wwPDB X-ray Structure Validation Summary Report (i)

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PDB ID	:	7X77
Title	:	Ectodomain structure of per os infectivity factor 5
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Deposited on	:	2022-03-09
Resolution	:	2.20 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 (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

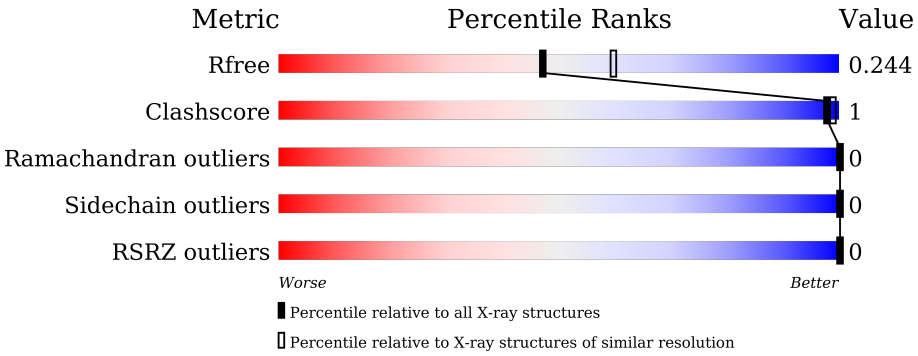
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.28.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.28.1

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}	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 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	A	378	80% · 19%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 2450 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 Per os infectivity factor 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	305	2359	1475	412	462	10	0	0	0

There are 57 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-25	MET	-	expression tag	UNP A0A0N7CNF5
A	-24	LYS	-	expression tag	UNP A0A0N7CNF5
A	-23	LEU	-	expression tag	UNP A0A0N7CNF5
A	-22	CYS	-	expression tag	UNP A0A0N7CNF5
A	-21	ILE	-	expression tag	UNP A0A0N7CNF5
A	-20	LEU	-	expression tag	UNP A0A0N7CNF5
A	-19	LEU	-	expression tag	UNP A0A0N7CNF5
A	-18	ALA	-	expression tag	UNP A0A0N7CNF5
A	-17	VAL	-	expression tag	UNP A0A0N7CNF5
A	-16	VAL	-	expression tag	UNP A0A0N7CNF5
A	-15	ALA	-	expression tag	UNP A0A0N7CNF5
A	-14	PHE	-	expression tag	UNP A0A0N7CNF5
A	-13	VAL	-	expression tag	UNP A0A0N7CNF5
A	-12	GLY	-	expression tag	UNP A0A0N7CNF5
A	-11	LEU	-	expression tag	UNP A0A0N7CNF5
A	-10	SER	-	expression tag	UNP A0A0N7CNF5
A	-9	LEU	-	expression tag	UNP A0A0N7CNF5
A	-8	GLY	-	expression tag	UNP A0A0N7CNF5
A	-7	ARG	-	expression tag	UNP A0A0N7CNF5
A	-6	SER	-	expression tag	UNP A0A0N7CNF5
A	-5	PRO	-	expression tag	UNP A0A0N7CNF5
A	-4	TRP	-	expression tag	UNP A0A0N7CNF5
A	-3	PRO	-	expression tag	UNP A0A0N7CNF5
A	-2	GLY	-	expression tag	UNP A0A0N7CNF5
A	-1	VAL	-	expression tag	UNP A0A0N7CNF5
A	0	PRO	-	expression tag	UNP A0A0N7CNF5
A	322	LEU	-	expression tag	UNP A0A0N7CNF5

