



wwPDB NMR Structure Validation Summary Report ⓘ

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PDB ID : 2KLF
Title : PERE NMR structure of maltodextrin-binding protein
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Deposited on : 2009-07-02

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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 ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) 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

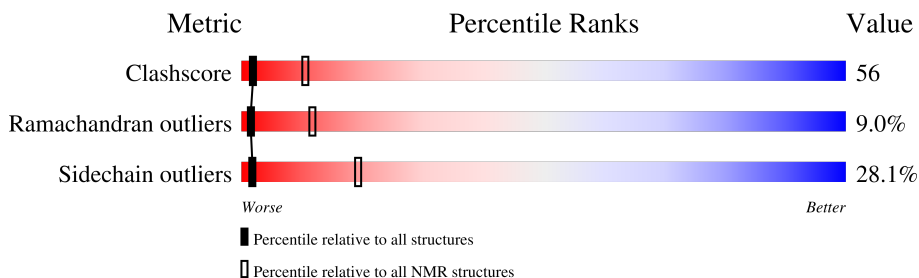
1 Overall quality at a glance

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 $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	370	

2 Ensemble composition and analysis

This entry contains 10 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:3-A:370 (368)	1.08	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 3 clusters. No single-model clusters were found.

Cluster number	Models
1	1, 3, 5, 7
2	4, 8, 9
3	2, 6, 10

3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 5735 atoms, of which 2858 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Maltose-binding periplasmic protein.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	370	5735	1851	2858	469	551	6	0

There is a discrepancy between the modelled and reference sequences:

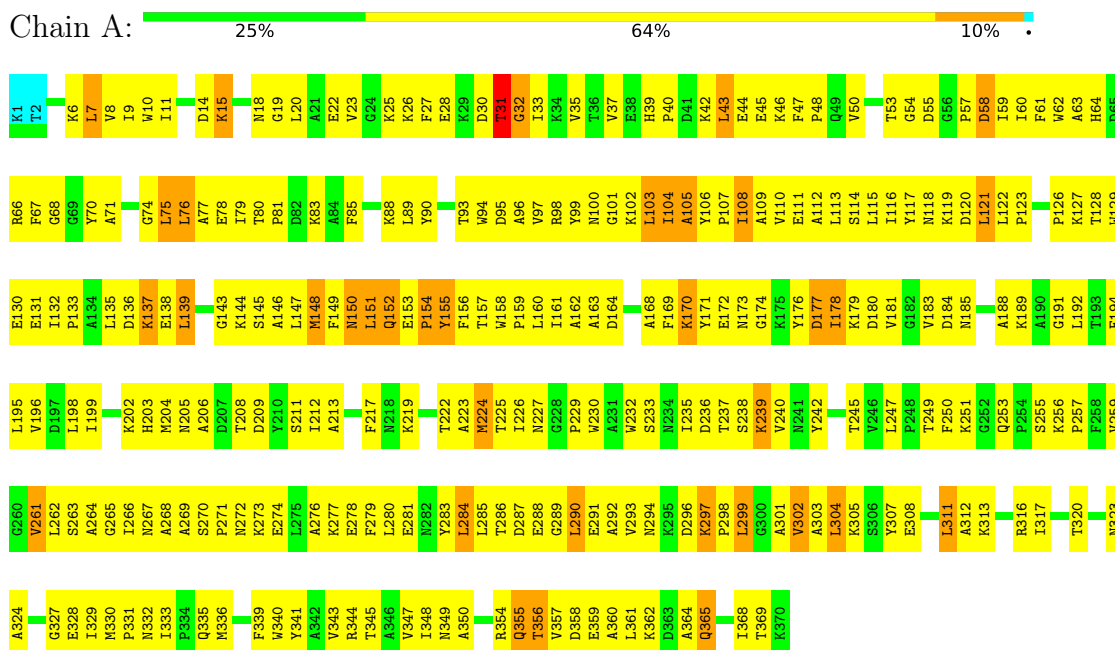
Chain	Residue	Modelled	Actual	Comment	Reference
A	2	THR	ILE	engineered mutation	UNP P0AEX9

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.

