wwPDB X-ray Structure Validation Summary Report (i)

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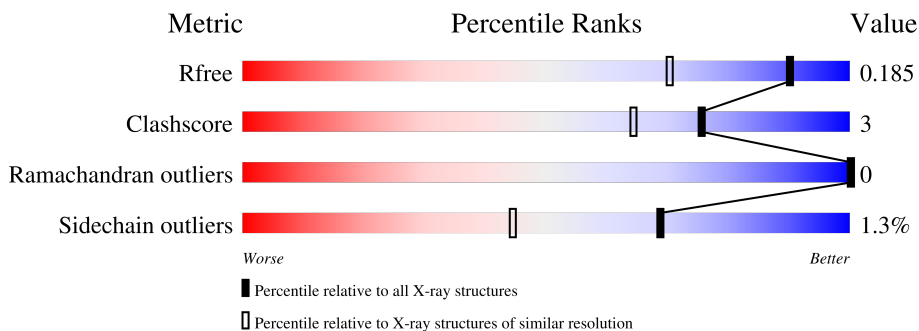|		
PDB ID	:	3EN0
Title	:	The Structure of Cyanophycinase
Authors	:	Kimber, M.S.; Law, A.M.; Lai, S.W.S.; Tavares, J.
Deposited on	:	2008-09-25
Resolution	:	1.50 Å(reported)

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 1.50 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	Percentile Ranks	Value
Rfree		0.185
Clashscore		3
Ramachandran outliers		0
Sidechain outliers		1.3%

Worse   *Better*

▮ Percentile relative to all X-ray structures

◫ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2936 (1.50-1.50)
Clashscore	141614	3144 (1.50-1.50)
Ramachandran outliers	138981	3066 (1.50-1.50)
Sidechain outliers	138945	3064 (1.50-1.50)

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	291	83% 8% 9%
1	B	291	86% 5% 9%
1	C	291	84% 5% 11%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 7100 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 Cyanophycinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	266	Total 2091	C 1306	N 382	O 390	S 13	0	17	0
1	B	265	Total 2119	C 1326	N 386	O 392	S 15	0	23	0
1	C	260	Total 2086	C 1310	N 386	O 376	S 14	0	21	0

There are 60 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	expression tag	UNP P73832
A	-18	GLY	-	expression tag	UNP P73832
A	-17	SER	-	expression tag	UNP P73832
A	-16	SER	-	expression tag	UNP P73832
A	-15	HIS	-	expression tag	UNP P73832
A	-14	HIS	-	expression tag	UNP P73832
A	-13	HIS	-	expression tag	UNP P73832
A	-12	HIS	-	expression tag	UNP P73832
A	-11	HIS	-	expression tag	UNP P73832
A	-10	HIS	-	expression tag	UNP P73832
A	-9	SER	-	expression tag	UNP P73832
A	-8	SER	-	expression tag	UNP P73832
A	-7	GLY	-	expression tag	UNP P73832
A	-6	LEU	-	expression tag	UNP P73832
A	-5	VAL	-	expression tag	UNP P73832
A	-4	PRO	-	expression tag	UNP P73832
A	-3	ARG	-	expression tag	UNP P73832
A	-2	GLY	-	expression tag	UNP P73832
A	-1	SER	-	expression tag	UNP P73832
A	0	HIS	-	expression tag	UNP P73832
B	-19	MET	-	expression tag	UNP P73832
B	-18	GLY	-	expression tag	UNP P73832
B	-17	SER	-	expression tag	UNP P73832

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-16	SER	-	expression tag	UNP P73832
B	-15	HIS	-	expression tag	UNP P73832
B	-14	HIS	-	expression tag	UNP P73832
B	-13	HIS	-	expression tag	UNP P73832
B	-12	HIS	-	expression tag	UNP P73832
B	-11	HIS	-	expression tag	UNP P73832
B	-10	HIS	-	expression tag	UNP P73832
B	-9	SER	-	expression tag	UNP P73832
B	-8	SER	-	expression tag	UNP P73832
B	-7	GLY	-	expression tag	UNP P73832
B	-6	LEU	-	expression tag	UNP P73832
B	-5	VAL	-	expression tag	UNP P73832
B	-4	PRO	-	expression tag	UNP P73832
B	-3	ARG	-	expression tag	UNP P73832
B	-2	GLY	-	expression tag	UNP P73832
B	-1	SER	-	expression tag	UNP P73832
B	0	HIS	-	expression tag	UNP P73832
C	-19	MET	-	expression tag	UNP P73832
C	-18	GLY	-	expression tag	UNP P73832
C	-17	SER	-	expression tag	UNP P73832
C	-16	SER	-	expression tag	UNP P73832
C	-15	HIS	-	expression tag	UNP P73832
C	-14	HIS	-	expression tag	UNP P73832
C	-13	HIS	-	expression tag	UNP P73832
C	-12	HIS	-	expression tag	UNP P73832
C	-11	HIS	-	expression tag	UNP P73832
C	-10	HIS	-	expression tag	UNP P73832
C	-9	SER	-	expression tag	UNP P73832
C	-8	SER	-	expression tag	UNP P73832
C	-7	GLY	-	expression tag	UNP P73832
C	-6	LEU	-	expression tag	UNP P73832
C	-5	VAL	-	expression tag	UNP P73832
C	-4	PRO	-	expression tag	UNP P73832
C	-3	ARG	-	expression tag	UNP P73832
C	-2	GLY	-	expression tag	UNP P73832
C	-1	SER	-	expression tag	UNP P73832
C	0	HIS	-	expression tag	UNP P73832

