



wwPDB X-ray Structure Validation Summary Report

Aug 5, 2014 – 10:48 PM EDT

PDB ID : 4FWG
Title : Crystal structure of the Lon-like protease MtaLonC in complex with lacta-
cystin
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Deposited on : 2012-07-01
Resolution : 1.99 Å(reported)

This is a wwPDB 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/ValidationPDFNotes.html>

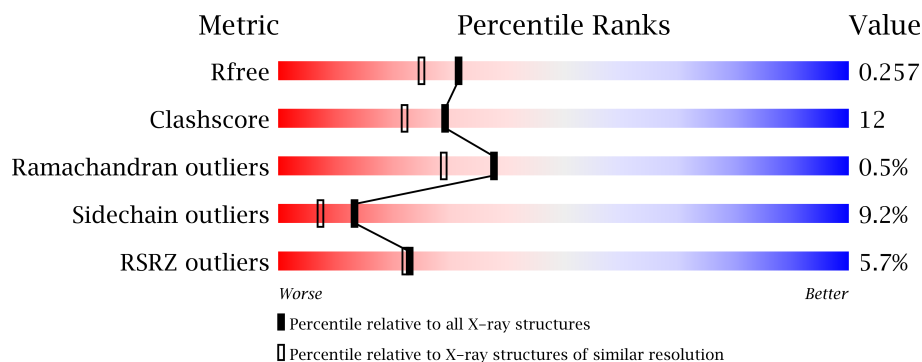
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.16 November 2013
Xtriage (Phenix)	:	dev-1439
EDS	:	stable23489
Percentile statistics	:	21963
Refmac	:	5.8.0049
CCP4	:	6.3.0 (Settle)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	stable23489

1 Overall quality at a glance

The reported resolution of this entry is 1.99 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}	66092	4888 (2.00-2.00)
Clashscore	79885	6188 (2.00-2.00)
Ramachandran outliers	78287	6102 (2.00-2.00)
Sidechain outliers	78261	6100 (2.00-2.00)
RSRZ outliers	66119	4890 (2.00-2.00)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	732	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5178 atoms, of which 0 are hydrogen and 0 are deuterium.

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.

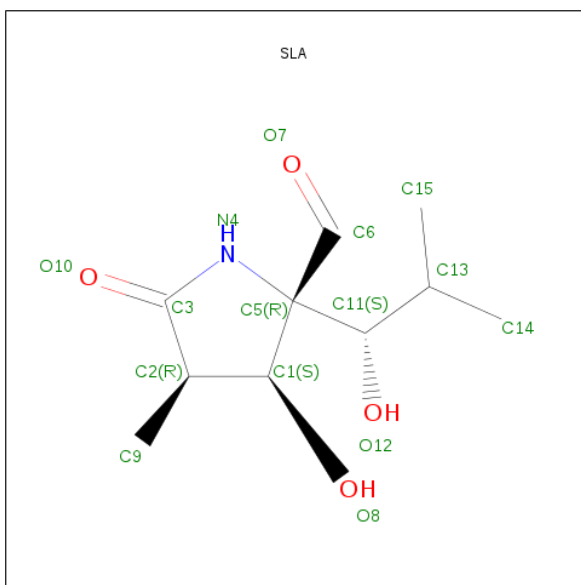
- Molecule 1 is a protein called TTC1975 peptidase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	594	Total	C	N	O	S	Se	0	2	0
			4575	2902	813	849	2	9			

There are 18 discrepancies between the modelled and reference sequences:

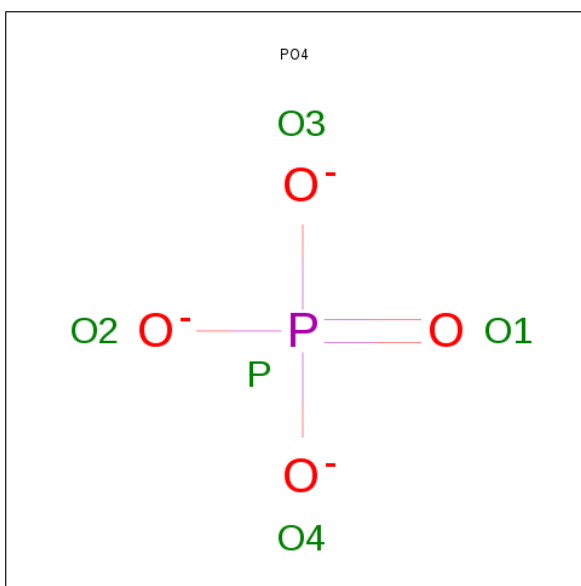
Chain	Residue	Modelled	Actual	Comment	Reference
A	91	MSE	LEU	ENGINEERED MUTATION	UNP C9DRU9
A	188	MSE	LEU	ENGINEERED MUTATION	UNP C9DRU9
A	359	MSE	ILE	ENGINEERED MUTATION	UNP C9DRU9
A	390	MSE	LEU	ENGINEERED MUTATION	UNP C9DRU9
A	557	MSE	TYR	ENGINEERED MUTATION	UNP C9DRU9
A	720	LYS	-	EXPRESSION TAG	UNP C9DRU9
A	721	LEU	-	EXPRESSION TAG	UNP C9DRU9
A	722	ALA	-	EXPRESSION TAG	UNP C9DRU9
A	723	ALA	-	EXPRESSION TAG	UNP C9DRU9
A	724	ALA	-	EXPRESSION TAG	UNP C9DRU9
A	725	LEU	-	EXPRESSION TAG	UNP C9DRU9
A	726	GLU	-	EXPRESSION TAG	UNP C9DRU9
A	727	HIS	-	EXPRESSION TAG	UNP C9DRU9
A	728	HIS	-	EXPRESSION TAG	UNP C9DRU9
A	729	HIS	-	EXPRESSION TAG	UNP C9DRU9
A	730	HIS	-	EXPRESSION TAG	UNP C9DRU9
A	731	HIS	-	EXPRESSION TAG	UNP C9DRU9
A	732	HIS	-	EXPRESSION TAG	UNP C9DRU9

