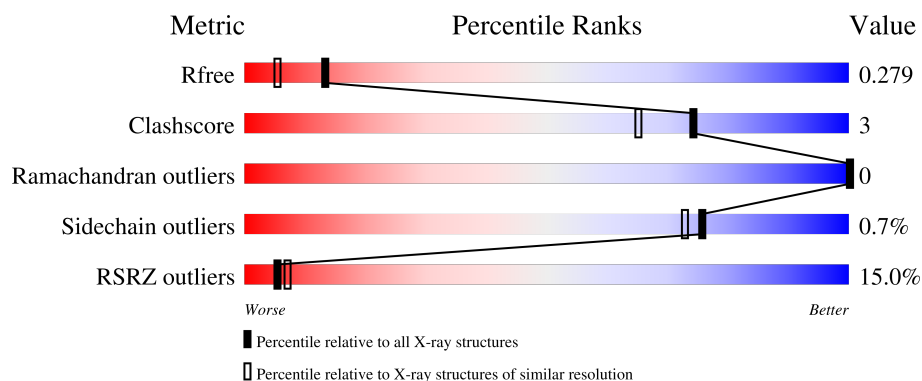
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.92 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	1188 (1.92-1.92)
Clashscore	190562	1209 (1.92-1.92)
Ramachandran outliers	187476	1195 (1.92-1.92)
Sidechain outliers	187428	1195 (1.92-1.92)
RSRZ outliers	180081	1188 (1.92-1.92)

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	D	272	 14% 84% 8% 8%
1	J	272	 14% 92% 5% . .

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4108 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 Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	J	264	Total	C	N	O	S	0	1	0
			1998	1241	358	397	2			
1	D	251	Total	C	N	O	S	0	1	0
			1894	1178	336	378	2			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
J	156	THR	LEU	engineered mutation	UNP A0A1U6XZ15
J	160	THR	LEU	engineered mutation	UNP A0A1U6XZ15
J	161	THR	LEU	engineered mutation	UNP A0A1U6XZ15
J	267	HIS	-	expression tag	UNP A0A1U6XZ15
J	268	HIS	-	expression tag	UNP A0A1U6XZ15
J	269	HIS	-	expression tag	UNP A0A1U6XZ15
J	270	HIS	-	expression tag	UNP A0A1U6XZ15
J	271	HIS	-	expression tag	UNP A0A1U6XZ15
J	272	HIS	-	expression tag	UNP A0A1U6XZ15
D	156	THR	LEU	engineered mutation	UNP A0A1U6XZ15
D	160	THR	LEU	engineered mutation	UNP A0A1U6XZ15
D	161	THR	LEU	engineered mutation	UNP A0A1U6XZ15
D	267	HIS	-	expression tag	UNP A0A1U6XZ15
D	268	HIS	-	expression tag	UNP A0A1U6XZ15
D	269	HIS	-	expression tag	UNP A0A1U6XZ15
D	270	HIS	-	expression tag	UNP A0A1U6XZ15
D	271	HIS	-	expression tag	UNP A0A1U6XZ15
D	272	HIS	-	expression tag	UNP A0A1U6XZ15

- Molecule 2 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	J	2	Total	Na	0	0
			2	2		

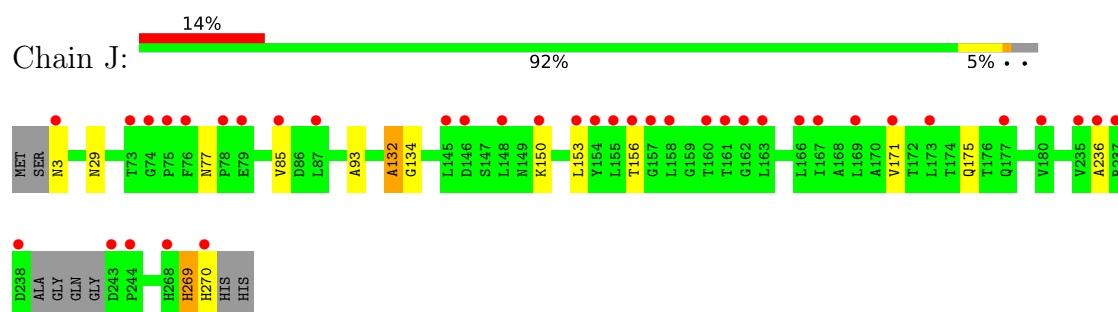
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	J	134	Total 134	O 134	0	0
3	D	80	Total 80	O 80	0	0

