



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 11, 2016 – 01:54 PM EDT

PDB ID : 5B7M
Title : Structure of perdeuterated CueO - the signal peptide was truncated by HRV3C protease
Authors : Akter, M.; Higuchi, Y.; Shibata, N.
Deposited on : 2016-06-07
Resolution : 1.80 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	unknown
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20027939
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20027939

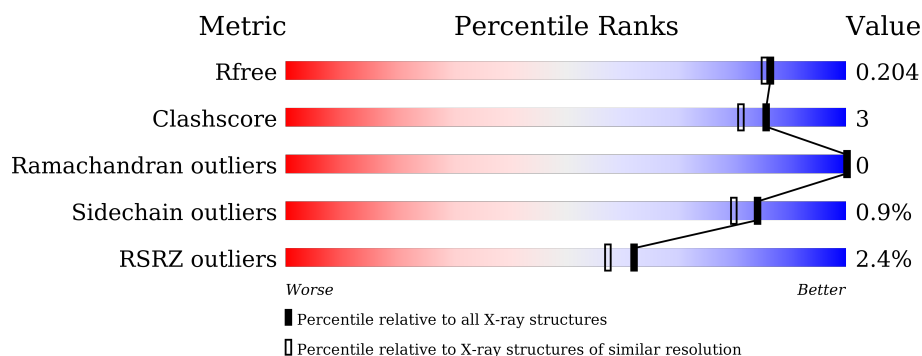
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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}	91344	4533 (1.80-1.80)
Clashscore	102246	5383 (1.80-1.80)
Ramachandran outliers	100387	5320 (1.80-1.80)
Sidechain outliers	100360	5319 (1.80-1.80)
RSRZ outliers	91569	4547 (1.80-1.80)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	492	<div> <div>2%</div> <div>87% 7% 6%</div> </div>
1	B	492	<div> <div>%</div> <div>88% 7% 6%</div> </div>
1	C	492	<div> <div>4%</div> <div>86% 8% 6%</div> </div>

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
2	CU	C	604	-	-	-	X

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 11511 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 Blue copper oxidase CueO.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	463	Total	C	N	O	S	0	7	0
			3593	2281	627	657	28			
1	B	464	Total	C	N	O	S	0	4	0
			3582	2274	624	658	26			
1	C	462	Total	C	N	O	S	0	3	0
			3561	2261	622	652	26			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	25	GLY	-	expression tag	UNP P36649
A	26	PRO	-	expression tag	UNP P36649
A	27	GLY	-	expression tag	UNP P36649
A	28	GLY	-	expression tag	UNP P36649
B	25	GLY	-	expression tag	UNP P36649
B	26	PRO	-	expression tag	UNP P36649
B	27	GLY	-	expression tag	UNP P36649
B	28	GLY	-	expression tag	UNP P36649
C	25	GLY	-	expression tag	UNP P36649
C	26	PRO	-	expression tag	UNP P36649
C	27	GLY	-	expression tag	UNP P36649
C	28	GLY	-	expression tag	UNP P36649

- Molecule 2 is COPPER (II) ION (three-letter code: CU) (formula: Cu).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	4	Total	Cu	0	0
			4	4		
2	A	4	Total	Cu	0	0
			4	4		
2	C	4	Total	Cu	0	0
			4	4		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	289	Total 289	O 289	0	0
3	B	298	Total 298	O 298	0	0
3	C	176	Total 176	O 176	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	49.91Å 106.92Å 262.89Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	37.48 – 1.80 43.37 – 1.80	Depositor EDS
% Data completeness (in resolution range)	99.7 (37.48-1.80) 99.7 (43.37-1.80)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.35 (at 1.79Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, R_{free}	0.166 , 0.204 0.166 , 0.204	Depositor DCC
R_{free} test set	1993 reflections (1.52%)	DCC
Wilson B-factor (Å ²)	21.5	Xtriage
Anisotropy	0.545	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 45.2	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	11511	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.35% 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

5.1 Standard geometry

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

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	0.38	0/3700	0.55	0/5022
1	B	0.39	0/3683	0.56	0/5002
1	C	0.31	0/3658	0.49	0/4966
All	All	0.36	0/11041	0.53	0/14990

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

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	3593	0	3583	20	0
1	B	3582	0	3563	19	0
1	C	3561	0	3543	20	0
2	A	4	0	0	0	0
2	B	4	0	0	0	0
2	C	4	0	0	0	0
3	A	289	0	0	4	0
3	B	298	0	0	1	0
3	C	176	0	0	1	0
All	All	11511	0	10689	59	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 3.

