



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 4, 2026 – 06:01 PM UTC

PDB ID : 2BO9 / pdb_00002bo9
Title : Human carboxypeptidase A4 in complex with human latexin.
Authors : Pallares, I.; Bonet, R.; Garcia-Castellanos, R.; Ventura, S.; Aviles, F.X.; Vendrell, J.; Gomis-Rueth, F.X.
Deposited on : 2005-04-08
Resolution : 1.60 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

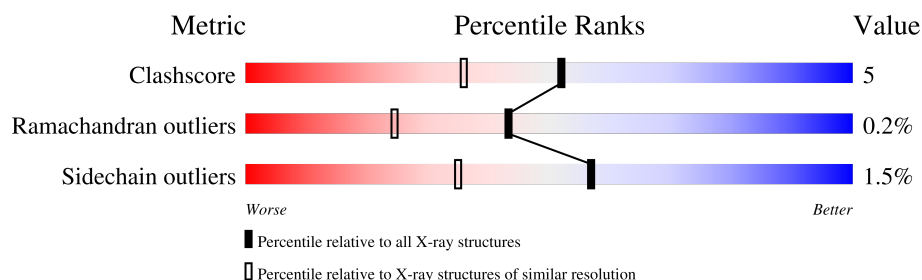
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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	4931 (1.60-1.60)
Ramachandran outliers	187476	4831 (1.60-1.60)
Sidechain outliers	187428	4830 (1.60-1.60)

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	308	
1	C	308	
2	B	222	
2	D	222	

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
5	VAL	A	903	-	-	X	-

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 9751 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.

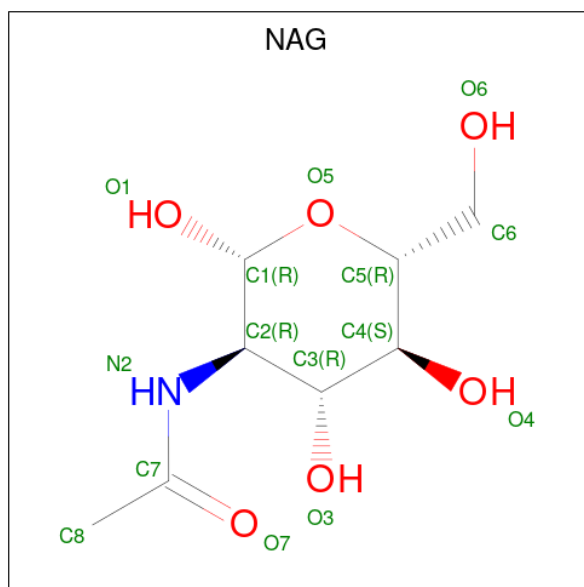
- Molecule 1 is a protein called CARBOXYPEPTIDASE A4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	307	Total	C	N	O	S	0	6	0
			2448	1554	426	458	10			
1	C	307	Total	C	N	O	S	0	6	0
			2443	1549	426	458	10			

- Molecule 2 is a protein called HUMAN LATEXIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	217	Total	C	N	O	S	0	3	0
			1783	1135	303	337	8			
2	D	217	Total	C	N	O	S	0	1	0
			1778	1133	302	335	8			

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).

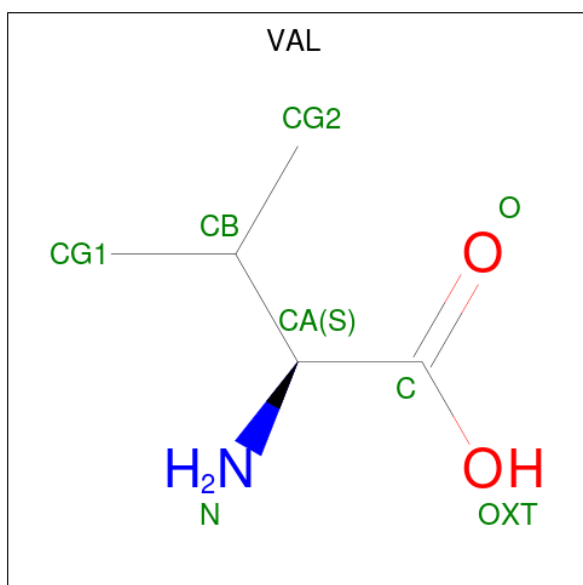


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	C	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Zn	0	0
			1	1		
4	C	1	Total	Zn	0	0
			1	1		

- Molecule 5 is VALINE (CCD ID: VAL) (formula: C₅H₁₁NO₂).



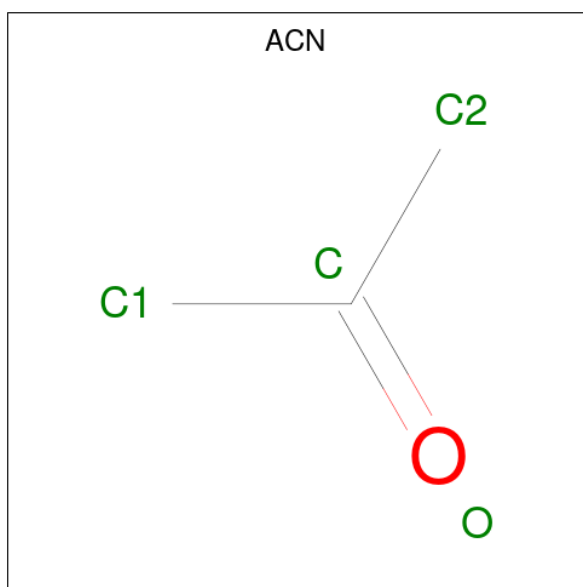
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			8	5	1	2		
5	C	1	Total	C	N	O	0	0
			8	5	1	2		

- Molecule 6 is (4S)-2-METHYL-2,4-PENTANEDIOL (CCD ID: MPD) (formula: C₆H₁₄O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			8	6	2		
6	A	1	Total	C	O	0	0
			8	6	2		
6	A	1	Total	C	O	0	0
			8	6	2		
6	B	1	Total	C	O	0	0
			8	6	2		
6	B	1	Total	C	O	0	0
			8	6	2		
6	B	1	Total	C	O	0	0
			8	6	2		
6	B	1	Total	C	O	0	0
			8	6	2		
6	C	1	Total	C	O	0	0
			8	6	2		
6	D	1	Total	C	O	0	0
			8	6	2		
6	D	1	Total	C	O	0	0
			8	6	2		
6	D	1	Total	C	O	0	0
			8	6	2		

- Molecule 7 is ACETONE (CCD ID: ACN) (formula: C₃H₆O).



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

- Molecule 8 is water.

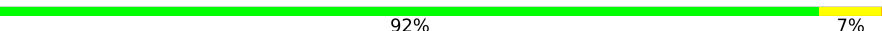
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	389	Total	O	0	0
			389	389		
8	B	225	Total	O	0	0
			225	225		
8	C	359	Total	O	0	0
			359	359		
8	D	180	Total	O	0	0
			180	180		

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.

Note EDS was not executed.

• Molecule 1: CARBOXYPEPTIDASE A4

Chain A:  92% 7% .



• Molecule 1: CARBOXYPEPTIDASE A4

Chain C:  95% . .



• Molecule 2: HUMAN LATEXIN

Chain B:  85% 12% . .



• Molecule 2: HUMAN LATEXIN

Chain D:  89% 9% .



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	78.92Å 96.65Å 92.36Å 90.00° 99.60° 90.00°	Depositor
Resolution (Å)	50.00 – 1.60	Depositor
% Data completeness (in resolution range)	99.8 (50.00-1.60)	Depositor
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC 5.1.9999	Depositor
R, R_{free}	0.149 , 0.176	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	9751	wwPDB-VP
Average B, all atoms (Å ²)	17.0	wwPDB-VP

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: ZN, ACN, NAG, MPD

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	0.69	0/2542	0.82	0/3455
1	C	0.65	0/2540	0.82	0/3452
2	B	0.54	0/1842	0.79	0/2505
2	D	0.52	0/1828	0.75	0/2486
All	All	0.62	0/8752	0.80	0/11898

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 [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	2448	0	2354	21	0
1	C	2443	0	2360	13	0
2	B	1783	0	1741	21	0
2	D	1778	0	1738	17	0
3	A	14	0	13	0	0
3	C	14	0	13	0	0
4	A	1	0	0	0	0
4	C	1	0	0	0	0
5	A	8	0	8	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	C	8	0	8	3	0
6	A	24	0	42	1	0
6	B	32	0	56	6	0
6	C	8	0	14	0	0
6	D	32	0	56	4	0
7	D	4	0	6	1	0
8	A	389	0	0	7	0
8	B	225	0	0	3	0
8	C	359	0	0	5	0
8	D	180	0	0	3	0
All	All	9751	0	8409	86	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 5.

The worst 5 of 86 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:B:53:ARG:HH11	2:B:53:ARG:HG3	1.25	1.00
6:D:303:MPD:HM2	8:D:471:HOH:O	1.70	0.92
8:A:1196:HOH:O	6:B:301:MPD:H53	1.72	0.89
8:C:639:HOH:O	6:D:303:MPD:H53	1.74	0.87
1:A:59:ARG:HD3	8:A:1271:HOH:O	1.74	0.86

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	311/308 (101%)	301 (97%)	9 (3%)	1 (0%)	36	20
1	C	310/308 (101%)	303 (98%)	6 (2%)	1 (0%)	36	20

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	218/222 (98%)	214 (98%)	4 (2%)	0	100	100
2	D	216/222 (97%)	211 (98%)	5 (2%)	0	100	100
All	All	1055/1060 (100%)	1029 (98%)	24 (2%)	2 (0%)	43	24

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	199	SER
1	C	199	SER

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	263/258 (102%)	261 (99%)	2 (1%)	73	59
1	C	263/258 (102%)	260 (99%)	3 (1%)	65	46
2	B	199/201 (99%)	191 (96%)	8 (4%)	28	8
2	D	197/201 (98%)	196 (100%)	1 (0%)	81	70
All	All	922/918 (100%)	908 (98%)	14 (2%)	57	35

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

Mol	Chain	Res	Type
2	B	132	GLU
2	B	167	LYS
2	D	53	ARG
1	C	132	ARG
1	C	228	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 16 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	35	GLN
2	D	18	GLN
2	B	108	GLN
1	C	171	ASN
2	B	81	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](#)

Of 19 ligands modelled in this entry, 2 are monoatomic - leaving 17 for Mogul analysis.

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	NAG	A	901	1	14,14,15	0.55	0	17,19,21	0.87	1 (5%)
6	MPD	A	905	-	7,7,7	0.23	0	9,10,10	0.66	0
6	MPD	D	302	-	7,7,7	0.25	0	9,10,10	0.73	0
6	MPD	B	303	-	7,7,7	0.25	0	9,10,10	0.45	0
6	MPD	D	301	-	7,7,7	0.29	0	9,10,10	0.38	0
6	MPD	A	904	-	7,7,7	0.35	0	9,10,10	0.35	0
3	NAG	C	402	1	14,14,15	0.56	0	17,19,21	1.07	2 (11%)
6	MPD	B	302	-	7,7,7	0.22	0	9,10,10	0.92	0
6	MPD	B	301	-	7,7,7	0.26	0	9,10,10	0.41	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	MPD	C	404	-	7,7,7	0.23	0	9,10,10	0.55	0
6	MPD	D	303	-	7,7,7	0.23	0	9,10,10	0.40	0
5	VAL	A	903	-	6,7,7	1.24	1 (16%)	8,9,9	0.74	0
6	MPD	A	906	-	7,7,7	0.35	0	9,10,10	0.57	0
6	MPD	B	304	-	7,7,7	0.35	0	9,10,10	0.35	0
6	MPD	D	304	-	7,7,7	0.33	0	9,10,10	0.40	0
5	VAL	C	401	-	6,7,7	1.28	1 (16%)	8,9,9	0.98	0
7	ACN	D	305	-	3,3,3	0.33	0	3,3,3	0.86	0

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
3	NAG	A	901	1	-	0/6/23/26	0/1/1/1
6	MPD	A	905	-	-	1/5/5/5	-
6	MPD	D	302	-	-	2/5/5/5	-
6	MPD	B	303	-	-	1/5/5/5	-
6	MPD	D	301	-	-	0/5/5/5	-
6	MPD	A	904	-	-	0/5/5/5	-
3	NAG	C	402	1	-	0/6/23/26	0/1/1/1
6	MPD	B	302	-	-	2/5/5/5	-
6	MPD	B	301	-	-	2/5/5/5	-
6	MPD	C	404	-	-	0/5/5/5	-
6	MPD	D	303	-	-	2/5/5/5	-
5	VAL	A	903	-	-	0/8/8/8	-
6	MPD	A	906	-	-	4/5/5/5	-
6	MPD	B	304	-	-	3/5/5/5	-
6	MPD	D	304	-	-	0/5/5/5	-
5	VAL	C	401	-	-	1/8/8/8	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	401	VAL	OXT-C	-2.46	1.22	1.30
5	A	903	VAL	OXT-C	-2.16	1.23	1.30

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	402	NAG	O5-C1-C2	-2.53	107.38	111.29
3	C	402	NAG	C1-O5-C5	2.20	115.13	112.19
3	A	901	NAG	O5-C1-C2	-2.03	108.14	111.29

There are no chirality outliers.

5 of 18 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	906	MPD	O2-C2-C3-C4
6	A	906	MPD	CM-C2-C3-C4
5	C	401	VAL	OXT-C-CA-N
6	A	905	MPD	O2-C2-C3-C4
6	B	303	MPD	O2-C2-C3-C4

There are no ring outliers.

7 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	302	MPD	4	0
6	B	301	MPD	2	0
6	D	303	MPD	4	0
5	A	903	VAL	4	0
6	A	906	MPD	1	0
5	C	401	VAL	3	0
7	D	305	ACN	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](#)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.