wwPDB NMR Structure Validation Summary Report

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PDB ID	:	1A57
Title	:	THE THREE-DIMENSIONAL STRUCTURE OF A HELIX-LESS VARIANT OF INTESTINAL FATTY ACID BINDING PROTEIN, NMR, 20 STRUCTURES
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Deposited on	:	1998-02-20

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
https://www.wwpdb.org/validation/2017/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:

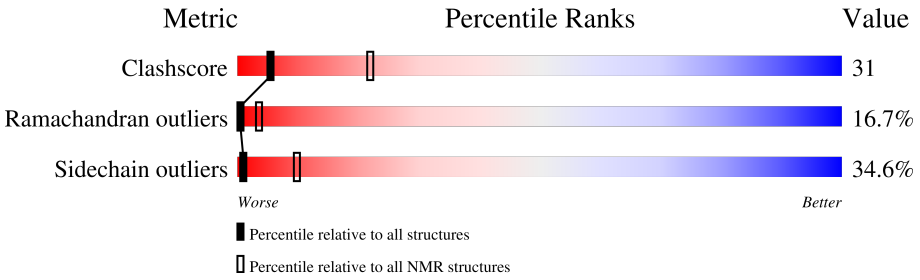
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.23.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

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 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	158937	12864
Ramachandran outliers	154571	11451
Sidechain outliers	154315	11428

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	116	10% 50% 22% 7% 11%

2 Ensemble composition and analysis

This entry contains 20 models. Model 2 is the overall representative, medoid model (most similar to other models).

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:2-A:8, A:21-A:116 (103)	0.64	2

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 2 clusters and 2 single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1838 atoms, of which 909 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called INTESTINAL FATTY ACID-BINDING PROTEIN.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	116	1838	586	909	157	185	1	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	GLU	deletion	UNP P02693
A	?	-	LYS	deletion	UNP P02693
A	?	-	PHE	deletion	UNP P02693
A	?	-	MET	deletion	UNP P02693
A	?	-	GLU	deletion	UNP P02693
A	?	-	LYS	deletion	UNP P02693
A	?	-	MET	deletion	UNP P02693
A	?	-	GLY	deletion	UNP P02693
A	?	-	ILE	deletion	UNP P02693
A	?	-	ASN	deletion	UNP P02693
A	?	-	VAL	deletion	UNP P02693
A	?	-	VAL	deletion	UNP P02693
A	?	-	LYS	deletion	UNP P02693
A	?	-	ARG	deletion	UNP P02693
A	?	-	LYS	deletion	UNP P02693
A	15	SER	LEU	engineered mutation	UNP P02693

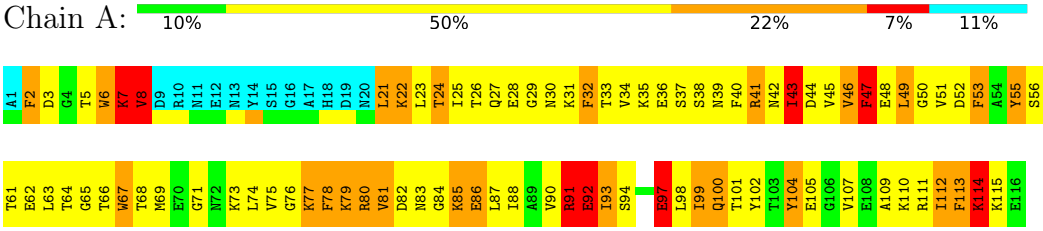
4 Residue-property plots

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA, DNA and oligosaccharide 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: INTESTINAL FATTY ACID-BINDING PROTEIN

Chain A:

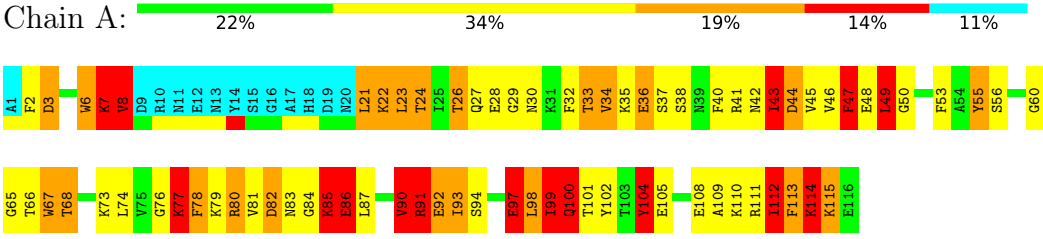


4.2 Residue scores for the representative (medoid) model from the NMR ensemble

The representative model is number 2. Colouring as in section 4.1 above.