All (59) 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:C:34:LEU:HD22	1:C:317:MET:HE1	1.76	0.67
1:C:343:LEU:HB3	1:C:431:ARG:HD2	1.79	0.65
1:A:350:LYS:NZ	3:A:702:HOH:O	2.31	0.64
1:A:250:ASP:OD2	1:A:291:LYS:NZ	2.32	0.61
1:A:276:LEU:HD11	1:A:474:LYS:HB2	1.86	0.56
1:A:102:TRP:HB3	1:A:105:LEU:HD22	1.88	0.56
1:A:228:ARG:NH2	1:A:323:ALA:HB2	2.21	0.56
1:A:374:GLN:HG2	3:A:872:HOH:O	2.06	0.55
1:B:374:GLN:HG2	3:B:891:HOH:O	2.04	0.55
1:A:455:LEU:HG	1:A:483:LEU:HG	1.89	0.54
1:C:183:VAL:HB	1:C:235:LEU:HD23	1.91	0.52
1:A:355[A]:MET:HG3	1:A:359:LEU:HD23	1.91	0.51
1:B:227:PRO:HB2	1:B:326:ALA:HB2	1.91	0.51
1:B:265:PRO:HD3	1:B:337:LEU:HD22	1.94	0.50
1:A:93:GLN:HG2	3:A:959:HOH:O	2.11	0.50
1:A:368[A]:MET:SD	1:A:376:MET:HG3	2.52	0.48
1:A:303:MET:HE2	1:A:379:MET:HG3	1.96	0.48
1:B:191:SER:OG	1:B:193:ASP:OD1	2.30	0.47
1:C:34:LEU:HD13	1:C:317:MET:HE3	1.96	0.47
1:A:228:ARG:HD3	1:A:289:ASP:HB2	1.97	0.47
1:C:100:LEU:O	1:C:113:GLY:HA3	2.15	0.47
1:C:355:MET:HG2	1:C:408:ASN:OD1	2.14	0.47
1:A:265:PRO:HD3	1:A:337:LEU:HD13	1.97	0.47
1:A:253:PRO:HG3	1:A:269:LYS:HE3	1.97	0.47
1:B:81:GLN:NE2	1:B:84:LYS:HE3	2.30	0.46
1:C:252:ARG:NH1	1:C:286:GLU:O	2.46	0.46
1:B:80:LEU:HB3	1:B:131:VAL:HG21	1.98	0.46
1:A:408:ASN:HB3	1:A:510:MET:HB2	1.99	0.45
1:C:410:ILE:HG21	1:C:512:LEU:HD23	1.98	0.45
1:B:147:LYS:HD3	1:B:150:ARG:HH21	1.81	0.44
1:C:359:LEU:HD22	1:C:407:ALA:HB3	1.98	0.44
1:B:81:GLN:OE1	1:B:84:LYS:HG3	2.17	0.44
1:C:276:LEU:HD11	1:C:474:LYS:HB2	1.98	0.44
1:B:492:LYS:HB2	1:B:492:LYS:HE3	1.73	0.44
1:B:276:LEU:HD11	1:B:474:LYS:HB2	2.00	0.44
1:B:482:VAL:HG23	1:B:484[B]:VAL:HG13	2.00	0.43
1:A:202:VAL:HG21	1:A:362:MET:HE2	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:355:MET:HE3	1:B:355:MET:HB3	1.87	0.43
1:B:41:THR:HG22	1:B:79:LYS:HB3	1.99	0.43
1:A:202:VAL:HG12	3:A:902:HOH:O	2.19	0.43
1:C:364:MET:O	1:C:368:MET:HG2	2.19	0.43
1:C:227:PRO:HB2	1:C:326:ALA:HB2	2.00	0.42
1:B:228:ARG:NH1	1:B:323:ALA:HB2	2.34	0.42
1:A:227:PRO:HB2	1:A:326:ALA:HB2	2.02	0.41
1:B:102:TRP:HB3	1:B:105:LEU:HD22	2.02	0.41
1:C:284:LEU:HD22	1:C:330:LEU:HD13	2.03	0.41
1:B:410:ILE:HG21	1:B:512:LEU:HD23	2.03	0.41
1:A:100:LEU:O	1:A:113:GLY:HA3	2.21	0.41
1:C:255:TYR:OH	1:C:269:LYS:NZ	2.54	0.41
1:A:228:ARG:CZ	1:A:323:ALA:HB2	2.51	0.41
1:C:140:PHE:CZ	1:C:158:GLY:HA3	2.56	0.41
1:B:55:GLY:HA3	1:B:72:ASN:OD1	2.21	0.41
1:C:80:LEU:HB3	1:C:131:VAL:HG21	2.02	0.40
1:B:408:ASN:HB3	1:B:510:MET:HB2	2.04	0.40
1:C:291:LYS:HE3	1:C:291:LYS:HB3	1.77	0.40
1:C:293:PHE:CE2	1:C:319:ILE:HD12	2.56	0.40
1:C:329:ALA:O	1:C:331:PRO:HD3	2.21	0.40
1:B:147:LYS:HD3	1:B:150:ARG:NH2	2.36	0.40
1:C:174:LYS:HD3	3:C:867:HOH:O	2.21	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	466/492 (95%)	453 (97%)	13 (3%)	0	100	100
1	B	464/492 (94%)	450 (97%)	14 (3%)	0	100	100
1	C	459/492 (93%)	443 (96%)	16 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	1389/1476 (94%)	1346 (97%)	43 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	388/401 (97%)	383 (99%)	5 (1%)	76	68
1	B	386/401 (96%)	383 (99%)	3 (1%)	86	83
1	C	383/401 (96%)	378 (99%)	5 (1%)	76	68
All	All	1157/1203 (96%)	1144 (99%)	13 (1%)	84	74

