



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2018 – 09:31 pm GMT

PDB ID : 2WSA
Title : Crystal Structure of Leishmania major N-myristoyltransferase (NMT) with bound myristoyl-CoA and a pyrazole sulphonamide ligand (DDD85646)
Authors : Robinson, D.A.; Brand, S.; Fairlamb, A.H.; Ferguson, M.A.J.; Frearson, J.A.; Wyatt, P.G.; Structural Genomics Consortium (SGC)
Deposited on : 2009-09-04
Resolution : 1.60 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 ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7.3 (157068), CSD as539be (2018)
Xtriage (Phenix) : 1.13
EDS : trunk30967
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk30967

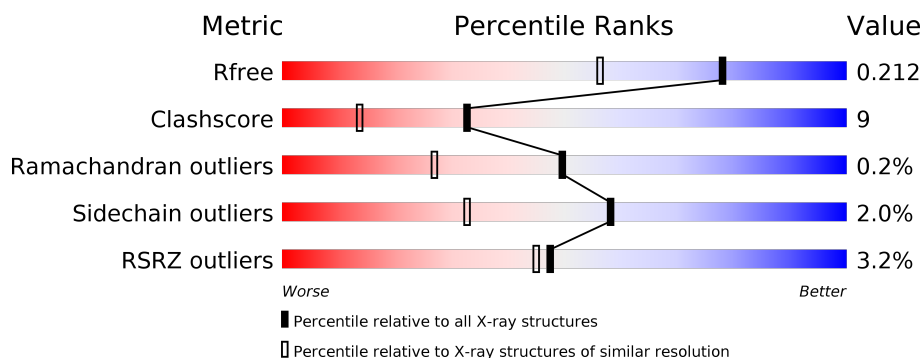
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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}	111664	2957 (1.60-1.60)
Clashscore	122126	3202 (1.60-1.60)
Ramachandran outliers	120053	3117 (1.60-1.60)
Sidechain outliers	120020	3116 (1.60-1.60)
RSRZ outliers	108989	2883 (1.60-1.60)

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	438	<div> <div>3%</div> <div> <div></div> <div>80%</div> <div>12%</div> <div>6%</div> </div> </div>

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 4002 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.

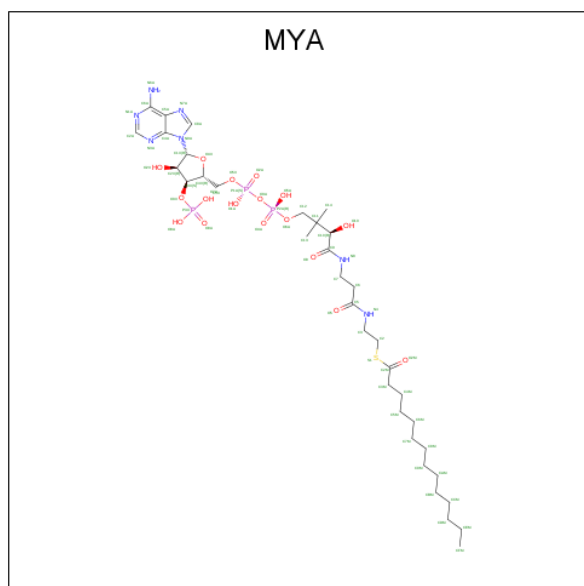
- Molecule 1 is a protein called GLYCYLPEPTIDE N-TETRADECANOYLTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	411	3351	2168	561	607	15	0	1	0

There is a discrepancy between the modelled and reference sequences:

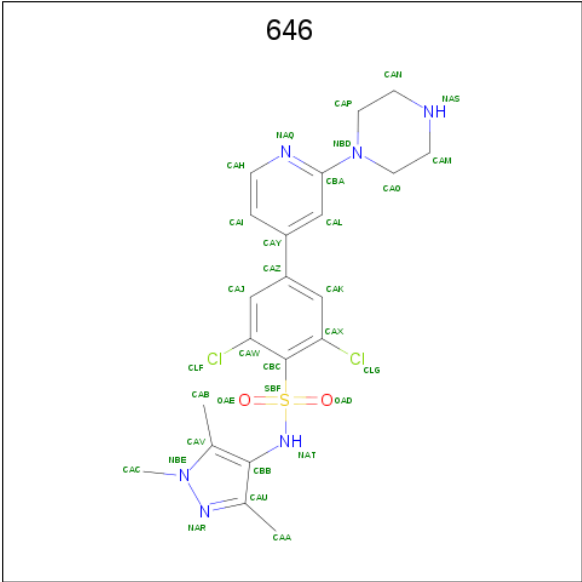
Chain	Residue	Modelled	Actual	Comment	Reference
A	27	ASP	THR	conflict	UNP Q4Q5S8

