Full wwPDB X-ray Structure Validation Report ⓘ

May 19, 2025 – 01:36 pm BST

PDB ID	:	8R4N / pdb_00008r4n
Title	:	Crystal structure of neutralizing Fab Eq4.Dp46-3A from equine antivenom bound to short chain three finger alpha-neurotoxin from Dendroaspis polylepis.
Authors	:	Wibmer, C.K.
Deposited on	:	2023-11-14
Resolution	:	2.20 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

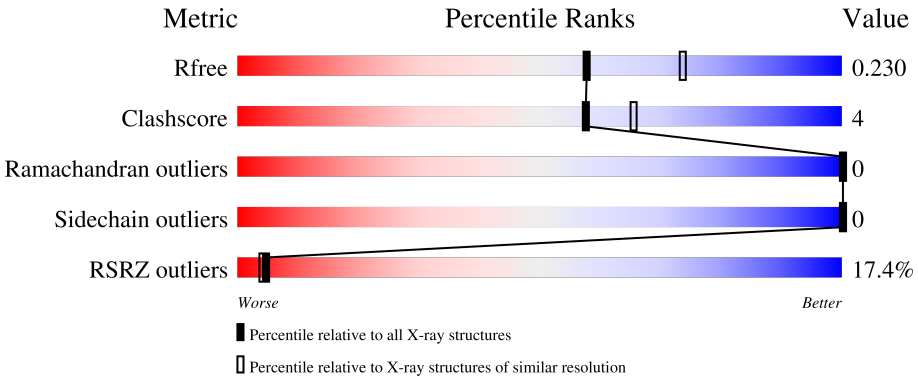
MolProbity	:	4-5-2 with Phenix2.0rc1
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.43.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 Å.

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)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	5791 (2.20-2.20)
Clashscore	180529	6634 (2.20-2.20)
Ramachandran outliers	177936	6560 (2.20-2.20)
Sidechain outliers	177891	6561 (2.20-2.20)
RSRZ outliers	164620	5791 (2.20-2.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. 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% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	H	236	14% 83% 9% 7%
2	L	217	23% 88% 8% .
3	N	67	4% 84% 7% 9%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7081 atoms, of which 3331 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Eq4.Dp46-3A heavy chain.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	H	219	Total	C	H	N	O	S	0	0	0
			3104	1000	1514	259	326	5			

- Molecule 2 is a protein called Eq4.Dp46-3A lambda chain.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	L	208	Total	C	H	N	O	S	0	0	0
			2853	917	1370	252	310	4			

- Molecule 3 is a protein called Short neurotoxin 1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
3	N	61	Total	C	H	N	O	S	0	0	0
			923	288	447	91	89	8			

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
N	60A	GLY	-	expression tag	UNP P01416
N	61	LEU	-	expression tag	UNP P01416
N	62	GLU	-	expression tag	UNP P01416
N	63	VAL	-	expression tag	UNP P01416
N	64	LEU	-	expression tag	UNP P01416
N	65	PHE	-	expression tag	UNP P01416
N	66	GLN	-	expression tag	UNP P01416

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	57	Total	O	0	0
			57	57		

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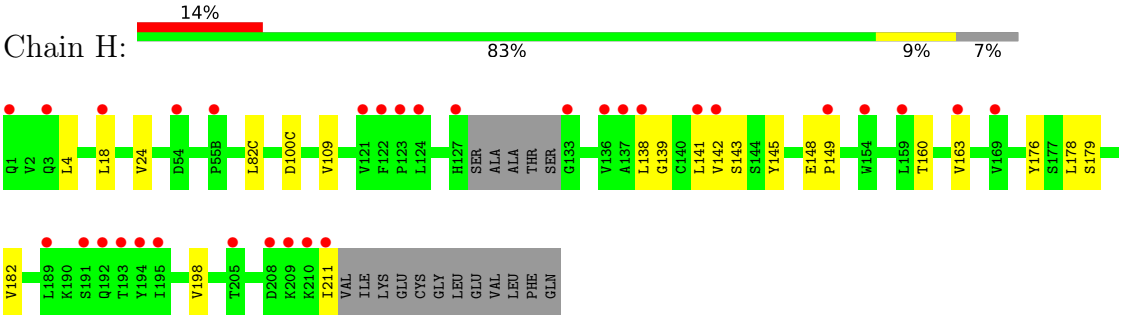
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	L	124	Total O 124 124	0	0
4	N	20	Total O 20 20	0	0