- Molecule 2 is OMURALIDE, OPEN FORM (three-letter code: SLA) (formula: C₁₀H₁₇NO₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			15	10	1	4		

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	P	0	0
			5	4	1		

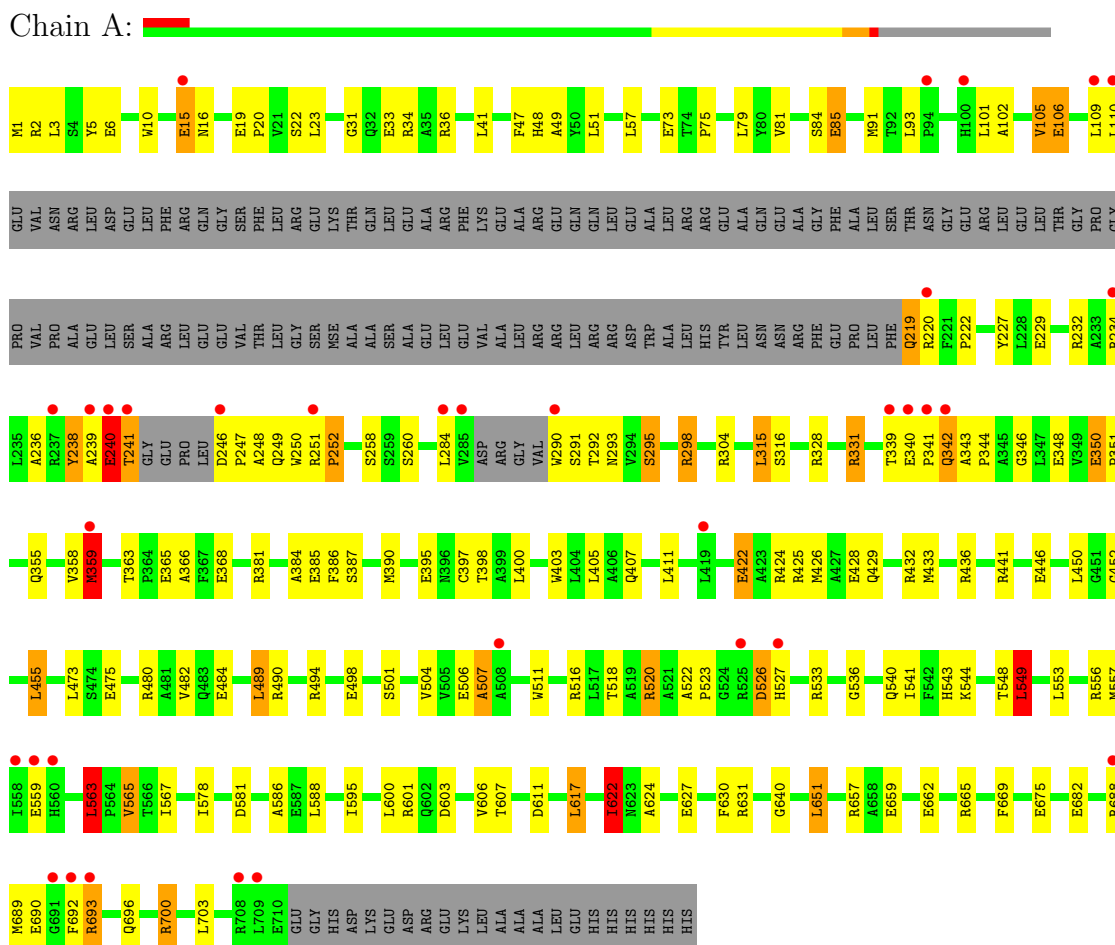
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	583	Total 583	O 583	0	0

