wwPDB NMR Structure Validation Summary Report (i)

Apr 26, 2016 – 09:33 PM BST

PDB ID	:	2JXU
Title	:	NMR solution structure of KP-TerB, a tellurite resistance protein from Klebsiella pneumoniae
Authors	:	Chiang, S.-K.; Lou, Y.-C.; Chen, C.
Deposited on	:	2007-11-30

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 (i) symbol.

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

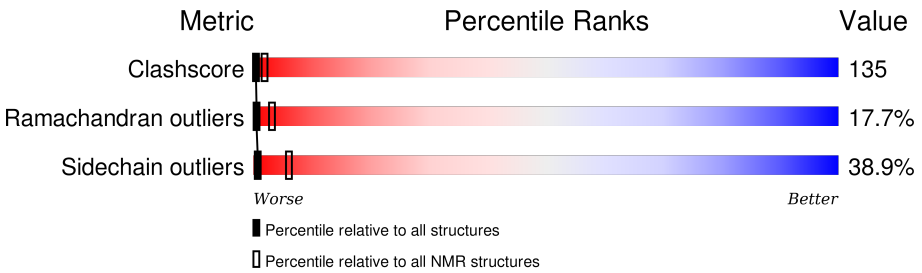
Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Mogul	:	unknown
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	rb-20027457
Ideal 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 (i)

The following experimental techniques were used to determine the structure:
SOLUTION NMR

The overall completeness of chemical shifts assignment is 92%.

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	153	10% 48% 32% • 6%

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 18 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *lowest energy*.

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:7-A:150 (144)	0.18	18

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 4 clusters and 2 single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 2387 atoms, of which 1197 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called TerB.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	153	2387	753	1197	199	233	5	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	152	LEU	-	EXPRESSION TAG	UNP Q6U646
A	153	GLU	-	EXPRESSION TAG	UNP Q6U646

4 Residue-property plots (i)

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA and DNA chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-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. Stretches of 2 or more consecutive residues without any outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

- Molecule 1: TerB

Chain A: 10% 48% 32% • 6%

M1 S2 F3 F4 D5 K6 V7 K8 G9 A10 L11 T12 S13 G14 R15 E16 E17 L18 T19 R20 Q21 V22 G23 R24 Y25 K26 N27 K28 K29 F30 M31 Q32 G33 T34 V35 A36 V37 C38 A39 R40 I41 A42 V43 A44 S45 D46 G47 V48 S49 S50 K53 Q54 K55 M56 I57 G58 F59 L60 R61

S62 S63 E64 E65 L66 K67 V68 F69 D70 T71 A72 E73 V74 I75 E76 F77 F78 N79 K80 L81 V82 T83 S84 F85 D86 F87 D88 L89 E90 I91 G92 K93 G94 E95 T96 M97 K98 Y99 I100 L101 A102 L103 K104 D105 Q106 P107 E108 A109 A110 Q111 L112 A113 L114 R115 V116 G117 I118 A119 V120 A121

K122 S123 D124 G125 N126 F127 D128 D129 D130 E131 A134 V135 R136 E137 I138 A139 R140 S141 L142 G143 F144 D145 P146 A147 E148 F149 G150 L151 L152 E153

4.2 Residue scores for the representative (medoid) model from the NMR ensemble

The representative model is number 18. Colouring as in section 4.1 above.

- Molecule 1: TerB

Chain A: 8% 46% 35% 5% 6%

M1 S2 F3 F4 D5 K6 V7 K8 G9 A10 L11 T12 S13 G14 R15 E16 E17 L18 T19 R20 Q21 V22 G23 R24 Y25 K26 N27 K28 K29 F30 M31 Q32 G33 T34 V35 A36 V37 C38 A39 R40 I41 A42 V43 A44 S45 D46 G47 V48 S49 S50 E51 E52 K53 Q54 K55 M56 I57 G58 F59 L60

R61 S62 S63 E64 E65 L66 K67 V68 F69 D70 T71 A72 E73 V74 I75 E76 F77 F78 N79 K80 L81 V82 T83 S84 F85 D86 F87 D88 L89 E90 I91 G92 K93 G94 E95 T96 M97 K98 Y99 I100 L101 A102 L103 K104 D105 Q106 P107 E108 A109 A110 Q111 L112 A113 L114 R115 V116 G117 I118 A119 V120

A121 K122 S123 D124 G125 N126 F127 D128 D129 D130 E131 K132 S133 A134 V135 R136 E137 I138 A139 R140 S141 L142 G143 F144 D145 P146 A147 E148 F149 G150 L151 L152 E153

5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *simulated annealing*.

