wwPDB NMR Structure Validation Summary Report (i)

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PDB ID	:	1IMO
Title	:	NMR STRUCTURE OF HUMAN DNA LIGASE IIIALPHA BRCT DOMAIN
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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:

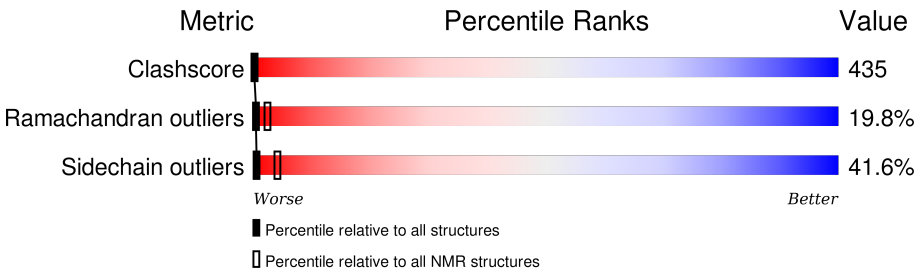
Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Mogul	:	unknown
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	rb-20027457
Ideal 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	88	6% 23% 40% 32%

2 Ensemble composition and analysis (i)

This entry contains 1 models. Identification of well-defined residues and clustering analysis are not possible.

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1398 atoms, of which 697 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called DNA LIGASE III.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	88	1398	446	697	124	127	4	0

There are 2 discrepancies between the modelled and reference sequences:

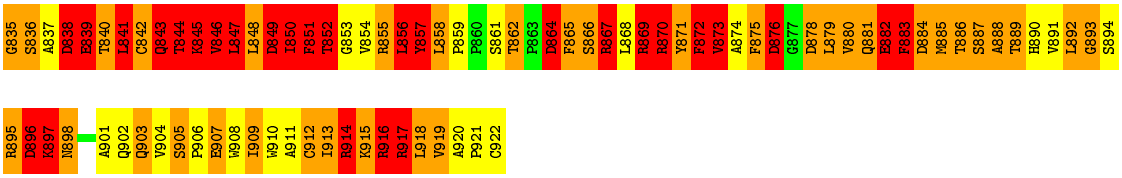
Chain	Residue	Modelled	Actual	Comment	Reference
A	835	GLY	LYS	CLONING ARTIFACT	UNP P49916
A	836	SER	ALA	CLONING ARTIFACT	UNP P49916

4 Residue-property plots (i)

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: DNA LIGASE III

Chain A: 6% 23% 40% 32%



5 Refinement protocol and experimental data overview (i)

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

Of the 299 calculated structures, 1 were deposited, based on the following criterion: *structure with the least restraint violations,structure with the lowest energy, target function.*

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

Software name	Classification	Version
DYANA	structure solution	1.5
DYANA	refinement	1.5

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	15.59	145/718 (20.2%)	15.90	174/976 (17.8%)
All	All	15.59	145/718 (20.2%)	15.90	174/976 (17.8%)

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	1	0
All	All	1	0

5 of 145 bond outliers are listed below. They are sorted according to the Z-score.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	867	ARG	CZ-NH1	-85.55	0.21	1.33
1	A	907	GLU	CD-OE1	-85.14	0.32	1.25
1	A	914	ARG	CZ-NH1	-74.16	0.36	1.33
1	A	907	GLU	CD-OE2	-67.83	0.51	1.25
1	A	839	GLU	CD-OE2	-65.45	0.53	1.25

5 of 174 angle outliers are listed below. They are sorted according to the Z-score.

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	867	ARG	NE-CZ-NH2	96.11	168.36	120.30
1	A	867	ARG	NE-CZ-NH1	-94.31	73.15	120.30
1	A	907	GLU	OE1-CD-OE2	-82.90	23.82	123.30
1	A	916	ARG	NE-CZ-NH1	-80.94	79.83	120.30
1	A	914	ARG	NE-CZ-NH1	-77.28	81.66	120.30

All chiral outliers are listed below.

Mol	Chain	Res	Type	Atoms
1	A	922	CYS	CA

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	701	697	688	604
All	All	701	697	688	604

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 435.

5 of 604 clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:885:MET:SD	1:A:897:LYS:HB2	1.63	1.26
1:A:916:ARG:CG	1:A:916:ARG:CZ	1.55	1.76
1:A:846:VAL:C	1:A:847:LEU:HD22	1.54	1.15
1:A:916:ARG:CD	1:A:916:ARG:CZ	1.51	1.78
1:A:850:ILE:CD1	1:A:913:ILE:HA	1.49	1.35

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	86/88 (98%)	43 (50%)	26 (30%)	17 (20%)	0 2
All	All	86/88 (98%)	43 (50%)	26 (30%)	17 (20%)	0 2

5 of 17 Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	886	THR
1	A	845	LYS
1	A	876	ASP
1	A	851	PHE
1	A	882	GLU

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	77/77 (100%)	45 (58%)	32 (42%)	0 4
All	All	77/77 (100%)	45 (58%)	32 (42%)	0 4

5 of 32 residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	845	LYS
1	A	914	ARG
1	A	919	VAL
1	A	880	VAL
1	A	839	GLU

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