



Full wwPDB X-ray Structure Validation Report ⓘ

May 23, 2020 – 02:28 pm BST

PDB ID : 6NTX
Title : Respiratory syncytial virus fusion protein N-terminal heptad repeat domain+VIQKI
Authors : Outlaw, V.K.; Kreitler, D.F.; Gellman, S.H.
Deposited on : 2019-01-30
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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
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) : 2.11

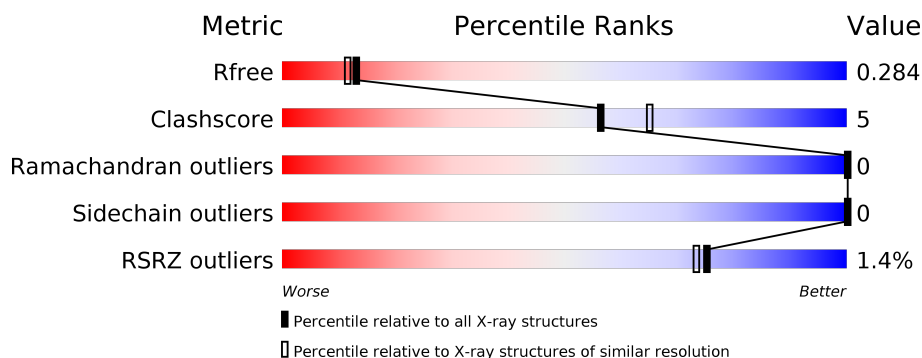
1 Overall quality at a glance

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}	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (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 on 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	53	<div> <div>2%</div> <div> <div></div> <div>75%</div> <div>6%</div> <div>19%</div> </div> </div>
1	B	53	<div> <div>68%</div> <div>8%</div> <div>25%</div> </div>
2	C	38	<div> <div>76%</div> <div>16%</div> <div>8%</div> </div>
2	D	38	<div> <div>3%</div> <div> <div></div> <div>58%</div> <div>13%</div> <div>29%</div> </div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2029 atoms, of which 982 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 Fusion glycoprotein F0.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	43	Total	C	H	N	O	0	0	0
			633	196	322	52	63			
1	B	40	Total	C	H	N	O	0	0	0
			494	160	238	42	54			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	158	ACE	-	acetylation	UNP A0A1U8ZTH8
A	210	NH2	-	amidation	UNP A0A1U8ZTH8
B	158	ACE	-	acetylation	UNP A0A1U8ZTH8
B	210	NH2	-	amidation	UNP A0A1U8ZTH8

- Molecule 2 is a protein called Fusion glycoprotein F0.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	35	Total	C	H	N	O	0	0	1
			490	159	234	43	54			
2	D	27	Total	C	H	N	O	0	0	0
			392	128	188	38	38			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	448	ACE	-	acetylation	UNP A0A1V0BZ41
C	459	VAL	GLU	engineered mutation	UNP A0A1V0BZ41
C	463	ILE	ALA	engineered mutation	UNP A0A1V0BZ41
C	466	GLN	ASP	engineered mutation	UNP A0A1V0BZ41
C	479	LYS	GLN	engineered mutation	UNP A0A1V0BZ41
C	480	ILE	LYS	engineered mutation	UNP A0A1V0BZ41
C	485	NH2	-	amidation	UNP A0A1V0BZ41
D	448	ACE	-	acetylation	UNP A0A1V0BZ41

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Chain	Residue	Modelled	Actual	Comment	Reference
D	459	VAL	GLU	engineered mutation	UNP A0A1V0BZ41
D	463	ILE	ALA	engineered mutation	UNP A0A1V0BZ41
D	466	GLN	ASP	engineered mutation	UNP A0A1V0BZ41
D	479	LYS	GLN	engineered mutation	UNP A0A1V0BZ41
D	480	ILE	LYS	engineered mutation	UNP A0A1V0BZ41
D	485	NH2	-	amidation	UNP A0A1V0BZ41

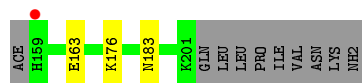
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	5	Total O 5 5	0	0
3	B	6	Total O 6 6	0	0
3	C	5	Total O 5 5	0	0
3	D	4	Total O 4 4	0	0