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: TTC1975 peptidase



4 Data and refinement statistics

Property	Value	Source
Space group	P 6	Depositor
Cell constants a, b, c, α , β , γ	115.99Å 115.99Å 135.05Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 1.99 19.87 – 1.99	Depositor EDS
% Data completeness (in resolution range)	99.3 (20.00-1.99) 99.6 (19.87-1.99)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.17 (at 1.99Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.230 , 0.259 0.219 , 0.257	Depositor DCC
R_{free} test set	3485 reflections (5.23%)	DCC
Wilson B-factor (Å ²)	25.8	Xtriage
Anisotropy	0.096	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 42.5	EDS
Estimated twinning fraction	0.748 for H, K, L 0.252 for K, H, -L 0.011 for h,-h-k,-l	Xtriage
Reported twinning fraction	0.748 for H, K, L 0.252 for K, H, -L	Depositor
L-test for twinning	$\langle L \rangle = 0.54$, $\langle L^2 \rangle = 0.39$	Xtriage
Outliers	1 of 70161 reflections (0.001%)	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5178	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.55% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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: PO4, SLA

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	1.50	44/4662 (0.9%)	1.35	41/6319 (0.6%)

The worst 5 of 44 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	475	GLU	CD-OE2	9.06	1.35	1.25
1	A	665	ARG	N-CA	6.98	1.60	1.46
1	A	5	TYR	CE1-CZ	6.90	1.47	1.38
1	A	662	GLU	N-CA	6.89	1.60	1.46
1	A	385	GLU	C-O	6.76	1.36	1.23

The worst 5 of 41 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	432	ARG	NE-CZ-NH2	-18.26	111.17	120.30
1	A	631	ARG	NE-CZ-NH2	-13.25	113.68	120.30
1	A	432	ARG	NE-CZ-NH1	11.14	125.87	120.30
1	A	622	ILE	CG1-CB-CG2	-10.42	88.48	111.40
1	A	549	LEU	CB-CG-CD2	-9.81	94.32	111.00

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the

chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4575	0	4601	113	0
2	A	15	0	16	1	0
3	A	5	0	0	0	0
4	A	583	0	0	15	0
All	All	5178	0	4617	113	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 12.

The worst 5 of 113 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:692:PHE:H	1:A:693:ARG:HB3	1.16	1.09
1:A:2:ARG:HD3	4:A:1238:HOH:O	1.53	1.06
1:A:692:PHE:H	1:A:693:ARG:CB	1.77	0.97
1:A:106:GLU:HG2	1:A:251:ARG:NH1	1.85	0.91
1:A:48:HIS:HD2	1:A:358:VAL:H	1.22	0.87

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	588/732 (80%)	560 (95%)	25 (4%)	3 (0%)	38 29

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	240	GLU
1	A	507	ALA
1	A	526	ASP

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	467/568 (82%)	423 (91%)	44 (9%)	13 7

5 of 44 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	331	ARG
1	A	355	GLN
1	A	693	ARG
1	A	339	THR
1	A	348	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	342	GLN
1	A	668	GLN
1	A	429	GLN
1	A	97	GLN
1	A	597	ASN

5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

2 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	SLA	A	801	1	15,15,15	2.44	5 (33%)	23,23,23	4.41	11 (47%)
3	PO4	A	802	-	4,4,4	0.73	0	6,6,6	0.36	0

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
2	SLA	A	801	1	-	0/12/32/32	0/1/1/1
3	PO4	A	802	-	-	0/0/0/0	0/0/0/0

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	801	SLA	C3-N4	-5.10	1.28	1.34
2	A	801	SLA	C5-C1	-4.74	1.51	1.56
2	A	801	SLA	O10-C3	4.02	1.31	1.23
2	A	801	SLA	O7-C6	2.91	1.29	1.20
2	A	801	SLA	C2-C3	-2.13	1.50	1.52

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	801	SLA	O10-C3-C2	-13.48	115.36	126.25
2	A	801	SLA	C2-C3-N4	12.75	116.62	108.92
2	A	801	SLA	C5-N4-C3	-5.79	109.58	115.24
2	A	801	SLA	C5-C1-C2	3.05	107.12	104.44
2	A	801	SLA	C1-C2-C3	-2.89	98.37	103.10

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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.

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	594/732 (81%)	0.36	34 (5%) 23 22	15, 28, 75, 100	0

The worst 5 of 34 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	285	VAL	6.7
1	A	342	GLN	5.5
1	A	560	HIS	5.4
1	A	692	PHE	5.0
1	A	237	ARG	4.8

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

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

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

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	RSR	LLDF	B-factors(Å ²)	Q<0.9
3	PO4	A	802	5/5	0.07	-1.12	19,23,25,31	0

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Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(\AA^2)	Q<0.9
2	SLA	A	801	15/15	0.07	-1.42	19,24,26,27	0

6.5 Other polymers ⓘ

There are no such residues in this entry.