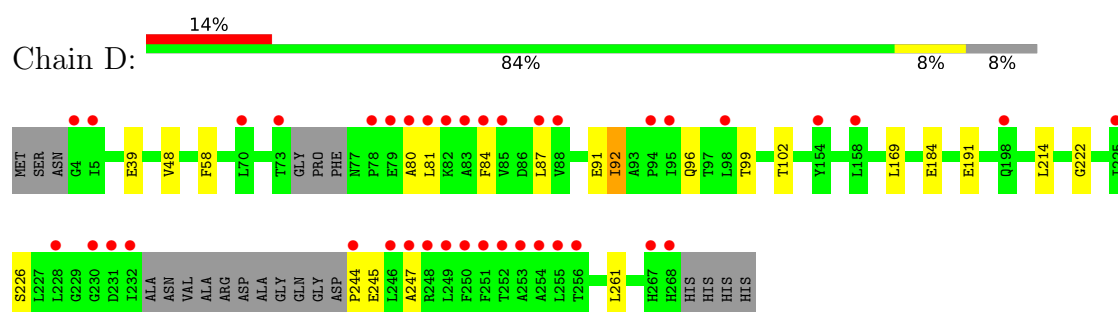
3 Residue-property plots [i](#)

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: Uncharacterized protein



• Molecule 1: Uncharacterized protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α , β , γ	88.54Å 88.54Å 290.98Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	76.68 – 1.92 76.68 – 1.92	Depositor EDS
% Data completeness (in resolution range)	100.0 (76.68-1.92) 100.0 (76.68-1.92)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.53 (at 1.92Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.234 , 0.278 0.242 , 0.279	Depositor DCC
R_{free} test set	2550 reflections (4.83%)	wwPDB-VP
Wilson B-factor (Å ²)	39.5	Xtriage
Anisotropy	0.179	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 31.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4108	wwPDB-VP
Average B, all atoms (Å ²)	51.0	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 67.90 % 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 4.7756e-06. 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: 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	D	1.09	0/1911	1.61	3/2591 (0.1%)
1	J	1.27	1/2020 (0.0%)	1.63	6/2743 (0.2%)
All	All	1.18	1/3931 (0.0%)	1.62	9/5334 (0.2%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	J	132	ALA	C-N	28.23	1.69	1.33

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	J	132	ALA	O-C-N	-6.77	113.94	122.27
1	D	184	GLU	CB-CA-C	-6.47	100.72	110.88
1	J	269	HIS	CA-CB-CG	5.52	119.32	113.80
1	J	156	THR	CA-C-N	5.30	126.95	120.22
1	J	156	THR	C-N-CA	5.30	126.95	120.22
1	D	191	GLU	CA-C-N	5.28	125.80	119.94
1	D	191	GLU	C-N-CA	5.28	125.80	119.94
1	J	132	ALA	CA-C-N	-5.17	113.65	120.22
1	J	132	ALA	C-N-CA	-5.17	113.65	120.22

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	D	1894	0	1929	13	1
1	J	1998	0	2021	11	0
2	J	2	0	0	0	0
3	D	80	0	0	2	1
3	J	134	0	0	3	0
All	All	4108	0	3950	24	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 3.

All (24) 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:J:132:ALA:C	1:J:134:GLY:N	1.69	1.46
1:J:85:VAL:HG11	1:J:236:ALA:HB2	1.58	0.83
1:J:132:ALA:C	1:J:134:GLY:CA	2.65	0.70
1:D:96:GLN:NE2	1:D:226:SER:HA	2.15	0.61
1:J:269:HIS:O	1:J:270:HIS:HB2	2.01	0.60
1:J:3:ASN:HB3	1:J:269:HIS:H	1.73	0.54
1:D:80:ALA:HA	3:D:372:HOH:O	2.10	0.51
1:J:3:ASN:OD1	1:J:269:HIS:CE1	2.63	0.51
1:D:214:LEU:C	1:D:214:LEU:HD23	2.35	0.51
1:D:169:LEU:HD23	1:D:169:LEU:C	2.37	0.50
1:D:91:GLU:OE1	3:D:302:HOH:O	2.20	0.48
1:D:81:LEU:CD1	1:D:247:ALA:HB2	2.46	0.46
1:D:99:THR:HG21	1:D:222:GLY:HA2	1.98	0.46
1:J:29:ASN:ND2	3:J:411:HOH:O	2.49	0.46
1:D:84:PHE:O	1:D:87:LEU:N	2.51	0.44
1:D:99:THR:HG21	1:D:222:GLY:CA	2.48	0.44
1:J:93:ALA:HA	3:J:448:HOH:O	2.19	0.42
1:D:48:VAL:HG22	1:D:102:THR:CG2	2.49	0.42
1:D:58:PHE:CZ	1:D:92:ILE:HG13	2.54	0.41
1:J:171:VAL:O	1:J:175:GLN:HG2	2.20	0.41
1:D:261:LEU:HD12	1:D:261:LEU:HA	1.89	0.41
1:J:153:LEU:HD23	1:J:153:LEU:C	2.46	0.40
1:D:245:GLU:OE1	1:D:245:GLU:O	2.39	0.40
1:J:150:LYS:C	3:J:407:HOH:O	2.65	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:39:GLU:OE2	3:D:301:HOH:O[5_554]	2.15	0.05

