wwPDB NMR Structure Validation Summary Report (i)

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PDB ID	:	2JYG
Title	:	Solution Structure of the W184A/M185A Mutant of the Carboxy-terminal Dimerization Domain of the HIV-1 Capsid Protein
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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
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:

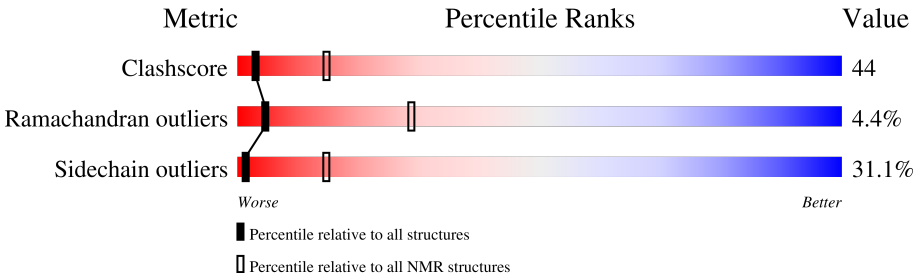
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.23.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

1 Overall quality at a glance (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	84	24% 37% 7% • 31%

2 Ensemble composition and analysis (i)

This entry contains 30 models. Model 9 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *lowest energy*.

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:149-A:155, A:160-A:174, A:186-A:221 (58)	0.27	9

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 6 clusters and 4 single-model clusters were found.

Cluster number	Models
1	1, 3, 7, 10, 12, 14, 16, 26, 30
2	4, 5, 17, 21, 22
3	9, 11, 19, 25, 28
4	6, 15, 24
5	8, 29
6	2, 13
Single-model clusters	18; 20; 23; 27

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1301 atoms, of which 661 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Capsid protein p24 (CA).

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	84	1301	398	661	115	123	4	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	184	ALA	TRP	engineered mutation	UNP P12497
A	185	ALA	MET	engineered mutation	UNP P12497

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: Capsid protein p24 (CA)

Chain A: 24% 37% 7% • 31%

T148 S149 I150 I153 R154 Q155 G156 P157 K158 E159 P160 F161 Y164 R167 F168 Y169 K170 T171 L172 R173 A174 E175 Q176 A177 S178 Q179 E180 V181 K182 N183 A184 A185 T186 E187 T188 L189 L190 V191 Q192 N193 A194 N195 P196 I201 L202 L205 G208 A209 T210 L211 E212 E213 M214 M215

T216 A217 C218 Q219 G220 V221 G222 G223 P224 G225 H226 K227 A228 R229 V230 L231

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

The representative model is number 9. Colouring as in section 4.1 above.

- Molecule 1: Capsid protein p24 (CA)

Chain A: 32% 23% 13% • 31%

T148 S149 I150 I153 R154 Q155 G156 P157 K158 E159 P160 F161 R167 F168 Y169 K170 T171 L172 R173 A174 E175 Q176 A177 S178 Q179 E180 V181 K182 N183 A184 A185 T186 E187 T188 L189 L190 V191 Q192 N193 A194 N195 P196 I201 L202 L205 G206 A209 T210 L211 E212 E213 M214 M215 T216 A217

G222 G223 P224 G225 H226 K227 A228 R229 V230 L231

5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *torsion angle dynamics*.

Of the 500 calculated structures, 30 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	
CYANA	refinement	

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	471	464	40±5
All	All	13620	14130	13920	1203

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 44.

5 of 211 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:191:VAL:HG22	1:A:202:LEU:HD13	1.10	1.19	10	13
1:A:205:LEU:HD21	1:A:209:ALA:HB2	1.03	1.27	24	3
1:A:191:VAL:HG22	1:A:202:LEU:HD23	1.02	1.26	2	3
1:A:205:LEU:HD13	1:A:217:ALA:HB2	0.95	1.38	19	6
1:A:205:LEU:HD21	1:A:209:ALA:CB	0.92	1.95	23	11

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	58/84 (69%)	52±1 (90±2%)	4±1 (6±2%)	3±1 (4±1%)	4 29
All	All	1740/2520 (69%)	1559 (90%)	105 (6%)	76 (4%)	4 29

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	208	GLY	26
1	A	205	LEU	18
1	A	195	ASN	16
1	A	196	PRO	9
1	A	221	VAL	4

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	50/68 (74%)	34±3 (69±5%)	16±3 (31±5%)	1 15
All	All	1500/2040 (74%)	1033 (69%)	467 (31%)	1 15

5 of 37 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	172	LEU	30
1	A	188	THR	29
1	A	201	ILE	29
1	A	205	LEU	28
1	A	216	THR	24

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