Of the 200 calculated structures, 20 were deposited, based on the following criterion: *structures with the least restraint violations*.

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

Software name	Classification	Version
X-PLOR NIH	refinement	

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 15574
Number of chemical shift lists	1
Total number of shifts	1898
Number of shifts mapped to atoms	1898
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	92%

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	1111	1118	1118	301±12
All	All	22220	22360	22360	6024

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 135.

5 of 999 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:118:ILE:HD13	1:A:119:ALA:N	1.22	1.50	4	2
1:A:118:ILE:HD12	1:A:119:ALA:N	1.09	1.62	9	18
1:A:131:GLU:O	1:A:135:VAL:HG22	1.03	1.52	1	5
1:A:135:VAL:HG11	1:A:149:PHE:CD1	1.02	1.89	12	5
1:A:115:ARG:O	1:A:118:ILE:HG23	1.02	1.53	3	2

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	144/153 (94%)	99±2 (69±1%)	19±2 (13±1%)	26±2 (18±1%)	0 3
All	All	2880/3060 (94%)	1985 (69%)	384 (13%)	511 (18%)	0 3

5 of 34 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	50	SER	20
1	A	10	ALA	20
1	A	147	ALA	20
1	A	63	SER	20
1	A	103	LEU	20

6.3.2 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 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	117/126 (93%)	71±4 (61±3%)	46±4 (39±3%)	1 6
All	All	2340/2520 (93%)	1429 (61%)	911 (39%)	1 6

5 of 94 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	87	PHE	20
1	A	54	GLN	20
1	A	91	ILE	20
1	A	93	LYS	20
1	A	60	LEU	20

6.3.3 RNA (i)

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 92% for the well-defined parts and 91% for the entire structure.

7.1 Chemical shift list 1

File name: BMRB entry 15574

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	1898
Number of shifts mapped to atoms	1898
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	1

7.1.2 Chemical shift referencing (i)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	151	-0.47 ± 0.08	None needed (< 0.5 ppm)
$^{13}C_{\beta}$	139	0.43 ± 0.07	None needed (< 0.5 ppm)
$^{13}C'$	151	-0.26 ± 0.12	None needed (< 0.5 ppm)
^{15}N	148	0.42 ± 0.22	None needed (< 0.5 ppm)

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 92%, i.e. 1600 atoms were assigned a chemical shift out of a possible 1743. 23 out of 23 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	715/716 (100%)	285/286 (100%)	288/288 (100%)	142/142 (100%)
Sidechain	779/921 (85%)	480/536 (90%)	291/340 (86%)	8/45 (18%)

Continued on next page...

Continued from previous page...

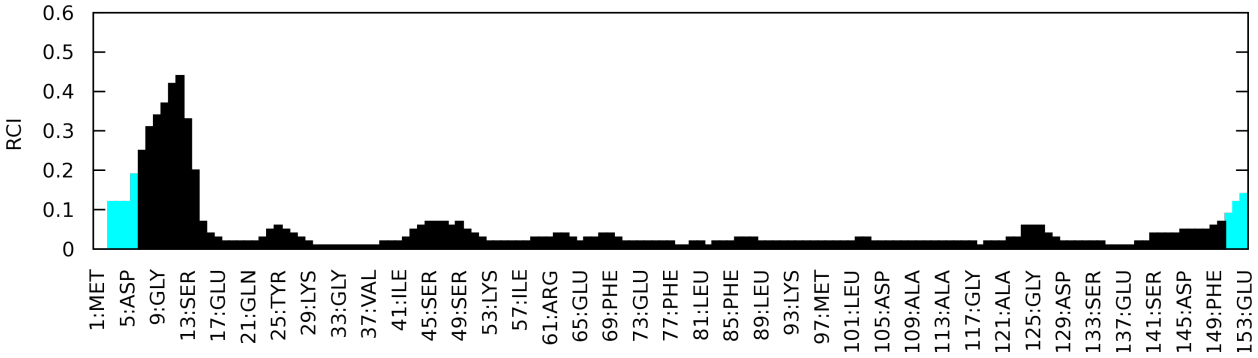
	Total	^{1}H	^{13}C	^{15}N
Aromatic	106/106 (100%)	58/58 (100%)	48/48 (100%)	0/0 (—%)
Overall	1600/1743 (92%)	823/880 (94%)	627/676 (93%)	150/187 (80%)

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	32	GLN	HG3	0.10	3.75 – 0.85	-7.6

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: