



wwPDB NMR Structure Validation Summary Report ⓘ

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Title : Solution structure of MerB, the Organomercurial Lyase involved in the bacterial mercury resistance system
Authors : Di Lello, P.; Benison, G.C.; Valafar, H.; Pitts, K.E.; Summers, A.O.; Legault, P.; Omichinski, J.G.
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This is a wwPDB NMR Structure Validation Summary 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/NMRValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Mogul	:	unknown
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	rb-20027457
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20027457

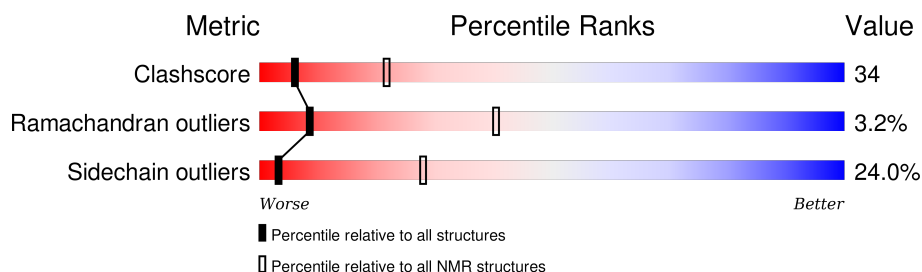
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment is 74%.

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)	NMR archive (#Entries)
Clashscore	114402	11133
Ramachandran outliers	111179	9975
Sidechain outliers	111093	9958

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and 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 $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	212	

2 Ensemble composition and analysis

This entry contains 20 models. Model 13 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *among the structures with the lowest rmsd to the minimized average structure, the model with the lowest energy was selected.*

The following residues are included in the computation of the global validation metrics.

Well-defined (core) protein residues			
Well-defined core	Residue range (total)	Backbone RMSD (Å)	Medoid model
1	A:25-A:72, A:76-A:146, A:162-A:179, A:184-A:201 (155)	0.66	13

Ill-defined regions of proteins are excluded from the global statistics.

Ligands and non-protein polymers are included in the analysis.

The models can be grouped into 3 clusters and 1 single-model cluster was found.

Cluster number	Models
1	1, 2, 9, 10, 11, 12, 13, 14, 16, 17
2	3, 5, 6, 8, 15, 18, 19
3	4, 20
Single-model clusters	7

3 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 2924 atoms, of which 1458 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Alkylmercury lyase.

Mol	Chain	Residues	Atoms						Trace
1	A	192	Total	C	H	N	O	S	0
			2924	927	1458	255	278	6	

5 Refinement protocol and experimental data overview

The models were refined using the following method: *Simulated annealing, with a combination of torsion angle dynamics and cartesian dynamics.*

Of the 55 calculated structures, 20 were deposited, based on the following criterion: *The submitted models are the 20 structures with no upper bound violation greater than 0.3 armstrongs and no dihedral angle restraint violation greater than 2 degrees and with the lowest energies..*

The following table shows the software used for structure solution, optimisation and refinement.

Software name	Classification	Version
CNS	structure solution	1.0
CNS	refinement	1.0

The following table shows chemical shift validation statistics as aggregates over all chemical shift files. Detailed validation can be found in section 7 of this report.

Chemical shift file(s)	BMRB entry 6047
Number of chemical shift lists	1
Total number of shifts	1802
Number of shifts mapped to atoms	1802
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	74%

No validations of the models with respect to experimental NMR restraints is performed at this time.

6 Model quality [i](#)

6.1 Standard geometry [i](#)

There are no covalent bond-length or bond-angle outliers.

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

There are no planarity outliers.

6.2 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 each 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 averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	1187	1190	1186	80±7
All	All	23740	23800	23720	1605

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 34.

