



wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 9, 2021 – 06:16 AM EDT

PDB ID : 7MPN
Title : Bartonella henselae NrnC bound to pGC
Authors : Lormand, J.D.; Sondermann, H.
Deposited on : 2021-05-04
Resolution : 1.94 Å(reported)

This is a wwPDB X-ray 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/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.23.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.1

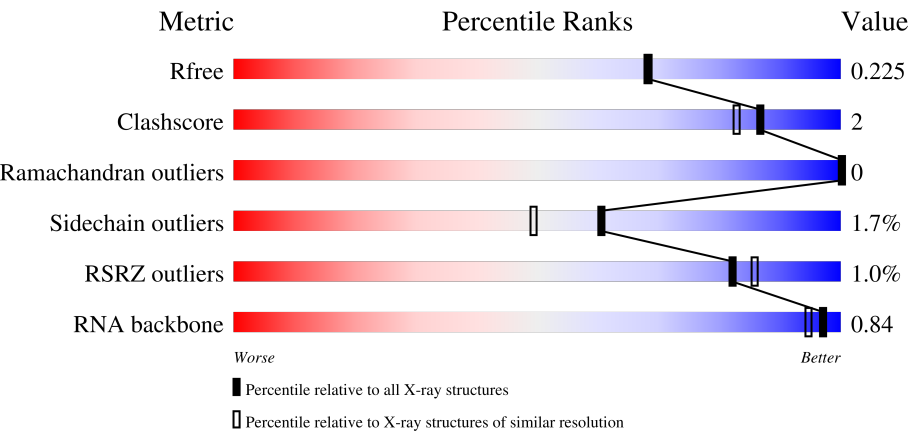
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.94 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}	130704	4310 (1.96-1.92)
Clashscore	141614	1023 (1.94-1.94)
Ramachandran outliers	138981	1007 (1.94-1.94)
Sidechain outliers	138945	1007 (1.94-1.94)
RSRZ outliers	127900	4250 (1.96-1.92)
RNA backbone	3102	1003 (2.46-1.42)

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 $\leq 5\%$. 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	A	207	<div><div></div><div>90%8%..</div></div>
1	C	207	<div><div>2%</div><div>95%..</div></div>
1	E	207	<div><div></div><div>94%..</div></div>
1	G	207	<div><div>%</div><div>90%9%.</div></div>

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Mol	Chain	Length	Quality of chain
1	I	207	<div> <div></div> <div>%</div> <div>94%</div> <div>5%</div> </div>
1	K	207	<div> <div></div> <div>95%</div> <div>.</div> <div>.</div> </div>
1	M	207	<div> <div></div> <div>2%</div> <div>95%</div> <div>.</div> </div>
1	O	207	<div> <div></div> <div>91%</div> <div>7%</div> <div>.</div> </div>
2	B	2	<div> <div></div> <div>50%</div> <div>50%</div> </div>
2	D	2	<div> <div></div> <div>50%</div> <div>50%</div> </div>
2	F	2	<div> <div></div> <div>50%</div> <div>50%</div> </div>
2	H	2	<div> <div></div> <div>50%</div> <div>50%</div> </div>
2	J	2	<div> <div></div> <div>50%</div> <div>50%</div> </div>
2	L	2	<div> <div></div> <div>50%</div> <div>50%</div> </div>
2	N	2	<div> <div></div> <div>50%</div> <div>50%</div> </div>
2	P	2	<div> <div></div> <div>50%</div> <div>50%</div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 15868 atoms, of which 0 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 NanoRNase C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	205	Total	C	N	O	S	0	2	0
			1646	1035	296	309	6			
1	C	206	Total	C	N	O	S	0	2	0
			1648	1036	294	312	6			
1	E	205	Total	C	N	O	S	0	5	0
			1659	1043	296	314	6			
1	G	205	Total	C	N	O	S	0	3	0
			1649	1037	295	311	6			
1	I	206	Total	C	N	O	S	0	1	0
			1647	1036	294	310	7			
1	K	204	Total	C	N	O	S	0	5	0
			1656	1043	297	310	6			
1	M	206	Total	C	N	O	S	0	5	0
			1659	1043	295	315	6			
1	O	204	Total	C	N	O	S	0	2	0
			1640	1032	295	307	6			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	SER	-	expression tag	UNP X5MEI1
C	0	SER	-	expression tag	UNP X5MEI1
E	0	SER	-	expression tag	UNP X5MEI1
G	0	SER	-	expression tag	UNP X5MEI1
I	0	SER	-	expression tag	UNP X5MEI1
K	0	SER	-	expression tag	UNP X5MEI1
M	0	SER	-	expression tag	UNP X5MEI1
O	0	SER	-	expression tag	UNP X5MEI1