- Molecule 2 is TETRADECANOYL-COA (three-letter code: MYA) (formula: $C_{35}H_{62}N_7O_{17}P_3S$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	N	O	P	S		
2	A	1	63	35	7	17	3	1	0	0

- Molecule 3 is 2,6-dichloro-4-(2-piperazin-1-ylpyridin-4-yl)-N-(1,3,5-trimethyl-1H-pyrazol-4-yl)benzenesulfonamide (three-letter code: 646) (formula: $C_{21}H_{24}Cl_2N_6O_2S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
3	A	1	Total	C	Cl	N	O	S	0	0
			32	21	2	6	2	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	556	Total	O	0	0
			556	556		

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	47.51Å 90.32Å 52.97Å 90.00° 112.27° 90.00°	Depositor
Resolution (Å)	20.00 – 1.60 19.83 – 1.60	Depositor EDS
% Data completeness (in resolution range)	99.1 (20.00-1.60) 99.1 (19.83-1.60)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.58 (at 1.60Å)	Xtriage
Refinement program	REFMAC 5.5.0072	Depositor
R, R_{free}	0.176 , 0.213 0.175 , 0.212	Depositor DCC
R_{free} test set	1677 reflections (3.11%)	wwPDB-VP
Wilson B-factor (Å ²)	16.8	Xtriage
Anisotropy	0.056	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 52.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	4002	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.23% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MYA, 646

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	0.78	1/3453 (0.0%)	0.81	6/4699 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	67	ASP	CB-CG	9.70	1.72	1.51

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	67	ASP	CB-CG-OD2	8.09	125.58	118.30
1	A	63	MET	CB-CG-SD	-7.36	90.32	112.40
1	A	304	ARG	NE-CZ-NH2	-6.49	117.06	120.30
1	A	220	ARG	NE-CZ-NH2	-6.14	117.23	120.30
1	A	250	LYS	CD-CE-NZ	5.97	125.42	111.70
1	A	67	ASP	CB-CA-C	-5.86	98.69	110.40

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	3351	0	3265	62	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	63	0	58	0	0
3	A	32	0	24	3	0
4	A	556	0	0	35	3
All	All	4002	0	3347	64	3

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 9.

