



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 24, 2026 – 09:16 PM EDT

PDB ID : 1ARL / pdb_00001arl
Title : CARBOXYPEPTIDASE A WITH ZN REMOVED
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Deposited on : 1994-11-22
Resolution : 1.88 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 ⓘ 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
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

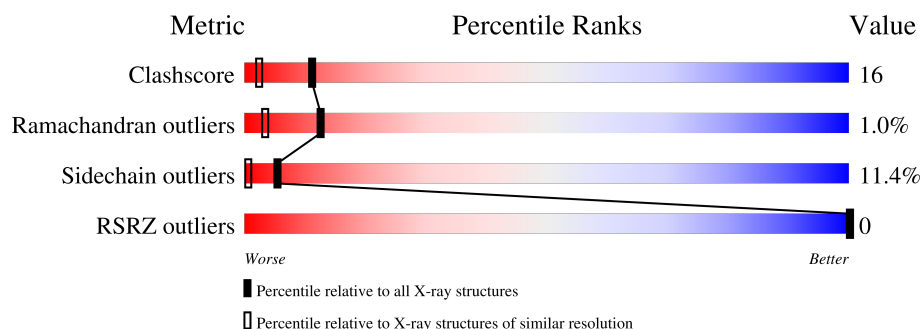
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.88 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	1234 (1.88-1.88)
Ramachandran outliers	187476	1222 (1.88-1.88)
Sidechain outliers	187428	1222 (1.88-1.88)
RSRZ outliers	180081	1220 (1.88-1.88)

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	307	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2616 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 APO-CARBOXYPEPTIDASE A=ALPHA= (COX).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	307	Total	C	N	O	S	0	0	0
			2437	1561	403	468	5			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	179	Total	O	0	0
			179	179		

3 Residue-property plots

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: APO-CARBOXYPEPTIDASE A=ALPHA= (COX)



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	51.70Å 60.32Å 47.20Å 90.00° 97.39° 90.00°	Depositor
Resolution (Å)	13.00 – 1.88 13.00 – 1.88	Depositor EDS
% Data completeness (in resolution range)	88.0 (13.00-1.88) 88.1 (13.00-1.88)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	14.93 (at 1.88Å)	Xtriage
Refinement program	TNT, PROLSQ	Depositor
R, R_{free}	0.143 , (Not available) 0.137 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	19.2	Xtriage
Anisotropy	0.120	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 94.8	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	0.97	EDS
Total number of atoms	2616	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.50% of the height of the origin peak. No significant pseudotranslation is detected.*

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](#)

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	1.33	5/2503 (0.2%)	1.86	53/3402 (1.6%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	220	ASN	N-CA	-5.28	1.39	1.46
1	A	86	PHE	C-O	-5.26	1.18	1.24
1	A	191	ALA	N-CA	5.25	1.52	1.46
1	A	5	ASN	CA-C	-5.04	1.45	1.52
1	A	164	THR	CA-CB	5.03	1.59	1.53

All (53) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	70	SER	N-CA-C	8.01	120.01	111.28
1	A	264	LYS	N-CA-C	7.84	119.45	111.07
1	A	11	THR	CA-CB-OG1	-7.58	98.23	109.60
1	A	221	GLN	CB-CG-CD	7.54	125.41	112.60
1	A	189	PHE	CA-CB-CG	-7.19	106.61	113.80
1	A	279	PHE	CA-CB-CG	-7.14	106.66	113.80
1	A	58	ASN	CA-CB-CG	-7.03	105.57	112.60
1	A	246	THR	N-CA-C	6.79	120.05	111.69
1	A	130	ARG	NE-CZ-NH2	-6.70	113.17	119.20
1	A	254	SER	CB-CA-C	-6.58	100.46	110.92
1	A	273	ASP	CA-C-N	-6.53	112.42	122.60
1	A	273	ASP	C-N-CA	-6.53	112.42	122.60
1	A	216	LYS	N-CA-C	6.51	118.93	111.11
1	A	106	PHE	CA-CB-CG	-6.50	107.30	113.80
1	A	216	LYS	CA-CB-CG	-6.46	101.17	114.10
1	A	101	ASP	CA-CB-CG	-6.32	106.28	112.60
1	A	5	ASN	CA-CB-CG	-6.31	106.29	112.60
1	A	6	THR	CA-C-O	6.25	125.92	119.05
1	A	100	LEU	N-CA-CB	6.25	120.94	110.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	293	THR	CA-CB-OG1	6.20	118.91	109.60
1	A	97	THR	N-CA-CB	6.16	119.17	110.12
1	A	71	ARG	NE-CZ-NH1	6.09	127.59	121.50
1	A	246	THR	N-CA-CB	6.08	119.25	110.20
1	A	271	LEU	N-CA-C	6.03	117.67	110.19
1	A	221	GLN	OE1-CD-NE2	-5.88	116.72	122.60
1	A	273	ASP	CA-CB-CG	5.87	118.47	112.60
1	A	135	SER	N-CA-CB	5.83	120.33	110.49
1	A	239	LYS	N-CA-C	-5.76	101.67	110.14
1	A	6	THR	CB-CA-C	5.58	118.92	109.55
1	A	287	ILE	N-CA-CB	5.58	114.80	110.45
1	A	303	HIS	CA-C-O	5.45	126.24	119.97
1	A	134	SER	N-CA-C	5.44	119.29	111.02
1	A	82	PHE	CB-CA-C	-5.40	102.40	110.88
1	A	271	LEU	N-CA-CB	-5.38	102.94	110.25
1	A	132	VAL	CB-CA-C	-5.30	102.59	111.29
1	A	280	LEU	N-CA-CB	-5.25	103.23	110.42
1	A	140	GLY	N-CA-C	5.24	119.28	112.68
1	A	5	ASN	CA-C-N	-5.23	113.95	122.26
1	A	5	ASN	C-N-CA	-5.23	113.95	122.26
1	A	71	ARG	CB-CG-CD	5.21	123.29	111.30
1	A	33	VAL	N-CA-C	5.20	116.21	108.46
1	A	97	THR	CB-CA-C	5.18	119.40	110.79
1	A	130	ARG	NE-CZ-NH1	5.17	126.67	121.50
1	A	144	ASN	CA-CB-CG	-5.15	107.45	112.60
1	A	212	SER	CB-CA-C	-5.12	100.88	109.53
1	A	69	HIS	ND1-CE1-NE2	5.10	113.50	108.40
1	A	261	GLN	OE1-CD-NE2	5.07	127.67	122.60
1	A	123	ASN	N-CA-CB	-5.06	103.00	110.90
1	A	189	PHE	CA-C-N	-5.06	113.82	122.11
1	A	189	PHE	C-N-CA	-5.06	113.82	122.11
1	A	307	ASN	CA-CB-CG	5.06	117.66	112.60
1	A	29	HIS	ND1-CG-CD2	5.00	111.10	106.10
1	A	60	PRO	CB-CA-C	-5.00	105.01	111.46

