Full wwPDB X-ray Structure Validation Report (i)

Jun 17, 2024 – 01:20 PM EDT

PDB ID	:	3LXQ
Title	:	The Crystal Structure of a Protein in the Alkaline Phosphatase Superfamily from Vibrio parahaemolyticus to 1.95A
Authors	:	Stein, A.J.; Weger, A.; Duggan, E.; Clancy, S.; Joachimiak, A.; Midwest Center for Structural Genomics (MCSG)
Deposited on	:	2010-02-25
Resolution	:	1.95 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 (i) 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 (i)) were used in the production of this report:

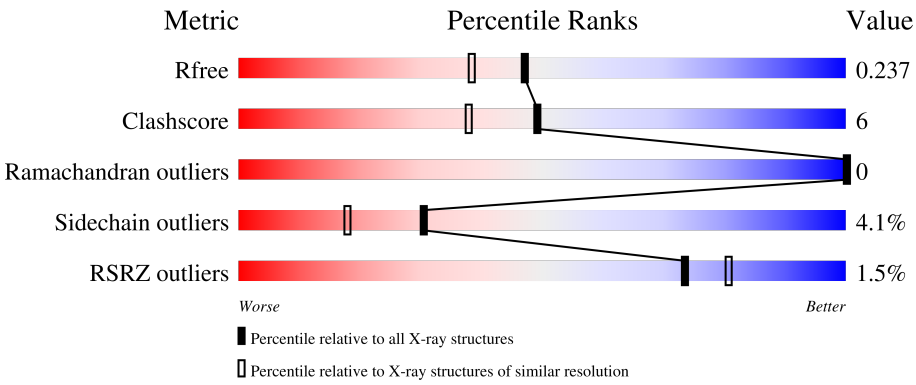
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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	A	450	2% 80% 9% • 9%
1	B	450	83% 7% • 9%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 6672 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 VP1736.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	Se			
1	A	409	3180	2022	525	620	13	0	1	0
1	B	408	3222	2052	532	625	13	0	2	0

- Molecule 2 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Cl		
2	A	1	1	1	0	0
2	B	1	1	1	0	0

- Molecule 3 is water.

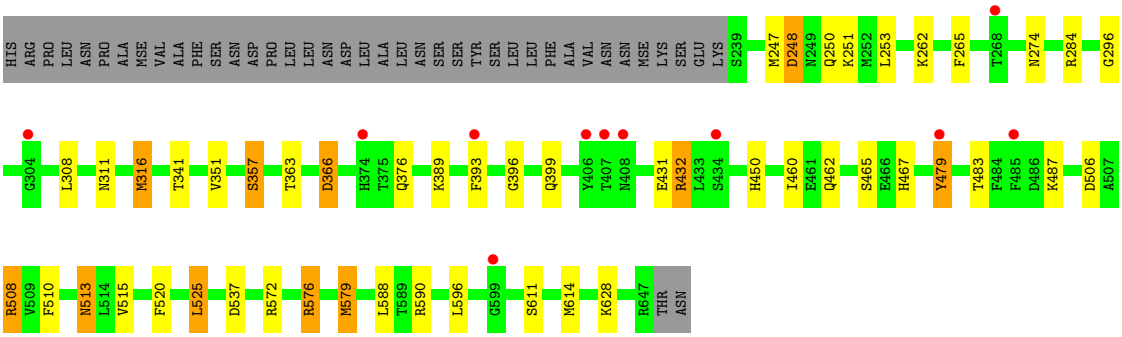
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	62	62	62	0	0
3	B	206	206	206	0	0

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.

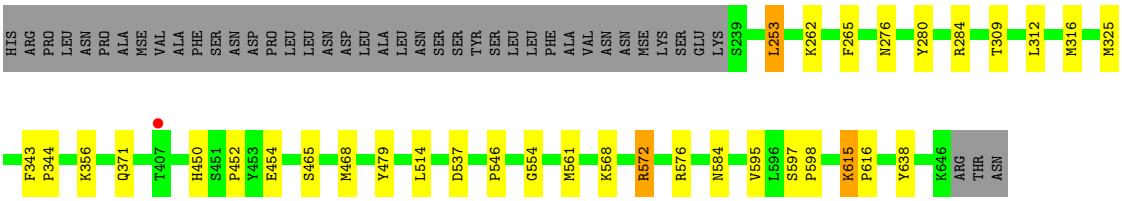
• Molecule 1: Uncharacterized protein VP1736

Chain A:



• Molecule 1: Uncharacterized protein VP1736

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	49.60Å 164.52Å 50.93Å 90.00° 109.34° 90.00°	Depositor
Resolution (Å)	40.99 – 1.95 40.99 – 1.95	Depositor EDS
% Data completeness (in resolution range)	98.8 (40.99-1.95) 98.8 (40.99-1.95)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.21 (at 1.95Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.198 , 0.237 0.197 , 0.237	Depositor DCC
R_{free} test set	2813 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å^2)	28.9	Xtriage
Anisotropy	0.240	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 37.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.035 for l,-k,h	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	6672	wwPDB-VP
Average B, all atoms (Å^2)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.25% of the height of the origin peak. No significant pseudotranslation is detected.*

[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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: CL

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	0.47	0/3248	0.61	0/4392
1	B	0.60	0/3293	0.65	2/4441 (0.0%)
All	All	0.54	0/6541	0.63	2/8833 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	253	LEU	CA-CB-CG	5.58	128.14	115.30
1	B	253	LEU	CB-CG-CD1	5.08	119.63	111.00

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	3180	0	2986	39	0
1	B	3222	0	3091	35	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	62	0	0	1	0
3	B	206	0	0	3	0
All	All	6672	0	6077	74	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 6.