All (64) 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:274:GLN:HB3	4:A:2444:HOH:O	1.29	1.26
1:A:243:GLN:HG2	4:A:2360:HOH:O	1.35	1.25
1:A:243:GLN:HB3	4:A:2359:HOH:O	1.04	1.18
1:A:298:SER:HB2	4:A:2424:HOH:O	0.84	1.01
1:A:110:TRP:HZ2	1:A:195:THR:HG21	1.33	0.94
1:A:57:GLU:OE2	1:A:115:ARG:HD2	1.67	0.93
1:A:124:ALA:HB1	1:A:184:LEU:HD11	1.53	0.91
1:A:257:SER:HB3	4:A:2382:HOH:O	0.71	0.88
1:A:27:ASP:OD1	4:A:2030:HOH:O	1.94	0.86
1:A:186:LYS:HE2	4:A:2299:HOH:O	1.84	0.78
1:A:48:GLU:OE1	4:A:2073:HOH:O	2.02	0.77
3:A:1423:646:HAAB	4:A:2492:HOH:O	1.84	0.77
1:A:246:MET:HG3	1:A:250:LYS:HE2	1.69	0.75
1:A:16:SER:HA	1:A:22:GLN:HE22	1.57	0.69
1:A:67:ASP:HB2	4:A:2117:HOH:O	1.95	0.66
1:A:110:TRP:CZ2	1:A:195:THR:HG21	2.25	0.66
1:A:186:LYS:CE	4:A:2299:HOH:O	2.45	0.62
1:A:251:ARG:O	1:A:254:GLN:HG2	1.99	0.62
1:A:261:ASN:ND2	1:A:358:GLN:HE21	1.98	0.61
1:A:64:GLU:CD	4:A:2111:HOH:O	2.39	0.61
1:A:162:HIS:HD2	4:A:2218:HOH:O	1.83	0.60
1:A:63:MET:HB3	1:A:102:CYS:SG	2.41	0.60
1:A:247:ALA:HA	1:A:250:LYS:HE3	1.83	0.60
1:A:216:GLN:HG3	4:A:2516:HOH:O	2.04	0.58
1:A:229:GLU:HG3	4:A:2342:HOH:O	2.03	0.58
1:A:64:GLU:CG	4:A:2111:HOH:O	2.52	0.58
1:A:117:LYS:HE2	4:A:2093:HOH:O	2.04	0.57
1:A:281:ASN:HB3	4:A:2402:HOH:O	2.05	0.56
1:A:87:MET:HE1	1:A:231:ARG:HB2	1.88	0.55
1:A:57:GLU:OE2	1:A:115:ARG:CD	2.49	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:261:ASN:HD21	1:A:358:GLN:HE21	1.53	0.54
1:A:152:GLU:CD	4:A:2252:HOH:O	2.47	0.53
1:A:336:SER:CB	4:A:2459:HOH:O	2.56	0.53
1:A:327:ARG:NH1	4:A:2449:HOH:O	2.41	0.52
1:A:298:SER:CB	4:A:2424:HOH:O	1.72	0.52
1:A:347:HIS:HE1	4:A:2121:HOH:O	1.91	0.52
1:A:41:THR:HG23	1:A:44:ASP:H	1.74	0.52
1:A:229:GLU:CG	4:A:2342:HOH:O	2.57	0.52
1:A:229:GLU:HG3	4:A:2343:HOH:O	2.09	0.51
1:A:141:MET:SD	1:A:144:LYS:HD2	2.51	0.51
1:A:25:ASP:O	1:A:29:LYS:HD3	2.12	0.50
1:A:192:VAL:O	1:A:195:THR:HG22	2.12	0.50
1:A:16:SER:HA	1:A:22:GLN:NE2	2.25	0.50
1:A:305:ASP:HA	4:A:2435:HOH:O	2.11	0.50
1:A:90:PHE:HZ	3:A:1423:646:HAK	1.78	0.49
1:A:246:MET:HG3	1:A:250:LYS:CE	2.41	0.49
1:A:98:GLN:NE2	4:A:2111:HOH:O	2.38	0.49
1:A:57:GLU:HG3	1:A:115:ARG:HG3	1.95	0.48
1:A:250:LYS:CD	4:A:2338:HOH:O	2.61	0.48
1:A:31:VAL:HA	1:A:141:MET:HE2	1.96	0.48
1:A:246:MET:O	1:A:250:LYS:HE2	2.14	0.47
1:A:146:GLN:HG2	4:A:2234:HOH:O	2.14	0.47
1:A:247:ALA:HA	1:A:250:LYS:CE	2.45	0.46
1:A:195:THR:HG23	4:A:2138:HOH:O	2.13	0.46
1:A:335:ASN:HD21	1:A:337:ASN:HB2	1.80	0.45
3:A:1423:646:HAC	3:A:1423:646:HAB	1.84	0.45
1:A:250:LYS:HD2	4:A:2338:HOH:O	2.16	0.44
1:A:123:LEU:HD13	1:A:175:LEU:HD11	1.99	0.44
1:A:376:ASN:ND2	4:A:2492:HOH:O	2.49	0.44
1:A:67:ASP:CG	1:A:67:ASP:O	2.56	0.43
1:A:162:HIS:HE1	4:A:2271:HOH:O	2.00	0.43
1:A:281:ASN:CB	4:A:2402:HOH:O	2.64	0.41
1:A:272:VAL:HG21	4:A:2424:HOH:O	2.20	0.41
1:A:335:ASN:HD22	1:A:338:TYR:H	1.69	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:2071:HOH:O	4:A:2327:HOH:O[2_645]	1.79	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:2117:HOH:O	4:A:2379:HOH:O[2_646]	1.86	0.34
4:A:2284:HOH:O	4:A:2359:HOH:O[2_746]	2.04	0.16

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	410/438 (94%)	399 (97%)	10 (2%)	1 (0%)	49 27

