Full wwPDB X-ray Structure Validation Report (i)

Jun 22, 2024 – 05:38 PM EDT

PDB ID	:	5DHM
Title	:	Crystal structure of the fimbrial protein Mfa4 from Porphyromonas gingivalis
Authors	:	Kloppsteck, P.; Hall, M.; Persson, K.
Deposited on	:	2015-08-31
Resolution	:	1.90 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 (1)) were used in the production of this report:

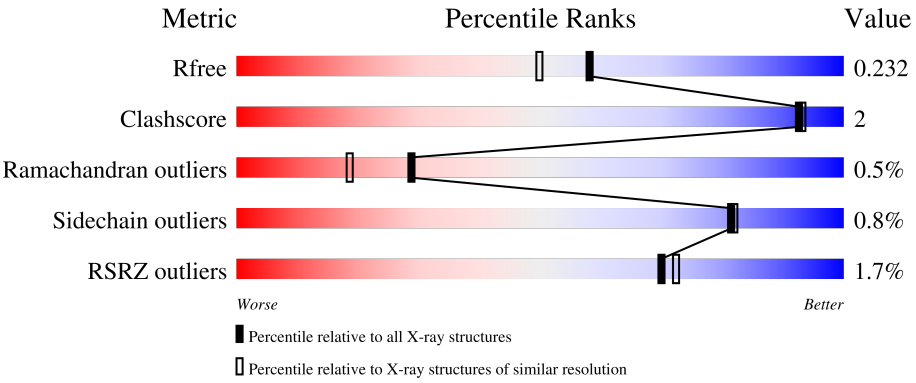
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (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 1.90 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	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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	53	49% · 47%
1	B	53	2% 40% 60%
2	C	282	% 92% · 5%
2	D	282	2% 88% 6% 6%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 9378 atoms, of which 4595 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 Immunoreactive 32 kDa antigen.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
1	A	28	Total C H N O Se 446 140 219 38 48 1	0	0	0
1	B	21	Total C H N O 348 108 174 31 35	0	0	0

There are 54 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	MSE	-	initiating methionine	UNP B2RHG4
A	0	LYS	-	expression tag	UNP B2RHG4
A	1	HIS	-	expression tag	UNP B2RHG4
A	2	HIS	-	expression tag	UNP B2RHG4
A	3	HIS	-	expression tag	UNP B2RHG4
A	4	HIS	-	expression tag	UNP B2RHG4
A	5	HIS	-	expression tag	UNP B2RHG4
A	6	HIS	-	expression tag	UNP B2RHG4
A	7	PRO	-	expression tag	UNP B2RHG4
A	8	MSE	-	expression tag	UNP B2RHG4
A	9	SER	-	expression tag	UNP B2RHG4
A	10	ASP	-	expression tag	UNP B2RHG4
A	11	TYR	-	expression tag	UNP B2RHG4
A	12	ASP	-	expression tag	UNP B2RHG4
A	13	ILE	-	expression tag	UNP B2RHG4
A	14	PRO	-	expression tag	UNP B2RHG4
A	15	THR	-	expression tag	UNP B2RHG4
A	16	THR	-	expression tag	UNP B2RHG4
A	17	GLU	-	expression tag	UNP B2RHG4
A	18	ASN	-	expression tag	UNP B2RHG4
A	19	LEU	-	expression tag	UNP B2RHG4
A	20	TYR	-	expression tag	UNP B2RHG4
A	21	PHE	-	expression tag	UNP B2RHG4
A	22	GLN	-	expression tag	UNP B2RHG4
A	23	GLY	-	expression tag	UNP B2RHG4