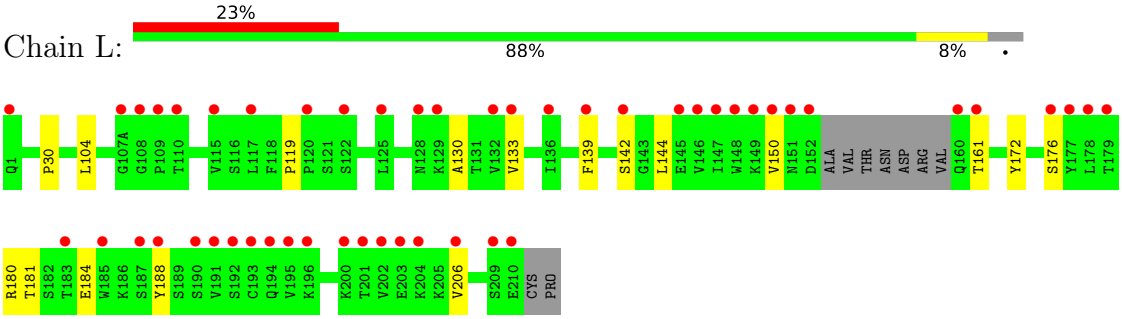
3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-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. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

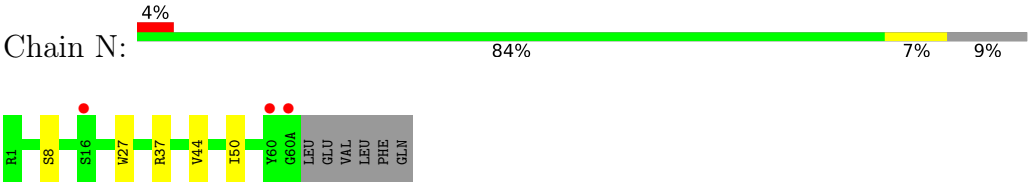
• Molecule 1: Eq4.Dp46-3A heavy chain



• Molecule 2: Eq4.Dp46-3A lambda chain



• Molecule 3: Short neurotoxin 1



4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, α, β, γ	104.62Å 104.62Å 216.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.20 50.00 – 2.20	Depositor EDS
% Data completeness (in resolution range)	98.7 (50.00-2.20) 95.0 (50.00-2.20)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.95 (at 2.20Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.206 , 0.228 0.207 , 0.230	Depositor DCC
R_{free} test set	29695 reflections (4.10%)	wwPDB-VP
Wilson B-factor (Å^2)	44.4	Xtriage
Anisotropy	0.168	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 60.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	7081	wwPDB-VP
Average B, all atoms (Å^2)	86.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.04% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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 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	H	0.19	0/1627	0.39	0/2232
2	L	0.12	0/1516	0.34	0/2074
3	N	0.11	0/486	0.33	0/652
All	All	0.15	0/3629	0.36	0/4958

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 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 the 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 within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	H	1590	1514	1514	18	0
2	L	1483	1370	1369	11	0
3	N	476	447	447	3	0
4	H	57	0	0	0	0
4	L	124	0	0	0	0
4	N	20	0	0	0	0
All	All	3750	3331	3330	30	0

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 4.

All (30) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:142:SER:HB3	2:L:172:TYR:CE1	2.36	0.59
2:L:139:PHE:CE2	2:L:144:LEU:HD23	2.36	0.59
1:H:145:TYR:CE1	1:H:176:TYR:HB2	2.39	0.57
3:N:8:SER:O	3:N:37:ARG:NH2	2.39	0.56
2:L:119:PRO:HB3	2:L:206:VAL:HG21	1.88	0.55
1:H:178:LEU:HD12	1:H:179:SER:N	2.23	0.53
1:H:148:GLU:N	1:H:149:PRO:HD2	2.26	0.50
2:L:161:THR:HG22	2:L:176:SER:OG	2.12	0.50
1:H:139:GLY:O	1:H:211:ILE:HD11	2.13	0.49
1:H:138:LEU:CD1	1:H:182:VAL:HG12	2.44	0.48
1:H:18:LEU:HB2	1:H:82(C):LEU:HD11	1.95	0.48
1:H:141:LEU:HD12	2:L:133:VAL:HG21	1.96	0.47
1:H:163:VAL:HG12	1:H:182:VAL:CG2	2.45	0.47
1:H:100(C):ASP:OD1	1:H:100(C):ASP:C	2.58	0.46
2:L:104:LEU:HD23	2:L:104:LEU:C	2.41	0.45
1:H:18:LEU:HD22	1:H:109:VAL:HG11	1.98	0.44
2:L:181:THR:O	2:L:184:GLU:N	2.51	0.44
2:L:30:PRO:HG3	3:N:27:TRP:CD2	2.53	0.44
2:L:130:ALA:HB3	2:L:180:ARG:O	2.17	0.43
1:H:138:LEU:HD11	1:H:182:VAL:HG12	1.99	0.43
3:N:44:VAL:HG11	3:N:50:ILE:HB	2.01	0.43
1:H:142:VAL:CG2	1:H:198:VAL:HG11	2.48	0.43
1:H:163:VAL:HG12	1:H:182:VAL:HG23	2.00	0.43
1:H:141:LEU:HD21	1:H:143:SER:HB2	2.01	0.42
2:L:150:VAL:HG11	2:L:188:TYR:CE2	2.55	0.41
1:H:138:LEU:C	1:H:138:LEU:HD12	2.46	0.41
1:H:4:LEU:HD22	1:H:24:VAL:HG22	2.02	0.41
1:H:141:LEU:CD2	1:H:143:SER:HB2	2.51	0.41
1:H:160:THR:O	1:H:163:VAL:HG22	2.20	0.40
2:L:161:THR:HG22	2:L:176:SER:CB	2.51	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 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 X-ray entries followed by that with respect to entries of similar resolution.