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	2437	0	2346	78	0
2	A	179	0	0	10	0
All	All	2616	0	2346	78	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 16.

All (78) 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:137:LEU:HD22	1:A:137:LEU:H	1.29	0.98
1:A:186:HIS:HD2	1:A:188:ASN:H	1.14	0.93
1:A:293:THR:HB	2:A:477:HOH:O	1.70	0.91
1:A:71:ARG:HD2	1:A:127:ARG:HB3	1.55	0.89
1:A:242:SER:O	1:A:246:THR:HG23	1.76	0.85
1:A:289:THR:O	1:A:293:THR:HG22	1.82	0.79
1:A:91:GLY:H	1:A:97:THR:CG2	2.00	0.75
1:A:62:ILE:HG21	1:A:301:MET:HE2	1.70	0.74
1:A:186:HIS:HD2	1:A:188:ASN:N	1.87	0.73
1:A:186:HIS:CD2	1:A:188:ASN:H	2.04	0.73
1:A:175:GLU:O	1:A:179:ILE:HD13	1.95	0.67
1:A:31:GLN:HB2	2:A:493:HOH:O	1.94	0.66
1:A:137:LEU:HD22	1:A:137:LEU:N	2.08	0.66
1:A:71:ARG:HD3	2:A:421:HOH:O	1.97	0.65
1:A:295:LEU:HD22	2:A:580:HOH:O	1.96	0.63
1:A:247:ILE:HG22	1:A:248:TYR:N	2.14	0.63
1:A:91:GLY:H	1:A:97:THR:HG21	1.66	0.60
1:A:93:ASP:O	1:A:97:THR:HG23	2.01	0.59
1:A:62:ILE:HD12	1:A:191:ALA:HB3	1.85	0.59
1:A:204:TYR:HB2	1:A:205:PRO:CD	2.33	0.58
1:A:137:LEU:H	1:A:137:LEU:CD2	2.08	0.58
1:A:29:HIS:N	1:A:30:PRO:HD3	2.19	0.57
1:A:32:LEU:HD11	1:A:100:LEU:HD13	1.85	0.56
1:A:132:VAL:O	1:A:133:THR:HG23	2.05	0.56
1:A:168:LYS:HG2	2:A:546:HOH:O	2.06	0.55
1:A:257:TRP:O	1:A:261:GLN:HG2	2.08	0.53
1:A:71:ARG:HD2	1:A:127:ARG:CB	2.33	0.53
1:A:42:TYR:OH	1:A:132:VAL:HG22	2.09	0.53
1:A:216:LYS:NZ	2:A:494:HOH:O	2.40	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:168:LYS:HD2	1:A:169:TYR:CE1	2.44	0.52
1:A:272:ARG:HH11	1:A:285:GLN:HE21	1.58	0.51
1:A:204:TYR:HB2	1:A:205:PRO:HD2	1.94	0.49
1:A:287:ILE:N	1:A:288:PRO:HD2	2.28	0.49
1:A:154:ALA:O	1:A:249:GLN:OE1	2.30	0.49
1:A:281:LEU:HD13	1:A:285:GLN:HB2	1.95	0.49
1:A:24:LEU:HD23	2:A:553:HOH:O	2.13	0.48
1:A:91:GLY:N	1:A:97:THR:HG21	2.29	0.48
1:A:112:ASN:ND2	1:A:115:GLY:H	2.11	0.47
1:A:233:LEU:HD13	1:A:234:TYR:CE2	2.50	0.47
1:A:196:HIS:ND1	1:A:268:THR:HG21	2.30	0.47
1:A:216:LYS:HG2	1:A:216:LYS:O	2.12	0.47
1:A:179:ILE:N	1:A:179:ILE:CD1	2.77	0.47
1:A:248:TYR:CD2	1:A:249:GLN:N	2.83	0.47
1:A:192:PHE:C	1:A:193:LEU:HD12	2.41	0.46
1:A:28:GLU:C	1:A:30:PRO:HD3	2.41	0.46
1:A:86:PHE:HE1	1:A:294:TRP:CZ3	2.34	0.46
1:A:239:LYS:HE3	2:A:468:HOH:O	2.15	0.45
1:A:132:VAL:HG23	1:A:133:THR:N	2.25	0.45
1:A:248:TYR:CG	1:A:249:GLN:N	2.84	0.45
1:A:272:ARG:HH11	1:A:285:GLN:NE2	2.15	0.45
1:A:287:ILE:N	1:A:288:PRO:CD	2.80	0.45