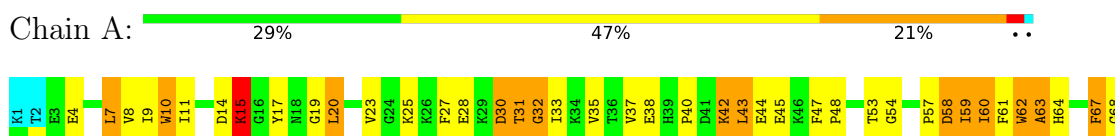
- Molecule 1: Maltose-binding periplasmic protein



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: Maltose-binding periplasmic protein



L689	A134	I199	I266	M332
Y70	L135	K200	M267	I333
A71	D136	M201	A268	F334
G74	K137	K202	A269	Q335
L75	E138	M204	S270	M336
L76	L139	M205	P271	S337
A77	K140	A206	M272	M338
E78	G143	D207	K273	F339
L79	K144	T208	E274	A342
T80	S145	D209	K277	V343
P81	A146	Y210	E278	B344
D82	L147	S211	F279	T345
K83	M148	I212	L280	A346
L89	F149	A213	Y283	V347
Y90	M150	E214	L284	M349
P91	L151	F217	L285	B354
F92	Q152	M218	T286	Q355
T93	E153	K219	D287	Q356
W94	F154	T222	E288	V357
D95	Y155	A223	G289	D358
A96	F156	M224	E291	L361
W97	T157	T225	A292	K362
R98	W158	L226	V293	D363
Y99	P159	N227	M294	Q365
M100	L160	G228	D296	A364
G101	L161	P229	K297	Q365
L102	A162	M230	P298	L368
K103	D164	A231	L299	T369
I104	G165	W232	G300	K370
I105	A168	D236	A301	
Y106	F169	T237	V302	
P107	K170	S238	A303	
I108	Y171	K239	L304	
A109	E172	Y242	K305	
V110	M173	T245	S306	
E111	G174	V246	Y307	
A112	K175	L247	E308	
L113	Y176	F250	L311	
S114	D177	K251	A312	
L115	I178	G252	K313	
I116	K179	Q253	D314	
Y117	D180	P254	F315	
M118	V181	S255	R316	
K119	G182	K256	I317	
D120	V183	P257	T320	
L121	G187	F258	M321	
L122	A188	V259	E322	
P123	G191	G260	N323	
M124	L192	L262	A324	
P125	T193	A263	Q325	
P126	F194	A264	I329	
K127	L195	A264	M330	
L128	V196	L198	P331	
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5 Refinement protocol and experimental data overview

The models were refined using the following method: *simulated annealing, Paramagnetic environment relaxation enhancement refinement.*

Of the 100 calculated structures, 10 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
CNS	structure solution	
CNS	refinement	

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	0.33±0.01	0±0/2930 (0.0± 0.0%)	0.52±0.02	1±2/3976 (0.0± 0.0%)
All	All	0.33	0/29300 (0.0%)	0.52	11/39760 (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	0.7±0.5
All	All	0	7

There are no bond-length outliers.

5 of 8 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(°)	Ideal(°)	Models	
								Worst	Total
1	A	266	ILE	CA-C-N	7.46	133.60	117.20	5	1
1	A	265	GLY	C-N-CA	7.04	139.31	121.70	5	1
1	A	266	ILE	N-CA-C	-6.94	92.25	111.00	5	1
1	A	356	THR	N-CA-C	-6.10	94.54	111.00	10	1
1	A	266	ILE	O-C-N	-5.95	113.18	122.70	5	1

There are no chirality outliers.

All unique planar outliers are listed below.

Mol	Chain	Res	Type	Group	Models (Total)
1	A	354	ARG	Mainchain	7

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	2861	2836	2833	319±26
All	All	28610	28360	28330	3189

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 56.

5 of 2040 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:155:TYR:O	1:A:159:PRO:CD	1.23	1.86	7	10
1:A:170:LYS:O	1:A:176:TYR:HA	1.20	1.36	8	10
1:A:155:TYR:O	1:A:159:PRO:CG	1.19	1.89	1	10
1:A:44:GLU:O	1:A:48:PRO:CD	1.08	2.01	7	10
1:A:301:ALA:HB2	1:A:311:LEU:HD13	1.07	1.25	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	367/370 (99%)	280±4 (76±1%)	53±6 (15±2%)	33±5 (9±1%)	1	12
All	All	3670/3700 (99%)	2805 (76%)	534 (15%)	331 (9%)	1	12

5 of 89 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	15	LYS	10
1	A	105	ALA	10
1	A	108	ILE	10

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Mol	Chain	Res	Type	Models (Total)
1	A	143	GLY	10
1	A	150	ASN	10

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	295/297 (99%)	212±6 (72±2%)	83±6 (28±2%)	2	19
All	All	2950/2970 (99%)	2122 (72%)	828 (28%)	2	19

5 of 241 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	103	LEU	10
1	A	7	LEU	9
1	A	245	THR	9
1	A	139	LEU	9
1	A	42	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

No chemical shift data were provided