Full wwPDB X-ray Structure Validation Report (i)

Sep 28, 2024 – 06:51 AM EDT

PDB ID	:	1CEX
Title	:	STRUCTURE OF CUTINASE
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Deposited on	:	1997-02-18
Resolution	:	1.00 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 (i) 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 (1)) were used in the production of this report:

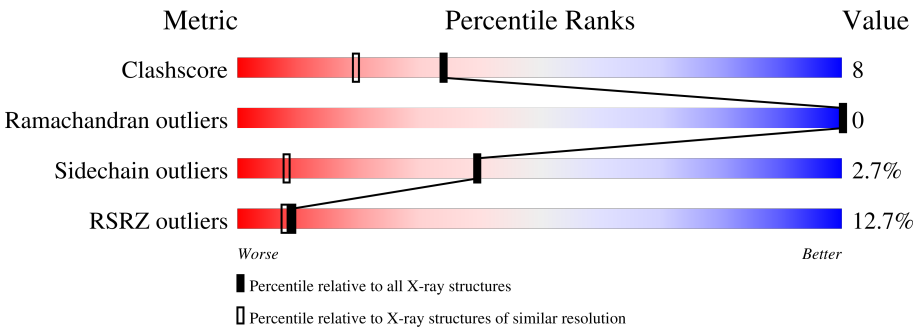
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

1 Overall quality at a glance (i)

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

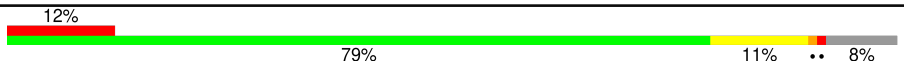
The reported resolution of this entry is 1.00 Å.

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))
Clashscore	180529	1363 (1.04-0.96)
Ramachandran outliers	177936	1301 (1.04-0.96)
Sidechain outliers	177891	1302 (1.04-0.96)
RSRZ outliers	164620	1203 (1.04-0.96)

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%

Mol	Chain	Length	Quality of chain
1	A	214	

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3199 atoms, of which 1451 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 CUTINASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	197	2911	901	1451	263	291	5	0	10	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	32	ALA	ARG	conflict	UNP P00590

- Molecule 2 is water.

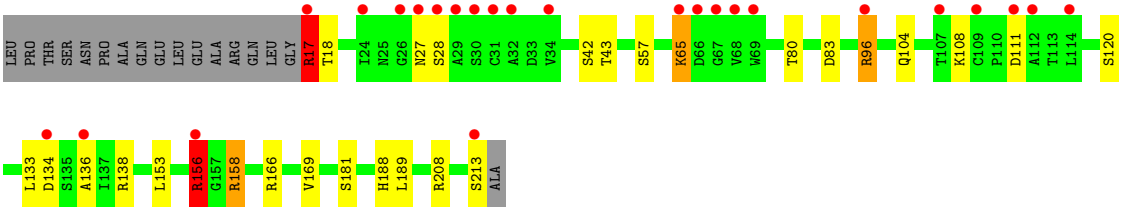
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	264	288	288	0	22

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. 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. 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: CUTINASE

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	35.12Å 67.36Å 37.05Å 90.00° 93.90° 90.00°	Depositor
Resolution (Å)	15.00 – 1.00 15.00 – 1.00	Depositor EDS
% Data completeness (in resolution range)	93.3 (15.00-1.00) 89.8 (15.00-1.00)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.12 (at 1.00Å)	Xtriage
Refinement program	SHELXL-93	Depositor
R, R_{free}	0.094 , 0.119 0.185 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	9.2	Xtriage
Anisotropy	0.239	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.39 , 50.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.98	EDS
Total number of atoms	3199	wwPDB-VP
Average B, all atoms (Å^2)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.74% 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 (i)

5.1 Standard geometry (i)

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	1.11	9/1538 (0.6%)	1.37	17/2086 (0.8%)

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
1	A	0	2

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	138	ARG	CD-NE	-10.02	1.29	1.46
1	A	156	ARG	CD-NE	6.70	1.57	1.46
1	A	181[A]	SER	CB-OG	-6.08	1.34	1.42
1	A	181[B]	SER	CB-OG	-6.08	1.34	1.42
1	A	156	ARG	NE-CZ	5.95	1.40	1.33
1	A	108	LYS	CD-CE	-5.82	1.36	1.51
1	A	57[A]	SER	CB-OG	-5.49	1.35	1.42
1	A	57[B]	SER	CB-OG	-5.49	1.35	1.42
1	A	57[C]	SER	CB-OG	-5.49	1.35	1.42

