



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 10, 2026 – 03:31 AM UTC

PDB ID : 1IEC / pdb_00001iec
Title : CRYSTAL STRUCTURE OF THE CATALYTIC SITE MUTANT (H157A)
OF THE HUMAN CYTOMEGALOVIRUS PROTEASE
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Deposited on : 2001-04-09
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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

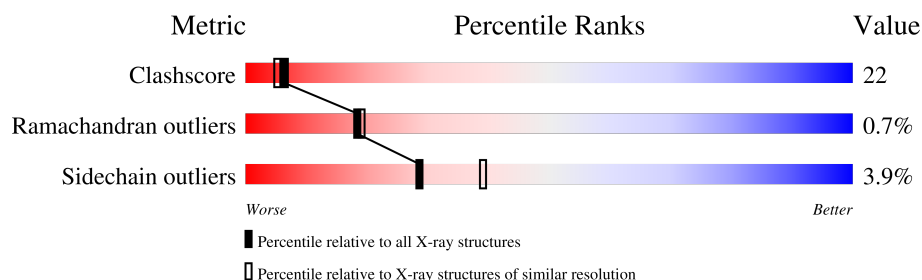
1 Overall quality at a glance

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))
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	256	
1	B	256	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
1	SEB	A	132	-	-	X	-

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3492 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 CAPSID PROTEIN P40: ASSEMBLIN PROTEASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	207	Total	C	N	O	S	0	0	0
			1629	1029	292	303	5			
1	B	219	Total	C	N	O	S	0	0	0
			1719	1080	307	327	5			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	132	SEB	SER	modified residue	UNP P16753
A	143	GLN	ALA	engineered mutation	UNP P16753
A	157	ALA	HIS	engineered mutation	UNP P16753
B	432	SEB	SER	modified residue	UNP P16753
B	443	GLN	ALA	engineered mutation	UNP P16753
B	457	ALA	HIS	engineered mutation	UNP P16753

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	62	Total	O	0	0
			62	62		
2	B	82	Total	O	0	0
			82	82		

4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	76.10Å 76.10Å 169.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.15 – 2.20	Depositor
% Data completeness (in resolution range)	96.7 (29.15-2.20)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.226 , 0.269	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3492	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.41	0/1644	0.93	8/2225 (0.4%)
1	B	0.38	0/1733	0.91	3/2345 (0.1%)
All	All	0.39	0/3377	0.92	11/4570 (0.2%)

There are no bond length outliers.

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	66	THR	N-CA-C	-7.64	103.02	112.88
1	B	476	ASP	CA-C-N	6.80	126.31	119.24
1	B	476	ASP	C-N-CA	6.80	126.31	119.24
1	B	413	SER	N-CA-C	6.55	124.29	109.81
1	A	249	GLU	N-CA-C	-5.57	106.44	113.18

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	1629	0	1614	89	0
1	B	1719	0	1691	64	1
2	A	62	0	0	3	0
2	B	82	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	3492	0	3305	146	1

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 22.

The worst 5 of 146 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:163:VAL:HG12	1:A:238:LEU:HD13	1.43	0.96
1:A:92:ARG:HH11	1:A:92:ARG:HG2	1.34	0.91
1:A:132:SEB:HE3	1:A:165:ARG:H	1.32	0.91
1:A:136:ARG:HA	1:A:136:ARG:HE	1.41	0.84
1:B:376:GLN:HE22	1:B:494:GLY:HA3	1.42	0.82

All (1) 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:B:550:ARG:NH1	1:B:550:ARG:NH1[7_646]	2.12	0.08

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	198/256 (77%)	187 (94%)	9 (4%)	2 (1%)	12	11
1	B	208/256 (81%)	200 (96%)	7 (3%)	1 (0%)	24	27
All	All	406/512 (79%)	387 (95%)	16 (4%)	3 (1%)	18	19

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	113	SER
1	B	413	SER
1	A	114	PRO

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	172/213 (81%)	168 (98%)	4 (2%)	44	59
1	B	183/213 (86%)	173 (94%)	10 (6%)	19	24
All	All	355/426 (83%)	341 (96%)	14 (4%)	28	39

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	376	GLN
1	B	384	CYS
1	B	538	LEU
1	B	431	LEU
1	B	476	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	376	GLN
1	B	482	GLN
1	A	182	GLN
1	B	306	GLN
1	B	362	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

2 non-standard protein/DNA/RNA residues are 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$
1	SEB	B	432	1	15,16,17	1.64	4 (26%)	16,21,23	1.42	2 (12%)
1	SEB	A	132	1	15,16,17	1.89	3 (20%)	16,21,23	1.34	4 (25%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	SEB	B	432	1	-	4/10/13/15	0/1/1/1
1	SEB	A	132	1	-	7/10/13/15	0/1/1/1

The worst 5 of 7 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	132	SEB	CE-SD	4.65	1.83	1.78
1	A	132	SEB	OD2-SD	4.16	1.54	1.44
1	B	432	SEB	CE-SD	3.71	1.82	1.78
1	B	432	SEB	OD2-SD	3.05	1.51	1.44
1	B	432	SEB	OG-SD	2.69	1.64	1.56

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	432	SEB	CB-OG-SD	-3.40	111.98	119.30
1	B	432	SEB	OG-CB-CA	3.34	111.72	107.63
1	A	132	SEB	CB-OG-SD	-3.32	112.15	119.30
1	A	132	SEB	OD1-SD-OD2	-2.26	108.05	116.38
1	A	132	SEB	OG-SD-CE	2.23	110.34	104.18

There are no chirality outliers.

5 of 11 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	132	SEB	SD-CE-CZ-CH2
1	A	132	SEB	SD-CE-CZ-CH1
1	A	132	SEB	CZ-CE-SD-OG
1	A	132	SEB	CB-OG-SD-CE
1	A	132	SEB	C-CA-CB-OG

There are no ring outliers.

2 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	432	SEB	2	0
1	A	132	SEB	12	0

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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.