wwPDB NMR Structure Validation Summary Report (i)

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PDB ID	:	1F0Z
Title	:	SOLUTION STRUCTURE OF THIS, THE SULFUR CARRIER PROTEIN IN E.COLI THIAMIN BIOSYNTHESIS
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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:

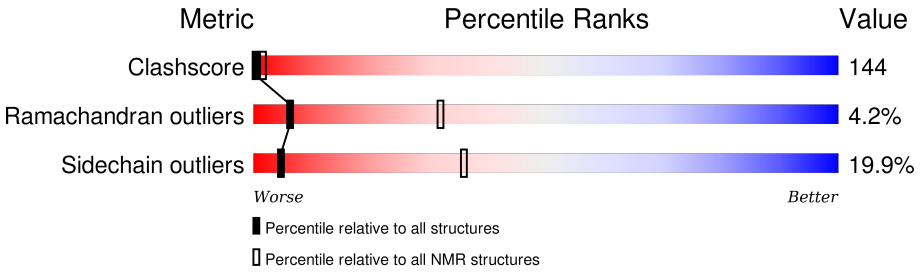
Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Mogul	:	unknown
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	rb-20027457
Ideal 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	66	5% 65% 11% • 18%

2 Ensemble composition and analysis (i)

This entry contains 24 models. Model 4 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:2-A:26, A:32-A:60 (54)	0.16	4

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 5 single-model clusters were found.

Cluster number	Models
1	2, 3, 4, 5, 7, 8, 11, 13, 16, 17, 22
2	1, 12, 15, 20
3	14, 24
4	10, 18
Single-model clusters	6; 9; 19; 21; 23

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1017 atoms, of which 504 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called THIS PROTEIN.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	66	1017	319	504	93	98	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 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: THIS PROTEIN

Chain A: 5% 65% 11% • 18%

M1 Q2 I3 L4 F5 N6 D7 Q8 A9 M10 Q11 C12 A13 A14 G15 Q16 T17 V18 H19 E20 L21 L22 L25 D26 Q27 R28 Q29 A30 G31 A32 A33 L34 A35 I36 N37 Q38 Q39 I40 V41 P42 R43 E44 Q45 W46 A47 Q48 H49 I50 V51 Q52 D53 G54 D55 Q56 I57 L58 L59 F60 Q61

V62 I63 A64 G65 G66

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

The representative model is number 4. Colouring as in section 4.1 above.

- Molecule 1: THIS PROTEIN

Chain A: 11% 55% 15% • 18%

M1 Q2 I3 L4 D7 Q8 A9 M10 Q11 C12 A13 A14 G15 Q16 T17 V18 H19 E20 L21 L22 L25 D26 Q27 R28 Q29 A30 G31 A32 A33 L34 A35 I36 N37 Q38 Q39 I40 V41 P42 R43 E44 Q45 W46 A47 Q48 H49 I50 V51 Q52 D53 G54 D55 Q56 I57 L58 L59 F60 Q61 V62

I63 A64 G65 G66

5 Refinement protocol and experimental data overview (i)

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

Of the 30 calculated structures, 24 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	structure solution	3.851
X-PLOR	refinement	3.851

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)

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	1.05±0.01	0±0/436 (0.0±0.0%)	1.29±0.01	0±0/594 (0.0±0.1%)
All	All	1.05	0/10464 (0.0%)	1.29	5/14256 (0.0%)

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	1.0±0.0
All	All	0	24

There are no bond-length outliers.

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	47	ALA	N-CA-CB	-5.23	102.78	110.10	14	4
1	A	44	GLU	N-CA-CB	-5.13	101.36	110.60	4	1

There are no chirality outliers.

All unique planar outliers are listed below.

Mol	Chain	Res	Type	Group	Models (Total)
1	A	43	ARG	Sidechain	24

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	429	417	417	122±6
All	All	10296	10008	10008	2918

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 144.

5 of 451 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:34:LEU:HD13	1:A:57:ILE:HG23	1.11	1.14	10	2
1:A:34:LEU:HD12	1:A:57:ILE:HG23	1.11	1.12	24	22
1:A:36:ILE:HD12	1:A:49:HIS:CE1	1.04	1.86	19	8
1:A:34:LEU:HD12	1:A:57:ILE:CG2	0.99	1.87	24	22
1:A:36:ILE:HG23	1:A:56:GLN:O	0.93	1.64	10	24

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	54/66 (82%)	45±1 (84±2%)	7±1 (12±2%)	2±1 (4±1%)	6 32
All	All	1296/1584 (82%)	1083 (84%)	158 (12%)	55 (4%)	6 32

5 of 6 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	17	THR	24
1	A	26	ASP	14
1	A	43	ARG	12
1	A	53	ASP	2
1	A	46	TRP	2

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	45/52 (87%)	36±2 (80±4%)	9±2 (20±4%)	5 36
All	All	1080/1248 (87%)	865 (80%)	215 (20%)	5 36

5 of 25 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	34	LEU	24
1	A	3	ILE	24
1	A	38	GLN	21
1	A	11	GLN	19
1	A	43	ARG	19

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