5 of 487 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:76:LEU:HD13	1:A:92:LEU:HD11	0.96	1.37	10	1
1:A:27:LEU:HD12	1:A:28:LEU:HD12	0.91	1.39	17	1
1:A:97:ALA:HB1	1:A:164:PHE:CZ	0.88	2.02	20	4
1:A:126:LEU:HD11	1:A:141:MET:CE	0.88	1.99	11	5
1:A:85:PHE:CE2	1:A:101:LEU:HD13	0.87	2.04	17	4

6.3 Torsion angles [i](#)

6.3.1 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 PDB entries followed by that with respect to all NMR entries. 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	155/212 (73%)	135±3 (87±2%)	15±2 (10±1%)	5±2 (3±1%)	8	40
All	All	3100/4240 (73%)	2693 (87%)	309 (10%)	98 (3%)	8	40

5 of 18 unique Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	132	GLU	20
1	A	88	ASP	15
1	A	102	ILE	9
1	A	184	LEU	8
1	A	89	ASP	8

6.3.2 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 PDB entries followed by that with respect to all NMR entries. 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	126/174 (72%)	96±3 (76±3%)	30±3 (24±3%)	3	28
All	All	2520/3480 (72%)	1914 (76%)	606 (24%)	3	28

5 of 87 unique residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	133	ILE	20
1	A	170	THR	20
1	A	187	VAL	20
1	A	126	LEU	20
1	A	41	THR	20

6.3.3 RNA ⓘ

There are no RNA molecules in this entry.

6.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

6.6 Ligand geometry [i](#)

There are no ligands in this entry.

6.7 Other polymers [i](#)

There are no such molecules in this entry.

6.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

7 Chemical shift validation [i](#)

The completeness of assignment taking into account all chemical shift lists is 74% for the well-defined parts and 70% for the entire structure.

7.1 Chemical shift list 1

File name: BMRB entry 6047

Chemical shift list name: *assigned_chem_shift_list_1*

7.1.1 Bookkeeping [i](#)

The following table shows the results of parsing the chemical shift list and reports the number of nuclei with statistically unusual chemical shifts.

Total number of shifts	1802
Number of shifts mapped to atoms	1802
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	4

7.1.2 Chemical shift referencing [i](#)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction \pm precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	174	-0.36 ± 0.14	None needed (< 0.5 ppm)
$^{13}\text{C}_\beta$	163	-0.07 ± 0.14	None needed (< 0.5 ppm)
$^{13}\text{C}'$	162	0.05 ± 0.11	None needed (< 0.5 ppm)
^{15}N	163	0.56 ± 0.42	None needed (imprecise)

7.1.3 Completeness of resonance assignments [i](#)

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 74%, i.e. 1371 atoms were assigned a chemical shift out of a possible 1845. 7 out of 31 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	712/759 (94%)	283/302 (94%)	289/310 (93%)	140/147 (95%)
Sidechain	630/940 (67%)	363/545 (67%)	262/356 (74%)	5/39 (13%)

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	Total	¹ H	¹³ C	¹⁵ N
Aromatic	29/146 (20%)	17/76 (22%)	9/59 (15%)	3/11 (27%)
Overall	1371/1845 (74%)	663/923 (72%)	560/725 (77%)	148/197 (75%)

7.1.4 Statistically unusual chemical shifts [i](#)

The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

Mol	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	A	97	ALA	HB3	-0.13	2.61 – 0.11	-6.0
1	A	97	ALA	HB2	-0.13	2.61 – 0.11	-6.0
1	A	97	ALA	HB1	-0.13	2.61 – 0.11	-6.0
1	A	46	LEU	HB2	-0.17	3.32 – -0.08	-5.3

7.1.5 Random Coil Index (RCI) plots [i](#)

The image below reports *random coil index* values for the protein chains in the structure. The height of each bar gives a probability of a given residue to be disordered, as predicted from the available chemical shifts and the amino acid sequence. A value above 0.2 is an indication of significant predicted disorder. The colour of the bar shows whether the residue is in the well-defined core (black) or in the ill-defined residue ranges (cyan), as described in section 2 on ensemble composition.

Random coil index (RCI) for chain A:

