



wwPDB X-ray Structure Validation Summary Report ⓘ

Apr 25, 2026 – 05:39 PM EDT

PDB ID : 4EJF / pdb_00004ejf
Title : Allosteric peptides that bind to a caspase zymogen and mediate caspase tetramerization
Authors : Murray, J.M.
Deposited on : 2012-04-06
Resolution : 2.65 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:

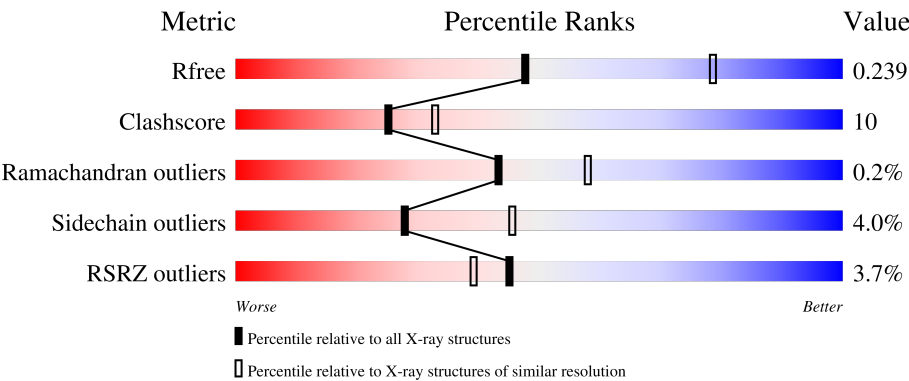
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance i

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

The reported resolution of this entry is 2.65 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}	180053	2053 (2.66-2.62)
Clashscore	190562	2097 (2.66-2.62)
Ramachandran outliers	187476	2066 (2.66-2.62)
Sidechain outliers	187428	2066 (2.66-2.62)
RSRZ outliers	180081	2052 (2.66-2.62)

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 $\leq 5\%$. 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	279	3% 70% 17% • 13%
1	B	279	3% 64% 21% • 13%
1	C	279	3% 64% 22% • 13%
1	D	279	2% 68% 18% • 13%
2	E	18	11% 50% 11% 6% 33%

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Mol	Chain	Length	Quality of chain
2	F	18	
2	G	18	
2	H	18	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 8485 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 Caspase-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	243	Total	C	N	O	S	7	0	0
			1947	1243	338	353	13			
1	B	243	Total	C	N	O	S	0	0	0
			1950	1245	338	353	14			
1	C	243	Total	C	N	O	S	0	0	0
			1944	1239	338	353	14			
1	D	243	Total	C	N	O	S	0	0	0
			1950	1245	338	353	14			

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	21	MET	-	expression tag	UNP P55212
A	22	GLY	-	expression tag	UNP P55212
A	23	SER	-	expression tag	UNP P55212
A	163	ALA	CYS	engineered mutation	UNP P55212
A	294	HIS	-	expression tag	UNP P55212
A	295	HIS	-	expression tag	UNP P55212
A	296	HIS	-	expression tag	UNP P55212
A	297	HIS	-	expression tag	UNP P55212
A	298	HIS	-	expression tag	UNP P55212
A	299	HIS	-	expression tag	UNP P55212
B	21	MET	-	expression tag	UNP P55212
B	22	GLY	-	expression tag	UNP P55212
B	23	SER	-	expression tag	UNP P55212
B	163	ALA	CYS	engineered mutation	UNP P55212
B	294	HIS	-	expression tag	UNP P55212
B	295	HIS	-	expression tag	UNP P55212
B	296	HIS	-	expression tag	UNP P55212
B	297	HIS	-	expression tag	UNP P55212
B	298	HIS	-	expression tag	UNP P55212
B	299	HIS	-	expression tag	UNP P55212
C	21	MET	-	expression tag	UNP P55212

