Full wwPDB/EMDataBank EM Map/Model Validation Report (i)

Jun 4, 2019 – 10:22 PM EDT

PDB ID	:	6ILL
EMDB ID:	:	EMD-9686
Title	:	Cryo-EM structure of Echovirus 6 complexed with its uncoating receptor FcRn at PH 5.5
Authors	:	Gao, G.F.; Liu, S.; Zhao, X.; Peng, R.
Deposited on	:	2018-10-19
Resolution	:	3.80 Å(reported)

This is a Full wwPDB/EMDataBank EM Map/Model Validation Report for a publicly released PDB/EMDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the (i) symbol.

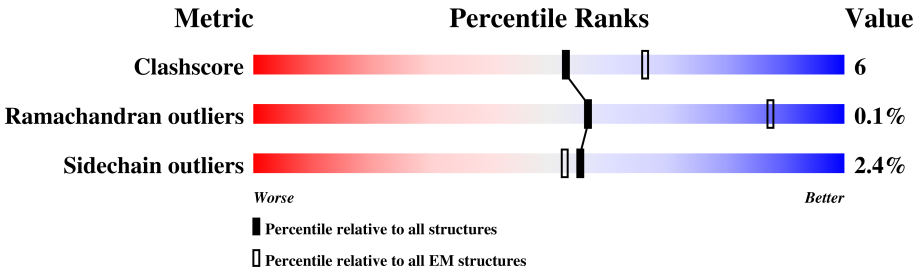
MolProbity	:	4.02b-467
Percentile statistics	:	20171227.v01 (using entries in the PDB archive December 27th 2017)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20031633

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.80 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)	EM structures (#Entries)
Clashscore	136327	1886
Ramachandran outliers	132723	1663
Sidechain outliers	132532	1531

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the 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%

Mol	Chain	Length	Quality of chain
1	A	273	87% 11% .
2	B	252	81% 17% .
3	C	238	81% 18%
4	D	68	79% 6% 15%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 6473 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Capsid protein VP1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	273	2194	1385	383	418	8	0	0

- Molecule 2 is a protein called Capsid protein VP2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	252	1968	1240	337	375	16	0	0

- Molecule 3 is a protein called Capsid protein VP3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	238	1859	1187	304	353	15	1	0

- Molecule 4 is a protein called Capsid protein VP4.

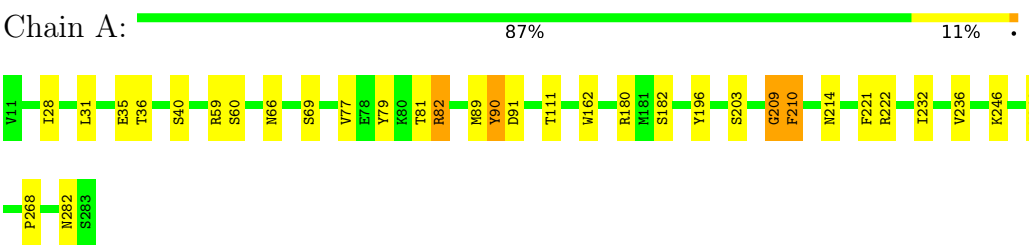
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	58	452	280	79	92	1	0	0

3 Residue-property plots (i)

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. 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. 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.

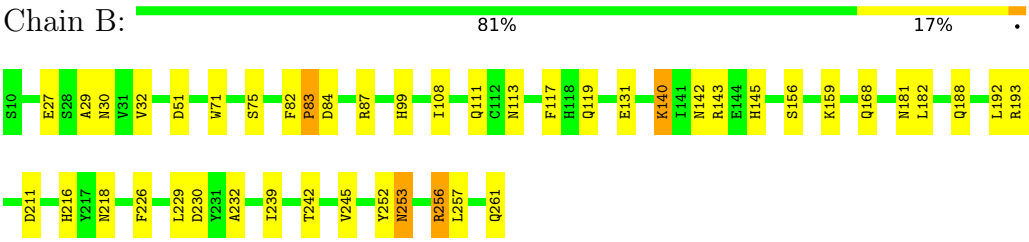
- Molecule 1: Capsid protein VP1

Chain A:



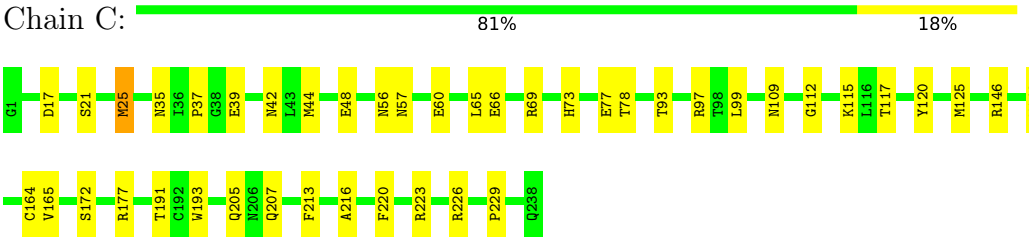
- Molecule 2: Capsid protein VP2

Chain B:



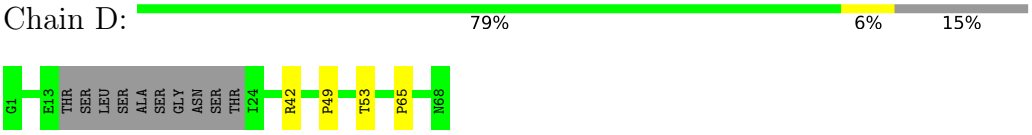
- Molecule 3: Capsid protein VP3

Chain C:



- Molecule 4: Capsid protein VP4

Chain D:



4 Experimental information (i)

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	Depositor
Number of particles used	937	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	40	Depositor
Minimum defocus (nm)	Not provided	Depositor
Maximum defocus (nm)	Not provided	Depositor
Magnification	Not provided	Depositor
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor

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	#$\|Z\|>2$	RMSZ	#$\|Z\|>2$
1	A	0.33	0/2257	0.54	0/3082
2	B	0.35	0/2018	0.55	1/2751 (0.0%)
3	C	0.36	0/1906	0.57	0/2604
4	D	0.34	0/460	0.62	0/620
All	All	0.34	0/6641	0.56	1/9057 (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
1	A	0	1
2	B	0	1
3	C	0	1
All	All	0	3

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	182	LEU	CA-CB-CG	6.95	131.28	115.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	209	GLY	Peptide
2	B	82	PHE	Peptide
3	C	60	GLU	Peptide

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	2194	0	2112	34	0
2	B	1968	0	1875	37	0
3	C	1859	0	1812	27	0
4	D	452	0	434	3	0
All	All	6473	0	6233	78	0

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 6.

