wwPDB NMR Structure Validation Summary Report (i)

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PDB ID	:	1ZRI
Title	:	NOE-based solution structure with dipolar coupling restraints of rat OMP (olfactory marker protein)
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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 (i) symbol.

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

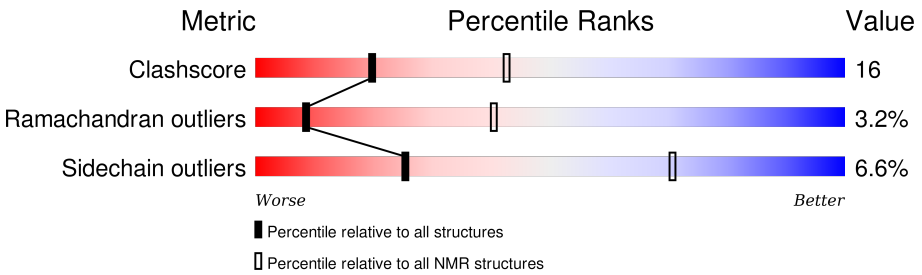
Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Mogul	:	unknown
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	rb-20027457
Ideal 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 was not calculated.

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	163	56% 24% • 18%

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 3 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *closest to the average*.

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:8-A:36, A:45-A:83, A:99-A:163 (133)	0.65	3

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 6 clusters. No single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 2655 atoms, of which 1329 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Olfactory marker protein.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	163	2655	839	1329	229	252	6	0

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: Olfactory marker protein

Chain A: 56% 24% • 18%

M1 A2 E3 D4 G5 P6 Q7 M13 P14 L15 V16 L17 L21 R26 L27 R28 L32 R35 G36 E37 K38 K39 Q40 D41 G42 E43 K44 L45 L46 R47 Y53 R54 L55 D56 F57 I58 Q59 Q60 Q61 K62 L63 H67 S84 Q85 N86 W87 T88 P89 D90 L91 T92 N93

L94 N95 T96 R97 Q98 L99 L100 D101 W107 R108 S112 W117 R128 L129 S130 D131 L132 A133 K134 I135 R136 M139 L142 I143 E150 P151 A152 N153 L154 L163

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

The representative model is number 3. Colouring as in section 4.1 above.

- Molecule 1: Olfactory marker protein

Chain A: 55% 23% • 18%

M1 A2 E3 D4 G5 P6 Q7 L11 D12 Q19 T22 R26 L27 R28 L32 R35 G36 E37 K38 K39 Q40 D41 G42 E43 K44 R47 E50 Y53 R54 L55 D56 Q60 D66 V70 V71 L72 D73 K74 T83 S84 Q85 N86 W87 T88 P89 D90 L91

T92 N93 L94 N95 T96 R97 Q98 L99 L100 D101 R108 N118 R128 D131 L132 A133 K134 I135 R136 M139 Y140 F141 L142 I143 T144 F145 G146 V149 E150 P151 A152 N153 L154 N161 Q162 L163

5 Refinement protocol and experimental data overview (i)

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

Of the 200 calculated structures, 20 were deposited, based on the following criterion: *structures with the lowest energy.*

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

Software name	Classification	Version
XPLOR-NIH	structure solution	2.9.3
XPLOR-NIH	refinement	2.9.3

No chemical shift data was provided. 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.

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	Planarity
1	A	0.0±0.0	7.2±0.8
All	All	0	144

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

5 of 8 unique planar outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Group	Models (Total)
1	A	54	ARG	Sidechain	19
1	A	47	ARG	Sidechain	19
1	A	28	ARG	Sidechain	18
1	A	35	ARG	Sidechain	18
1	A	26	ARG	Sidechain	18

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	1085	1100	1100	36±8
All	All	21700	22000	22000	713

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 16.

5 of 408 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:63:LEU:H	1:A:63:LEU:HD22	0.93	1.24	6	2
1:A:17:LEU:HD22	1:A:17:LEU:H	0.78	1.39	2	2
1:A:46:LEU:H	1:A:46:LEU:HD22	0.75	1.41	14	3
1:A:100:LEU:HD13	1:A:100:LEU:H	0.75	1.40	9	1
1:A:17:LEU:N	1:A:17:LEU:HD22	0.73	1.98	2	1

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	132/163 (81%)	119±2 (90±2%)	8±2 (6±2%)	4±2 (3±1%)	8	40
All	All	2640/3260 (81%)	2389 (90%)	166 (6%)	85 (3%)	8	40

5 of 17 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	LEU	18
1	A	151	PRO	13
1	A	100	LEU	13
1	A	60	GLN	10
1	A	75	PRO	5

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	118/145 (81%)	110±2 (93±2%)	8±2 (7±2%)	25	71
All	All	2360/2900 (81%)	2205 (93%)	155 (7%)	25	71

5 of 56 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	101	ASP	15
1	A	63	LEU	10
1	A	100	LEU	8
1	A	45	LEU	7
1	A	112	SER	6

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)

No chemical shift data were provided