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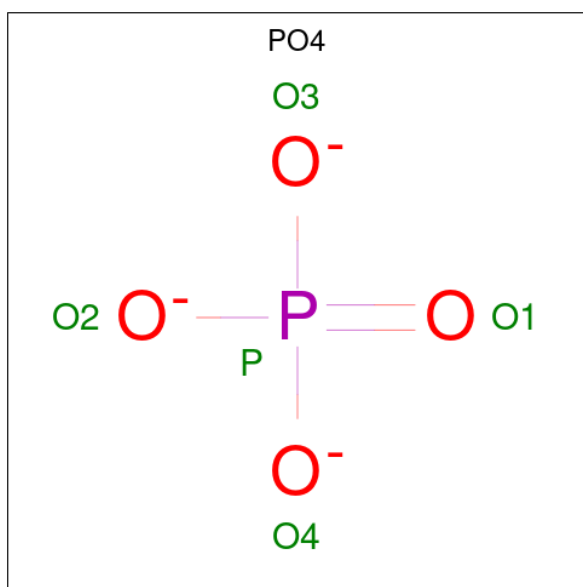
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Chain	Residue	Modelled	Actual	Comment	Reference
C	22	GLY	-	expression tag	UNP P55212
C	23	SER	-	expression tag	UNP P55212
C	163	ALA	CYS	engineered mutation	UNP P55212
C	294	HIS	-	expression tag	UNP P55212
C	295	HIS	-	expression tag	UNP P55212
C	296	HIS	-	expression tag	UNP P55212
C	297	HIS	-	expression tag	UNP P55212
C	298	HIS	-	expression tag	UNP P55212
C	299	HIS	-	expression tag	UNP P55212
D	21	MET	-	expression tag	UNP P55212
D	22	GLY	-	expression tag	UNP P55212
D	23	SER	-	expression tag	UNP P55212
D	163	ALA	CYS	engineered mutation	UNP P55212
D	294	HIS	-	expression tag	UNP P55212
D	295	HIS	-	expression tag	UNP P55212
D	296	HIS	-	expression tag	UNP P55212
D	297	HIS	-	expression tag	UNP P55212
D	298	HIS	-	expression tag	UNP P55212
D	299	HIS	-	expression tag	UNP P55212

- Molecule 2 is a protein called phage-derived peptide 419.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	12	Total	C	N	O	S	0	0	0
			102	66	18	17	1			
2	F	11	Total	C	N	O	S	0	0	0
			93	61	17	14	1			
2	G	12	Total	C	N	O	S	0	0	0
			108	69	21	17	1			
2	H	12	Total	C	N	O	S	0	0	0
			102	66	18	17	1			

- Molecule 3 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).

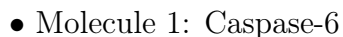
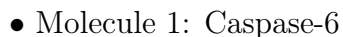


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	C	1	Total	O	P	0	0
			5	4	1		
3	D	1	Total	O	P	0	0
			5	4	1		

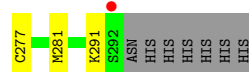
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	65	Total	O	0	0
			65	65		
4	B	72	Total	O	0	0
			72	72		
4	C	61	Total	O	0	0
			61	61		
4	D	74	Total	O	0	0
			74	74		
4	E	2	Total	O	0	0
			2	2		
4	F	3	Total	O	0	0
			3	3		
4	H	2	Total	O	0	0
			2	2		

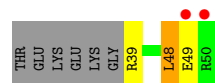
- Molecule 1: Caspase-6



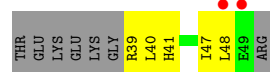
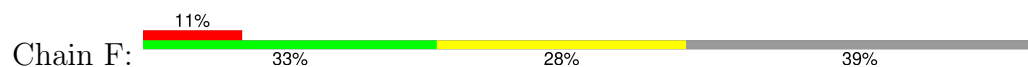
- Molecule 1: Caspase-6



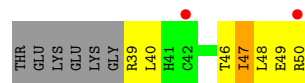
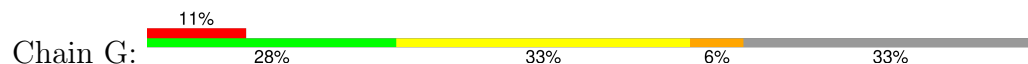
- Molecule 2: phage-derived peptide 419



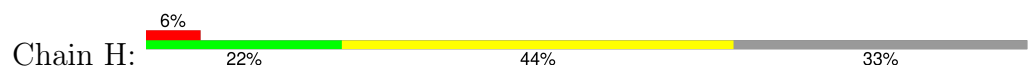
- Molecule 2: phage-derived peptide 419



- Molecule 2: phage-derived peptide 419



- Molecule 2: phage-derived peptide 419



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	128.30Å 105.69Å 91.92Å 90.00° 106.61° 90.00°	Depositor
Resolution (Å)	58.93 – 2.65 58.93 – 2.65	Depositor EDS
% Data completeness (in resolution range)	99.4 (58.93-2.65) 92.4 (58.93-2.65)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.04 (at 2.65Å)	Xtriage
Refinement program	PHENIX dev_713	Depositor
R, R_{free}	0.188 , 0.239 0.193 , 0.239	Depositor DCC
R_{free} test set	1720 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	31.4	Xtriage
Anisotropy	0.679	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 57.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8485	wwPDB-VP
Average B, all atoms (Å ²)	44.0	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 53.94 % 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 3.9251e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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: PO4

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	0/1992	0.75	2/2683 (0.1%)
1	B	0.26	0/1995	0.75	4/2686 (0.1%)
1	C	0.29	0/1988	0.70	0/2677
1	D	0.28	0/1995	0.72	1/2686 (0.0%)
2	E	0.24	0/104	0.60	0/141
2	F	0.26	0/95	0.59	0/129
2	G	0.23	0/110	0.62	0/148
2	H	0.24	0/104	0.62	0/141
All	All	0.27	0/8383	0.72	7/11291 (0.1%)

There are no bond length outliers.

