



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 10, 2020 – 12:36 AM BST

PDB ID : 6NYQ
Title : Crystal structure of glycosylated lysosomal membrane protein (GLMP) luminal domain bound to a Fab fragment
Authors : Huang, C.S.; Boenig, G.; Hymowitz, S.G.
Deposited on : 2019-02-12
Resolution : 1.85 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

<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 : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.13.1
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) : 2.13.1

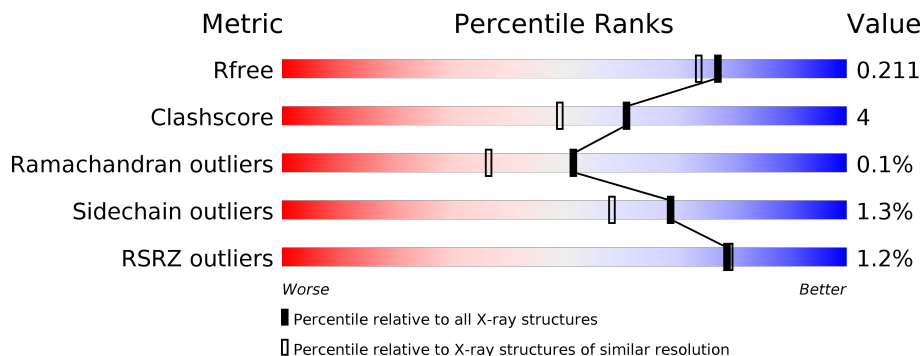
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

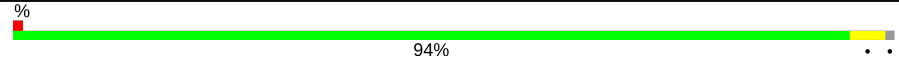
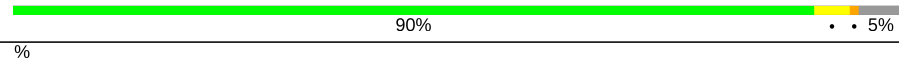

The reported resolution of this entry is 1.85 Å.

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}	130704	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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 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 $\leq 5\%$. 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	L	214	
2	H	227	
3	C	404	

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 6292 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 1H3 Fab light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	L	212	1613	1019	271	318	5	0	0	0

- Molecule 2 is a protein called 1H3 Fab heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	H	215	1584	1004	259	316	5	0	0	0

- Molecule 3 is a protein called Glycosylated lysosomal membrane protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	319	2379	1521	406	442	10	0	0	0

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	1	Total	Na	0	0
			1	1		
4	C	3	Total	Na	0	0
			3	3		

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	C	1	14	8	1	5	0	0
5	C	1	14	8	1	5	0	0
5	C	1	14	8	1	5	0	0
5	C	1	14	8	1	5	0	0
5	C	1	14	8	1	5	0	0
5	C	1	14	8	1	5	0	0

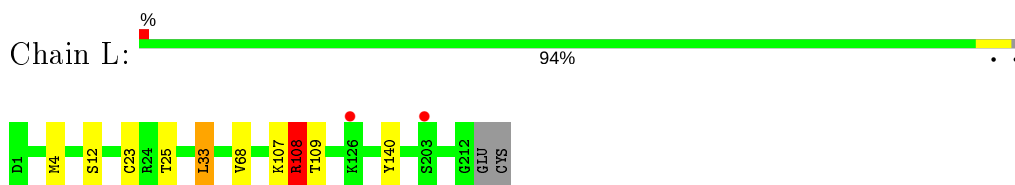
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
6	L	162	162	162	0	0
6	H	204	204	204	0	0
6	C	262	262	262	0	0

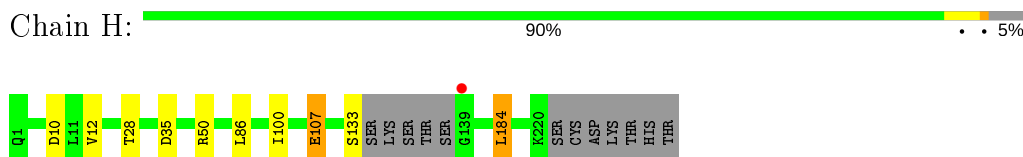
3 Residue-property plots [i](#)

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.

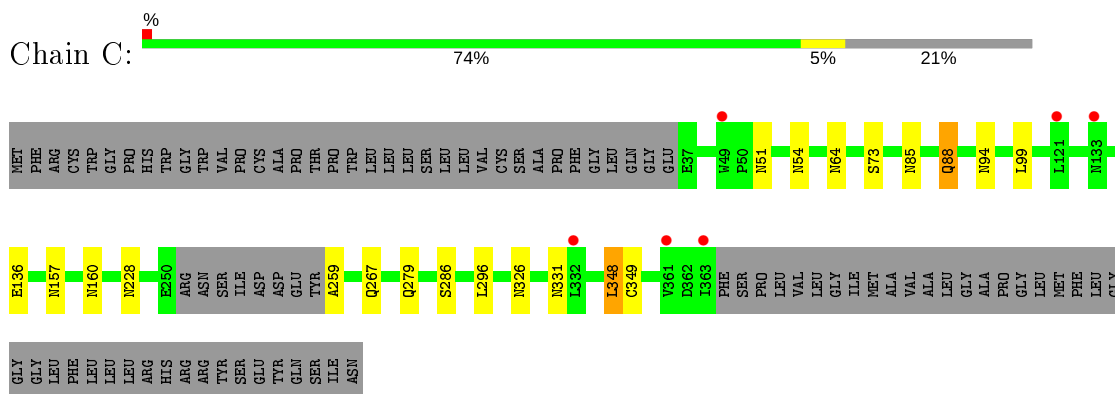
- Molecule 1: 1H3 Fab light chain



- Molecule 2: 1H3 Fab heavy chain



- Molecule 3: Glycosylated lysosomal membrane protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	81.92Å 55.24Å 99.64Å 90.00° 99.35° 90.00°	Depositor
Resolution (Å)	30.00 – 1.85 27.85 – 1.85	Depositor EDS
% Data completeness (in resolution range)	99.6 (30.00-1.85) 99.6 (27.85-1.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.96 (at 1.85Å)	Xtrriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.164 , 0.204 0.173 , 0.211	Depositor DCC
R_{free} test set	3783 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	25.4	Xtrriage
Anisotropy	0.026	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 43.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	6292	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.35% 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: NA, NAG

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	L	0.75	0/1653	0.83	2/2253 (0.1%)
2	H	0.81	1/1621 (0.1%)	0.82	3/2214 (0.1%)
3	C	0.78	0/2452	0.83	2/3364 (0.1%)
All	All	0.78	1/5726 (0.0%)	0.83	7/7831 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	107	GLU	CD-OE1	5.80	1.32	1.25

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	L	108	ARG	NE-CZ-NH1	12.27	126.44	120.30
1	L	108	ARG	NE-CZ-NH2	-9.57	115.52	120.30
2	H	50	ARG	NE-CZ-NH1	6.29	123.44	120.30
3	C	349	CYS	CA-CB-SG	-5.98	103.24	114.00
2	H	184	LEU	CA-CB-CG	5.97	129.02	115.30

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	L	1613	0	1546	11	0
2	H	1584	0	1548	3	0
3	C	2379	0	2276	35	0
4	C	3	0	0	0	0
4	H	1	0	0	0	0
5	C	84	0	78	26	0
6	C	262	0	0	5	3
6	H	204	0	0	1	1
6	L	162	0	0	0	2
All	All	6292	0	5448	49	4

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 4.

The worst 5 of 49 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)
3:C:331:ASN:HD21	5:C:509:NAG:C1	1.02	1.58
3:C:157:ASN:HD21	5:C:507:NAG:C1	0.96	1.55
3:C:85:ASN:HD21	5:C:505:NAG:C1	0.92	1.55
3:C:85:ASN:ND2	5:C:505:NAG:C1	1.76	1.45
3:C:331:ASN:ND2	5:C:509:NAG:C1	1.83	1.40

All (4) 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)
6:L:452:HOH:O	6:C:812:HOH:O[2_455]	1.93	0.27
6:H:410:HOH:O	6:H:415:HOH:O[2_444]	1.98	0.22
6:C:613:HOH:O	6:C:840:HOH:O[2_355]	2.05	0.15
6:L:462:HOH:O	6:C:862:HOH:O[2_455]	2.12	0.08

