WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB NMR Structure Validation Report ⓘ

Nov 6, 2023 – 10:02 AM EST

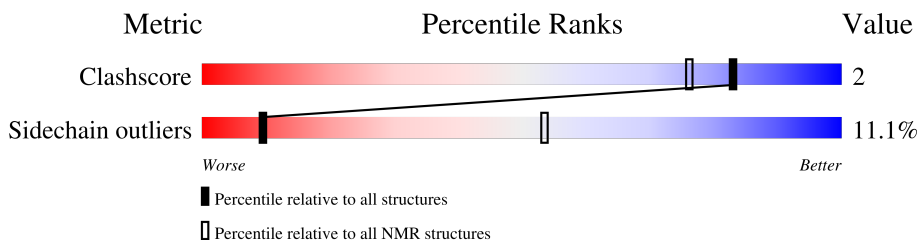|		
PDB ID	:	1AY3
Title	:	Nodularin from Nodularia spumigena
Authors	:	Annila, A.J.
Deposited on	:	1997-11-14

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	Percentile Ranks	Value
Clashscore		2
Sidechain outliers		11.1%

Worse *Better*

■ Percentile relative to all structures
▯ Percentile relative to all NMR structures

Metric	Whole archive (#Entries)	NMR archive (#Entries)
Clashscore	158937	12864
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	5	20% 80%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA and RNA chains that are outliers for geometric criteria:

Mol	Chain	Compound	Res	Total models with violations	
				Chirality	Geometry
1	A	ACB	1	-	8

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2 Ensemble composition and analysis ⓘ

This entry contains 27 models.

Cyrange was unable to find well-defined residues.

Error message: Less than two structures selected.

NmrClust was unable to cluster the ensemble.

Error message: Wrapper check: not enough residues in core to run NmrClust

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 117 atoms, of which 59 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called PEPTIDIC TOXIN NODULARIN.

Mol	Chain	Residues	Atoms					Trace
1	A	5	Total	C	H	N	O	0
			117	41	59	8	9	

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	3	MFD	1ZN	conflict	NOR NOR00279

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.

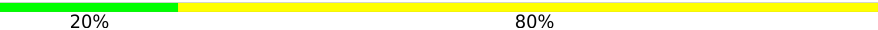• Molecule 1: PEPTIDIC TOXIN NODULARIN

4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

• Molecule 1: PEPTIDIC TOXIN NODULARIN
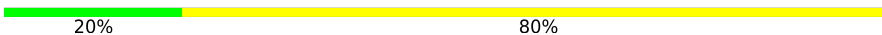

4.2.2 Score per residue for model 2

• Molecule 1: PEPTIDIC TOXIN NODULARIN

4.2.3　Score per residue for model 3

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.4　Score per residue for model 4

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.5　Score per residue for model 5

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.6　Score per residue for model 6

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.7　Score per residue for model 7

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.8 Score per residue for model 8

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.9 Score per residue for model 9

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.10 Score per residue for model 10

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.11 Score per residue for model 11

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.12 Score per residue for model 12

• Molecule 1: PEPTIDIC TOXIN NODULARIN
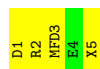
Chain A:

4.2.13   Score per residue for model 13

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.14   Score per residue for model 14

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.15   Score per residue for model 15

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.16   Score per residue for model 16
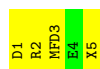
• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:
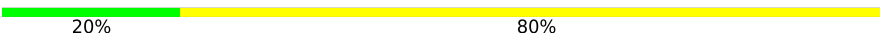
4.2.17   Score per residue for model 17

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.18 Score per residue for model 18

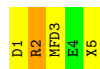• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

20%   80%

D1 R2 MFD3 E4 X5

4.2.19 Score per residue for model 19

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

20%   40%   40%

D1 R2 MFD3 E4 X5

4.2.20 Score per residue for model 20

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

20%   80%

D1 R2 MFD3 E4 X5
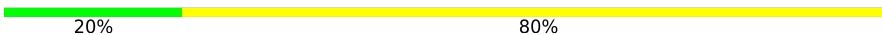
4.2.21 Score per residue for model 21

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

20%   80%

D1 R2 MFD3 E4 X5

4.2.22 Score per residue for model 22

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

20%   80%

D1 R2 MFD3 E4 X5
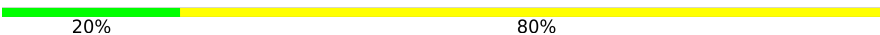
4.2.23 Score per residue for model 23

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

4.2.24 Score per residue for model 24
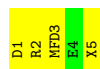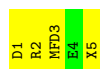
• Molecule 1: PEPTIDIC TOXIN NODULARIN
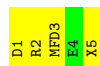
Chain A:

4.2.25 Score per residue for model 25
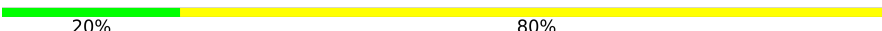
• Molecule 1: PEPTIDIC TOXIN NODULARIN
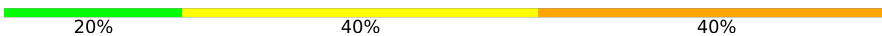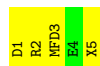
Chain A:

4.2.26 Score per residue for model 26

• Molecule 1: PEPTIDIC TOXIN NODULARIN
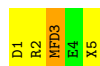
Chain A:

4.2.27 Score per residue for model 27

• Molecule 1: PEPTIDIC TOXIN NODULARIN

Chain A:

5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: ?.