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Chain	Residue	Modelled	Actual	Comment	Reference
A	323	GLU	-	expression tag	UNP A0A0N7CNF5
A	324	SER	-	expression tag	UNP A0A0N7CNF5
A	325	ARG	-	expression tag	UNP A0A0N7CNF5
A	326	GLY	-	expression tag	UNP A0A0N7CNF5
A	327	PRO	-	expression tag	UNP A0A0N7CNF5
A	328	PHE	-	expression tag	UNP A0A0N7CNF5
A	329	GLU	-	expression tag	UNP A0A0N7CNF5
A	330	GLY	-	expression tag	UNP A0A0N7CNF5
A	331	LYS	-	expression tag	UNP A0A0N7CNF5
A	332	PRO	-	expression tag	UNP A0A0N7CNF5
A	333	ILE	-	expression tag	UNP A0A0N7CNF5
A	334	PRO	-	expression tag	UNP A0A0N7CNF5
A	335	ASN	-	expression tag	UNP A0A0N7CNF5
A	336	PRO	-	expression tag	UNP A0A0N7CNF5
A	337	LEU	-	expression tag	UNP A0A0N7CNF5
A	338	LEU	-	expression tag	UNP A0A0N7CNF5
A	339	GLY	-	expression tag	UNP A0A0N7CNF5
A	340	LEU	-	expression tag	UNP A0A0N7CNF5
A	341	ASP	-	expression tag	UNP A0A0N7CNF5
A	342	SER	-	expression tag	UNP A0A0N7CNF5
A	343	THR	-	expression tag	UNP A0A0N7CNF5
A	344	ARG	-	expression tag	UNP A0A0N7CNF5
A	345	THR	-	expression tag	UNP A0A0N7CNF5
A	346	GLY	-	expression tag	UNP A0A0N7CNF5
A	347	HIS	-	expression tag	UNP A0A0N7CNF5
A	348	HIS	-	expression tag	UNP A0A0N7CNF5
A	349	HIS	-	expression tag	UNP A0A0N7CNF5
A	350	HIS	-	expression tag	UNP A0A0N7CNF5
A	351	HIS	-	expression tag	UNP A0A0N7CNF5
A	352	HIS	-	expression tag	UNP A0A0N7CNF5

- Molecule 2 is water.

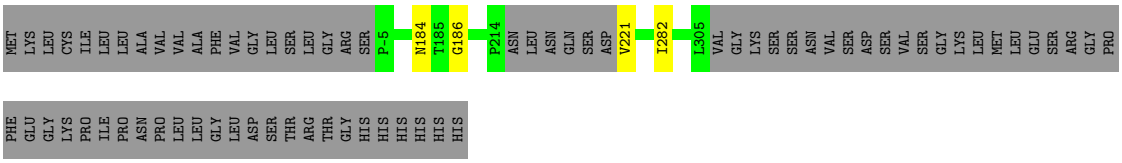
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	91	Total O 91 91	0	0

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: Per os infectivity factor 5

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	68.17Å 92.36Å 52.65Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.18 – 2.20 46.18 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.8 (46.18-2.20) 99.8 (46.18-2.20)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.12 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, R_{free}	0.199 , 0.244 0.199 , 0.244	Depositor DCC
R_{free} test set	869 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	25.1	Xtriage
Anisotropy	1.084	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 32.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	2450	wwPDB-VP
Average B, all atoms (Å^2)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.94% 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	A	0.36	0/2411	0.53	0/3289

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	A	2359	0	2278	3	0
2	A	91	0	0	0	0
All	All	2450	0	2278	3	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 1.

All (3) 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:A:184:ASN:HB3	1:A:221:VAL:CG2	2.44	0.47
1:A:186:GLY:HA2	1:A:282:ILE:O	2.16	0.46
1:A:184:ASN:HB3	1:A:221:VAL:HG21	2.01	0.41

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	A	301/378 (80%)	296 (98%)	5 (2%)	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	A	266/329 (81%)	266 (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 (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	140	GLN
1	A	176	GLN
1	A	207	GLN
1	A	233	ASN

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 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, 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	A	305/378 (80%)	-0.43	0 100 100	18, 28, 45, 68	0

There are no RSRZ outliers to report.

6.2 Non-standard residues in protein, DNA, RNA chains

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

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.