Full wwPDB X-ray Structure Validation Report (i)

Jun 12, 2024 – 03:03 PM EDT

PDB ID	:	1ARM
Title	:	CARBOXYPEPTIDASE A WITH ZN REPLACED BY HG
Authors	:	Greenblatt, H.M.; Feinberg, H.; Tucker, P.A.; Shoham, G.
Deposited on	:	1994-11-22
Resolution	:	1.76 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 (i)) were used in the production of this report:

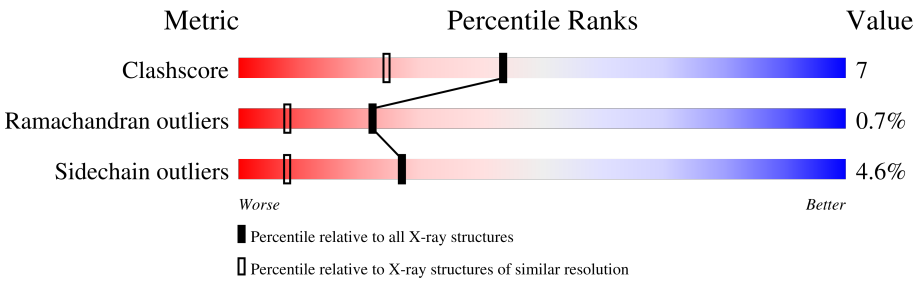
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 1.76 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	141614	2466 (1.76-1.76)
Ramachandran outliers	138981	2437 (1.76-1.76)
Sidechain outliers	138945	2437 (1.76-1.76)

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	309	76% 20% • •

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 2666 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 HG-CARBOXYPEPTIDASE A=ALPHA= (COX).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	307	2436	1561	403	467	5	0	0	0

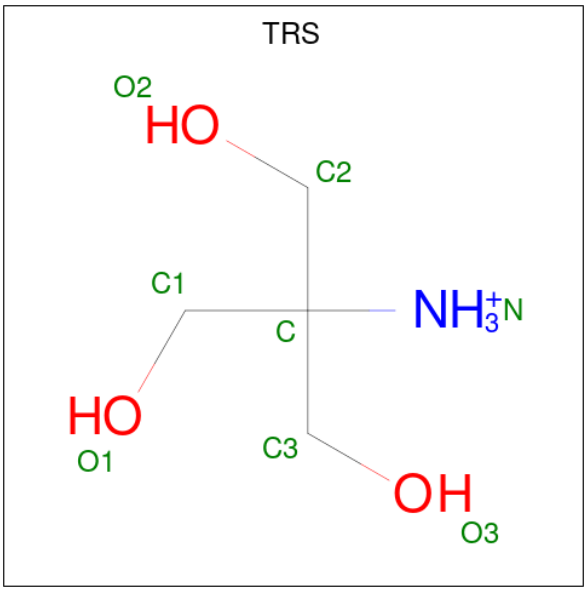
- Molecule 2 is MERCURY (II) ION (three-letter code: HG) (formula: Hg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Hg		
2	A	4	4	4	0	0

- Molecule 3 is COPPER (II) ION (three-letter code: CU) (formula: Cu).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Cu		
3	A	1	1	1	0	0

- Molecule 4 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: TRS) (formula: $C_4H_{12}NO_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	8	4	1	3	0	0

- Molecule 5 is water.

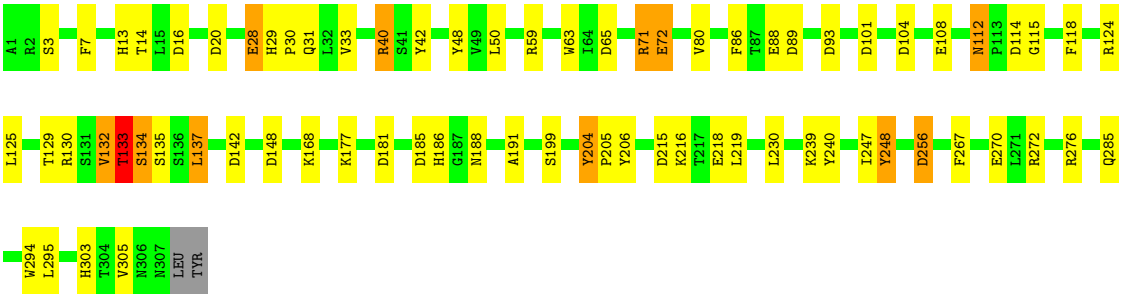
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	217	217	217	0	0

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: HG-CARBOXYPEPTIDASE A=ALPHA= (COX)