All (74) 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:572:ARG:HH11	1:B:572:ARG:HG2	1.09	1.10
1:B:572:ARG:HH11	1:B:572:ARG:CG	1.65	1.08
1:A:572:ARG:HH11	1:A:590:ARG:HB3	1.27	0.99
1:B:284:ARG:HH12	1:B:371:GLN:HE21	0.93	0.93
1:B:284:ARG:NH1	1:B:371:GLN:HE21	1.77	0.82
1:A:316:MSE:HE3	1:A:525:LEU:HG	1.60	0.82
1:B:572:ARG:CG	1:B:572:ARG:NH1	2.35	0.82
1:B:572:ARG:HG2	1:B:572:ARG:NH1	1.89	0.81
1:A:572:ARG:NH1	1:A:590:ARG:HB3	1.99	0.78
1:A:316:MSE:HE3	1:A:525:LEU:HB2	1.67	0.77
1:B:537[B]:ASP:OD2	3:B:698:HOH:O	2.01	0.76
1:B:284:ARG:HH12	1:B:371:GLN:NE2	1.78	0.76
1:A:572:ARG:HH11	1:A:590:ARG:CB	2.02	0.70
1:A:462:GLN:NE2	1:A:467:HIS:HD2	1.91	0.69
1:B:276:ASN:HD21	1:B:568:LYS:NZ	1.91	0.68
1:B:537[B]:ASP:OD1	3:B:79:HOH:O	2.13	0.65
1:A:462:GLN:HE22	1:A:467:HIS:HD2	1.45	0.65
1:A:316:MSE:HE3	1:A:525:LEU:CG	2.26	0.64
1:B:452:PRO:O	1:B:468:MSE:HE2	1.97	0.64
1:B:262:LYS:HB2	1:B:265:PHE:CZ	2.33	0.63
1:A:316:MSE:CE	1:A:525:LEU:HB2	2.29	0.61
1:A:316:MSE:HE3	1:A:525:LEU:CB	2.31	0.59
1:A:247:MSE:HE2	1:A:251:LYS:HE2	1.87	0.55
1:A:450:HIS:HE1	3:A:59:HOH:O	1.89	0.55
1:B:276:ASN:ND2	1:B:568:LYS:NZ	2.55	0.55
1:B:597:SER:HB2	1:B:598:PRO:CD	2.37	0.55
1:B:454:GLU:CG	1:B:468:MSE:HE3	2.37	0.55
1:A:483:THR:O	1:A:487:LYS:HG3	2.08	0.54
1:B:454:GLU:HG3	1:B:468:MSE:CE	2.39	0.53
1:B:454:GLU:HG3	1:B:468:MSE:HE3	1.89	0.53
1:A:248:ASP:OD2	1:A:248:ASP:N	2.39	0.53
1:A:341:THR:HG22	1:A:363:THR:HG22	1.92	0.52
1:B:276:ASN:HD21	1:B:568:LYS:HZ3	1.54	0.52
1:B:572:ARG:NH1	1:B:572:ARG:HG3	2.19	0.52
1:B:584:ASN:OD1	1:B:597:SER:HB3	2.09	0.52
1:B:597:SER:HB2	1:B:598:PRO:HD2	1.92	0.51
1:A:316:MSE:CE	1:A:525:LEU:HG	2.38	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:276:ASN:HD21	1:B:568:LYS:HZ2	1.61	0.49
1:A:432:ARG:CG	1:A:432:ARG:HH21	2.25	0.49
1:A:515:VAL:HG11	1:A:579:MSE:HG3	1.95	0.49
1:A:376:GLN:OE1	1:A:399:GLN:NE2	2.46	0.48
1:B:276:ASN:ND2	1:B:568:LYS:HZ3	2.11	0.48
1:B:572:ARG:HH11	1:B:572:ARG:HG3	1.64	0.48
1:A:296:GLY:HA3	1:A:506:ASP:OD1	2.13	0.48
1:B:450:HIS:HE1	3:B:40:HOH:O	1.95	0.48
1:B:280:TYR:O	1:B:554:GLY:HA2	2.12	0.48
1:A:432:ARG:HG3	1:A:432:ARG:NH2	2.28	0.48
1:A:262:LYS:HB2	1:A:265:PHE:CZ	2.49	0.47
1:A:520:PHE:CD2	1:A:579:MSE:HB2	2.49	0.47
1:A:311:ASN:ND2	1:A:479:TYR:HA	2.30	0.46
1:A:537:ASP:O	1:A:590:ARG:NH1	2.49	0.46
1:B:514:LEU:HB3	1:B:595:VAL:HG11	1.97	0.46
1:A:513:ASN:HD22	1:A:513:ASN:HA	1.53	0.45
1:B:312:LEU:O	1:B:316:MSE:HG2	2.17	0.45
1:A:432:ARG:HH21	1:A:432:ARG:HG3	1.82	0.45
1:A:432:ARG:HD2	1:A:432:ARG:C	2.37	0.44
1:A:596:LEU:HD11	1:A:628:LYS:HA	1.99	0.44
1:A:462:GLN:NE2	1:A:467:HIS:CD2	2.80	0.44
1:A:572:ARG:NH1	1:A:590:ARG:CB	2.71	0.44
1:B:309:THR:HB	1:B:312:LEU:HB3	1.99	0.43
1:A:262:LYS:HE3	1:A:274:ASN:ND2	2.34	0.43
1:B:452:PRO:O	1:B:468:MSE:HB3	2.18	0.43
1:A:462:GLN:HE22	1:A:467:HIS:CD2	2.30	0.42
1:A:316:MSE:CE	1:A:525:LEU:CG	2.97	0.42
1:B:615:LYS:HB2	1:B:616:PRO:CD	2.50	0.42
1:A:508:ARG:HG2	1:A:510:PHE:CZ	2.55	0.42
1:B:546:PRO:HB2	1:B:561:MSE:SE	2.70	0.42
1:A:316:MSE:CE	1:A:525:LEU:CB	2.95	0.42
1:B:356:LYS:HB2	1:B:638:TYR:CZ	2.56	0.41
1:A:351:VAL:HB	1:A:357:SER:CB	2.50	0.41
1:A:576:ARG:HA	1:A:588:LEU:O	2.21	0.41
1:B:325:MSE:HE2	1:B:325:MSE:HB2	1.95	0.41
1:A:366[A]:ASP:HB3	1:A:396:GLY:HA3	2.02	0.41
1:B:343:PHE:HA	1:B:344:PRO:HD3	1.99	0.40