1:A:85:LYS:HE3	1:A:89:ASP:OD2	2.18	0.44
1:A:179:ILE:HD11	2:A:403:HOH:O	2.16	0.44
1:A:268:THR:HG22	1:A:269:PHE:N	2.33	0.44
1:A:137:LEU:N	1:A:137:LEU:HD13	2.33	0.43
1:A:192:PHE:O	1:A:193:LEU:HD12	2.19	0.43
1:A:150:GLY:O	1:A:151:PHE:C	2.60	0.43
1:A:177:LYS:HA	1:A:177:LYS:HD3	1.81	0.43
1:A:156:ALA:HB1	1:A:166:HIS:HB3	2.01	0.43
1:A:69:HIS:HB2	1:A:72:GLU:CD	2.44	0.43
1:A:71:ARG:CD	1:A:127:ARG:HB3	2.36	0.42
1:A:160:PRO:HA	1:A:165:TYR:CG	2.54	0.42
1:A:55:GLY:O	1:A:59:ARG:HD2	2.20	0.42
1:A:134:SER:C	1:A:136:SER:H	2.28	0.41
1:A:40:ARG:HH11	1:A:40:ARG:HD3	1.75	0.41
1:A:196:HIS:CE1	1:A:268:THR:HG21	2.55	0.41
1:A:247:ILE:CG2	1:A:248:TYR:N	2.76	0.41
1:A:163:GLU:HG3	2:A:568:HOH:O	2.21	0.41
1:A:50:LEU:HD23	1:A:50:LEU:HA	1.89	0.41
1:A:219:LEU:HG	1:A:267:PHE:CZ	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:255:ILE:HB	1:A:266:SER:HB3	2.03	0.41
1:A:11:THR:OG1	1:A:12:TYR:N	2.54	0.40
1:A:119:THR:HA	1:A:123:ASN:O	2.21	0.40
1:A:32:LEU:O	1:A:32:LEU:HD12	2.21	0.40
1:A:133:THR:HB	1:A:134:SER:H	1.28	0.40
1:A:216:LYS:HZ2	1:A:216:LYS:HG3	1.76	0.40
1:A:60:PRO:HB2	1:A:103:MET:HE3	2.02	0.40
1:A:3:SER:HB3	1:A:6:THR:HB	2.04	0.40

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	305/307 (99%)	293 (96%)	9 (3%)	3 (1%)	12 3

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	199	SER
1	A	135	SER
1	A	133	THR

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	263/263 (100%)	233 (89%)	30 (11%)	5 0

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	THR
1	A	31	GLN
1	A	32	LEU
1	A	33	VAL
1	A	34	SER
1	A	57	SER
1	A	58	ASN
1	A	97	THR
1	A	133	THR
1	A	137	LEU
1	A	139	VAL
1	A	168	LYS
1	A	179	ILE
1	A	184	LYS
1	A	202	LEU
1	A	203	LEU
1	A	212	SER
1	A	216	LYS
1	A	227	VAL
1	A	233	LEU
1	A	239	LYS
1	A	246	THR
1	A	254	SER
1	A	271	LEU
1	A	276	ARG
1	A	281	LEU
1	A	287	ILE
1	A	295	LEU
1	A	298	LEU
1	A	305	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	5	ASN
1	A	37	GLN
1	A	92	GLN

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Mol	Chain	Res	Type
1	A	112	ASN
1	A	122	GLN
1	A	171	ASN
1	A	186	HIS
1	A	285	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](#)

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](#)

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	307/307 (100%)	-0.95	0 100 100	10, 18, 47, 97	0

There are no RSRZ outliers to report.

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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.