- Molecule 2 is a RNA chain called 5'-phosphorylated GC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	2	Total 44	C 19	N 8	O 15	P 2	0	0	0
2	D	2	Total 44	C 19	N 8	O 15	P 2	0	0	0
2	F	2	Total 44	C 19	N 8	O 15	P 2	0	0	0
2	H	2	Total 44	C 19	N 8	O 15	P 2	0	0	0
2	J	2	Total 44	C 19	N 8	O 15	P 2	0	0	0
2	L	2	Total 44	C 19	N 8	O 15	P 2	0	0	0
2	N	2	Total 44	C 19	N 8	O 15	P 2	0	0	0
2	P	2	Total 44	C 19	N 8	O 15	P 2	0	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	272	Total 272	O 272	0	0
3	B	12	Total 12	O 12	0	0
3	C	284	Total 284	O 284	0	0
3	D	12	Total 12	O 12	0	0
3	E	276	Total 276	O 276	0	0
3	F	9	Total 9	O 9	0	0
3	G	268	Total 268	O 268	0	0
3	H	14	Total 14	O 14	0	0
3	I	276	Total 276	O 276	0	0
3	J	12	Total 12	O 12	0	0
3	K	264	Total 264	O 264	0	0
3	L	9	Total 9	O 9	0	0

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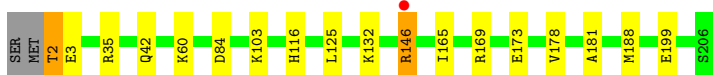
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	M	278	Total 278	O 278	0	0
3	N	14	Total 14	O 14	0	0
3	O	302	Total 302	O 302	0	0
3	P	10	Total 10	O 10	0	0

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.

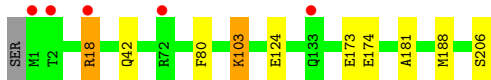
- Molecule 1: NanoRNase C

Chain A: 



- Molecule 1: NanoRNase C

Chain C: 

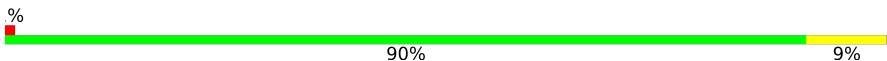


- Molecule 1: NanoRNase C

Chain E: 



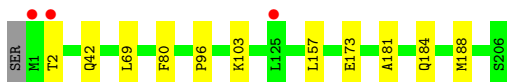
- Molecule 1: NanoRNase C

Chain G: 



- Molecule 1: NanoRNase C

Chain I: 



- Molecule 1: NanoRNase C

Chain K:  95% ..



• Molecule 1: NanoRNase C

Chain M:  95% .



• Molecule 1: NanoRNase C

Chain O:  91% 7% .