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

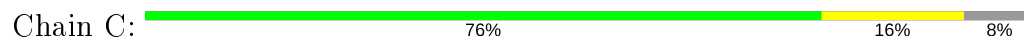
- Molecule 1: Fusion glycoprotein F0



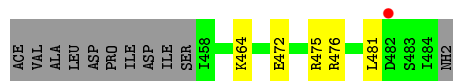
- Molecule 1: Fusion glycoprotein F0



- Molecule 2: Fusion glycoprotein F0



- Molecule 2: Fusion glycoprotein F0



4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α , β , γ	51.97Å 51.97Å 299.09Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	28.76 – 2.20 44.50 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.8 (28.76-2.20) 88.5 (44.50-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.13	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.71 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.13 _2998	Depositor
R, R_{free}	0.232 , 0.285 0.231 , 0.284	Depositor DCC
R_{free} test set	837 reflections (9.97%)	wwPDB-VP
Wilson B-factor (Å ²)	37.5	Xtriage
Anisotropy	0.152	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 86.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	2029	wwPDB-VP
Average B, all atoms (Å ²)	56.0	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 21.93 % 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 6.3256e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² Theoretical 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ACE, NH2

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	0.58	0/311	0.73	0/420
1	B	0.51	0/253	0.67	1/345 (0.3%)
2	C	0.81	0/257	0.61	0/349
2	D	0.83	0/205	0.71	0/274
All	All	0.69	0/1026	0.68	1/1388 (0.1%)

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 outliers	#Planarity outliers
2	D	0	1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	B	181	LEU	CB-CG-CD2	-5.45	101.73	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	D	476	ARG	Sidechain

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	311	322	322	3	0
1	B	256	238	241	2	0
2	C	256	234	232	6	0
2	D	204	188	187	3	0
3	A	5	0	0	1	0
3	B	6	0	0	0	0
3	C	5	0	0	0	0
3	D	4	0	0	0	0
All	All	1047	982	982	10	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 5.

All (10) 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:C:472:GLU:OE1	2:C:475:ARG:NH1	2.27	0.68
2:C:472:GLU:OE1	2:C:475:ARG:HD2	2.10	0.52
2:C:452:ASP:OD1	2:D:464:LYS:NZ	2.43	0.51
1:A:163:GLU:HG2	2:C:484:ILE:HG23	1.93	0.48
2:D:472:GLU:OE2	2:D:475:ARG:NH1	2.49	0.46
1:A:176:LYS:HD3	2:C:473:TRP:CZ2	2.51	0.46
1:A:183:ASN:ND2	3:A:301:HOH:O	2.47	0.43
1:B:168:LYS:HE2	2:D:481:LEU:O	2.19	0.43
2:C:455:ASP:OD1	2:C:455:ASP:O	2.37	0.43
1:B:159:HIS:O	1:B:162:GLY:N	2.54	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 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 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	41/53 (77%)	41 (100%)	0	0	100	100
1	B	38/53 (72%)	37 (97%)	1 (3%)	0	100	100
2	C	33/38 (87%)	33 (100%)	0	0	100	100
2	D	25/38 (66%)	25 (100%)	0	0	100	100
All	All	137/182 (75%)	136 (99%)	1 (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	35/47 (74%)	35 (100%)	0	100	100
1	B	24/47 (51%)	24 (100%)	0	100	100
2	C	27/35 (77%)	27 (100%)	0	100	100
2	D	18/35 (51%)	18 (100%)	0	100	100
All	All	104/164 (63%)	104 (100%)	0	100	100

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

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

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 carbohydrates 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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	43/53 (81%)	0.18	1 (2%) 60 58	25, 37, 85, 100	0
1	B	39/53 (73%)	0.10	0 100 100	29, 40, 77, 81	0
2	C	34/38 (89%)	0.13	0 100 100	28, 45, 87, 106	0
2	D	27/38 (71%)	0.14	1 (3%) 41 39	33, 53, 78, 83	0
All	All	143/182 (78%)	0.14	2 (1%) 75 73	25, 47, 85, 106	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	482	ASP	2.1
1	A	159	HIS	2.1

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 carbohydrates 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.