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	L	210/214 (98%)	203 (97%)	6 (3%)	1 (0%)	29	15
2	H	211/227 (93%)	207 (98%)	4 (2%)	0	100	100
3	C	315/404 (78%)	309 (98%)	6 (2%)	0	100	100
All	All	736/845 (87%)	719 (98%)	16 (2%)	1 (0%)	51	36

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	L	68	VAL

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	L	179/189 (95%)	177 (99%)	2 (1%)	73	65
2	H	177/194 (91%)	173 (98%)	4 (2%)	50	34
3	C	255/337 (76%)	253 (99%)	2 (1%)	81	76
All	All	611/720 (85%)	603 (99%)	8 (1%)	69	58

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

Mol	Chain	Res	Type
2	H	35	ASP
3	C	348	LEU
2	H	184	LEU
2	H	10	ASP
2	H	133	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
3	C	64	ASN

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Mol	Chain	Res	Type
3	C	85	ASN
3	C	157	ASN
3	C	228	ASN
3	C	331	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 4 are monoatomic - leaving 6 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	$\# Z > 2$
5	NAG	C	509	-	14,14,15	0.74	0	17,19,21	1.10	2 (11%)
5	NAG	C	506	-	14,14,15	0.65	0	17,19,21	1.68	2 (11%)
5	NAG	C	505	-	14,14,15	0.68	0	17,19,21	1.55	3 (17%)
5	NAG	C	504	-	14,14,15	0.62	0	17,19,21	1.67	4 (23%)
5	NAG	C	508	-	14,14,15	0.50	0	17,19,21	1.71	4 (23%)
5	NAG	C	507	-	14,14,15	0.51	0	17,19,21	0.90	1 (5%)

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
5	NAG	C	509	-	-	0/6/23/26	0/1/1/1
5	NAG	C	506	-	-	2/6/23/26	0/1/1/1
5	NAG	C	505	-	-	1/6/23/26	0/1/1/1
5	NAG	C	504	-	-	4/6/23/26	0/1/1/1
5	NAG	C	508	-	-	3/6/23/26	0/1/1/1
5	NAG	C	507	-	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	506	NAG	C3-C4-C5	4.52	118.30	110.24
5	C	504	NAG	C3-C4-C5	4.42	118.13	110.24
5	C	506	NAG	C4-C3-C2	4.33	117.37	111.02
5	C	505	NAG	C1-C2-N2	-3.63	104.29	110.49
5	C	508	NAG	O5-C5-C6	3.40	112.54	107.20

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	506	NAG	O5-C5-C6-O6
5	C	504	NAG	O5-C5-C6-O6
5	C	506	NAG	C4-C5-C6-O6
5	C	504	NAG	C4-C5-C6-O6
5	C	504	NAG	C8-C7-N2-C2

There are no ring outliers.

6 monomers are involved in 26 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	509	NAG	5	0
5	C	506	NAG	4	0
5	C	505	NAG	6	0
5	C	504	NAG	3	0
5	C	508	NAG	3	0
5	C	507	NAG	5	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	L	212/214 (99%)	-0.42	2 (0%) 84 84	17, 29, 47, 71	0
2	H	215/227 (94%)	-0.45	1 (0%) 91 91	17, 27, 43, 63	0
3	C	319/404 (78%)	-0.31	6 (1%) 66 66	19, 27, 44, 68	0
All	All	746/845 (88%)	-0.38	9 (1%) 79 79	17, 28, 45, 71	0

The worst 5 of 9 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	49	TRP	4.8
2	H	139	GLY	4.0
3	C	363	ILE	3.5
3	C	133	ASN	2.5
1	L	126	LYS	2.5

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 monosaccharides 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
5	NAG	C	504	14/15	0.78	0.33	77,88,93,98	0
5	NAG	C	508	14/15	0.82	0.21	51,59,68,76	0
5	NAG	C	509	14/15	0.84	0.20	37,44,46,46	0
5	NAG	C	506	14/15	0.85	0.27	73,82,87,88	0
5	NAG	C	507	14/15	0.93	0.11	37,42,50,62	0
5	NAG	C	505	14/15	0.94	0.19	35,44,52,52	0
4	NA	H	301	1/1	0.98	0.09	38,38,38,38	0
4	NA	C	502	1/1	0.98	0.06	33,33,33,33	0
4	NA	C	503	1/1	0.99	0.14	32,32,32,32	0
4	NA	C	501	1/1	1.00	0.12	28,28,28,28	0

6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.