• Molecule 2: 5'-phosphorylated GC

Chain B:  50% 50%




• Molecule 2: 5'-phosphorylated GC

Chain D:  50% 50%



• Molecule 2: 5'-phosphorylated GC

Chain F:  50% 50%



• Molecule 2: 5'-phosphorylated GC

Chain H:  50% 50%



• Molecule 2: 5'-phosphorylated GC

Chain J:  50% 50%



- Molecule 2: 5'-phosphorylated GC



- Molecule 2: 5'-phosphorylated GC



- Molecule 2: 5'-phosphorylated GC



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	100.08Å 142.39Å 148.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.21 – 1.94 47.21 – 1.94	Depositor EDS
% Data completeness (in resolution range)	99.7 (47.21-1.94) 91.5 (47.21-1.94)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.55 (at 1.95Å)	Xtriage
Refinement program	PHENIX 1.15.2_3471	Depositor
R, R_{free}	0.194 , 0.225 0.194 , 0.225	Depositor DCC
R_{free} test set	2001 reflections (1.28%)	wwPDB-VP
Wilson B-factor (Å ²)	21.8	Xtriage
Anisotropy	0.219	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 53.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.000 for -h,l,k	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	15868	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 59.19 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.8295e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ 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	A	0.33	0/1680	0.54	0/2269
1	C	0.35	0/1682	0.56	0/2273
1	E	0.35	0/1702	0.54	0/2299
1	G	0.34	0/1686	0.53	0/2277
1	I	0.36	0/1678	0.52	0/2266
1	K	0.35	0/1699	0.53	0/2293
1	M	0.34	0/1702	0.51	0/2300
1	O	0.35	0/1674	0.54	0/2260
2	B	1.69	1/48 (2.1%)	1.02	0/71
2	D	1.55	1/48 (2.1%)	0.97	0/71
2	F	1.54	1/48 (2.1%)	0.94	0/71
2	H	1.73	1/48 (2.1%)	1.07	0/71
2	J	1.61	1/48 (2.1%)	0.88	0/71
2	L	1.68	1/48 (2.1%)	0.91	0/71
2	N	1.68	1/48 (2.1%)	1.19	0/71
2	P	1.54	1/48 (2.1%)	1.01	0/71
All	All	0.44	8/13887 (0.1%)	0.55	0/18805

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	603	G	OP3-P	-11.27	1.47	1.61
2	L	603	G	OP3-P	-11.24	1.47	1.61
2	H	603	G	OP3-P	-11.20	1.47	1.61
2	N	603	G	OP3-P	-10.85	1.48	1.61
2	J	603	G	OP3-P	-10.81	1.48	1.61

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	A	1646	0	1650	12	0
1	C	1648	0	1646	7	0
1	E	1659	0	1663	7	0
1	G	1649	0	1653	13	0
1	I	1647	0	1651	6	0
1	K	1656	0	1668	5	0
1	M	1659	0	1662	5	0
1	O	1640	0	1645	10	0
2	B	44	0	23	0	0
2	D	44	0	23	0	0
2	F	44	0	23	0	0
2	H	44	0	23	0	0
2	J	44	0	23	0	0
2	L	44	0	23	0	0
2	N	44	0	23	0	0
2	P	44	0	23	0	0
3	A	272	0	0	6	1
3	B	12	0	0	0	0
3	C	284	0	0	4	0
3	D	12	0	0	0	0
3	E	276	0	0	4	0
3	F	9	0	0	0	0
3	G	268	0	0	6	0
3	H	14	0	0	0	0
3	I	276	0	0	1	0
3	J	12	0	0	0	0
3	K	264	0	0	2	1
3	L	9	0	0	0	0
3	M	278	0	0	2	1
3	N	14	0	0	0	0
3	O	302	0	0	4	1
3	P	10	0	0	0	0
All	All	15868	0	13422	57	2

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.

The worst 5 of 57 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)
1:G:191:ASN:OD1	3:G:301:HOH:O	1.80	0.99
1:O:131:SER:OG	3:O:301:HOH:O	1.86	0.93
1:E:84:ASP:OD2	3:E:302:HOH:O	2.03	0.77
1:E:167:GLU:OE2	3:E:301:HOH:O	2.03	0.75
1:A:84:ASP:OD2	3:A:301:HOH:O	2.06	0.73

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:M:488:HOH:O	3:O:474:HOH:O[4_545]	2.05	0.15
3:A:307:HOH:O	3:K:353:HOH:O[3_555]	2.09	0.11