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

SO4

O1

O

O3 O⁻ — S — O⁻ O4

S

O

O2

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total 5	O 4	S 1	0	0
2	B	1	Total 5	O 4	S 1	0	0
2	C	1	Total 5	O 4	S 1	0	0

• Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	251	Total 251	O 251	0	0
3	B	284	Total 286	O 286	0	2
3	C	252	Total 252	O 252	0	0

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. 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: Cyanophycinase

Chain A:

• Molecule 1: Cyanophycinase

Chain B:

• Molecule 1: Cyanophycinase

Chain C:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	75.85Å 133.01Å 164.31Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.50 34.95 – 1.39	Depositor EDS
% Data completeness (in resolution range)	97.9 (50.00-1.50) 93.2 (34.95-1.39)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.12 (at 1.39Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.156 , 0.179 0.163 , 0.185	Depositor DCC
R_{free} test set	7755 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	18.5	Xtriage
Anisotropy	0.069	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 43.4	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.012 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.019 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	7100	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.80% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	0.54	1/2194 (0.0%)	0.68	0/2962
1	B	0.55	0/2236	0.72	2/3019 (0.1%)
1	C	0.53	2/2194 (0.1%)	0.73	0/2959
All	All	0.54	3/6624 (0.0%)	0.71	2/8940 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	105[A]	CYS	CB-SG	-6.29	1.71	1.82
1	C	105[B]	CYS	CB-SG	-6.29	1.71	1.82
1	A	62	ASP	CG-OD1	5.32	1.37	1.25

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	216[A]	ILE	CB-CA-C	-5.13	101.34	111.60
1	B	216[B]	ILE	CB-CA-C	-5.13	101.34	111.60

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	2091	0	2082	19	0
1	B	2119	0	2117	13	0
1	C	2086	0	2108	9	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
2	C	5	0	0	0	0
3	A	251	0	0	0	0
3	B	286	0	0	2	0
3	C	252	0	0	0	0
All	All	7100	0	6307	40	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.

The worst 5 of 40 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:B:216[B]:ILE:HG22	3:B:462:HOH:O	1.71	0.88
1:C:244:SER:C	1:C:245[B]:LEU:HD22	1.99	0.82
1:B:73:ILE:HD11	1:B:113[A]:LEU:CD2	2.10	0.82
1:B:244:SER:C	1:B:245[B]:LEU:HD22	2.03	0.79
1:A:170[B]:VAL:HG23	1:A:194:LEU:HD13	1.69	0.74

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	281/291 (97%)	275 (98%)	6 (2%)	0	100	100
1	B	286/291 (98%)	281 (98%)	5 (2%)	0	100	100
1	C	277/291 (95%)	271 (98%)	6 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	844/873 (97%)	827 (98%)	17 (2%)	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	231/236 (98%)	228 (99%)	3 (1%)	69 44
1	B	236/236 (100%)	233 (99%)	3 (1%)	69 44
1	C	231/236 (98%)	229 (99%)	2 (1%)	78 61
All	All	698/708 (99%)	690 (99%)	8 (1%)	69 53

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	173	GLN
1	C	151	TRP
1	B	151	TRP
1	B	50	LEU
1	B	263	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	264	GLN
1	C	20	HIS
1	C	179	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

3 ligands are modelled in this entry.

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	$\#|Z| > 2$
2	SO4	B	272	-	4,4,4	0.35	0	6,6,6	0.81	0
2	SO4	C	272	-	4,4,4	0.37	0	6,6,6	0.67	0
2	SO4	A	272	-	4,4,4	0.22	0	6,6,6	0.87	0

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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

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

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

6.3 Carbohydrates ⓘ

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

6.4 Ligands ⓘ

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

6.5 Other polymers ⓘ

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