



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 10:19 AM GMT

PDB ID : 3LNN
Title : Crystal structure of ZneB from Cupriavidus metallidurans
Authors : Lee, J.K.; De Angelis, F.; Miercke, L.J.; Stroud, R.M.; Vandenbussche, G.;
Center for Structures of Membrane Proteins (CSMP)
Deposited on : 2010-02-02
Resolution : 2.80 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
<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 : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
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) : trunk26865

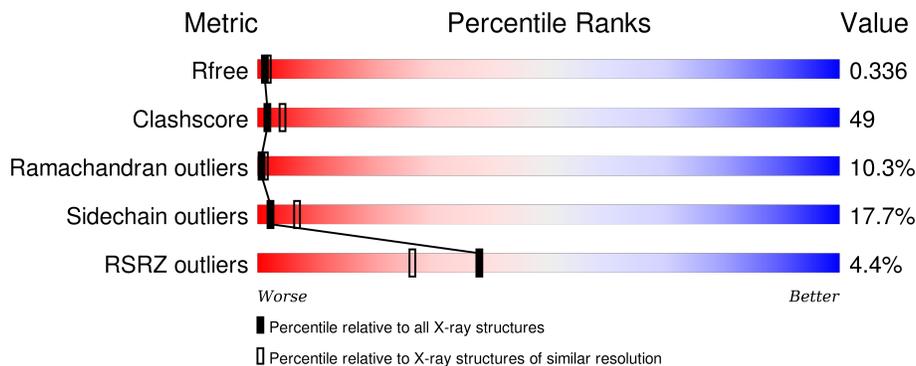
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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	2393 (2.80-2.80)
Clashscore	102246	2827 (2.80-2.80)
Ramachandran outliers	100387	2782 (2.80-2.80)
Sidechain outliers	100360	2784 (2.80-2.80)
RSRZ outliers	91569	2404 (2.80-2.80)

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	359	
1	B	359	

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 4361 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 Membrane fusion protein (MFP) heavy metal cation efflux ZneB (CzcB-like).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	341	2537	1581	461	487	8	0	0	0
1	B	245	1807	1120	323	358	6	0	0	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	expression tag	UNP Q1LCD7
A	351	PRO	-	expression tag	UNP Q1LCD7
A	352	ASP	-	expression tag	UNP Q1LCD7
A	353	LEU	-	expression tag	UNP Q1LCD7
A	354	LEU	-	expression tag	UNP Q1LCD7
A	355	GLU	-	expression tag	UNP Q1LCD7
A	356	VAL	-	expression tag	UNP Q1LCD7
A	357	LEU	-	expression tag	UNP Q1LCD7
A	358	PHE	-	expression tag	UNP Q1LCD7
A	359	GLN	-	expression tag	UNP Q1LCD7
B	1	MET	-	expression tag	UNP Q1LCD7
B	351	PRO	-	expression tag	UNP Q1LCD7
B	352	ASP	-	expression tag	UNP Q1LCD7
B	353	LEU	-	expression tag	UNP Q1LCD7
B	354	LEU	-	expression tag	UNP Q1LCD7
B	355	GLU	-	expression tag	UNP Q1LCD7
B	356	VAL	-	expression tag	UNP Q1LCD7
B	357	LEU	-	expression tag	UNP Q1LCD7
B	358	PHE	-	expression tag	UNP Q1LCD7
B	359	GLN	-	expression tag	UNP Q1LCD7

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	5	Total	O	0	0
			5	5		
3	B	11	Total	O	0	0
			11	11		

ASN
ASP
PRO
ASP
LEU
LEU
GLU
VAL
LEU
PHE
GLN

4 Data and refinement statistics i

Property	Value	Source
Space group	I 41 2 2	Depositor
Cell constants a, b, c, α , β , γ	137.11Å 137.11Å 202.90Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	32.96 – 2.80 37.38 – 2.80	Depositor EDS
% Data completeness (in resolution range)	85.1 (32.96-2.80) 95.9 (37.38-2.80)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.34 (at 2.81Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.5_2)	Depositor
R, R_{free}	0.237 , 0.314 0.249 , 0.336	Depositor DCC
R_{free} test set	1187 reflections (5.11%)	DCC
Wilson B-factor (Å ²)	78.6	Xtrriage
Anisotropy	0.166	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 59.2	EDS
Estimated twinning fraction	0.018 for $-1/2^*h-1/2^*k-1/2^*l,-1/2^*h-1/2^*k+1/2^*l,-h+k$ 0.001 for $-1/2^*h+1/2^*k-1/2^*l,1/2^*h-1/2^*k-1/2^*l,-h-k$	Xtrriage
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtrriage
Outliers	0 of 23240 reflections	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	4361	wwPDB-VP
Average B, all atoms (Å ²)	90.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.72% 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, 0.375 respectively for untwinned datasets, and 0.333, 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:
ZN

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	0.52	0/2579	0.83	2/3506 (0.1%)
1	B	0.47	0/1834	0.71	1/2493 (0.0%)
All	All	0.50	0/4413	0.79	3/5999 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	56	LYS	N-CA-C	7.18	130.38	111.00
1	B	56	LYS	N-CA-C	-6.99	92.14	111.00
1	A	278	ALA	C-N-CA	5.47	135.38	121.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	55	ALA	Peptide

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	2537	0	2501	240	0
1	B	1807	0	1754	190	0
2	A	1	0	0	0	0
3	A	5	0	0	0	0
3	B	11	0	0	1	0
All	All	4361	0	4255	424	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 49.

The worst 5 of 424 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:308:VAL:HB	1:A:309:ALA:HB3	1.27	1.11
1:B:93:LEU:HD12	1:B:94:ALA:N	1.66	1.11
1:B:214:ALA:HB1	1:B:215:GLN:HB2	1.25	1.11
1:A:226:GLN:HA	1:A:227:SER:HB2	1.34	1.09
1:A:319:LYS:HA	1:A:320:LEU:HB2	1.26	1.09

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	339/359 (94%)	266 (78%)	39 (12%)	34 (10%)	1 1

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	243/359 (68%)	192 (79%)	25 (10%)	26 (11%)	0	1
All	All	582/718 (81%)	458 (79%)	64 (11%)	60 (10%)	1	1

5 of 60 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	16	GLU
1	A	23	GLU
1	A	56	LYS
1	A	122	LYS
1	A	123	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	256/283 (90%)	212 (83%)	44 (17%)	2	7
1	B	180/283 (64%)	147 (82%)	33 (18%)	2	6
All	All	436/566 (77%)	359 (82%)	77 (18%)	2	7

5 of 77 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	300	PHE
1	A	348	LEU
1	B	244	ARG
1	A	301	TYR
1	A	318	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	146	GLN
1	B	221	HIS

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Mol	Chain	Res	Type
1	B	226	GLN
1	B	265	ASN

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 1 ligands modelled in this entry, 1 is 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 [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	341/359 (94%)	0.27	12 (3%) 48 35	53, 79, 139, 218	0
1	B	245/359 (68%)	0.35	14 (5%) 27 17	59, 86, 144, 268	0
All	All	586/718 (81%)	0.31	26 (4%) 38 26	53, 83, 144, 268	0

The worst 5 of 26 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	125	ILE	12.4
1	B	167	GLY	9.3
1	A	127	ALA	8.3
1	B	166	GLY	6.5
1	A	125	ILE	6.0

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(\AA^2)	Q<0.9
2	ZN	A	360	1/1	0.99	0.17	-	77,77,77,77	0

6.5 Other polymers [i](#)

There are no such residues in this entry.