All (78) 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:79:TYR:HB2	1:A:89:MET:O	1.58	1.04
1:A:210:PHE:HD1	2:B:131:GLU:OE1	1.58	0.87
1:A:196:TYR:O	1:A:209:GLY:O	2.04	0.75
1:A:210:PHE:CD1	2:B:131:GLU:OE1	2.43	0.70
1:A:90:TYR:HB2	1:A:221:PHE:O	1.94	0.68
3:C:117:THR:HB	3:C:213:PHE:HB2	1.77	0.66
2:B:140:LYS:HB2	2:B:140:LYS:HZ2	1.61	0.64
2:B:140:LYS:HB2	2:B:140:LYS:NZ	2.13	0.63
1:A:77:VAL:HG13	1:A:91:ASP:OD2	1.98	0.63
2:B:226:PHE:HA	3:C:65:LEU:HD21	1.81	0.63
3:C:172:SER:HB2	3:C:177:ARG:HH21	1.66	0.61
3:C:57:ASN:ND2	3:C:93:THR:O	2.34	0.60
2:B:205:ILE:HG12	3:C:37:PRO:HG2	1.82	0.60
3:C:161:GLN:NE2	4:D:65:PRO:O	2.35	0.60
2:B:193:ARG:HG3	2:B:194:THR:HG23	1.84	0.59
2:B:27:GLU:HB2	2:B:196:ASN:HB2	1.86	0.58
2:B:32:VAL:HG23	2:B:188:GLN:HE21	1.67	0.58
1:A:81:THR:HG22	1:A:232:ILE:H	1.69	0.58
2:B:156:SER:H	2:B:168:GLN:HB3	1.69	0.57
1:A:82:ARG:HA	1:A:89:MET:HE1	1.87	0.57
1:A:210:PHE:O	1:A:210:PHE:HD2	1.87	0.57
1:A:36:THR:HG22	2:B:29:ALA:HB1	1.88	0.56
1:A:40:SER:O	3:C:115:LYS:NZ	2.36	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:108:ILE:HA	2:B:245:VAL:HG12	1.89	0.55
1:A:263:ASN:ND2	1:A:265:ASP:OD2	2.41	0.54
2:B:119:GLN:HE21	2:B:230:ASP:HB3	1.73	0.54
1:A:210:PHE:HD1	2:B:131:GLU:CD	2.10	0.54
1:A:268:PRO:HD2	2:B:159:LYS:HE2	1.91	0.53
3:C:73:HIS:HB3	3:C:207:GLN:HG2	1.91	0.53
1:A:69:SER:OG	4:D:42:ARG:NH2	2.42	0.52
2:B:140:LYS:CB	2:B:140:LYS:NZ	2.73	0.50
2:B:256:ARG:NH1	2:B:257:LEU:O	2.44	0.50
3:C:164:CYS:SG	3:C:165:VAL:N	2.85	0.50
3:C:48:GLU:HG2	3:C:216:ALA:HB3	1.94	0.49
2:B:229:LEU:HD11	2:B:239:ILE:HD12	1.95	0.49
3:C:120:TYR:HB2	3:C:156:TRP:HH2	1.77	0.48
1:A:268:PRO:HG2	2:B:159:LYS:HG3	1.95	0.48
2:B:142:ASN:HB2	2:B:145:HIS:HD2	1.77	0.48
1:A:180:ARG:NH2	3:C:17:ASP:OD2	2.43	0.48
1:A:111:THR:HB	1:A:249:VAL:HG13	1.96	0.48
1:A:60:SER:O	1:A:66:ASN:ND2	2.46	0.48
1:A:90:TYR:HD2	1:A:162:TRP:HZ2	1.62	0.48
4:D:49:PRO:O	4:D:53:THR:OG1	2.30	0.47
2:B:211:ASP:OD2	2:B:216:HIS:ND1	2.48	0.47
1:A:90:TYR:C	1:A:90:TYR:CD1	2.86	0.47
2:B:87:ARG:HH22	2:B:143:ARG:HH22	1.61	0.47
1:A:28:ILE:HD12	1:A:31:LEU:HB2	1.96	0.47
2:B:51:ASP:OD1	2:B:253:ASN:ND2	2.42	0.47
1:A:77:VAL:HG13	1:A:91:ASP:CG	2.35	0.47
3:C:25[A]:MET:SD	3:C:25[A]:MET:N	2.88	0.47
1:A:59:ARG:HE	3:C:44:MET:HE2	1.80	0.46
2:B:232:ALA:HA	3:C:205:GLN:HE21	1.81	0.46
3:C:226:ARG:HH12	3:C:229:PRO:HD3	1.81	0.46
2:B:71:TRP:HD1	2:B:75:SER:HB2	1.81	0.45
2:B:113:ASN:HB3	2:B:196:ASN:HD21	1.82	0.45
1:A:246:LYS:NZ	3:C:39:GLU:OE2	2.41	0.45
1:A:210:PHE:HB2	2:B:131:GLU:OE2	2.17	0.45
2:B:111:GLN:N	2:B:242:THR:O	2.50	0.44
3:C:109:ASN:ND2	3:C:223:ARG:HH11	2.16	0.44
2:B:181:ASN:ND2	3:C:97:ARG:O	2.50	0.44
2:B:71:TRP:HZ3	2:B:192:LEU:HD11	1.81	0.44
1:A:90:TYR:O	1:A:90:TYR:CD1	2.71	0.44
1:A:203:SER:HB3	2:B:261:GLN:HA	2.00	0.44
2:B:83:PRO:HG3	2:B:218:ASN:H	1.83	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:191:THR:HG1	3:C:193:TRP:HE1	1.64	0.43
2:B:181:ASN:OD1	3:C:99:LEU:N	2.52	0.42
1:A:77:VAL:HB	1:A:236:VAL:HG13	2.01	0.42
2:B:84:ASP:OD1	2:B:87:ARG:NH1	2.41	0.42
3:C:112:GLY:HA3	3:C:220:PHE:HA	2.00	0.42
1:A:59:ARG:HD3	3:C:44:MET:HG3	2.01	0.41
2:B:117:PHE:HE1	3:C:125:MET:HG3	1.84	0.41
3:C:77:GLU:HG3	3:C:78:THR:HG22	2.01	0.41
1:A:209:GLY:HA2	1:A:210:PHE:CB	2.50	0.41
2:B:99:HIS:CG	2:B:252:TYR:HB3	2.56	0.41
3:C:66:GLU:HA	3:C:69:ARG:HH11	1.85	0.41
1:A:35:GLU:OE1	2:B:194:THR:OG1	2.29	0.41
1:A:182:SER:OG	3:C:21:SER:OG	2.39	0.41
1:A:209:GLY:CA	1:A:210:PHE:CB	3.00	0.40

There are no symmetry-related clashes.

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 PDB entries followed by that with respect to all EM entries.

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	271/273 (99%)	243 (90%)	28 (10%)	0	100 100
2	B	250/252 (99%)	230 (92%)	19 (8%)	1 (0%)	36 75
3	C	237/238 (100%)	208 (88%)	29 (12%)	0	100 100
4	D	54/68 (79%)	42 (78%)	12 (22%)	0	100 100
All	All	812/831 (98%)	723 (89%)	88 (11%)	1 (0%)	56 87

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	83	PRO

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 PDB entries followed by that with respect to all EM entries.

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	251/251 (100%)	245 (98%)	6 (2%)	52 77
2	B	214/214 (100%)	209 (98%)	5 (2%)	53 78
3	C	209/208 (100%)	202 (97%)	7 (3%)	41 72
4	D	49/57 (86%)	49 (100%)	0	100 100
All	All	723/730 (99%)	705 (98%)	18 (2%)	55 77

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	82	ARG
1	A	90	TYR
1	A	210	PHE
1	A	214	ASN
1	A	222	ARG
1	A	282	ASN
2	B	30	ASN
2	B	140	LYS
2	B	196	ASN
2	B	253	ASN
2	B	256	ARG
3	C	25[A]	MET
3	C	25[B]	MET
3	C	35	ASN
3	C	42	ASN
3	C	56	ASN
3	C	146	ARG
3	C	149	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	66	ASN

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Mol	Chain	Res	Type
1	A	190	ASN
1	A	214	ASN
1	A	225	ASN
1	A	282	ASN
2	B	30	ASN
2	B	145	HIS
2	B	188	GLN
2	B	196	ASN
3	C	35	ASN
3	C	42	ASN
3	C	56	ASN
3	C	63	ASN
3	C	105	ASN
3	C	109	ASN
3	C	205	GLN
3	C	238	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

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.