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	145	GLY	N-CA-C	8.04	122.38	112.73
1	A	266	ASP	CA-C-N	7.16	127.16	119.28
1	A	266	ASP	C-N-CA	7.16	127.16	119.28
1	B	200	LEU	CA-C-N	6.55	127.92	120.85
1	B	200	LEU	C-N-CA	6.55	127.92	120.85

There are no chirality outliers.

There are no planarity outliers.

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	1947	0	1915	38	0
1	B	1950	0	1922	42	0
1	C	1944	0	1915	43	0
1	D	1950	0	1922	28	0
2	E	102	0	96	1	0
2	F	93	0	90	5	0
2	G	108	0	107	10	0
2	H	102	0	96	11	0
3	C	5	0	0	1	0
3	D	5	0	0	0	0
4	A	65	0	0	0	0
4	B	72	0	0	3	0
4	C	61	0	0	3	0
4	D	74	0	0	0	0
4	E	2	0	0	0	0
4	F	3	0	0	0	0
4	H	2	0	0	0	0
All	All	8485	0	8063	157	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 157 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:G:50:ARG:C	2:H:39:ARG:HH12	1.86	0.83
2:G:49:GLU:HG2	2:G:50:ARG:H	1.45	0.81
1:C:30:MET:HG3	1:C:31:PHE:H	1.48	0.79
1:B:95:GLU:O	1:B:99:LYS:HD3	1.89	0.72
1:C:30:MET:HG3	1:C:31:PHE:N	2.05	0.71

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	239/279 (86%)	224 (94%)	15 (6%)	0	100	100
1	B	239/279 (86%)	225 (94%)	12 (5%)	2 (1%)	16	24
1	C	239/279 (86%)	229 (96%)	10 (4%)	0	100	100
1	D	239/279 (86%)	231 (97%)	8 (3%)	0	100	100
2	E	10/18 (56%)	10 (100%)	0	0	100	100
2	F	9/18 (50%)	8 (89%)	1 (11%)	0	100	100
2	G	10/18 (56%)	9 (90%)	1 (10%)	0	100	100
2	H	10/18 (56%)	10 (100%)	0	0	100	100
All	All	995/1188 (84%)	946 (95%)	47 (5%)	2 (0%)	43	58

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	124	GLY
1	B	267	PRO

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	210/245 (86%)	206 (98%)	4 (2%)	50	70
1	B	211/245 (86%)	207 (98%)	4 (2%)	50	70
1	C	210/245 (86%)	196 (93%)	14 (7%)	15	24
1	D	211/245 (86%)	204 (97%)	7 (3%)	33	53
2	E	11/17 (65%)	8 (73%)	3 (27%)	0	0
2	F	10/17 (59%)	9 (90%)	1 (10%)	7	10
2	G	12/17 (71%)	10 (83%)	2 (17%)	2	2
2	H	11/17 (65%)	11 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
All	All	886/1048 (84%)	851 (96%)	35 (4%)	28	45

5 of 35 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	265	LYS
2	E	39	ARG
2	F	48	LEU
1	C	53	GLU
1	C	48	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	126	HIS
1	B	58	HIS
1	C	161	GLN
1	C	224	ASN
1	C	230	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 ligands 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	$\# Z > 2$
3	PO4	D	301	-	4,4,4	0.97	0	6,6,6	0.44	0
3	PO4	C	301	-	4,4,4	0.97	0	6,6,6	0.47	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
3	C	301	PO4	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 [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	242/279 (86%)	-0.17	8 (3%) 49 43	22, 38, 78, 168	0
1	B	243/279 (87%)	-0.20	9 (3%) 45 39	23, 37, 84, 151	0
1	C	243/279 (87%)	-0.16	8 (3%) 49 43	22, 39, 86, 160	0
1	D	243/279 (87%)	-0.31	6 (2%) 58 54	21, 35, 83, 145	0
2	E	12/18 (66%)	0.78	2 (16%) 4 3	28, 51, 86, 94	0
2	F	11/18 (61%)	0.58	2 (18%) 3 3	28, 37, 67, 68	0
2	G	12/18 (66%)	0.63	2 (16%) 4 3	37, 51, 115, 124	0
2	H	12/18 (66%)	0.43	1 (8%) 17 13	33, 44, 87, 105	0
All	All	1018/1188 (85%)	-0.17	38 (3%) 45 39	21, 38, 87, 168	0

The worst 5 of 38 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	262	ASP	4.9
2	E	50	ARG	4.8
1	C	261	VAL	4.1
1	B	260	ARG	3.7
1	A	263	PHE	3.7

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 oligosaccharides in this entry.

6.4 Ligands [i](#)

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, 95th 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($\text{\AA}^2$)	Q<0.9
3	PO4	C	301	5/5	0.89	0.21	60,75,80,81	0
3	PO4	D	301	5/5	0.95	0.20	60,67,71,74	0

6.5 Other polymers [i](#)

There are no such residues in this entry.