Full wwPDB NMR Structure Validation Report (i)

Feb 12, 2022 – 04:51 PM EST

PDB ID	:	1G5W
Title	:	SOLUTION STRUCTURE OF HUMAN HEART-TYPE FATTY ACID BINDING PROTEIN
Authors	:	Luecke, C.; Rademacher, M.; Zimmerman, A.; van Moerkerk, H.T.B.; Veerkamp, J.H.; Rueterjans, H.
Deposited on	:	2000-11-02

This is a Full wwPDB NMR Structure Validation 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:

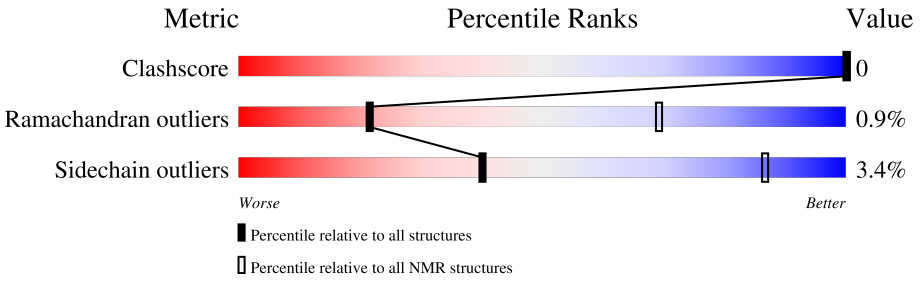
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.26
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.26

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	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	132	77% 20% •

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 6 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:1-A:55, A:59-A:132 (129)	0.34	6

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 3 single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 2097 atoms, of which 1061 are hydrogens and 0 are deuteriums.

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

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	132	2097	657	1061	172	204	3	0

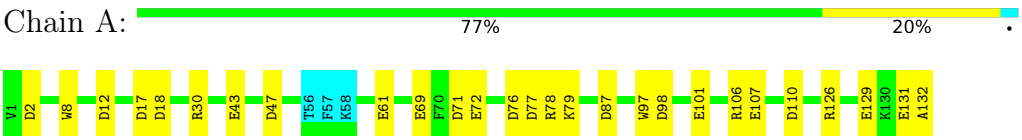
4 Residue-property plots (i)

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: FATTY ACID-BINDING PROTEIN

Chain A:



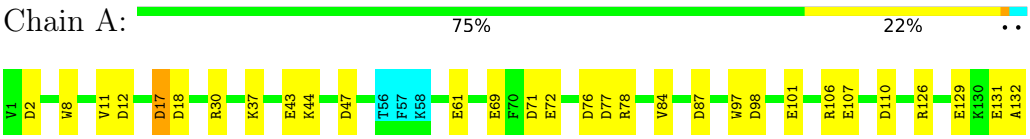
4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

• Molecule 1: FATTY ACID-BINDING PROTEIN

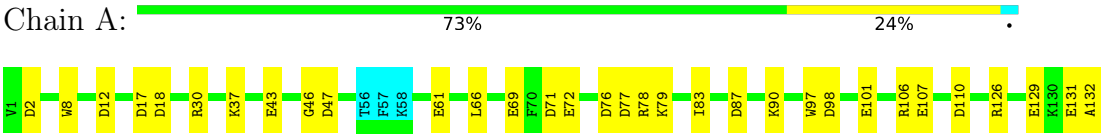
Chain A:



4.2.2 Score per residue for model 2

• Molecule 1: FATTY ACID-BINDING PROTEIN

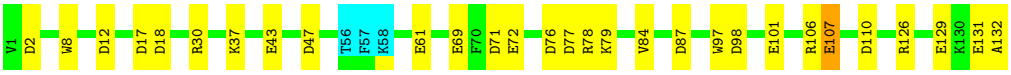
Chain A:



4.2.3 Score per residue for model 3

• Molecule 1: FATTY ACID-BINDING PROTEIN

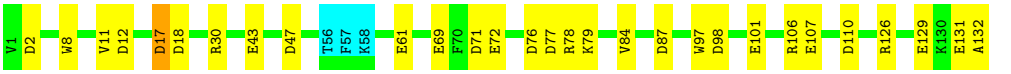
Chain A: 76% 21% • •



4.2.4 Score per residue for model 4

• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 76% 21% • •



4.2.5 Score per residue for model 5

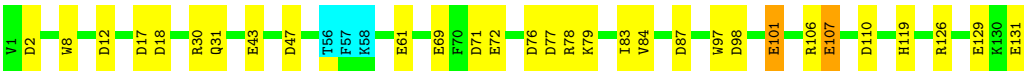
• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 76% 21% • •

4.2.6 Score per residue for model 6 (medoid)

• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 74% 22% • •



4.2.7 Score per residue for model 7

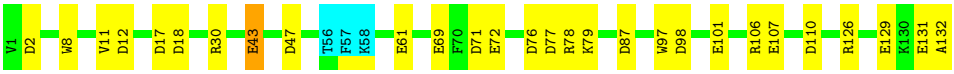
• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 75% 23% •

