wwPDB X-ray Structure Validation Summary Report (i)

Aug 22, 2020 – 04:43 AM BST

PDB ID	:	6W8R
Title	:	Crystal structure of metacaspase 4 C139A from Arabidopsis
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Deposited on	:	2020-03-21
Resolution	:	2.80 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:

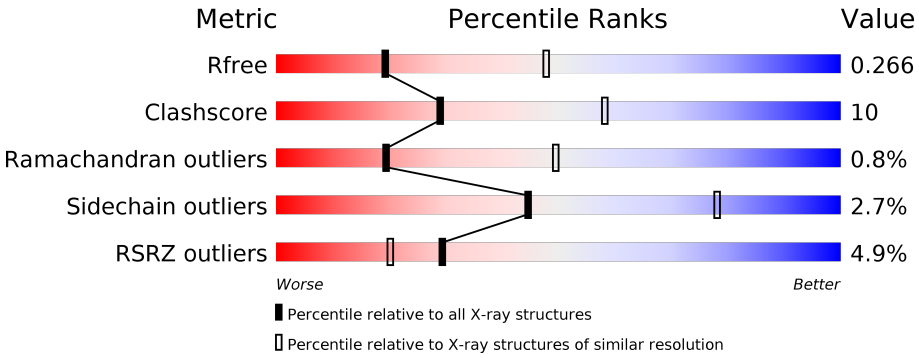
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.13.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.13.1

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 2.80 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	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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 <=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	433	3% 64% 20% 16%
1	B	433	5% 61% 19% 19%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5414 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 Metacaspase-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	364	Total	C	N	O	S	0	0	0
			2741	1693	468	562	18			
1	B	352	Total	C	N	O	S	0	0	0
			2651	1639	454	541	17			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	139	ALA	CYS	engineered mutation	UNP O64517
A	419	VAL	-	expression tag	UNP O64517
A	420	ASP	-	expression tag	UNP O64517
A	421	LYS	-	expression tag	UNP O64517
A	422	LEU	-	expression tag	UNP O64517
A	423	ALA	-	expression tag	UNP O64517
A	424	ALA	-	expression tag	UNP O64517
A	425	ALA	-	expression tag	UNP O64517
A	426	LEU	-	expression tag	UNP O64517
A	427	GLU	-	expression tag	UNP O64517
A	428	HIS	-	expression tag	UNP O64517
A	429	HIS	-	expression tag	UNP O64517
A	430	HIS	-	expression tag	UNP O64517
A	431	HIS	-	expression tag	UNP O64517
A	432	HIS	-	expression tag	UNP O64517
A	433	HIS	-	expression tag	UNP O64517
B	139	ALA	CYS	engineered mutation	UNP O64517
B	419	VAL	-	expression tag	UNP O64517
B	420	ASP	-	expression tag	UNP O64517
B	421	LYS	-	expression tag	UNP O64517
B	422	LEU	-	expression tag	UNP O64517
B	423	ALA	-	expression tag	UNP O64517
B	424	ALA	-	expression tag	UNP O64517
B	425	ALA	-	expression tag	UNP O64517
B	426	LEU	-	expression tag	UNP O64517

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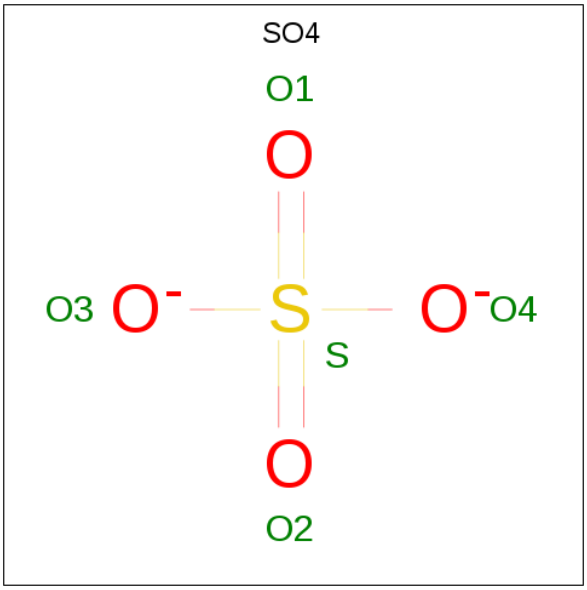
Chain	Residue	Modelled	Actual	Comment	Reference
B	427	GLU	-	expression tag	UNP O64517
B	428	HIS	-	expression tag	UNP O64517
B	429	HIS	-	expression tag	UNP O64517
B	430	HIS	-	expression tag	UNP O64517
B	431	HIS	-	expression tag	UNP O64517
B	432	HIS	-	expression tag	UNP O64517
B	433	HIS	-	expression tag	UNP O64517

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	B	1	Total O S 5 4 1	0	0

- Molecule 3 is water.