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	H	215/236 (91%)	207 (96%)	8 (4%)	0	100	100
2	L	204/217 (94%)	197 (97%)	7 (3%)	0	100	100
3	N	59/67 (88%)	56 (95%)	3 (5%)	0	100	100
All	All	478/520 (92%)	460 (96%)	18 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 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 X-ray entries followed by that with respect to entries of similar resolution.

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	H	177/201 (88%)	177 (100%)	0	100	100
2	L	160/184 (87%)	160 (100%)	0	100	100
3	N	53/60 (88%)	53 (100%)	0	100	100
All	All	390/445 (88%)	390 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	H	197	ASN
2	L	79	GLN
2	L	197	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains (i)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

There are no ligands in this entry.

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å^2)	Q<0.9
1	H	219/236 (92%)	0.89	32 (14%) 7 6	43, 84, 159, 185	0
2	L	208/217 (95%)	0.90	50 (24%) 2 2	37, 64, 167, 188	0
3	N	61/67 (91%)	0.68	3 (4%) 36 33	47, 78, 101, 121	0
All	All	488/520 (93%)	0.87	85 (17%) 5 4	37, 80, 160, 188	0

All (85) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	L	185	TRP	5.3
2	L	149	LYS	5.1
2	L	152	ASP	4.7
2	L	151	ASN	4.5
2	L	203	GLU	4.3
2	L	150	VAL	4.1
2	L	108	GLY	4.0
1	H	127	HIS	4.0
2	L	187	SER	3.9
3	N	60(A)	GLY	3.9
1	H	211	ILE	3.9
2	L	148	TRP	3.8
2	L	110	THR	3.8
1	H	138	LEU	3.7
2	L	147	ILE	3.5
1	H	210	LYS	3.5
1	H	195	ILE	3.4
2	L	209	SER	3.3
2	L	107(A)	GLY	3.3
2	L	191	VAL	3.3
2	L	195	VAL	3.3
3	N	16	SER	3.2
2	L	202	VAL	3.1

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Mol	Chain	Res	Type	RSRZ
1	H	209	LYS	3.1
1	H	133	GLY	3.0
2	L	177	TYR	3.0
2	L	133	VAL	3.0
1	H	142	VAL	3.0
2	L	145	GLU	3.0
1	H	169	VAL	2.9
2	L	109	PRO	2.9
2	L	192	SER	2.9
2	L	136	ILE	2.8
2	L	160	GLN	2.8
1	H	149	PRO	2.8
1	H	159	LEU	2.8
1	H	192	GLN	2.8
2	L	129	LYS	2.7
2	L	146	VAL	2.7
1	H	137	ALA	2.7
2	L	206	VAL	2.7
1	H	205	THR	2.7
1	H	121	VAL	2.7
2	L	122	SER	2.6
2	L	117	LEU	2.6
2	L	201	THR	2.6
2	L	178	LEU	2.5
2	L	128	ASN	2.5
2	L	188	TYR	2.5
1	H	55(B)	PRO	2.5
2	L	176	SER	2.5
1	H	122	PHE	2.5
2	L	179	THR	2.5
1	H	154	TRP	2.5
2	L	1	GLN	2.5
2	L	142	SER	2.4
2	L	210	GLU	2.4
2	L	196	LYS	2.4
1	H	194	TYR	2.4
2	L	193	CYS	2.4
2	L	194	GLN	2.4
2	L	183	THR	2.3
1	H	18	LEU	2.3
1	H	141	LEU	2.3
1	H	123	PRO	2.3

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Mol	Chain	Res	Type	RSRZ
2	L	132	VAL	2.3
1	H	191	SER	2.3
1	H	3	GLN	2.3
1	H	54	ASP	2.3
1	H	1	GLN	2.2
2	L	125	LEU	2.2
2	L	190	SER	2.2
1	H	189	LEU	2.2
3	N	60	TYR	2.2
1	H	193	THR	2.2
1	H	136	VAL	2.2
2	L	115	VAL	2.2
1	H	124	LEU	2.1
2	L	120	PRO	2.1
2	L	161	THR	2.1
2	L	139	PHE	2.1
2	L	200	LYS	2.0
1	H	163	VAL	2.0
1	H	208	ASP	2.0
2	L	204	LYS	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (i)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.