4.2.8 Score per residue for model 8

• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 77% 20% • •



4.2.9 Score per residue for model 9

• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 74% 20% • •

4.2.10 Score per residue for model 10

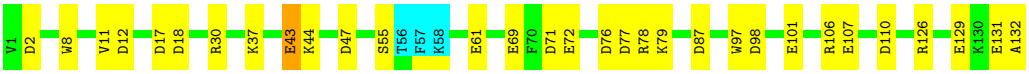
• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 75% 21% • •

4.2.11 Score per residue for model 11

• Molecule 1: FATTY ACID-BINDING PROTEIN

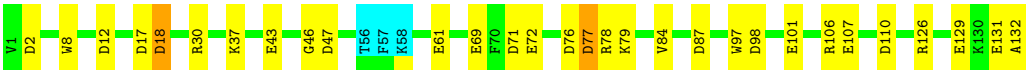
Chain A: 74% 23% • •



4.2.12 Score per residue for model 12

• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 75% 21% • •



4.2.13 Score per residue for model 13

• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 77% 17%

4.2.14 Score per residue for model 14

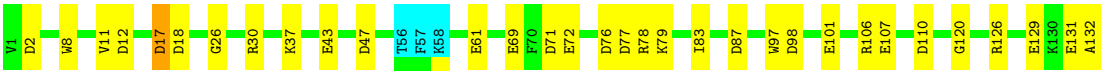
• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 74% 23%

4.2.15 Score per residue for model 15

• Molecule 1: FATTY ACID-BINDING PROTEIN

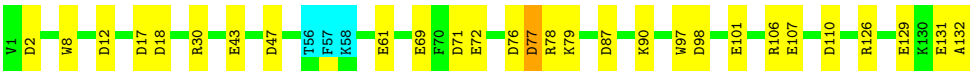
Chain A: 73% 23%



4.2.16 Score per residue for model 16

• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 77% 20%



4.2.17 Score per residue for model 17

• Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 77% 20%

4.2.18 Score per residue for model 18

- Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 75% 21%

V1 D2 W8 D12 D17 D18 R30 E43 K44 D47 T56 F57 K58 E61 L66 E69 F70 D71 E72 D76 D77 R78 K79 D87 W97 D98 E101 R106 E107 L108 I109 D110 R126 E129 K130 E131 A132

4.2.19 Score per residue for model 19

- Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 77% 20%

V1 D2 W8 V11 D12 D17 D18 R30 E43 D47 T56 F57 K58 E61 E69 F70 D71 E72 D76 D77 R78 K79 D87 W97 D98 E101 R106 E107 D110 R126 E129 K130 E131 A132

4.2.20 Score per residue for model 20

- Molecule 1: FATTY ACID-BINDING PROTEIN

Chain A: 75% 21%

V1 D2 W8 V11 D12 D17 D18 T29 R30 K37 E43 D47 T56 F57 K58 E61 E69 F70 D71 E72 D76 D77 R78 K79 D87 W97 D98 E101 R106 E107 D110 R126 E129 K130 E131 A132

5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *simulated annealing and energy-minimization.*

Of the 100 calculated structures, 20 were deposited, based on the following criterion: *structures with lowest violations of experimental constraints.*

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

Software name	Classification	Version
DYANA	structure solution	1.5
Discover	refinement	97

No chemical shift data was provided.

6 Model quality (i)

6.1 Standard geometry (i)

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	1.56±0.00	20±0/1023 (2.0± 0.0%)	1.50±0.01	28±1/1380 (2.1± 0.1%)
All	All	1.56	400/20460 (2.0%)	1.50	568/27600 (2.1%)

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	0.1±0.3
All	All	0	2

All 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	72	GLU	CD-OE2	10.84	1.37	1.25	1	20
1	A	69	GLU	CD-OE2	10.83	1.37	1.25	3	20
1	A	107	GLU	CD-OE2	10.81	1.37	1.25	9	20
1	A	101	GLU	CD-OE2	10.78	1.37	1.25	1	20
1	A	61	GLU	CD-OE2	10.77	1.37	1.25	4	20
1	A	131	GLU	CD-OE2	10.76	1.37	1.25	16	20
1	A	43	GLU	CD-OE2	10.73	1.37	1.25	11	20
1	A	129	GLU	CD-OE2	10.73	1.37	1.25	8	20
1	A	132	ALA	C-OXT	-6.58	1.10	1.23	6	20
1	A	87	ASP	CG-OD2	5.32	1.37	1.25	5	20
1	A	47	ASP	CG-OD2	5.32	1.37	1.25	2	20
1	A	2	ASP	CG-OD2	5.32	1.37	1.25	12	20
1	A	71	ASP	CG-OD2	5.31	1.37	1.25	6	20
1	A	110	ASP	CG-OD2	5.31	1.37	1.25	2	20
1	A	76	ASP	CG-OD2	5.31	1.37	1.25	20	20
1	A	17	ASP	CG-OD2	5.30	1.37	1.25	18	20

