wwPDB NMR Structure Validation Summary Report (i)

Apr 20, 2024 – 06:15 PM EDT

PDB ID	:	2EXD
Title	:	The solution structure of the C-terminal domain of a nfeD homolog from Pyrococcus horikoshii
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Deposited on	:	2005-11-08

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 types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

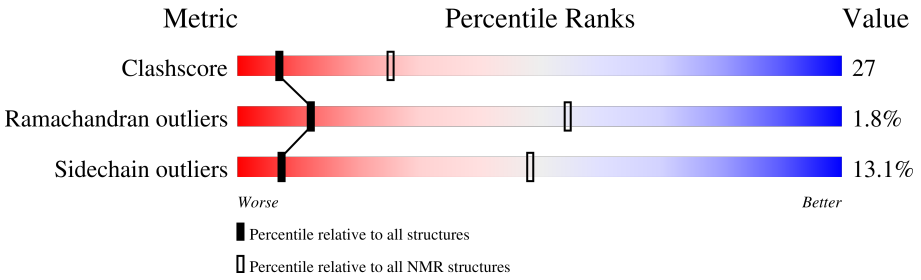
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
wwPDB-RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
wwPDB-ShiftChecker	:	v1.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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	80	44% 25% • 21% 8%

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 1 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:84-A:140 (57)	0.39	1

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. No single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1201 atoms, of which 613 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called nfeD short homolog.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	74	1201	376	613	100	111	1	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	144	LEU	-	cloning artifact	GB 14590384
A	145	GLU	-	cloning artifact	GB 14590384
A	146	HIS	-	expression tag	GB 14590384
A	147	HIS	-	expression tag	GB 14590384
A	148	HIS	-	expression tag	GB 14590384
A	149	HIS	-	expression tag	GB 14590384
A	150	HIS	-	expression tag	GB 14590384
A	151	HIS	-	expression tag	GB 14590384

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: nfeD short homolog

Chain A: 44% 25% • 21% 8%

R72 R73 E74 T75 T76 D77 I78 G79 G80 G81 K82 Y83 T84 F85 E86 L87 K88 V94 I97 A98 H101 Y102 V106 D109 K110 W111 I112 A113 Y114 K118 L119 S120 D123 V127 V130 L135 K136 P141 P142 Q143 L144 E145 HIS HIS HIS HIS HIS HIS

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

The representative model is number 1. Colouring as in section 4.1 above.

- Molecule 1: nfeD short homolog

Chain A: 39% 26% 6% 21% 8%

R72 R73 E74 T75 T76 D77 I78 G79 G80 G81 K82 Y83 T84 F85 E86 L87 K88 K93 V94 V95 K96 I97 A98 E99 D100 H101 Y102 V106 E107 W111 I112 A113 Y114 S120 D123 V128 L133 K134 L135 K136 P141 P142 Q143 L144 E145 HIS HIS HIS HIS HIS HIS

5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *distance geometry, rigid body restrained molecular dynamics, dihedral angle molecular dynamics.*

Of the 200 calculated structures, 20 were deposited, based on the following criterion: *target function.*

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

Software name	Classification	Version
CYANA	structure solution	2.0.17
CYANA	refinement	2.0.17

No chemical shift data was provided.

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	454	482	481	25±4
All	All	9080	9640	9620	508

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 27.

5 of 166 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:94:VAL:HG22	1:A:123:ASP:O	0.87	1.70	18	16
1:A:97:ILE:HG23	1:A:102:TYR:CD2	0.84	2.07	11	17
1:A:130:VAL:HG22	1:A:135:LEU:HB3	0.82	1.51	14	9
1:A:135:LEU:HD13	1:A:135:LEU:N	0.82	1.90	13	5
1:A:134:LYS:C	1:A:135:LEU:HD13	0.80	1.96	15	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	57/80 (71%)	51±1 (89±3%)	5±2 (9±3%)	1±1 (2±1%)	12 54
All	All	1140/1600 (71%)	1011 (89%)	108 (9%)	21 (2%)	12 54

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	118	LYS	8
1	A	87	LEU	5
1	A	88	LYS	4
1	A	132	GLY	2
1	A	94	VAL	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	50/70 (71%)	43±2 (87±4%)	7±2 (13±4%)	7 48
All	All	1000/1400 (71%)	869 (87%)	131 (13%)	7 48

5 of 30 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	LEU	20
1	A	135	LEU	20
1	A	120	SER	17
1	A	88	LYS	8
1	A	93	LYS	8

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