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	A	205/207 (99%)	202 (98%)	3 (2%)	0	100	100
1	C	206/207 (100%)	204 (99%)	2 (1%)	0	100	100
1	E	208/207 (100%)	206 (99%)	2 (1%)	0	100	100
1	G	206/207 (100%)	204 (99%)	2 (1%)	0	100	100
1	I	205/207 (99%)	204 (100%)	1 (0%)	0	100	100
1	K	207/207 (100%)	205 (99%)	2 (1%)	0	100	100
1	M	209/207 (101%)	208 (100%)	1 (0%)	0	100	100
1	O	204/207 (99%)	202 (99%)	2 (1%)	0	100	100
All	All	1650/1656 (100%)	1635 (99%)	15 (1%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 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 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	A	180/180 (100%)	174 (97%)	6 (3%)	38	24
1	C	180/180 (100%)	176 (98%)	4 (2%)	52	39
1	E	183/180 (102%)	180 (98%)	3 (2%)	62	52
1	G	181/180 (101%)	178 (98%)	3 (2%)	60	49
1	I	180/180 (100%)	178 (99%)	2 (1%)	73	67
1	K	182/180 (101%)	180 (99%)	2 (1%)	73	67
1	M	183/180 (102%)	181 (99%)	2 (1%)	73	67
1	O	179/180 (99%)	176 (98%)	3 (2%)	60	49
All	All	1448/1440 (101%)	1423 (98%)	25 (2%)	60	49

5 of 25 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	173	GLU
1	I	173	GLU
1	O	173	GLU
1	I	42	GLN
1	K	42	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	O	90	HIS

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	B	1/2 (50%)	0	0
2	D	1/2 (50%)	0	0
2	F	1/2 (50%)	0	0

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Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	H	1/2 (50%)	0	0
2	J	1/2 (50%)	0	0
2	L	1/2 (50%)	0	0
2	N	1/2 (50%)	0	0
2	P	1/2 (50%)	0	0
All	All	8/16 (50%)	0	0

There are no RNA backbone outliers to report.

There are no RNA pucker outliers to report.

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 monosaccharides 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, 95th 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	A	205/207 (99%)	0.09	1 (0%) 91 93	15, 23, 38, 68	0
1	C	206/207 (99%)	0.31	5 (2%) 59 66	16, 23, 39, 77	0
1	E	205/207 (99%)	0.28	0 100 100	16, 24, 37, 53	0
1	G	205/207 (99%)	0.30	2 (0%) 82 86	17, 24, 40, 60	0
1	I	206/207 (99%)	0.26	3 (1%) 73 79	15, 22, 37, 73	0
1	K	204/207 (98%)	0.16	0 100 100	16, 23, 38, 54	0
1	M	206/207 (99%)	0.33	5 (2%) 59 66	17, 25, 43, 77	0
1	O	204/207 (98%)	0.29	1 (0%) 91 93	17, 25, 39, 59	0
2	B	2/2 (100%)	-0.28	0 100 100	23, 23, 23, 26	0
2	D	2/2 (100%)	-0.12	0 100 100	23, 23, 23, 25	0
2	F	2/2 (100%)	-0.01	0 100 100	23, 23, 23, 27	0
2	H	2/2 (100%)	-0.11	0 100 100	23, 23, 23, 26	0
2	J	2/2 (100%)	-0.18	0 100 100	27, 27, 27, 28	0
2	L	2/2 (100%)	-0.21	0 100 100	27, 27, 27, 28	0
2	N	2/2 (100%)	-0.29	0 100 100	23, 23, 23, 25	0
2	P	2/2 (100%)	-0.24	0 100 100	24, 24, 24, 26	0
All	All	1657/1672 (99%)	0.25	17 (1%) 82 86	15, 24, 39, 77	0

The worst 5 of 17 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	I	2	THR	7.9
1	M	1	MET	6.0
1	I	1	MET	4.4
1	C	1	MET	4.3
1	M	2	THR	3.8

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.