



wwPDB X-ray Structure Validation Summary Report ⓘ

May 16, 2020 – 06:01 pm BST

PDB ID : 3EYQ
Title : Crystal structure of MJ5 Fab, a germline antibody variant of anti-human cytomegalovirus antibody 8f9
Authors : Thomson, C.A.; Bryson, S.; McLean, G.R.; Creagh, A.L.; Pai, E.F.; Schrader, J.W.
Deposited on : 2008-10-21
Resolution : 2.40 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
Xtriage (Phenix)	:	1.13
EDS	:	2.11
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)	:	2.11

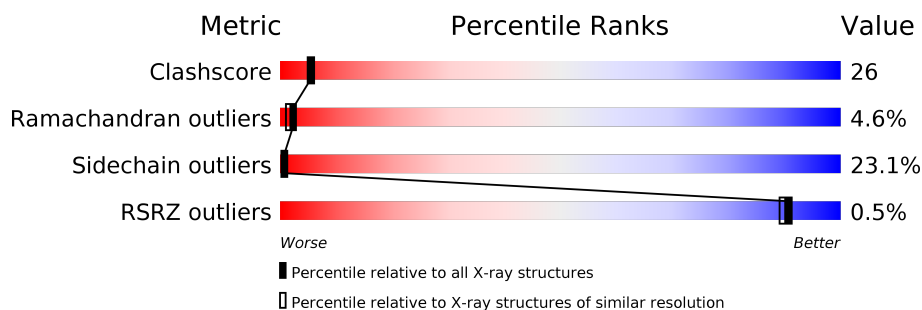
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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))
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	C	216	 32% 36% 24% 6% •
2	D	242	 35% 32% 16% • 14%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3294 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 M2J5 Fab.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	212	Total	C	N	O	S	0	0	0
			1638	1026	280	328	4			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	0	MET	-	EXPRESSION TAG	PDB 3EYQ

- Molecule 2 is a protein called 8f9 Fab.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	208	Total	C	N	O	S	0	0	0
			1568	994	264	304	6			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	235	LEU	-	EXPRESSION TAG	PDB 3EYQ
D	236	GLU	-	EXPRESSION TAG	PDB 3EYQ
D	237	HIS	-	EXPRESSION TAG	PDB 3EYQ
D	238	HIS	-	EXPRESSION TAG	PDB 3EYQ
D	239	HIS	-	EXPRESSION TAG	PDB 3EYQ
D	240	HIS	-	EXPRESSION TAG	PDB 3EYQ
D	241	HIS	-	EXPRESSION TAG	PDB 3EYQ
D	242	HIS	-	EXPRESSION TAG	PDB 3EYQ

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	C	55	Total	O	0	0
			55	55		

Continued on next page...

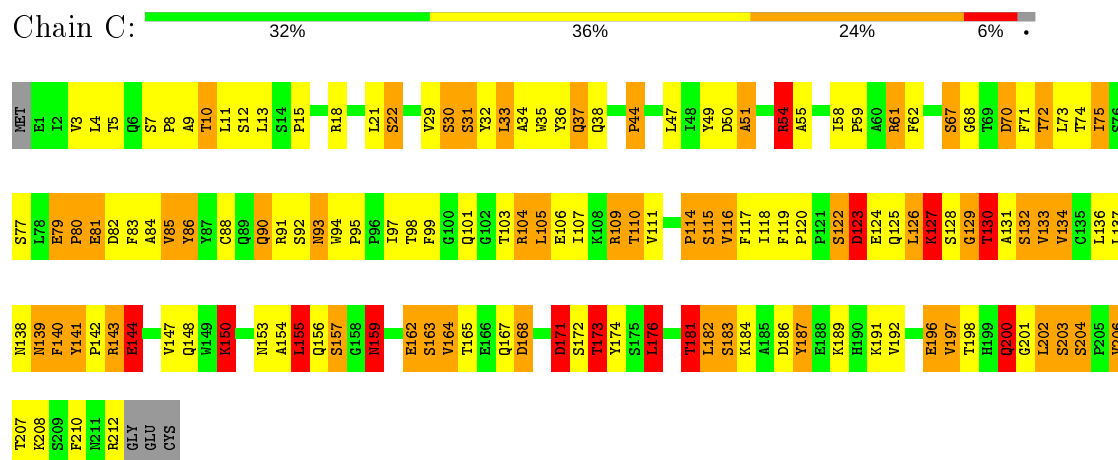
Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	33	Total	O	0	0
			33	33		

