



Full wwPDB X-ray Structure Validation Report

Feb 27, 2014 – 03:06 PM GMT

PDB ID : 4GL8
Title : X-ray crystal structure of a periplasmic oligopeptide-binding protein/Oligopeptide ABC transporter(OppAIV) from *Borrelia burgdorferi*
Authors : Seattle Structural Genomics Center for Infectious Disease (SSGCID)
Deposited on : 2012-08-13
Resolution : 2.20 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

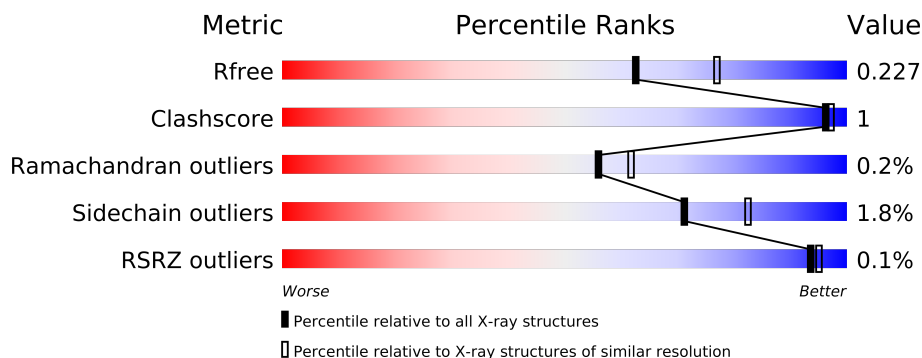
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.20 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}	66092	2938 (2.20-2.20)
Clashscore	79885	3751 (2.20-2.20)
Ramachandran outliers	78287	3681 (2.20-2.20)
Sidechain outliers	78261	3682 (2.20-2.20)
RSRZ outliers	66119	2939 (2.20-2.20)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	529	
1	B	529	
2	C	4	
2	D	4	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8452 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Oligopeptide ABC transporter OppAIV.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	500	Total	C	N	O	S	0	3	0
			3991	2552	651	778	10			
1	B	500	Total	C	N	O	S	0	1	0
			3956	2532	649	765	10			

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	2	MET	-	EXPRESSION TAG	UNP H7C7K8
A	3	ALA	-	EXPRESSION TAG	UNP H7C7K8
A	4	HIS	-	EXPRESSION TAG	UNP H7C7K8
A	5	HIS	-	EXPRESSION TAG	UNP H7C7K8
A	6	HIS	-	EXPRESSION TAG	UNP H7C7K8
A	7	HIS	-	EXPRESSION TAG	UNP H7C7K8
A	8	HIS	-	EXPRESSION TAG	UNP H7C7K8
A	9	HIS	-	EXPRESSION TAG	UNP H7C7K8
A	10	MET	-	EXPRESSION TAG	UNP H7C7K8
A	11	GLY	-	EXPRESSION TAG	UNP H7C7K8
A	12	THR	-	EXPRESSION TAG	UNP H7C7K8
A	13	LEU	-	EXPRESSION TAG	UNP H7C7K8
A	14	GLU	-	EXPRESSION TAG	UNP H7C7K8
A	15	ALA	-	EXPRESSION TAG	UNP H7C7K8
A	16	GLN	-	EXPRESSION TAG	UNP H7C7K8
A	17	THR	-	EXPRESSION TAG	UNP H7C7K8
A	18	GLN	-	EXPRESSION TAG	UNP H7C7K8
A	19	GLY	-	EXPRESSION TAG	UNP H7C7K8
A	20	PRO	-	EXPRESSION TAG	UNP H7C7K8
A	21	GLY	-	EXPRESSION TAG	UNP H7C7K8
A	22	SER	-	EXPRESSION TAG	UNP H7C7K8
A	23	MET	-	EXPRESSION TAG	UNP H7C7K8
B	2	MET	-	EXPRESSION TAG	UNP H7C7K8
B	3	ALA	-	EXPRESSION TAG	UNP H7C7K8
B	4	HIS	-	EXPRESSION TAG	UNP H7C7K8

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Chain	Residue	Modelled	Actual	Comment	Reference
B	5	HIS	-	EXPRESSION TAG	UNP H7C7K8
B	6	HIS	-	EXPRESSION TAG	UNP H7C7K8
B	7	HIS	-	EXPRESSION TAG	UNP H7C7K8
B	8	HIS	-	EXPRESSION TAG	UNP H7C7K8
B	9	HIS	-	EXPRESSION TAG	UNP H7C7K8
B	10	MET	-	EXPRESSION TAG	UNP H7C7K8
B	11	GLY	-	EXPRESSION TAG	UNP H7C7K8
B	12	THR	-	EXPRESSION TAG	UNP H7C7K8
B	13	LEU	-	EXPRESSION TAG	UNP H7C7K8
B	14	GLU	-	EXPRESSION TAG	UNP H7C7K8
B	15	ALA	-	EXPRESSION TAG	UNP H7C7K8
B	16	GLN	-	EXPRESSION TAG	UNP H7C7K8
B	17	THR	-	EXPRESSION TAG	UNP H7C7K8
B	18	GLN	-	EXPRESSION TAG	UNP H7C7K8
B	19	GLY	-	EXPRESSION TAG	UNP H7C7K8
B	20	PRO	-	EXPRESSION TAG	UNP H7C7K8
B	21	GLY	-	EXPRESSION TAG	UNP H7C7K8
B	22	SER	-	EXPRESSION TAG	UNP H7C7K8
B	23	MET	-	EXPRESSION TAG	UNP H7C7K8

- Molecule 2 is a protein called Peptide of unknown sequence.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	4	Total	C	N	O	0	0	0
			22	13	4	5			
2	D	4	Total	C	N	O	0	0	0
			22	13	4	5			

- Molecule 3 is water.