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	199	GLN
1	A	228	ARG
1	A	280[A]	ARG
1	A	280[B]	ARG
1	A	350	LYS
1	B	199	GLN
1	B	280[A]	ARG
1	B	280[B]	ARG
1	C	199	GLN
1	C	280[A]	ARG
1	C	280[B]	ARG
1	C	327	SER
1	C	470	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 12 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

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

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	463/492 (94%)	-0.10	8 (1%) 73 69	12, 22, 43, 72	0
1	B	464/492 (94%)	-0.07	6 (1%) 79 76	11, 23, 41, 62	0
1	C	462/492 (93%)	0.13	19 (4%) 41 35	22, 36, 65, 94	0
All	All	1389/1476 (94%)	-0.01	33 (2%) 62 57	11, 27, 54, 94	0

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	378	GLY	5.1
1	A	290	ASN	3.9
1	A	289	ASP	3.9
1	C	377	ALA	3.6
1	B	327	SER	3.6
1	A	361	MET	3.6
1	C	45	ARG	3.4
1	B	378	GLY	3.3
1	C	340	LEU	3.3
1	C	379	MET	3.2
1	A	377	ALA	3.1
1	B	45	ARG	3.0
1	C	341	PRO	2.9
1	C	327	SER	2.8
1	C	290	ASN	2.8
1	A	327	SER	2.8
1	B	361	MET	2.7
1	C	323	ALA	2.6
1	C	322	ILE	2.5
1	C	288	ASN	2.5
1	B	44	ALA	2.5
1	C	171	MET	2.4
1	A	171	MET	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	44	ALA	2.4
1	C	291	LYS	2.3
1	C	440	MET	2.3
1	A	332	ASP	2.2
1	C	339	ALA	2.2
1	C	418	ASN	2.2
1	C	344	GLU	2.1
1	A	379	MET	2.1
1	B	376	MET	2.1
1	C	250	ASP	2.0

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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å ²)	Q<0.9
2	CU	C	604	1/1	0.81	0.23	9.99	96,96,96,96	1
2	CU	C	602	1/1	0.99	0.07	-1.51	34,34,34,34	1
2	CU	A	601	1/1	1.00	0.09	-1.53	17,17,17,17	0
2	CU	C	601	1/1	1.00	0.07	-1.94	30,30,30,30	0
2	CU	B	601	1/1	1.00	0.08	-2.12	17,17,17,17	0
2	CU	B	602	1/1	0.99	0.08	-2.27	24,24,24,24	1
2	CU	A	602	1/1	1.00	0.07	-2.40	26,26,26,26	1
2	CU	C	603	1/1	1.00	0.06	-2.74	28,28,28,28	1
2	CU	A	604	1/1	0.98	0.06	-2.88	36,36,36,36	1
2	CU	B	604	1/1	0.99	0.06	-3.02	41,41,41,41	1
2	CU	B	603	1/1	1.00	0.08	-3.51	18,18,18,18	1
2	CU	A	603	1/1	1.00	0.07	-4.08	20,20,20,20	1

6.5 Other polymers [i](#)

There are no such residues in this entry.