wwPDB NMR Structure Validation Summary Report (i)

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PDB ID	:	1LQI
Title	:	INSECTICIDAL ALPHA SCORPION TOXIN ISOLATED FROM THE VENOM OF SCORPION LEIURUS QUINQUESTRIATUS HEBRAEUS, NMR, 29 STRUCTURES
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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:

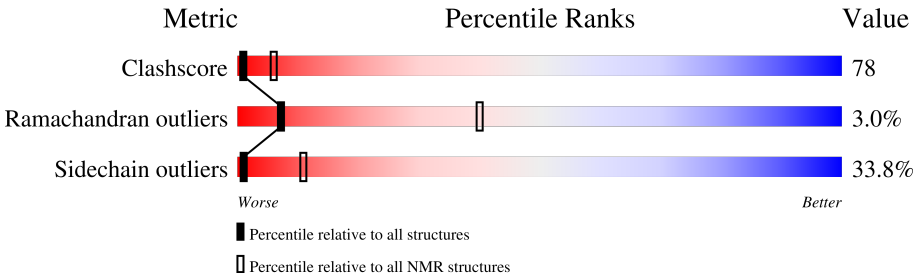
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.26
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.26

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
SOLUTION NMR

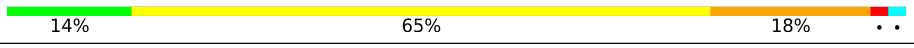
The overall completeness of chemical shifts assignment was not calculated.

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	65	

2 Ensemble composition and analysis (i)

This entry contains 29 models. Model 14 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:2-A:65 (64)	0.35	14

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 5 clusters and 5 single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 985 atoms, of which 472 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called INSECT TOXIN ALPHA.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	65	985	322	472	90	92	9	0

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: INSECT TOXIN ALPHA

Chain A: 14% 65% 18%

M1 V2 R3 D4 A5 Y6 I7 A8 K9 N10 Y11 N12 C13 V14 Y15 E16 C17 F18 R19 D20 A21 Y22 C23 N24 E25 L26 C27 T28 K29 N30 G31 A32 S33 S34 G35 Y36 C37 Q38 W39 A40 G41 K42 Y43 G44 N45 A46 C47 W48 C49 Y50 A51 L52 P53 D54 N55 V56 P57 I58 R59 V60

K63 C64 R65

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

The representative model is number 14. Colouring as in section 4.1 above.

• Molecule 1: INSECT TOXIN ALPHA

Chain A: 17% 57% 23%

M1 V2 R3 D4 A5 Y6 I7 A8 K9 N10 Y11 N12 C13 V14 Y15 E16 C17 F18 R19 D20 A21 Y22 C23 N24 E25 L26 C27 T28 K29 N30 G31 A32 S33 S34 G35 Y36 C37 Q38 W39 A40 Y43 G44 N45 A46 C47 W48 C49 Y50 A51 L52 P53 D54 N55 V56 P57 I58 R59 V60

C64 R65

5 Refinement protocol and experimental data overview (i)

Of the ? calculated structures, 29 were deposited, based on the following criterion: *?*.

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

Software name	Classification	Version
X-PLOR	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	1.03±0.00	0±0/519 (0.0± 0.0%)	1.32±0.01	0±0/704 (0.0± 0.0%)
All	All	1.03	0/15051 (0.0%)	1.32	1/20416 (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	3.8±0.4
All	All	0	110

There are no bond-length outliers.

All unique angle outliers are listed below.

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})	Models	
								Worst	Total
1	A	40	ALA	N-CA-CB	-5.01	103.08	110.10	10	1

There are no chirality outliers.

All unique planar outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Group	Models (Total)
1	A	3	ARG	Sidechain	28
1	A	19	ARG	Sidechain	28
1	A	59	ARG	Sidechain	27
1	A	65	ARG	Sidechain	27

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	505	464	464	76±9
All	All	14645	13456	13456	2199

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 78.

5 of 494 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:55:ASN:OD1	1:A:56:VAL:HG23	0.93	1.64	21	7
1:A:5:ALA:HB3	1:A:58:ILE:HG21	0.93	1.37	1	7
1:A:12:ASN:OD1	1:A:60:VAL:HG22	0.92	1.65	29	28
1:A:33:SER:OG	1:A:51:ALA:HB3	0.92	1.64	26	2
1:A:8:ALA:HB2	1:A:59:ARG:N	0.91	1.79	22	7

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	63/65 (97%)	47±2 (75±3%)	14±2 (22±3%)	2±1 (3±1%)	7	40
All	All	1827/1885 (97%)	1363 (75%)	409 (22%)	55 (3%)	7	40

5 of 10 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	40	ALA	24
1	A	12	ASN	12
1	A	10	ASN	6

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Mol	Chain	Res	Type	Models (Total)
1	A	62	GLY	6
1	A	51	ALA	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	52/53 (98%)	34±3 (66±5%)	18±3 (34±5%)	1 11
All	All	1508/1537 (98%)	999 (66%)	509 (34%)	1 11

5 of 36 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	4	ASP	29
1	A	20	ASP	29
1	A	43	TYR	29
1	A	3	ARG	28
1	A	64	CYS	28

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