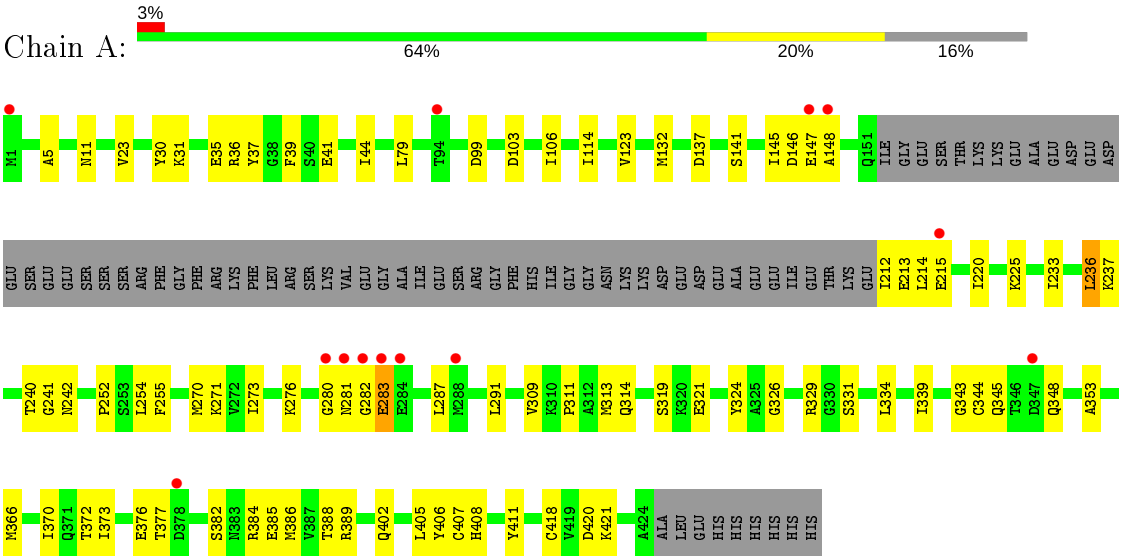
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	9	Total O 9 9	0	0
3	B	8	Total O 8 8	0	0

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.

