W O R L D W I D E

wwPDB

P R O T E I N   D A T A   B A N K

Full wwPDB X-ray Structure Validation Report ⓘ

Sep 24, 2023 – 08:54 PM EDT

PDB ID	:	5UUM
Title	:	Human Mcl-1 in complex with a Bfl-1-specific selected peptide
Authors	:	Jenson, J.M.; Grant, R.A.; Keating, A.E.
Deposited on	:	2017-02-17
Resolution	:	2.35 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 types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

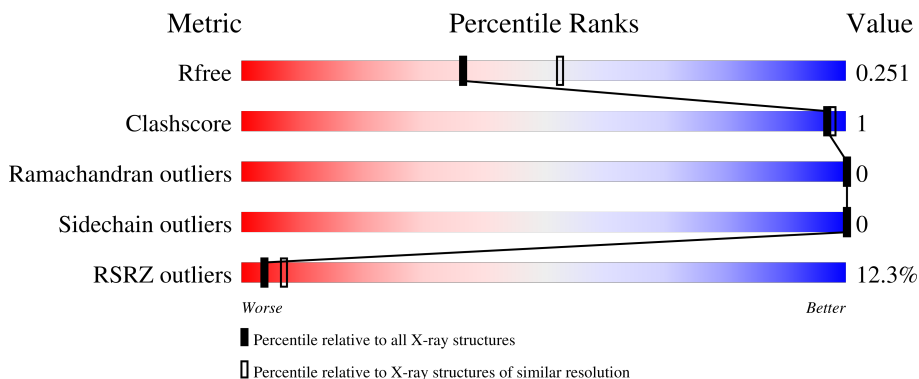|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 2.35 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		0.251
Clashscore		1
Ramachandran outliers		0
Sidechain outliers		0
RSRZ outliers		12.3%

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	2096 (2.36-2.32)
Clashscore	141614	2193 (2.36-2.32)
Ramachandran outliers	138981	2159 (2.36-2.32)
Sidechain outliers	138945	2160 (2.36-2.32)
RSRZ outliers	127900	2067 (2.36-2.32)

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% 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	156	12% / 96% ·
1	B	156	15% / 99% ·
2	C	25	92% / 8%
2	D	25	8% / 84% / 8% / 8%

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
3	ZN	A	401	-	-	-	X

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 5971 atoms, of which 2881 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 Induced myeloid leukemia cell differentiation protein Mcl-1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	156	Total	C	H	N	O	S	0	0	0
			2507	784	1255	229	235	4			
1	B	156	Total	C	H	N	O	S	0	1	0
			2526	789	1266	232	235	4			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	170	GLY	-	expression tag	UNP Q07820
A	171	SER	-	expression tag	UNP Q07820
B	170	GLY	-	expression tag	UNP Q07820
B	171	SER	-	expression tag	UNP Q07820

- Molecule 2 is a protein called Bfl-1 specific peptide FS2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	23	Total	C	H	N	O	0	0	0
			364	111	180	39	34			
2	D	23	Total	C	H	N	O	0	0	0
			364	111	180	39	34			

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	4	Total	Zn	0	0
			4	4		
3	B	4	Total	Zn	0	0
			4	4		

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

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

• Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	82	Total 82	O 82	0	0
5	B	88	Total 88	O 88	0	0
5	C	12	Total 12	O 12	0	0
5	D	10	Total 10	O 10	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 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.
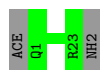
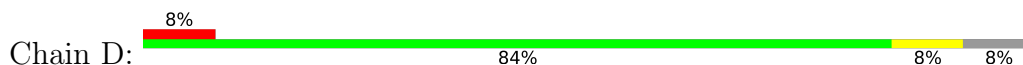- Molecule 1: Induced myeloid leukemia cell differentiation protein Mcl-1
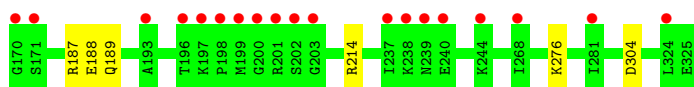
Chain A:

- Molecule 1: Induced myeloid leukemia cell differentiation protein Mcl-1

Chain B:

- Molecule 2: Bfl-1 specific peptide FS2

Chain C:

- Molecule 2: Bfl-1 specific peptide FS2

Chain D:
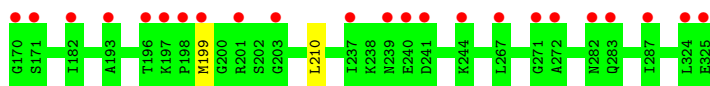
4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	132.62Å 62.76Å 48.79Å 90.00° 98.14° 90.00°	Depositor
Resolution (Å)	27.33 – 2.35 27.33 – 2.35	Depositor EDS
% Data completeness (in resolution range)	99.6 (27.33-2.35) 94.3 (27.33-2.35)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.05 (at 2.34Å)	Xtriage
Refinement program	PHENIX 1.11.1_2575	Depositor
R, R_{free}	0.216 , 0.251 0.216 , 0.251	Depositor DCC
R_{free} test set	1670 reflections (10.00%)	wwPDB-VP
Wilson B-factor (Å^2)	31.6	Xtriage
Anisotropy	0.444	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.40 , 48.7	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	5971	wwPDB-VP
Average B, all atoms (Å^2)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.50% 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, 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	0.25	0/1272	0.45	0/1710
1	B	0.25	0/1283	0.41	0/1724
2	C	0.27	0/185	0.39	0/249
2	D	0.25	0/185	0.36	0/249
All	All	0.25	0/2925	0.42	0/3932

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	1252	1255	1255	3	1
1	B	1260	1266	1268	1	0
2	C	184	180	183	0	0
2	D	184	180	183	1	1
3	A	4	0	0	0	0
3	B	4	0	0	0	0
4	A	5	0	0	0	0
4	B	5	0	0	0	0
5	A	82	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	88	0	0	0	0
5	C	12	0	0	0	0
5	D	10	0	0	1	0
All	All	3090	2881	2889	5	1

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 1.

All (5) 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)
2:D:4:ARG:NH1	5:D:101:HOH:O	2.25	0.69
1:A:188:GLU:OE2	1:A:214:ARG:NH2	2.36	0.56
1:B:199:MET:HE3	1:B:210:LEU:HD22	1.90	0.52
1:A:187:ARG:NH1	5:A:506:HOH:O	2.49	0.45
1:A:189:GLN:HB3	1:A:276:LYS:HE2	2.02	0.41

All (1) 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)
1:A:304:ASP:OD2	2:D:11:ARG:HH22[1_565]	1.59	0.01

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	154/156 (99%)	149 (97%)	5 (3%)	0	100	100
1	B	155/156 (99%)	151 (97%)	4 (3%)	0	100	100
2	C	21/25 (84%)	21 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	D	21/25 (84%)	21 (100%)	0	0	100	100
All	All	351/362 (97%)	342 (97%)	9 (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	136/136 (100%)	136 (100%)	0	100	100
1	B	137/136 (101%)	137 (100%)	0	100	100
2	C	17/17 (100%)	17 (100%)	0	100	100
2	D	17/17 (100%)	17 (100%)	0	100	100
All	All	307/306 (100%)	307 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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

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 (i)

Of 10 ligands modelled in this entry, 8 are monoatomic - leaving 2 for Mogul analysis.

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	$\#|Z| > 2$
4	SO4	A	405	-	4,4,4	0.14	0	6,6,6	0.04	0
4	SO4	B	405	-	4,4,4	0.14	0	6,6,6	0.06	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 (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	156/156 (100%)	0.92	19 (12%)	4	7	25, 43, 76, 93	0
1	B	156/156 (100%)	1.09	23 (14%)	2	4	24, 47, 81, 96	0
2	C	23/25 (92%)	0.36	0	100	100	30, 36, 58, 72	0
2	D	23/25 (92%)	0.38	2 (8%)	10	15	26, 34, 65, 67	0
All	All	358/362 (98%)	0.93	44 (12%)	4	7	24, 45, 79, 96	0

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	170	GLY	11.3
1	A	201	ARG	9.0
1	B	196	THR	8.2
1	B	198	PRO	7.8
1	B	170	GLY	6.9
1	A	196	THR	6.5
1	A	198	PRO	6.0
1	A	200	GLY	5.4
1	A	199	MET	4.8
1	B	237	ILE	4.8
1	B	201	ARG	4.8
1	A	237	ILE	4.6
1	B	199	MET	3.9
1	A	203	GLY	3.7
1	B	244	LYS	3.6
1	B	193	ALA	3.6
1	A	239	ASN	3.5
1	B	241	ASP	3.5
1	A	324	LEU	3.4
1	A	202	SER	3.3
1	A	171	SER	3.3

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Mol	Chain	Res	Type	RSRZ
1	B	325	GLU	3.2
1	A	197	LYS	3.2
1	B	197	LYS	3.1
1	A	238	LYS	3.1
1	B	240	GLU	2.9
1	B	272	ALA	2.8
1	A	240	GLU	2.7
1	B	324	LEU	2.6
1	B	203	GLY	2.6
1	B	171	SER	2.5
1	A	268	ILE	2.5
1	B	287	ILE	2.5
1	B	271	GLY	2.5
1	B	267	LEU	2.4
1	B	239	ASN	2.4
1	A	244	LYS	2.4
1	B	283	GLN	2.3
1	B	282	ASN	2.2
2	D	1	GLN	2.2
1	A	193	ALA	2.2
1	A	281	ILE	2.1
2	D	22	GLU	2.1
1	B	182	ILE	2.0

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 monosaccharides 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. 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.

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å²)	Q<0.9

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å²)	Q<0.9
3	ZN	A	401	1/1	0.77	0.45	102,102,102,102	0
4	SO4	B	405	5/5	0.77	0.23	86,90,101,120	0
4	SO4	A	405	5/5	0.80	0.19	62,67,75,100	0
3	ZN	B	402	1/1	0.86	0.42	94,94,94,94	0
3	ZN	A	404	1/1	0.88	0.38	141,141,141,141	0
3	ZN	B	403	1/1	0.94	0.20	99,99,99,99	0
3	ZN	A	403	1/1	0.96	0.23	128,128,128,128	0
3	ZN	B	404	1/1	0.96	0.23	110,110,110,110	0
3	ZN	A	402	1/1	0.97	0.19	55,55,55,55	0
3	ZN	B	401	1/1	0.99	0.17	47,47,47,47	0

6.5 Other polymers ⓘ

There are no such residues in this entry.