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	51.70Å 60.32Å 47.20Å 90.00° 97.39° 90.00°	Depositor
Resolution (Å)	12.10 – 1.76 12.11 – 1.76	Depositor EDS
% Data completeness (in resolution range)	91.0 (12.10-1.76) 91.1 (12.11-1.76)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.82 (at 1.75Å)	Xtriage
Refinement program	TNT, PROLSQ	Depositor
R, R_{free}	(Not available) , (Not available) 0.140 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	20.4	Xtriage
Anisotropy	0.157	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 103.7	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	2666	wwPDB-VP
Average B, all atoms (Å^2)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.98% 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)

Bond lengths and bond angles in the following residue types are not validated in this section: CU, TRS, HG

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	1.09	7/2502 (0.3%)	1.61	44/3402 (1.3%)

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	28	GLU	CD-OE2	8.26	1.34	1.25
1	A	108	GLU	CD-OE1	-6.74	1.18	1.25
1	A	108	GLU	CD-OE2	6.66	1.32	1.25
1	A	88	GLU	CD-OE2	6.15	1.32	1.25
1	A	72	GLU	CD-OE1	6.15	1.32	1.25
1	A	218	GLU	CD-OE2	5.22	1.31	1.25
1	A	16	ASP	CG-OD2	5.21	1.37	1.25

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	71	ARG	NE-CZ-NH2	-11.46	114.57	120.30
1	A	124	ARG	NE-CZ-NH2	-11.09	114.75	120.30
1	A	142	ASP	CB-CG-OD2	-9.51	109.74	118.30
1	A	185	ASP	CB-CG-OD2	-9.31	109.92	118.30
1	A	40	ARG	NE-CZ-NH1	-9.05	115.77	120.30
1	A	130	ARG	NE-CZ-NH1	9.00	124.80	120.30
1	A	118	PHE	CB-CG-CD2	8.89	127.03	120.80
1	A	142	ASP	CB-CG-OD1	8.26	125.73	118.30
1	A	104	ASP	CB-CG-OD1	7.63	125.17	118.30
1	A	89	ASP	CB-CG-OD2	-7.52	111.53	118.30
1	A	65	ASP	CB-CG-OD2	-7.27	111.76	118.30
1	A	14	THR	CA-CB-CG2	-7.22	102.28	112.40
1	A	204	TYR	CB-CG-CD1	-7.19	116.69	121.00
1	A	124	ARG	NE-CZ-NH1	7.16	123.88	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	185	ASP	CB-CG-OD1	6.99	124.59	118.30
1	A	114	ASP	CB-CG-OD2	6.97	124.57	118.30
1	A	215	ASP	CB-CG-OD1	-6.84	112.14	118.30
1	A	59	ARG	NE-CZ-NH2	6.73	123.67	120.30
1	A	104	ASP	CB-CG-OD2	-6.37	112.57	118.30
1	A	93	ASP	CB-CG-OD2	-6.31	112.62	118.30
1	A	130	ARG	NE-CZ-NH2	-6.24	117.18	120.30
1	A	20	ASP	CB-CG-OD1	6.18	123.86	118.30
1	A	65	ASP	CB-CG-OD1	6.08	123.77	118.30
1	A	16	ASP	CB-CG-OD2	-6.06	112.84	118.30
1	A	80	VAL	CA-CB-CG2	-5.96	101.96	110.90
1	A	276	ARG	NE-CZ-NH2	5.92	123.26	120.30
1	A	181	ASP	CB-CG-OD2	-5.89	113.00	118.30
1	A	135	SER	N-CA-CB	5.86	119.30	110.50
1	A	89	ASP	CB-CG-OD1	5.68	123.42	118.30
1	A	101	ASP	CB-CG-OD1	5.60	123.34	118.30
1	A	270	GLU	CG-CD-OE2	-5.57	107.15	118.30
1	A	132	VAL	CG1-CB-CG2	-5.54	102.03	110.90
1	A	191	ALA	N-CA-CB	5.37	117.62	110.10
1	A	42	TYR	CB-CG-CD2	-5.34	117.80	121.00
1	A	133	THR	CA-C-N	-5.23	105.69	117.20
1	A	129	THR	CA-CB-CG2	-5.21	105.11	112.40
1	A	148	ASP	CB-CG-OD1	5.18	122.96	118.30
1	A	256	ASP	CB-CG-OD1	5.15	122.94	118.30
1	A	30	PRO	C-N-CA	-5.11	108.93	121.70
1	A	256	ASP	CB-CG-OD2	-5.10	113.71	118.30
1	A	48	TYR	CG-CD1-CE1	-5.07	117.24	121.30
1	A	63	TRP	CG-CD2-CE3	-5.07	129.33	133.90
1	A	118	PHE	CB-CG-CD1	-5.05	117.26	120.80
1	A	240	TYR	CB-CG-CD1	-5.04	117.97	121.00

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	2436	0	2345	32	0
2	A	4	0	0	0	0
3	A	1	0	0	0	0
4	A	8	0	10	1	0
5	A	217	0	0	7	0
All	All	2666	0	2355	32	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 7.

All (32) 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:186:HIS:HD2	1:A:188:ASN:H	1.06	0.92
1:A:137:LEU:HD22	1:A:137:LEU:H	1.40	0.86
1:A:186:HIS:CD2	1:A:188:ASN:H	1.97	0.77
1:A:272:ARG:HH11	1:A:285:GLN:HE21	1.32	0.76
1:A:72:GLU:OE2	4:A:319:TRS:H11	1.86	0.75
1:A:133:THR:HG21	5:A:434:HOH:O	1.88	0.73
1:A:186:HIS:HD2	1:A:188:ASN:N	1.84	0.71
1:A:303:HIS:ND1	5:A:364:HOH:O	2.23	0.70
1:A:137:LEU:HD22	1:A:137:LEU:N	2.05	0.70
1:A:132:VAL:HG23	1:A:133:THR:N	2.15	0.62
1:A:168:LYS:HG2	5:A:404:HOH:O	1.99	0.62
1:A:204:TYR:HB2	1:A:205:PRO:CD	2.30	0.62
1:A:132:VAL:O	1:A:133:THR:HG23	2.00	0.61
1:A:28:GLU:HB2	1:A:29:HIS:CD2	2.35	0.60
1:A:272:ARG:HH11	1:A:285:GLN:NE2	1.99	0.57
1:A:86:PHE:HE1	1:A:294:TRP:CZ3	2.26	0.53
1:A:230:LEU:C	1:A:230:LEU:HD23	2.33	0.50
1:A:168:LYS:HE3	5:A:425:HOH:O	2.12	0.49
1:A:177:LYS:NZ	5:A:418:HOH:O	2.41	0.48
1:A:112:ASN:ND2	1:A:115:GLY:H	2.12	0.47
1:A:40:ARG:HH11	1:A:40:ARG:HD3	1.45	0.46
1:A:239:LYS:HE2	1:A:239:LYS:H	1.81	0.46
1:A:137:LEU:N	1:A:137:LEU:HD13	2.30	0.46
1:A:247:ILE:HG22	1:A:248:TYR:CD2	2.53	0.43
1:A:133:THR:HB	1:A:134:SER:H	1.05	0.43
1:A:186:HIS:HE1	5:A:347:HOH:O	2.01	0.43
1:A:86:PHE:HE1	1:A:294:TRP:HZ3	1.66	0.43
1:A:50:LEU:HA	1:A:50:LEU:HD23	1.78	0.42
1:A:7:PHE:CZ	1:A:13:HIS:CD2	3.07	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:206:TYR:HA	1:A:256:ASP:OD1	2.19	0.41
1:A:168:LYS:HE3	5:A:404:HOH:O	2.20	0.41
1:A:219:LEU:HG	1:A:267:PHE:CZ	2.56	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	305/309 (99%)	292 (96%)	11 (4%)	2 (1%)	22 8

All (2) Ramachandran outliers are listed below:

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

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	263/265 (99%)	251 (95%)	12 (5%)	27 8

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	SER
1	A	31	GLN
1	A	33	VAL
1	A	71	ARG
1	A	112	ASN
1	A	125	LEU
1	A	134	SER
1	A	137	LEU
1	A	216	LYS
1	A	248	TYR
1	A	295	LEU
1	A	305	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	5	ASN
1	A	37	GLN
1	A	112	ASN
1	A	171	ASN
1	A	186	HIS
1	A	249	GLN
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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 6 ligands modelled in this entry, 5 are monoatomic - leaving 1 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	$\#\|Z\| > 2$
4	TRS	A	319	2	7,7,7	0.74	0	9,9,9	1.70	1 (11%)

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
4	TRS	A	319	2	-	8/9/9/9	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	319	TRS	C2-C-N	3.84	119.45	107.98

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	319	TRS	C2-C-C1-O1
4	A	319	TRS	C1-C-C3-O3
4	A	319	TRS	N-C-C1-O1
4	A	319	TRS	N-C-C2-O2
4	A	319	TRS	C3-C-C1-O1
4	A	319	TRS	C1-C-C2-O2
4	A	319	TRS	C2-C-C3-O3
4	A	319	TRS	N-C-C3-O3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	319	TRS	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)

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates (i)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands (i)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.5 Other polymers (i)

Unable to reproduce the depositors R factor - this section is therefore empty.