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	138	ARG	CD-NE-CZ	24.09	157.32	123.60
1	A	156	ARG	CD-NE-CZ	-13.55	104.63	123.60
1	A	156	ARG	NE-CZ-NH2	-13.33	113.63	120.30
1	A	134	ASP	CB-CG-OD1	10.50	127.75	118.30
1	A	158	ARG	NE-CZ-NH1	9.66	125.13	120.30
1	A	138	ARG	CG-CD-NE	7.46	127.48	111.80
1	A	96	ARG	NE-CZ-NH2	7.23	123.92	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	17	ARG	NE-CZ-NH1	7.17	123.89	120.30
1	A	208	ARG	NE-CZ-NH2	-6.75	116.93	120.30
1	A	17	ARG	CD-NE-CZ	6.67	132.94	123.60
1	A	166	ARG	NE-CZ-NH2	-6.61	116.99	120.30
1	A	133	LEU	CB-CG-CD1	6.14	121.44	111.00
1	A	133	LEU	CA-CB-CG	6.11	129.36	115.30
1	A	108	LYS	CD-CE-NZ	6.11	125.74	111.70
1	A	138	ARG	NE-CZ-NH2	-6.07	117.27	120.30
1	A	111	ASP	CB-CG-OD1	-5.84	113.04	118.30
1	A	136	ALA	N-CA-CB	5.39	117.65	110.10

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	156	ARG	Sidechain
1	A	17	ARG	Sidechain

5.2 Too-close contacts (i)

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	1460	1451	1441	22	1
2	A	288	0	0	10	1
All	All	1748	1451	1441	22	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 8.

All (22) 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:65:LYS:HE2	2:A:834:HOH:O	1.74	0.87
1:A:17:ARG:HH11	1:A:17:ARG:HA	1.51	0.75
1:A:104[A]:GLN:HG3	2:A:607:HOH:O	1.98	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:17:ARG:CG	1:A:18:THR:N	2.64	0.61
1:A:17:ARG:HG2	1:A:18:THR:H	1.68	0.59
1:A:17:ARG:CG	1:A:18:THR:H	2.16	0.57
1:A:17:ARG:N	2:A:850:HOH:O	2.41	0.53
1:A:17:ARG:HH11	1:A:17:ARG:HG3	1.74	0.52
1:A:17:ARG:HH11	1:A:17:ARG:CA	2.21	0.51
1:A:28:SER:HB3	2:A:622:HOH:O	2.12	0.49
1:A:17:ARG:HG3	1:A:17:ARG:NH1	2.26	0.49
1:A:80[B]:THR:HG21	2:A:847:HOH:O	2.14	0.47
1:A:153:LEU:O	1:A:156:ARG:NH2	2.50	0.45
1:A:17:ARG:HH11	1:A:17:ARG:CG	2.29	0.44
1:A:158:ARG:HD2	2:A:613:HOH:O	2.16	0.44
1:A:28:SER:CB	2:A:622:HOH:O	2.66	0.43
1:A:189:LEU:HD21	2:A:842:HOH:O	2.17	0.43
1:A:120[B]:SER:HB2	1:A:188:HIS:NE2	2.34	0.42
1:A:80[B]:THR:HG22	1:A:83:ASP:OD2	2.19	0.42
1:A:96:ARG:NH2	2:A:548[A]:HOH:O	2.49	0.41
1:A:17:ARG:HA	1:A:17:ARG:NH1	2.26	0.41
1:A:42:SER:HB2	2:A:849:HOH:O	2.20	0.41

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)
1:A:27:ASN:HD21	1:A:169:VAL:H[1_556]	1.19	0.41
2:A:556:HOH:O	2:A:842:HOH:O[1_455]	2.18	0.02

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	206/214 (96%)	203 (98%)	3 (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	157/159 (99%)	153 (98%)	4 (2%)	42 10

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	17	ARG
1	A	43	THR
1	A	65	LYS
1	A	213	SER

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

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 (i)

6.1 Protein, DNA and RNA chains (i)

Warning: The R factor obtained from EDS is 0.1842,which does not match the depositor's R factor of 0.094. Please interpret the results in this section carefully.

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	197/214 (92%)	1.01	25 (12%) 9 8	7, 14, 29, 72	9 (4%)

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	31	CYS	4.1
1	A	69	TRP	4.0
1	A	29	ALA	3.9
1	A	213	SER	3.5
1	A	27	ASN	3.2
1	A	17	ARG	3.1
1	A	26	GLY	2.9
1	A	28	SER	2.7
1	A	114	LEU	2.7
1	A	34	VAL	2.4
1	A	66	ASP	2.4
1	A	30	SER	2.4
1	A	96	ARG	2.4
1	A	107[A]	THR	2.3
1	A	112	ALA	2.3
1	A	109	CYS	2.2
1	A	136	ALA	2.2
1	A	156	ARG	2.2
1	A	32	ALA	2.2
1	A	111	ASP	2.2
1	A	65	LYS	2.2
1	A	134	ASP	2.1
1	A	68	VAL	2.1
1	A	67	GLY	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	24	ILE	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 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.