W O R L D W I D E
wwPDB
PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Feb 1, 2016 – 08:32 AM GMT

PDB ID : 3F12
Title : Germline V-genes sculpt the binding site of a family of antibodies neutralizing human cytomegalovirus
Authors : Thomson, C.A.; Bryson, S.; McLean, G.R.; Creagh, A.L.; Pai, E.F.; Schrader, J.W.
Deposited on : 2008-10-27
Resolution : 2.95 Å(reported)

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
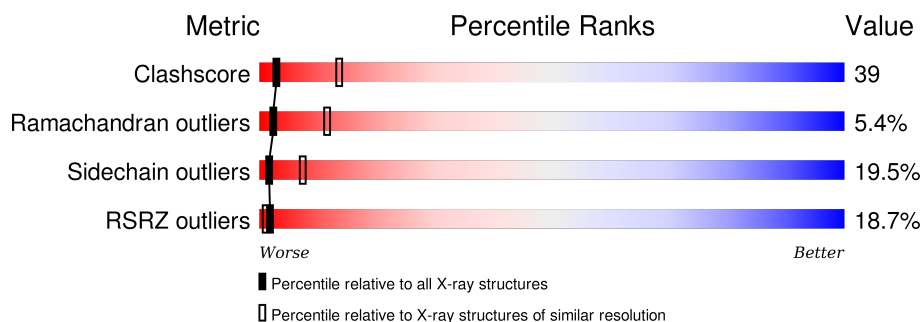Validation Pipeline (wwPDB-VP) : trunk26865

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.95 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
Clashscore		39
Ramachandran outliers		5.4%
Sidechain outliers		19.5%
RSRZ outliers		18.7%

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))
Clashscore	102246	2552 (3.00-2.92)
Ramachandran outliers	100387	2468 (3.00-2.92)
Sidechain outliers	100360	2471 (3.00-2.92)
RSRZ outliers	91569	2201 (3.00-2.92)

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 <=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	216	14% / 44% 44% 9% •
1	C	216	22% / 36% 47% 16% •
2	B	242	18% / 33% 37% 12% 18%
2	D	242	13% / 31% 42% 9% • 17%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 6303 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 M2J1 Fab.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	211	Total 1630	C 1024	N 275	O 327	S 4	0	0	0
1	C	213	Total 1642	C 1030	N 277	O 331	S 4	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	EXPRESSION TAG	PDB 3F12
C	0	MET	-	EXPRESSION TAG	PDB 3F12

- Molecule 2 is a protein called 8f9 Fab.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	199	Total 1508	C 959	N 253	O 290	S 6	0	0	0
2	D	202	Total 1523	C 967	N 255	O 295	S 6	0	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	235	LEU	-	EXPRESSION TAG	PDB 3F12
B	236	GLU	-	EXPRESSION TAG	PDB 3F12
B	237	HIS	-	EXPRESSION TAG	PDB 3F12
B	238	HIS	-	EXPRESSION TAG	PDB 3F12
B	239	HIS	-	EXPRESSION TAG	PDB 3F12
B	240	HIS	-	EXPRESSION TAG	PDB 3F12
B	241	HIS	-	EXPRESSION TAG	PDB 3F12
B	242	HIS	-	EXPRESSION TAG	PDB 3F12
D	235	LEU	-	EXPRESSION TAG	PDB 3F12
D	236	GLU	-	EXPRESSION TAG	PDB 3F12

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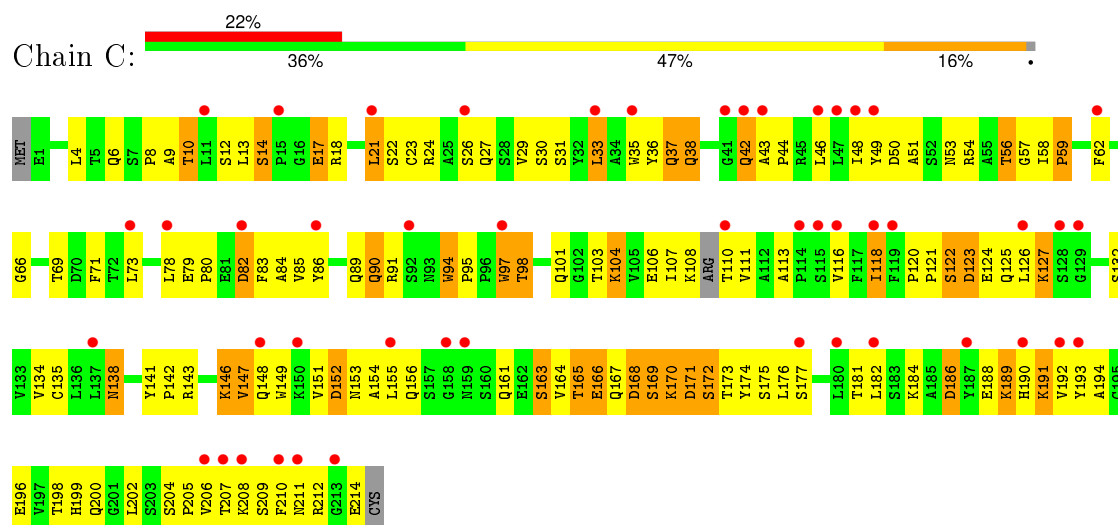| Chain	Residue	Modelled	Actual	Comment	Reference
D	237	HIS	-	EXPRESSION TAG	PDB 3F12
D	238	HIS	-	EXPRESSION TAG	PDB 3F12
D	239	HIS	-	EXPRESSION TAG	PDB 3F12
D	240	HIS	-	EXPRESSION TAG	PDB 3F12
D	241	HIS	-	EXPRESSION TAG	PDB 3F12
D	242	HIS	-	EXPRESSION TAG	PDB 3F12

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.
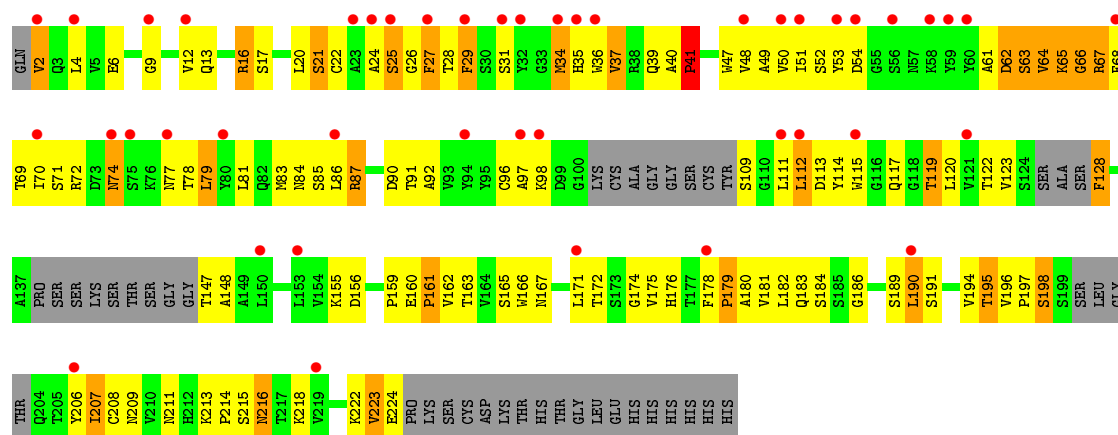
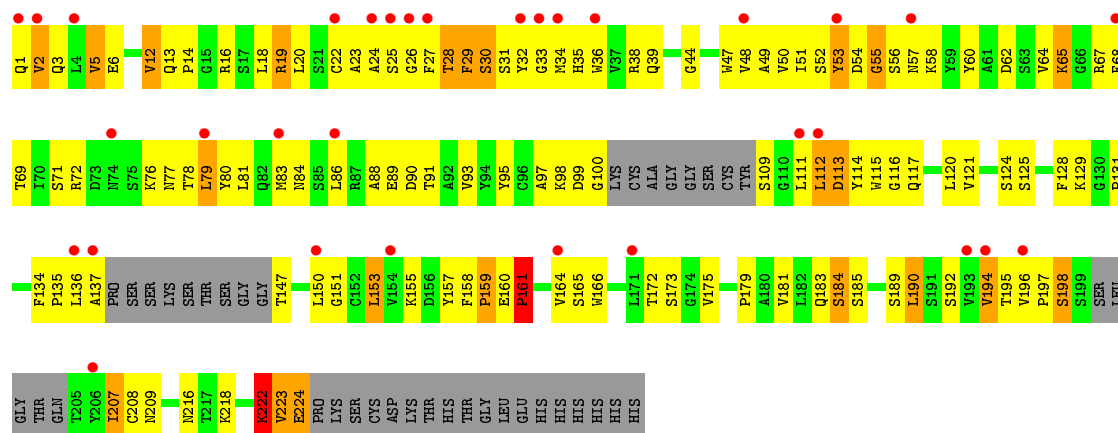- Molecule 1: M2J1 Fab

- Molecule 1: M2J1 Fab

- Molecule 2: 8f9 Fab

● Molecule 2: 8f9 Fab

Chain D:

4   Data and refinement statistics (i)

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	87.86Å 87.86Å 241.85Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.00 – 2.95 47.34 – 2.93	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-2.95) 93.0 (47.34-2.93)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	4.65 (at 2.91Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.300 , 0.320 0.304 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	DCC
Wilson B-factor (Å^2)	69.8	Xtriage
Anisotropy	0.685	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 43.7	EDS
Estimated twinning fraction	0.021 for -h,-k,l	Xtriage
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.34$	Xtriage
Outliers	0 of 44003 reflections	Xtriage
F_o,F_c correlation	0.85	EDS
Total number of atoms	6303	wwPDB-VP
Average B, all atoms (Å^2)	68.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.02% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

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	0.48	0/1668	0.79	0/2270
1	C	0.50	0/1680	0.84	0/2285
2	B	0.47	0/1541	0.84	2/2091 (0.1%)
2	D	0.51	0/1557	0.89	2/2115 (0.1%)
All	All	0.49	0/6446	0.84	4/8761 (0.0%)

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
2	D	0	1

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	55	GLY	N-CA-C	6.86	130.24	113.10
2	B	77	ASN	N-CA-C	5.65	126.25	111.00
2	B	66	GLY	N-CA-C	-5.40	99.59	113.10
2	D	44	GLY	N-CA-C	5.27	126.27	113.10

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	D	53	TYR	Sidechain

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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	1630	0	1580	107	8
1	C	1642	0	1585	141	8
2	B	1508	0	1472	126	0
2	D	1523	0	1484	167	0
All	All	6303	0	6121	489	8

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 39.

The worst 5 of 489 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:B:218:LYS:HB2	2:D:16:ARG:HH21	1.09	1.09
2:D:12:VAL:HG22	2:D:16:ARG:HD3	1.23	1.09
1:A:61:ARG:NH1	1:A:79:GLU:HG3	1.75	1.02
2:D:135:PRO:HB3	2:D:223:VAL:HG22	1.42	1.01
1:C:97:TRP:HE1	2:D:35:HIS:CE1	1.77	1.01

The worst 5 of 8 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:108:LYS:CE	1:C:111:VAL:CG2[2_564]	0.27	1.93
1:A:108:LYS:NZ	1:C:111:VAL:CB[2_564]	0.69	1.51
1:A:108:LYS:CD	1:C:111:VAL:CG2[2_564]	1.26	0.94
1:A:108:LYS:NZ	1:C:111:VAL:CG1[2_564]	1.27	0.93
1:A:108:LYS:NZ	1:C:111:VAL:CA[2_564]	1.47	0.73

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	207/216 (96%)	177 (86%)	23 (11%)	7 (3%)	5	22
1	C	209/216 (97%)	170 (81%)	27 (13%)	12 (6%)	2	10
2	B	189/242 (78%)	155 (82%)	20 (11%)	14 (7%)	1	5
2	D	194/242 (80%)	162 (84%)	22 (11%)	10 (5%)	2	12
All	All	799/916 (87%)	664 (83%)	92 (12%)	43 (5%)	2	11

5 of 43 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	51	ALA
1	A	126	LEU
1	A	139	ASN
2	B	21	SER
2	B	62	ASP

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	184/188 (98%)	153 (83%)	31 (17%)	2	11
1	C	185/188 (98%)	147 (80%)	38 (20%)	1	6
2	B	167/202 (83%)	131 (78%)	36 (22%)	1	5
2	D	168/202 (83%)	136 (81%)	32 (19%)	2	8
All	All	704/780 (90%)	567 (80%)	137 (20%)	2	7

5 of 137 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	191	SER
1	C	38	GLN
2	D	181	VAL
2	B	207	ILE
1	C	12	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	117	GLN
2	B	209	ASN
2	D	176	HIS
2	B	176	HIS
2	B	183	GLN

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)

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(Å²)	Q<0.9
1	A	211/216 (97%)	0.93	30 (14%)	4	2	49, 67, 85, 92	0
1	C	213/216 (98%)	1.19	48 (22%)	1	1	49, 69, 87, 96	0
2	B	199/242 (82%)	1.12	44 (22%)	1	1	49, 67, 88, 95	0
2	D	202/242 (83%)	0.96	32 (15%)	3	1	45, 63, 86, 111	0
All	All	825/916 (90%)	1.05	154 (18%)	2	1	45, 67, 87, 111	0

The worst 5 of 154 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	110	THR	12.5
2	B	54	ASP	7.7
2	B	98	LYS	7.5
2	B	23	ALA	6.8
1	A	110	THR	6.5

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 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.