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Chain	Residue	Modelled	Actual	Comment	Reference
A	24	ALA	-	expression tag	UNP B2RHG4
A	25	MSE	-	expression tag	UNP B2RHG4
B	-1	MSE	-	initiating methionine	UNP B2RHG4
B	0	LYS	-	expression tag	UNP B2RHG4
B	1	HIS	-	expression tag	UNP B2RHG4
B	2	HIS	-	expression tag	UNP B2RHG4
B	3	HIS	-	expression tag	UNP B2RHG4
B	4	HIS	-	expression tag	UNP B2RHG4
B	5	HIS	-	expression tag	UNP B2RHG4
B	6	HIS	-	expression tag	UNP B2RHG4
B	7	PRO	-	expression tag	UNP B2RHG4
B	8	MSE	-	expression tag	UNP B2RHG4
B	9	SER	-	expression tag	UNP B2RHG4
B	10	ASP	-	expression tag	UNP B2RHG4
B	11	TYR	-	expression tag	UNP B2RHG4
B	12	ASP	-	expression tag	UNP B2RHG4
B	13	ILE	-	expression tag	UNP B2RHG4
B	14	PRO	-	expression tag	UNP B2RHG4
B	15	THR	-	expression tag	UNP B2RHG4
B	16	THR	-	expression tag	UNP B2RHG4
B	17	GLU	-	expression tag	UNP B2RHG4
B	18	ASN	-	expression tag	UNP B2RHG4
B	19	LEU	-	expression tag	UNP B2RHG4
B	20	TYR	-	expression tag	UNP B2RHG4
B	21	PHE	-	expression tag	UNP B2RHG4
B	22	GLN	-	expression tag	UNP B2RHG4
B	23	GLY	-	expression tag	UNP B2RHG4
B	24	ALA	-	expression tag	UNP B2RHG4
B	25	MSE	-	expression tag	UNP B2RHG4

- Molecule 2 is a protein called Immunoreactive 32 kDa antigen.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	C	268	Total	C	H	N	O	Se	0	0	0
			4222	1349	2111	356	402	4			
2	D	266	Total	C	H	N	O	Se	0	0	0
			4177	1332	2091	353	397	4			

- Molecule 3 is water.

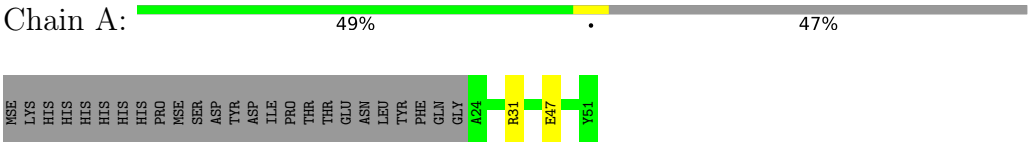
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	15	Total O 15 15	0	0
3	C	110	Total O 110 110	0	0
3	B	3	Total O 3 3	0	0
3	D	57	Total O 57 57	0	0

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.

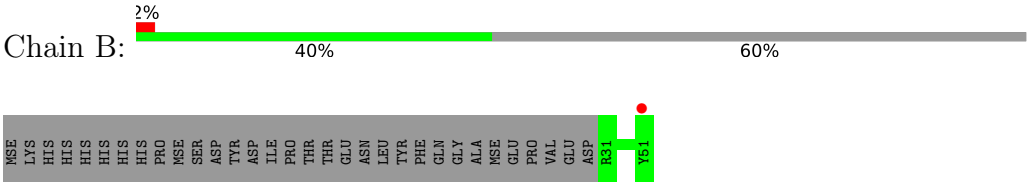
• Molecule 1: Immunoreactive 32 kDa antigen

Chain A:



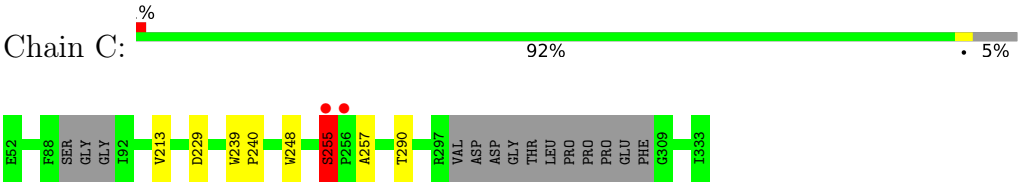
• Molecule 1: Immunoreactive 32 kDa antigen

Chain B:



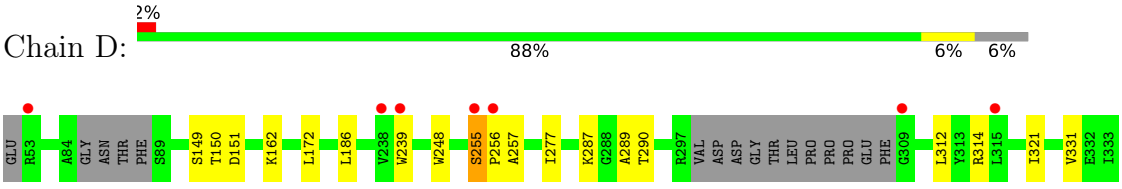
• Molecule 2: Immunoreactive 32 kDa antigen

Chain C:



• Molecule 2: Immunoreactive 32 kDa antigen

Chain D:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	54.68Å 84.54Å 138.36Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	53.54 – 1.90 72.14 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.3 (53.54-1.90) 99.4 (72.14-1.90)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$< I/\sigma(I) >$ [1]	1.72 (at 1.90Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.183 , 0.230 0.187 , 0.232	Depositor DCC
R_{free} test set	2616 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å^2)	30.7	Xtriage
Anisotropy	0.526	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 38.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.45$, $< L^2 > = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	9378	wwPDB-VP
Average B, all atoms (Å^2)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.89% 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

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	0.44	0/228	0.62	0/305
1	B	0.34	0/175	0.50	0/234
2	C	0.40	0/2152	0.58	0/2926
2	D	0.37	0/2126	0.54	0/2890
All	All	0.38	0/4681	0.56	0/6355

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	C	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	C	255	SER	Peptide

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	A	227	219	220	1	1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	174	174	174	0	0
2	C	2111	2111	2111	3	0
2	D	2086	2091	2091	10	0
3	A	15	0	0	1	0
3	B	3	0	0	0	0
3	C	110	0	0	1	1
3	D	57	0	0	2	1
All	All	4783	4595	4596	14	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 2.

All (14) 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:31:ARG:NH1	3:A:401:HOH:O	2.10	0.83
2:D:287:LYS:NZ	3:D:401:HOH:O	2.12	0.83
2:C:229:ASP:OD2	3:C:401:HOH:O	2.19	0.53
2:D:255:SER:HB2	2:D:256:PRO:HD3	1.91	0.50
2:D:151:ASP:OD2	3:D:402:HOH:O	2.20	0.49
2:C:239:TRP:CG	2:C:240:PRO:HA	2.52	0.45
2:D:239:TRP:NE1	2:D:312:LEU:HB2	2.33	0.44
2:C:213:VAL:HB	2:C:290:THR:HB	1.98	0.44
2:D:289:ALA:HB3	2:D:321:ILE:HD11	1.99	0.44
2:D:186:LEU:HD11	2:D:331:VAL:HG21	2.01	0.43
2:D:186:LEU:HB3	2:D:277:ILE:HG23	2.01	0.42
2:D:290:THR:HG21	2:D:314:ARG:HG2	2.02	0.42
2:D:162:LYS:HD3	2:D:172:LEU:HD11	2.02	0.41
2:D:149:SER:HA	2:D:150:THR:HA	1.85	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)
1:A:31:ARG:HH12	1:A:47:GLU:OE2[4_457]	1.56	0.04
3:C:499:HOH:O	3:D:455:HOH:O[4_457]	2.17	0.03

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	26/53 (49%)	24 (92%)	2 (8%)	0	100 100
1	B	19/53 (36%)	19 (100%)	0	0	100 100
2	C	262/282 (93%)	257 (98%)	3 (1%)	2 (1%)	19 9
2	D	260/282 (92%)	254 (98%)	5 (2%)	1 (0%)	34 24
All	All	567/670 (85%)	554 (98%)	10 (2%)	3 (0%)	29 18

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	257	ALA
2	D	257	ALA
2	C	255	SER

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	26/47 (55%)	26 (100%)	0	100 100
1	B	20/47 (43%)	20 (100%)	0	100 100
2	C	231/238 (97%)	229 (99%)	2 (1%)	78 79
2	D	228/238 (96%)	226 (99%)	2 (1%)	78 79
All	All	505/570 (89%)	501 (99%)	4 (1%)	81 82

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	C	248	TRP
2	C	255	SER
2	D	248	TRP
2	D	255	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	D	161	ASN

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)

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, 95^{th} 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	27/53 (50%)	-0.09	0 100 100	25, 33, 60, 71	0
1	B	21/53 (39%)	0.39	1 (4%) 30 33	37, 55, 86, 105	0
2	C	264/282 (93%)	-0.13	2 (0%) 86 87	23, 34, 64, 97	0
2	D	262/282 (92%)	0.11	7 (2%) 54 57	28, 45, 83, 117	0
All	All	574/670 (85%)	-0.00	10 (1%) 70 72	23, 40, 80, 117	0

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	238	VAL	4.8
2	D	309	GLY	3.2
2	D	239	TRP	2.8
2	C	255	SER	2.6
1	B	51	TYR	2.5
2	D	255	SER	2.2
2	D	53	ARG	2.2
2	C	256	PRO	2.1
2	D	256	PRO	2.1
2	D	315	LEU	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 monosaccharides 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.