• Molecule 1: INTESTINAL FATTY ACID-BINDING PROTEIN

Chain A:



5 Refinement protocol and experimental data overview

The models were refined using the following method: *DISTANCE GEOMETRY WITH SIMULATED ANNEALING REFINEMENT.*

Of the 23 calculated structures, 20 were deposited, based on the following criterion: *FINAL PENALTY FUNCTION VALUES GREATER THAN 10.0 OR GREATER THAN TWO STANDARD DEVIATIONS FROM THE MEAN WERE OMITTED.*

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

Software name	Classification	Version
Tinker	refinement	
Tinker	structure solution	

No chemical shift data was provided.

6 Model quality

6.1 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 (average) 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	1.50±0.02	10±0/840 (1.2± 0.1%)	2.69±0.06	71±6/1127 (6.3± 0.5%)
All	All	1.50	207/16800 (1.2%)	2.69	1420/22540 (6.3%)

5 of 21 unique bond outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	104	TYR	CE1-CZ	-14.69	1.19	1.38	18	12
1	A	104	TYR	CE2-CZ	-14.64	1.19	1.38	17	8
1	A	55	TYR	CE1-CZ	-14.14	1.20	1.38	10	16
1	A	55	TYR	CE2-CZ	-14.08	1.20	1.38	7	4
1	A	102	TYR	CE1-CZ	-13.98	1.20	1.38	6	8

5 of 199 unique angle outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})	Models	
								Worst	Total
1	A	78	PHE	CB-CG-CD2	16.73	132.51	120.80	12	10
1	A	78	PHE	CB-CG-CD1	16.44	132.31	120.80	18	16
1	A	104	TYR	CB-CG-CD1	14.96	129.98	121.00	3	8
1	A	102	TYR	CB-CG-CD2	14.64	129.79	121.00	6	11
1	A	41	ARG	NE-CZ-NH1	13.61	127.11	120.30	14	11

There are no chirality outliers.

There are no planarity outliers.

6.2 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 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	827	827	827	52±11
All	All	16540	16540	16540	1031

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 31.

5 of 478 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:101:THR:HG23	1:A:110:LYS:HG3	0.90	1.42	13	1
1:A:2:PHE:CE1	1:A:93:ILE:HD11	0.86	2.06	1	2
1:A:25:ILE:HG22	1:A:32:PHE:CD1	0.85	2.07	20	2
1:A:2:PHE:CZ	1:A:93:ILE:HD11	0.84	2.06	1	3
1:A:43:ILE:HD11	1:A:57:LEU:CD1	0.82	2.02	20	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	102/116 (88%)	55±5 (54±5%)	30±5 (30±4%)	17±3 (17±3%)	0	3
All	All	2040/2320 (88%)	1093 (54%)	607 (30%)	340 (17%)	0	3

5 of 60 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	8	VAL	19
1	A	24	THR	18
1	A	49	LEU	16
1	A	43	ILE	15
1	A	3	ASP	15

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	89/99 (90%)	58±4 (65±4%)	31±4 (35±4%)	1 10
All	All	1780/1980 (90%)	1165 (65%)	615 (35%)	1 10

5 of 80 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	33	THR	20
1	A	97	GLU	20
1	A	114	LYS	20
1	A	21	LEU	19
1	A	41	ARG	18

6.3.3 RNA

There are no RNA molecules in this entry.

6.4 Non-standard residues in protein, DNA, RNA chains

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

6.5 Carbohydrates

There are no monosaccharides in this entry.

6.6 Ligand geometry

There are no ligands in this entry.

6.7 Other polymers

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

No chemical shift data were provided