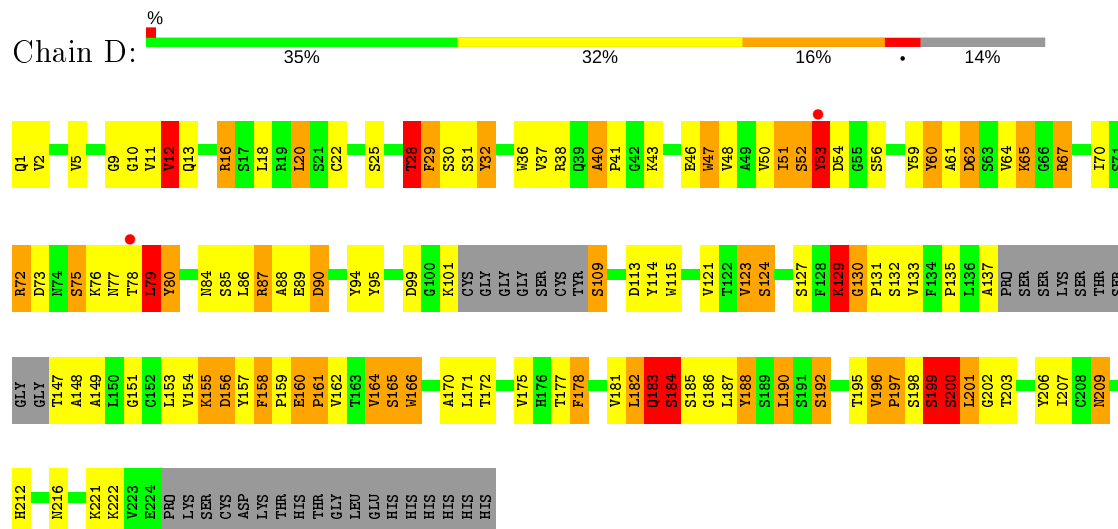
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of 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: M2J5 Fab



• Molecule 2: 8f9 Fab



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	65.38Å 76.05Å 111.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.40 56.40 – 2.40	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-2.40) 85.9 (56.40-2.40)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.03 (at 2.40Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.250 , 0.270 0.262 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	22.5	Xtriage
Anisotropy	0.133	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 49.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	3294	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.50% 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

5.1 Standard geometry

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	C	2.52	76/1675 (4.5%)	1.57	21/2279 (0.9%)
2	D	2.42	62/1603 (3.9%)	1.49	15/2177 (0.7%)
All	All	2.47	138/3278 (4.2%)	1.53	36/4456 (0.8%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	4	8
2	D	4	14
All	All	8	22

The worst 5 of 138 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	174	TYR	CE1-CZ	-11.03	1.24	1.38
1	C	32	TYR	CD1-CE1	-11.03	1.22	1.39
1	C	32	TYR	CD2-CE2	-10.86	1.23	1.39
1	C	174	TYR	CD2-CE2	-10.23	1.24	1.39
1	C	134	VAL	CB-CG2	-10.18	1.31	1.52

The worst 5 of 36 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	123	ASP	CB-CG-OD2	9.79	127.12	118.30
1	C	186	ASP	CB-CG-OD2	9.52	126.87	118.30
2	D	73	ASP	CB-CG-OD2	8.32	125.79	118.30
1	C	168	ASP	CB-CG-OD2	8.11	125.60	118.30
1	C	176	LEU	CA-CB-CG	7.47	132.48	115.30

5 of 8 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	C	51	ALA	CA
1	C	115	SER	CA
1	C	123	ASP	CA
1	C	130	THR	CA
2	D	28	THR	CA

5 of 22 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	114	PRO	Peptide
1	C	51	ALA	Peptide
1	C	54	ARG	Peptide
1	C	80	PRO	Peptide
1	C	99	PHE	Peptide

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	C	1638	0	1597	97	0
2	D	1568	0	1539	71	5
3	C	55	0	0	5	0
3	D	33	0	0	2	0
All	All	3294	0	3136	166	5

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 26.

The worst 5 of 166 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:C:171:ASP:HB3	1:C:173:THR:OG1	1.50	1.11
1:C:130:THR:HG22	1:C:131:ALA:H	0.94	1.05
1:C:127:LYS:HD2	1:C:127:LYS:N	1.73	1.03
1:C:130:THR:HG22	1:C:131:ALA:N	1.74	0.99
2:D:67:ARG:NH2	2:D:90:ASP:OD2	1.96	0.96

All (5) 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)
2:D:53:TYR:OH	2:D:216:ASN:ND2[4_546]	0.45	1.75
2:D:53:TYR:OH	2:D:216:ASN:CG[4_546]	1.12	1.08
2:D:53:TYR:CZ	2:D:216:ASN:ND2[4_546]	1.27	0.93
2:D:53:TYR:OH	2:D:216:ASN:OD1[4_546]	1.82	0.38
2:D:53:TYR:CE1	2:D:216:ASN:ND2[4_546]	2.00	0.20

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	C	210/216 (97%)	180 (86%)	22 (10%)	8 (4%)	3	2
2	D	202/242 (84%)	180 (89%)	11 (5%)	11 (5%)	2	1
All	All	412/458 (90%)	360 (87%)	33 (8%)	19 (5%)	2	1

5 of 19 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	81	GLU
1	C	123	ASP
2	D	28	THR
2	D	53	TYR
2	D	88	ALA

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	C	185/188 (98%)	139 (75%)	46 (25%)	0	0
2	D	174/202 (86%)	137 (79%)	37 (21%)	1	1
All	All	359/390 (92%)	276 (77%)	83 (23%)	1	1

5 of 83 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	171	ASP
2	D	1	GLN
2	D	184	SER
1	C	173	THR
1	C	189	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 8 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	159	ASN
2	D	204	GLN
1	C	190	HIS
1	C	156	GLN
1	C	167	GLN

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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

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	C	212/216 (98%)	-0.27	0	100 100	8, 20, 31, 39	0
2	D	208/242 (85%)	-0.10	2 (0%)	82 80	11, 24, 41, 48	0
All	All	420/458 (91%)	-0.19	2 (0%)	91 89	8, 22, 39, 48	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	53	TYR	2.7
2	D	78	THR	2.3

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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.