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	379	GLU

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	359/385 (93%)	352 (98%)	7 (2%)	60 36

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	29	LYS
1	A	63	MET
1	A	67	ASP

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Mol	Chain	Res	Type
1	A	115	ARG
1	A	117	LYS
1	A	195	THR
1	A	355	PRO

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	22	GLN
1	A	162	HIS
1	A	193	ASN
1	A	261	ASN
1	A	274	GLN
1	A	315	ASN
1	A	335	ASN
1	A	339	ASN
1	A	347	HIS

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](#)

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	MYA	A	1422	-	54,65,65	0.74	1 (1%)	66,91,91	1.76	9 (13%)
3	646	A	1423	-	34,35,35	1.55	7 (20%)	42,52,52	2.29	14 (33%)

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	MYA	A	1422	-	-	0/59/80/80	0/3/3/3
3	646	A	1423	-	-	0/17/27/27	0/4/4/4

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1423	646	CAY-CAZ	-3.33	1.40	1.49
3	A	1423	646	CBB-NAT	-2.51	1.38	1.43
3	A	1423	646	CAV-NBE	-2.01	1.34	1.37
2	A	1422	MYA	P3X-O9A	2.03	1.57	1.50
3	A	1423	646	CAC-NBE	2.45	1.50	1.47
3	A	1423	646	CAA-CAU	2.89	1.55	1.50
3	A	1423	646	OAE-SBF	3.60	1.47	1.43
3	A	1423	646	OAD-SBF	4.04	1.47	1.43

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1422	MYA	N3A-C2A-N1A	-9.01	121.15	128.86
3	A	1423	646	CAK-CAX-CLG	-5.16	110.30	118.48
3	A	1423	646	CAX-CBC-SBF	-4.26	120.42	123.31
3	A	1423	646	CAC-NBE-CAV	-4.13	123.64	128.75
3	A	1423	646	OAE-SBF-OAD	-3.82	114.76	119.56
3	A	1423	646	CBC-SBF-NAT	-3.39	102.94	106.60
3	A	1423	646	CAP-NBD-CBA	-2.69	114.05	120.33
2	A	1422	MYA	P2A-O3A-P1A	-2.43	124.45	132.63
2	A	1422	MYA	O8A-P3X-O9A	-2.10	102.39	110.60
2	A	1422	MYA	C4M-C3M-C2M	-2.10	107.91	113.87
2	A	1422	MYA	C2X-C3X-C4X	2.04	106.87	103.26
2	A	1422	MYA	O7A-P3X-O9A	2.13	118.91	110.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1422	MYA	C2A-N1A-C6A	2.21	122.51	118.75
3	A	1423	646	CAK-CAX-CBC	2.25	123.70	121.36
3	A	1423	646	CAZ-CAJ-CAW	2.47	122.80	120.31
3	A	1423	646	CAL-CBA-NBD	2.48	125.07	122.17
3	A	1423	646	CAH-NAQ-CBA	3.25	121.28	116.86
3	A	1423	646	CAP-NBD-CAO	3.30	118.63	111.54
3	A	1423	646	CAU-NAR-NBE	3.49	107.35	104.35
2	A	1422	MYA	C3-N4-C5	3.54	129.56	122.85
3	A	1423	646	OAD-SBF-CBC	4.75	115.61	108.82
3	A	1423	646	CBC-CAX-CLG	5.42	125.87	121.51
2	A	1422	MYA	O2M-C2M-C3M	6.12	120.13	109.11

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1423	646	3	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](#)

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	411/438 (93%)	-0.02	13 (3%) 47 45	9, 15, 28, 39	3 (0%)

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	72	ILE	4.9
1	A	25	ASP	3.8
1	A	11	ALA	3.5
1	A	28	GLU	3.5
1	A	316	ASP	3.5
1	A	262	SER	3.4
1	A	118	ALA	3.3
1	A	336	SER	3.0
1	A	29	LYS	2.6
1	A	337	ASN	2.6
1	A	30	ILE	2.5
1	A	38	GLU	2.5
1	A	238	GLN	2.1

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. 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	B-factors(\AA^2)	Q<0.9
3	646	A	1423	32/32	0.95	0.09	12,15,18,20	0
2	MYA	A	1422	63/63	0.97	0.08	9,12,16,17	0

6.5 Other polymers [i](#)

There are no such residues in this entry.