Full wwPDB X-ray Structure Validation Report (i)

Jan 30, 2017 – 09:54 PM EST

PDB ID	:	5FCD
Title	:	Crystal structure of MccD protein
Authors	:	Nocek, B.; Jedrzejczak, R.; Anderson, W.F.; Severinov, K.; Dubiley, S.; Joachimiak, A.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on	:	2015-12-15
Resolution	:	2.10 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
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

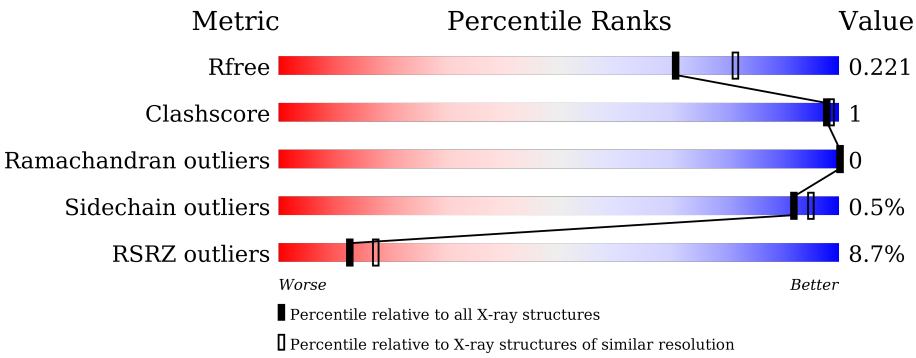
MolProbity	:	4.02b-467
Mogul	:	unknown
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20028442
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20028442

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 2.10 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}	91344	3939 (2.10-2.10)
Clashscore	102246	4460 (2.10-2.10)
Ramachandran outliers	100387	4413 (2.10-2.10)
Sidechain outliers	100360	4414 (2.10-2.10)
RSRZ outliers	91569	3948 (2.10-2.10)

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. 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	D	5	100%
2	E	6	100%
3	A	267	6%, 81%, •, 15%
3	B	267	8%, 83%, •, 15%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 7451 atoms, of which 3478 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 UNK-UNK-UNK-MSE-UNK.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	Se			
1	D	5	59	17	31	5	5	1	0	0	0

- Molecule 2 is a protein called UNK-UNK-UNK-UNK-MSE-UNK.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	Se			
2	E	6	69	20	36	6	6	1	0	0	0

- Molecule 3 is a protein called MccD.

Mol	Chain	Residues	Atoms							ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S	Se			
3	A	228	3600	1177	1752	315	344	8	4	0	3	0
3	B	228	3457	1141	1659	309	336	7	5	0	1	0

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Cl		
4	A	1	1	1	0	0

- Molecule 5 is water.

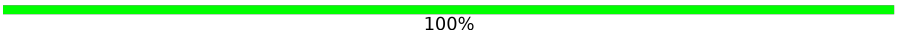
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	137	137	137	0	0
5	B	128	128	128	0	0

3 Residue-property plots (i)

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: UNK-UNK-UNK-MSE-UNK

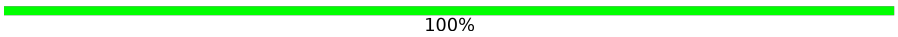
Chain D:



There are no outlier residues recorded for this chain.

- Molecule 2: UNK-UNK-UNK-UNK-MSE-UNK

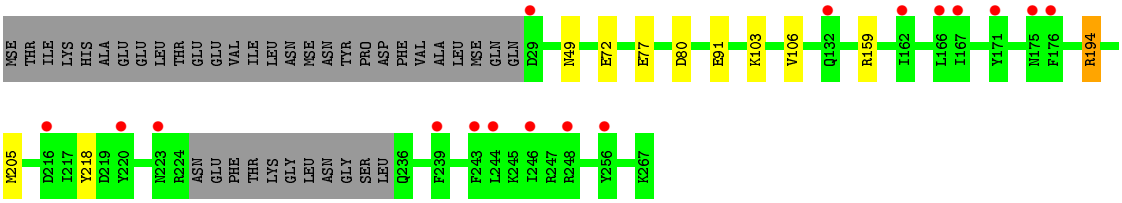
Chain E:



There are no outlier residues recorded for this chain.

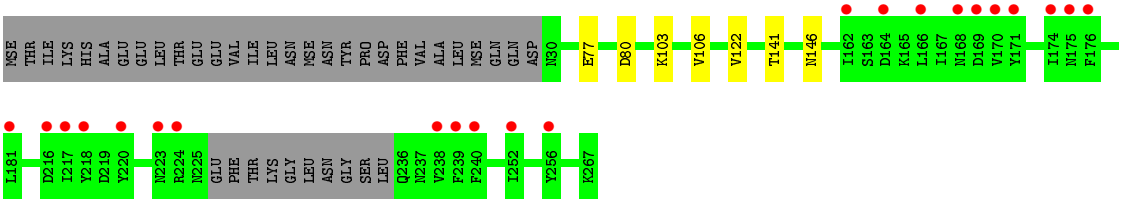
- Molecule 3: MccD

Chain A:



- Molecule 3: MccD

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α, β, γ	95.10Å 95.10Å 128.69Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.22 – 2.10 39.22 – 2.10	Depositor EDS
% Data completeness (in resolution range)	94.3 (39.22-2.10) 97.1 (39.22-2.10)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.87 (at 2.10Å)	Xtriage
Refinement program	PHENIX (phenix.refine: dev_1888)	Depositor
R, R_{free}	0.199 , 0.223 0.190 , 0.221	Depositor DCC
R_{free} test set	1875 reflections (5.02%)	DCC
Wilson B-factor (Å^2)	26.3	Xtriage
Anisotropy	0.039	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.42 , 64.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.048 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	7451	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 4.18% 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	D	0.10	0/7	0.32	0/7
2	E	0.16	0/7	0.88	0/7
3	A	0.23	0/1900	0.38	0/2562
3	B	0.24	0/1836	0.39	0/2482
All	All	0.24	0/3750	0.38	0/5058

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	D	28	31	15	0	0
2	E	33	36	16	0	0
3	A	1848	1752	1741	5	1
3	B	1798	1659	1657	3	0
4	A	1	0	0	0	0
5	A	137	0	0	1	1
5	B	128	0	0	0	1
All	All	3973	3478	3429	8	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 1.

All (8) 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)
3:A:159:ARG:NH2	3:A:205:MSE:O	2.27	0.68
3:A:194:ARG:N	5:A:402:HOH:O	2.40	0.53
3:A:49:ASN:HA	3:A:72:GLU:CG	2.49	0.43
3:B:80:ASP:O	3:B:106:VAL:HA	2.19	0.42
3:A:77:GLU:HA	3:A:103:LYS:O	2.19	0.42
3:A:80:ASP:O	3:A:106:VAL:HA	2.20	0.41
3:B:122:VAL:HG21	3:B:141:THR:HG23	2.03	0.41
3:B:77:GLU:HA	3:B:103:LYS:O	2.21	0.41

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)
5:A:535:HOH:O	5:B:416:HOH:O[5_555]	2.14	0.06
3:A:91:GLU:OE1	3:A:218:TYR:HH[2_545]	1.56	0.04

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	1/5 (20%)	1 (100%)	0	0	100	100
2	E	1/6 (17%)	0	1 (100%)	0	100	100
3	A	227/267 (85%)	219 (96%)	8 (4%)	0	100	100
3	B	225/267 (84%)	218 (97%)	7 (3%)	0	100	100
All	All	454/545 (83%)	438 (96%)	16 (4%)	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	-	1 (100%)	0	100	100
2	E	-	1 (100%)	0	100	100
3	A	197/233 (84%)	196 (100%)	1 (0%)	92	95
3	B	184/233 (79%)	183 (100%)	1 (0%)	92	95
All	All	383/466 (82%)	381 (100%)	2 (0%)	92	95

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	194	ARG
3	B	146	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 carbohydrates in this entry.

5.6 Ligand geometry (i)

Of 1 ligands modelled in this entry, 1 is 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	D	0/5	-	-			-	-
2	E	0/6	-	-			-	-
3	A	224/267 (83%)	0.35	17 (7%)	17	23	17, 33, 90, 123	0
3	B	224/267 (83%)	0.46	22 (9%)	10	13	17, 33, 108, 190	1 (0%)
All	All	448/545 (82%)	0.40	39 (8%)	13	17	17, 33, 101, 190	1 (0%)

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	B	174	ILE	11.4
3	A	220	TYR	5.4
3	B	238	VAL	5.1
3	B	175	ASN	4.3
3	A	239	PHE	4.3
3	B	168	ASN	4.1
3	A	166	LEU	3.6
3	B	166	LEU	3.6
3	B	171	TYR	3.5
3	B	239	PHE	3.4
3	A	162	ILE	3.3
3	B	176	PHE	3.2
3	A	243	PHE	3.1
3	A	223	ASN	3.1
3	B	162	ILE	3.1
3	B	170	VAL	3.0
3	A	171	TYR	3.0
3	A	29	ASP	2.9
3	A	175	ASN	2.9
3	B	240	PHE	2.7
3	B	220	TYR	2.7
3	B	256	TYR	2.6

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
3	B	216	ASP	2.5
3	A	256	TYR	2.5
3	A	176	PHE	2.4
3	A	167	ILE	2.4
3	A	246	ILE	2.4
3	A	216	ASP	2.3
3	B	218	TYR	2.3
3	B	169	ASP	2.3
3	B	224	ARG	2.3
3	B	164	ASP	2.2
3	B	252	ILE	2.2
3	A	244	LEU	2.2
3	B	223	ASN	2.1
3	A	248	ARG	2.0
3	A	132	GLN	2.0
3	B	181	LEU	2.0
3	B	217	ILE	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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å^2)	Q<0.9
4	CL	A	301	1/1	0.99	0.18	1.34	19,19,19,19	0

6.5 Other polymers (i)

There are no such residues in this entry.