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	18	ASP	CG-OD2	5.30	1.37	1.25	12	20
1	A	77	ASP	CG-OD2	5.28	1.37	1.25	14	20
1	A	98	ASP	CG-OD2	5.27	1.37	1.25	13	20
1	A	12	ASP	CG-OD2	5.27	1.37	1.25	12	20

All 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	106	ARG	NE-CZ-NH1	8.28	124.44	120.30	18	20
1	A	30	ARG	NE-CZ-NH1	8.22	124.41	120.30	20	20
1	A	78	ARG	NE-CZ-NH1	8.22	124.41	120.30	13	20
1	A	126	ARG	NE-CZ-NH1	8.10	124.35	120.30	2	20
1	A	12	ASP	CB-CG-OD2	-7.56	111.49	118.30	6	20
1	A	17	ASP	CB-CG-OD2	-7.40	111.64	118.30	3	20
1	A	47	ASP	CB-CG-OD2	-7.40	111.64	118.30	11	20
1	A	18	ASP	CB-CG-OD2	-7.40	111.64	118.30	8	20
1	A	12	ASP	CB-CG-OD1	7.05	124.65	118.30	6	20
1	A	87	ASP	CB-CG-OD2	-6.92	112.07	118.30	11	20
1	A	77	ASP	CB-CG-OD2	-6.89	112.10	118.30	14	20
1	A	110	ASP	CB-CG-OD2	-6.89	112.10	118.30	16	20
1	A	47	ASP	CB-CG-OD1	6.88	124.49	118.30	11	19
1	A	76	ASP	CB-CG-OD2	-6.82	112.17	118.30	19	20
1	A	71	ASP	CB-CG-OD2	-6.81	112.17	118.30	6	20
1	A	98	ASP	CB-CG-OD2	-6.81	112.17	118.30	1	20
1	A	2	ASP	CB-CG-OD2	-6.77	112.21	118.30	16	20
1	A	17	ASP	CB-CG-OD1	6.73	124.35	118.30	3	20
1	A	18	ASP	CB-CG-OD1	6.70	124.33	118.30	14	19
1	A	77	ASP	CB-CG-OD1	6.09	123.78	118.30	13	20
1	A	87	ASP	CB-CG-OD1	5.92	123.63	118.30	19	20
1	A	71	ASP	CB-CG-OD1	5.88	123.59	118.30	15	20
1	A	98	ASP	CB-CG-OD1	5.87	123.58	118.30	19	20
1	A	110	ASP	CB-CG-OD1	5.86	123.57	118.30	6	20
1	A	76	ASP	CB-CG-OD1	5.84	123.56	118.30	19	20
1	A	126	ARG	NE-CZ-NH2	-5.84	117.38	120.30	11	3
1	A	2	ASP	CB-CG-OD1	5.80	123.52	118.30	8	20
1	A	8	TRP	CD1-NE1-CE2	-5.79	103.79	109.00	6	20
1	A	97	TRP	CD1-NE1-CE2	-5.70	103.87	109.00	12	20
1	A	30	ARG	NE-CZ-NH2	-5.31	117.64	120.30	9	4
1	A	78	ARG	NE-CZ-NH2	-5.02	117.79	120.30	13	2
1	A	119	HIS	ND1-CE1-NE2	5.01	120.93	109.90	6	1

There are no chirality outliers.

All 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	128	TYR	Sidechain	1
1	A	108	LEU	Peptide	1

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
All	All	20180	20660	20560	-

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 -.

There are no clashes.

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	127/132 (96%)	113±3 (89±2%)	12±2 (10±2%)	1±1 (1±1%)	21	69
All	All	2540/2640 (96%)	2269 (89%)	247 (10%)	24 (1%)	21	69

All 10 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	77	ASP	6
1	A	17	ASP	5
1	A	66	LEU	3

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Mol	Chain	Res	Type	Models (Total)
1	A	46	GLY	2
1	A	98	ASP	2
1	A	120	GLY	2
1	A	55	SER	1
1	A	26	GLY	1
1	A	37	LYS	1
1	A	76	ASP	1

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	113/116 (97%)	109±1 (97±1%)	4±1 (3±1%)	40 87
All	All	2260/2320 (97%)	2184 (97%)	76 (3%)	40 87

All 20 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	79	LYS	19
1	A	11	VAL	9
1	A	84	VAL	8
1	A	37	LYS	7
1	A	101	GLU	5
1	A	44	LYS	4
1	A	83	ILE	3
1	A	107	GLU	3
1	A	66	LEU	2
1	A	90	LYS	2
1	A	21	LYS	2
1	A	31	GLN	2
1	A	43	GLU	2
1	A	96	LYS	2
1	A	17	ASP	1
1	A	76	ASP	1
1	A	81	LYS	1
1	A	18	ASP	1

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Mol	Chain	Res	Type	Models (Total)
1	A	61	GLU	1
1	A	29	THR	1

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 monosaccharides 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