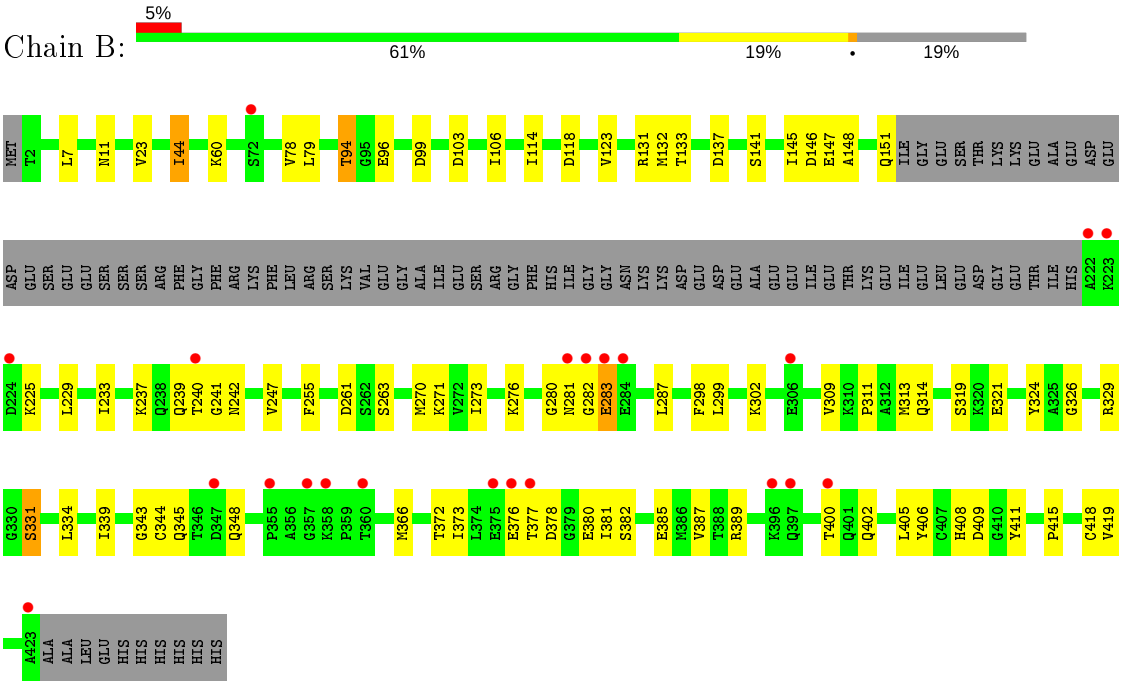
- Molecule 1: Metacaspase-4

Chain A:



- Molecule 1: Metacaspase-4

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	108.16Å 216.10Å 40.49Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.80 – 2.80 39.80 – 2.80	Depositor EDS
% Data completeness (in resolution range)	81.0 (39.80-2.80) 81.0 (39.80-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.03 (at 2.81Å)	Xtriage
Refinement program	PHENIX 1.10.1_2155	Depositor
R, R_{free}	0.248 , 0.266 0.251 , 0.266	Depositor DCC
R_{free} test set	981 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å^2)	15.0	Xtriage
Anisotropy	0.194	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 33.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.85	EDS
Total number of atoms	5414	wwPDB-VP
Average B, all atoms (Å^2)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.94% 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

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	0.28	0/2779	0.50	0/3748
1	B	0.28	0/2688	0.50	0/3625
All	All	0.28	0/5467	0.50	0/7373

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	2741	0	2696	52	0
1	B	2651	0	2616	54	0
2	B	5	0	0	1	0
3	A	9	0	0	0	0
3	B	8	0	0	0	0
All	All	5414	0	5312	103	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 10.

The worst 5 of 103 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:B:151:GLN:HE22	1:B:405:LEU:HB3	1.35	0.91
1:A:339:ILE:HD11	1:A:405:LEU:HD11	1.64	0.80
1:A:31:LYS:HG2	1:B:419:VAL:HG11	1.69	0.73
1:B:131:ARG:NH2	1:B:415:PRO:O	2.22	0.72
1:B:133:THR:HG23	1:B:339:ILE:HD11	1.73	0.70

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	360/433 (83%)	336 (93%)	21 (6%)	3 (1%)	19	49
1	B	348/433 (80%)	330 (95%)	15 (4%)	3 (1%)	17	46
All	All	708/866 (82%)	666 (94%)	36 (5%)	6 (1%)	19	49

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	241	GLY
1	B	241	GLY
1	A	147	GLU
1	B	147	GLU
1	B	281	ASN

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	300/360 (83%)	294 (98%)	6 (2%)	55 84
1	B	291/360 (81%)	281 (97%)	10 (3%)	37 71
All	All	591/720 (82%)	575 (97%)	16 (3%)	44 78

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	94	THR
1	B	141	SER
1	B	331	SER
1	B	44	ILE
1	B	378	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	151	GLN
1	A	348	GLN
1	B	151	GLN
1	B	348	GLN

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)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and

the number of bonds (or 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 length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	SO4	B	501	-	4,4,4	0.17	0	6,6,6	0.30	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501	SO4	1	0

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	364/433 (84%)	0.16	13 (3%)	42	32	11, 32, 69, 154	0
1	B	352/433 (81%)	0.13	22 (6%)	20	12	12, 31, 69, 161	0
All	All	716/866 (82%)	0.14	35 (4%)	29	20	11, 31, 70, 161	0

The worst 5 of 35 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	281	ASN	8.5
1	A	282	GLY	6.8
1	A	283	GLU	6.0
1	B	72	SER	4.8
1	A	281	ASN	4.4

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	SO4	B	501	5/5	0.86	0.26	54,54,54,54	0

6.5 Other polymers (i)

There are no such residues in this entry.