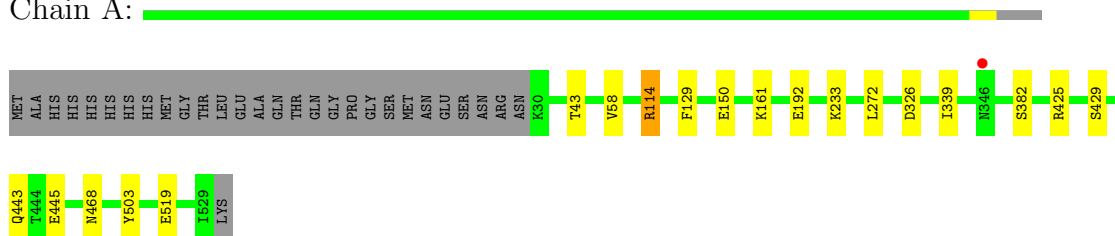
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	231	Total	O	0	0
			231	231		
3	B	230	Total	O	0	0
			230	230		

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

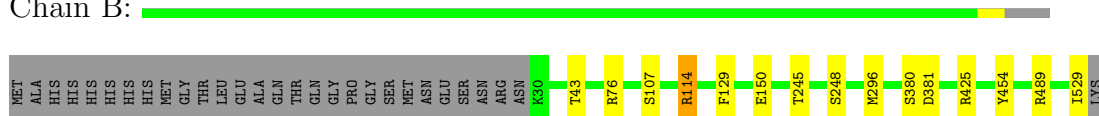
- Molecule 1: Oligopeptide ABC transporter OppAIV

Chain A:



- Molecule 1: Oligopeptide ABC transporter OppAIV

Chain B:



- Molecule 2: Peptide of unknown sequence

Chain C:



There are no outlier residues recorded for this chain.

- Molecule 2: Peptide of unknown sequence

Chain D:



There are no outlier residues recorded for this chain.

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	99.75Å 103.58Å 104.81Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.86 – 2.20 19.85 – 2.20	Depositor EDS
% Data completeness (in resolution range)	98.6 (19.86-2.20) 98.8 (19.85-2.20)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.70 (at 2.19Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.172 , 0.220 0.180 , 0.227	Depositor DCC
R_{free} test set	2800 reflections (5.36%)	DCC
Wilson B-factor (Å ²)	27.0	Xtriage
Anisotropy	0.143	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 26.1	EDS
Estimated twinning fraction	0.014 for -h,l,k 0.016 for -l,-k,-h 0.016 for k,h,-l 0.000 for k,l,h 0.000 for l,h,k	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	1 of 55023 reflections (0.002%)	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8452	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.45% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

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	0.59	0/4084	0.73	2/5544 (0.0%)
1	B	0.58	0/4046	0.73	2/5497 (0.0%)
All	All	0.58	0/8130	0.73	4/11041 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	114	ARG	NE-CZ-NH2	-7.46	116.57	120.30
1	B	114	ARG	NE-CZ-NH2	-6.11	117.25	120.30
1	A	114	ARG	NE-CZ-NH1	5.68	123.14	120.30
1	B	76	ARG	NE-CZ-NH2	-5.22	117.69	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3991	0	1	5	0
1	B	3956	0	1	4	0
2	C	22	0	11	0	0
2	D	22	0	11	0	0
3	A	231	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	230	0	0	1	0
All	All	8452	0	24	9	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 1.

All (9) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:468:ASN:ND2	3:A:656:HOH:O	2.24	0.69
1:A:114:ARG:NH2	1:A:150:GLU:OE1	2.45	0.49
1:B:114:ARG:NH2	1:B:150:GLU:OE1	2.46	0.49
1:A:161:LYS:NZ	3:A:785:HOH:O	2.45	0.48
1:B:489:ARG:NE	3:B:740:HOH:O	2.48	0.47
1:B:248:SER:OG	1:B:381:ASP:OD2	2.34	0.45
1:A:443:GLN:NE2	1:A:445:GLU:OE2	2.51	0.44
1:B:296:MET:CE	1:B:454:TYR:CD1	3.03	0.42
1:A:503:TYR:OH	1:A:519:GLU:OE2	2.39	0.40

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	A	501/529 (95%)	481 (96%)	19 (4%)	1 (0%)	56	62
1	B	499/529 (94%)	482 (97%)	16 (3%)	1 (0%)	56	62
All	All	1000/1058 (94%)	963 (96%)	35 (4%)	2 (0%)	56	62

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	245	THR
1	A	233	LYS

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	439/479 (92%)	428 (98%)	11 (2%)	60	71
1	B	433/479 (90%)	427 (99%)	6 (1%)	78	88
All	All	872/958 (91%)	855 (98%)	17 (2%)	71	81

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	43	THR
1	A	58	VAL
1	A	129	PHE
1	A	192	GLU
1	A	272	LEU
1	A	326[A]	ASP
1	A	326[B]	ASP
1	A	339	ILE
1	A	382	SER
1	A	425	ARG
1	A	429	SER
1	B	43	THR
1	B	107	SER
1	B	129	PHE
1	B	380	SER
1	B	425	ARG
1	B	529	ILE

Some 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 chains 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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

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	500/529 (94%)	-0.51	1 (0%) 93 94	17, 26, 41, 55	0
1	B	500/529 (94%)	-0.55	0 100 100	17, 26, 41, 57	0
2	C	0/4	-	-	-	-
2	D	0/4	-	-	-	-
All	All	1000/1066 (93%)	-0.53	1 (0%) 93 95	17, 26, 41, 57	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	346	ASN	2.0

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 carbohydrates in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.