Of the 100 calculated structures, 27 were deposited, based on the following criterion: *RESTRAINT VIOLATIONS*.

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

Software name	Classification	Version
IRMA	refinement	
FELIXREMARK 210 METHOD	structure solution	METHOD

No chemical shift data was provided.

6 Model quality (i)

6.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: ACB, MDH, FGA, MFD

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	3.84±0.02	3±0/10 (30.0± 0.0%)	1.59±0.13	0±0/11 (0.0± 0.0%)
All	All	3.84	81/270 (30.0%)	1.59	0/297 (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	2.0±0.0
All	All	0	54

All unique bond 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(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	2	ARG	CZ-NH1	7.66	1.43	1.33	10	27
1	A	2	ARG	CZ-NH2	7.35	1.42	1.33	4	27
1	A	2	ARG	NE-CZ	5.74	1.40	1.33	16	27

There are no bond-angle outliers.

There are no chirality outliers.

All unique planar outliers are listed below.

Mol	Chain	Res	Type	Group	Models (Total)
1	A	3	MFD	Mainchain,Peptide	27

6.2　Too-close contacts ⓘ

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	58	59	49	0±1
All	All	1566	1593	1323	7

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 2.

All unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models Worst	Total
1:A:3:MFD:HM62	1:A:3:MFD:HM82	0.52	1.81	16	3
1:A:3:MFD:HM63	1:A:3:MFD:H'2	0.51	1.82	10	1
1:A:3:MFD:HM82	1:A:3:MFD:CM6	0.43	2.43	16	3

6.3　Torsion angles ⓘ

6.3.1　Protein backbone ⓘ

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	0	-	-	-	-
All	All	0	-	-	-	-

There are no Ramachandran outliers.

6.3.2　Protein sidechains ⓘ

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	1/1 (100%)	1±0 (89±31%)	0±0 (11±31%)	9	53
All	All	27/27 (100%)	24 (89%)	3 (11%)	9	53

All 1 unique residues with a non-rotameric sidechain are listed below.

Mol	Chain	Res	Type	Models (Total)
1	A	2	ARG	3

6.3.3   RNA ⓘ

There are no RNA molecules in this entry.

6.4   Non-standard residues in protein, DNA, RNA chains ⓘ

3 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds for which Mogul statistics could be retrieved, the number of bonds that are observed in the model and the number of bonds that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length is the number of standard deviations the observed value is removed from the expected value. A bond length with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond lengths.

Mol	Type	Chain	Res	Link	Bond lengths		
					Counts	RMSZ	#Z>2
1	ACB	A	1	1	7,8,9	1.95±0.02	2±0 (22±7%)
1	MDH	A	5	1	4,6,7	2.90±0.03	1±0 (25±0%)
1	FGA	A	4	1	6,7,9	0.75±0.02	0±0 (0±0%)

In the following table, the Counts columns list the number of angles for which Mogul statistics could be retrieved, the number of angles that are observed in the model and the number of angles that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond angle is the number of standard deviations the observed value is removed from the expected value. A bond angle with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond angles.

Mol	Type	Chain	Res	Link	Bond angles		
					Counts	RMSZ	#Z>2
1	ACB	A	1	1	6,10,12	2.49±0.08	3±1 (43±15%)
1	MDH	A	5	1	4,6,8	2.25±0.02	2±0 (50±0%)

Mol	Type	Chain	Res	Link	Bond angles		
					Counts	RMSZ	#Z>2
1	FGA	A	4	1	2,7,11	0.83±0.02	0±0 (0±0%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	MDH	A	5	1	-	0±0,2,6,8	-
1	FGA	A	4	1	-	0±0,4,6,9	-
1	ACB	A	1	1	-	0±0,10,10,12	-

All unique bond 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(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	5	MDH	C-CA	5.81	1.51	1.43	2	27
1	A	1	ACB	OD2-CG	4.47	1.23	1.42	24	27
1	A	1	ACB	OXT-C	2.05	1.23	1.30	14	15

All 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(^{o})	Ideal(^{o})	Models	
								Worst	Total
1	A	1	ACB	OD2-CG-CB	4.77	121.08	111.33	8	27
1	A	5	MDH	O-C-CA	3.65	120.74	125.39	18	27
1	A	1	ACB	C4-CB-CG	2.56	106.52	109.88	2	15
1	A	5	MDH	CM-N-CA	2.41	119.79	123.45	1	27
1	A	1	ACB	C4-CB-CA	2.31	116.74	111.04	2	16
1	A	1	ACB	OXT-C-O	2.02	128.68	124.09	9	13

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6.5　Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.6 Ligand geometry ⓘ

There are no ligands in this entry.

6.7 Other polymers ⓘ

There are no such molecules in this entry.

6.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

7 Chemical shift validation ⓘ

No chemical shift data were provided