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	D	246/272 (90%)	243 (99%)	3 (1%)	0	100	100
1	J	261/272 (96%)	259 (99%)	2 (1%)	0	100	100
All	All	507/544 (93%)	502 (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	D	206/221 (93%)	204 (99%)	2 (1%)	68	64
1	J	217/221 (98%)	216 (100%)	1 (0%)	81	80
All	All	423/442 (96%)	420 (99%)	3 (1%)	76	73

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

Mol	Chain	Res	Type
1	J	77	ASN

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Mol	Chain	Res	Type
1	D	92	ILE
1	D	244	PRO

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	J	54	GLN
1	J	110	ASN
1	J	203	GLN
1	J	267	HIS
1	J	269	HIS
1	J	270	HIS
1	D	28	GLN
1	D	96	GLN
1	D	107	GLN
1	D	186	GLN
1	D	197	GLN
1	D	203	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 oligosaccharides 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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	J	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	J	132:ALA	C	134:GLY	N	1.69

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	D	251/272 (92%)	1.06	39 (15%) 5 6	24, 48, 92, 126	1 (0%)
1	J	264/272 (97%)	0.89	38 (14%) 6 8	23, 42, 86, 112	1 (0%)
All	All	515/544 (94%)	0.97	77 (14%) 5 7	23, 46, 89, 126	2 (0%)

All (77) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	232	ILE	11.0
1	D	246	LEU	5.9
1	D	244	PRO	5.8
1	J	153	LEU	5.5
1	D	81	LEU	5.5
1	J	158	LEU	5.1
1	D	83	ALA	4.7
1	J	167	ILE	4.7
1	D	268	HIS	4.7
1	D	73	THR	4.4
1	D	84	PHE	4.3
1	J	244	PRO	4.2
1	J	270	HIS	4.1
1	J	76	PHE	4.1
1	J	236	ALA	4.0
1	J	74	GLY	4.0
1	D	228	LEU	4.0
1	D	82	LYS	4.0
1	D	80	ALA	4.0
1	J	154	TYR	3.9
1	D	88	VAL	3.9
1	J	75	PRO	3.7
1	J	169	LEU	3.6
1	J	161	THR	3.6

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Mol	Chain	Res	Type	RSRZ
1	D	85	VAL	3.5
1	J	155	LEU	3.5
1	D	158	LEU	3.5
1	J	160	THR	3.4
1	J	78	PRO	3.4
1	J	163	LEU	3.3
1	D	250	PHE	3.3
1	D	78	PRO	3.3
1	J	148	LEU	3.2
1	D	256	THR	3.2
1	D	95	ILE	3.1
1	J	238	ASP	3.1
1	D	247	ALA	3.1
1	D	253	ALA	3.1
1	J	235	VAL	3.0
1	D	230	GLY	3.0
1	D	154	TYR	2.9
1	D	231	ASP	2.8
1	D	87	LEU	2.8
1	D	249	LEU	2.8
1	D	254	ALA	2.8
1	D	251	PHE	2.8
1	J	237	ARG	2.6
1	J	157	GLY	2.6
1	J	162	GLY	2.6
1	J	145	LEU	2.5
1	J	243	ASP	2.5
1	D	252	THR	2.5
1	D	79	GLU	2.5
1	J	146	ASP	2.5
1	J	150	LYS	2.5
1	D	267	HIS	2.5
1	D	98	LEU	2.5
1	J	85	VAL	2.5
1	J	173	LEU	2.4
1	D	248	ARG	2.4
1	J	73	THR	2.4
1	J	166	LEU	2.4
1	J	156	THR	2.3
1	D	94	PRO	2.3
1	J	87	LEU	2.3
1	D	70	LEU	2.3

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Mol	Chain	Res	Type	RSRZ
1	D	4	GLY	2.3
1	D	255	LEU	2.3
1	D	5	ILE	2.2
1	J	79	GLU	2.2
1	J	177	GLN	2.2
1	D	225	ILE	2.1
1	J	268	HIS	2.1
1	J	3	ASN	2.1
1	D	198	GLN	2.1
1	J	171	VAL	2.1
1	J	180	VAL	2.0

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
2	NA	J	302	1/1	0.88	0.10	62,62,62,62	0
2	NA	J	301	1/1	0.98	0.08	52,52,52,52	0

6.5 Other polymers [i](#)

There are no such residues in this entry.