There are no symmetry-related clashes.

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	408/450 (91%)	399 (98%)	9 (2%)	0	100	100
1	B	408/450 (91%)	398 (98%)	10 (2%)	0	100	100
All	All	816/900 (91%)	797 (98%)	19 (2%)	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	A	335/377 (89%)	312 (93%)	23 (7%)	15	5
1	B	347/377 (92%)	341 (98%)	6 (2%)	60	55
All	All	682/754 (90%)	653 (96%)	29 (4%)	30	16

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	248	ASP
1	A	250	GLN
1	A	253	LEU
1	A	284	ARG
1	A	308	LEU
1	A	316	MSE
1	A	357	SER
1	A	366[A]	ASP

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Mol	Chain	Res	Type
1	A	366[B]	ASP
1	A	389	LYS
1	A	393	PHE
1	A	431	GLU
1	A	432	ARG
1	A	460	ILE
1	A	465	SER
1	A	479	TYR
1	A	508	ARG
1	A	513	ASN
1	A	525	LEU
1	A	576	ARG
1	A	579	MSE
1	A	611	SER
1	A	614	MSE
1	B	253	LEU
1	B	465	SER
1	B	479	TYR
1	B	572	ARG
1	B	576	ARG
1	B	615	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (26) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	250	GLN
1	A	274	ASN
1	A	276	ASN
1	A	311	ASN
1	A	324	GLN
1	A	358	GLN
1	A	376	GLN
1	A	384	ASN
1	A	387	ASN
1	A	399	GLN
1	A	424	ASN
1	A	462	GLN
1	A	467	HIS
1	A	471	ASN
1	A	513	ASN
1	A	641	ASN
1	B	274	ASN

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Mol	Chain	Res	Type
1	B	276	ASN
1	B	358	GLN
1	B	371	GLN
1	B	376	GLN
1	B	387	ASN
1	B	424	ASN
1	B	471	ASN
1	B	521	HIS
1	B	612	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

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 (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	396/450 (88%)	0.19	11 (2%)	53	62	23, 46, 71, 106	0
1	B	395/450 (87%)	-0.25	1 (0%)	94	96	16, 29, 47, 60	0
All	All	791/900 (87%)	-0.03	12 (1%)	73	81	16, 35, 65, 106	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	485	PHE	4.2
1	A	406	TYR	3.7
1	A	393	PHE	3.5
1	A	268	THR	3.2
1	A	374	HIS	2.7
1	A	479	TYR	2.5
1	A	599	GLY	2.5
1	A	434	SER	2.4
1	B	407	THR	2.2
1	A	304	GLY	2.0
1	A	407	THR	2.0
1	A	408	ASN	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 monosaccharides 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	CL	A	1	1/1	0.99	0.06	26,26,26,26	0
2	CL	B	2	1/1	0.99	0.05	24,24,24,24	0

6.5 Other polymers (i)

There are no such residues in this entry.