wwPDB X-ray Structure Validation Summary Report (i)

May 12, 2020 – 11:08 pm BST

PDB ID	:	1HTM
Title	:	STRUCTURE OF INFLUENZA HAEMAGGLUTININ AT THE PH OF MEMBRANE FUSION
Authors	:	Bullough, P.A.; Hughson, F.M.; Skehel, J.J.; Wiley, D.C.
Deposited on	:	1994-11-02
Resolution	:	2.50 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 (i) symbol.

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

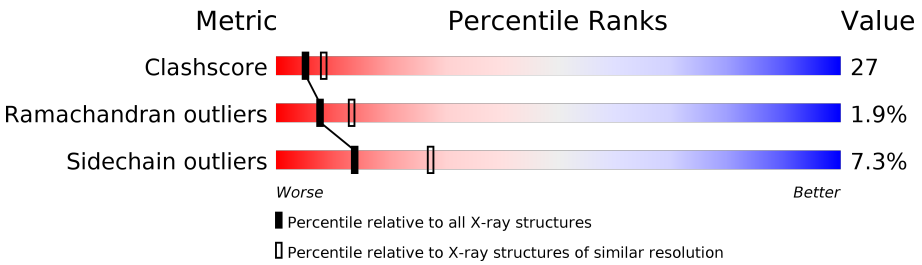
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.50 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	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)

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 <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	27	11% • • 81%
1	C	27	• 19% 78%
1	E	27	11% 15% • 70%
2	B	138	42% 36% • • 17%
2	D	138	53% 34% • 11%
2	F	138	35% 50% • 11%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 3129 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 HEMAGGLUTININ HA1 CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	5	33	21	5	6	1	0	0	0
			Total	C	N	O	S			
1	C	6	38	24	6	7	1	0	0	0
			Total	C	N	O	S			
1	E	8	55	34	10	10	1	0	0	0

- Molecule 2 is a protein called HEMAGGLUTININ HA2 CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	114	938	580	164	189	5	0	0	0
			Total	C	N	O	S			
2	D	123	1014	627	176	206	5	0	0	0
			Total	C	N	O	S			
2	F	123	1014	627	176	206	5	0	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	B	13	13	13	0	0
			Total	O		
3	D	15	15	15	0	0
			Total	O		
3	E	1	1	1	0	0
			Total	O		
3	F	8	8	8	0	0

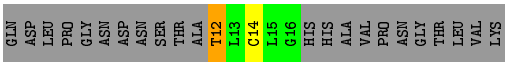
3 Residue-property plots (i)

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.

Note EDS was not executed.

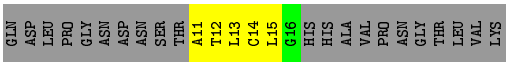
- Molecule 1: HEMAGGLUTININ HA1 CHAIN

Chain A:



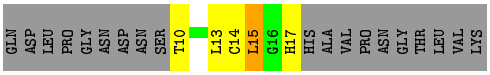
- Molecule 1: HEMAGGLUTININ HA1 CHAIN

Chain C:



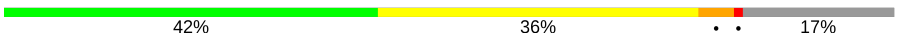
- Molecule 1: HEMAGGLUTININ HA1 CHAIN

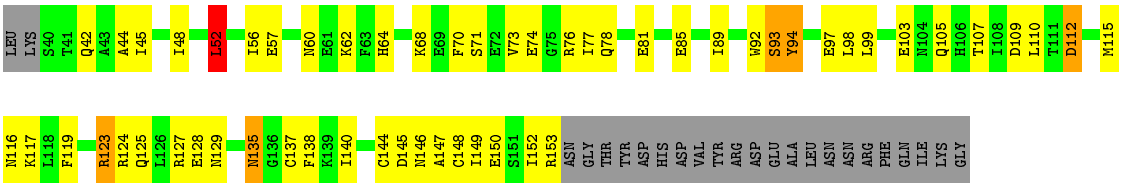
Chain E:



- Molecule 2: HEMAGGLUTININ HA2 CHAIN

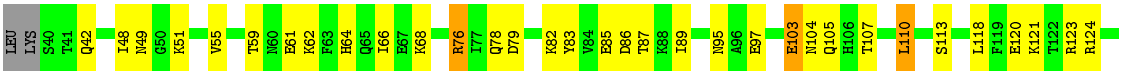
Chain B:

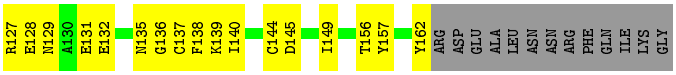




- Molecule 2: HEMAGGLUTININ HA2 CHAIN

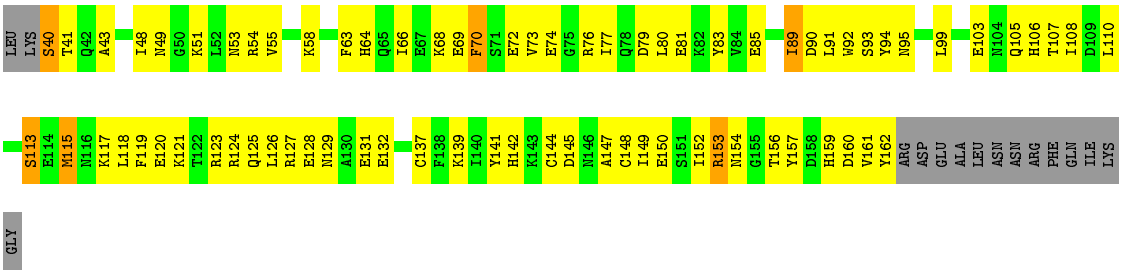
Chain D:





- Molecule 2: HEMAGGLUTININ HA2 CHAIN

Chain F:



4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	168.70Å 231.70Å 53.80Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.50	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.50)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.222 , 0.291	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3129	wwPDB-VP
Average B, all atoms ($Å^2$)	60.0	wwPDB-VP

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	0.69	0/32	1.00	0/42
1	C	0.58	0/37	0.96	0/49
1	E	0.76	0/55	0.99	0/74
2	B	0.82	2/949 (0.2%)	0.88	1/1272 (0.1%)
2	D	0.83	1/1028 (0.1%)	0.87	0/1381
2	F	0.80	0/1028	0.88	0/1381
All	All	0.81	3/3129 (0.1%)	0.88	1/4199 (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	B	0	1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	57	GLU	CG-CD	7.19	1.62	1.51
2	D	61	GLU	CG-CD	7.01	1.62	1.51
2	B	57	GLU	CB-CG	6.21	1.64	1.52

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	52	LEU	CA-CB-CG	5.66	128.31	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	94	TYR	Sidechain

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	33	0	35	2	0
1	C	38	0	40	2	0
1	E	55	0	54	4	0
2	B	938	0	911	51	0
2	D	1014	0	969	57	0
2	F	1014	0	969	84	0
3	B	13	0	0	0	0
3	D	15	0	0	2	0
3	E	1	0	0	0	0
3	F	8	0	0	1	0
All	All	3129	0	2978	162	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 27.

The worst 5 of 162 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:F:154:ASN:OD1	2:F:156:THR:HB	1.70	0.89
2:F:131:GLU:HB3	2:F:139:LYS:HB3	1.56	0.88
2:B:144:CYS:SG	2:B:149:ILE:HD13	2.18	0.84
2:D:48:ILE:HD11	2:F:49:ASN:HD21	1.44	0.82
2:F:51:LYS:HG3	2:F:54:ARG:HH12	1.44	0.82

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 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	3/27 (11%)	2 (67%)	1 (33%)	0	100	100
1	C	4/27 (15%)	2 (50%)	1 (25%)	1 (25%)	0	0
1	E	6/27 (22%)	5 (83%)	0	1 (17%)	0	0
2	B	112/138 (81%)	105 (94%)	5 (4%)	2 (2%)	8	14
2	D	121/138 (88%)	107 (88%)	11 (9%)	3 (2%)	5	8
2	F	121/138 (88%)	111 (92%)	10 (8%)	0	100	100
All	All	367/495 (74%)	332 (90%)	28 (8%)	7 (2%)	8	13

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	135	ASN
1	E	15	LEU
1	C	13	LEU
2	D	104	ASN
2	D	110	LEU

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	4/22 (18%)	3 (75%)	1 (25%)	0	1
1	C	4/22 (18%)	2 (50%)	2 (50%)	0	0
1	E	6/22 (27%)	5 (83%)	1 (17%)	2	4

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	104/125 (83%)	95 (91%)	9 (9%)	10	20
2	D	112/125 (90%)	108 (96%)	4 (4%)	35	61
2	F	112/125 (90%)	104 (93%)	8 (7%)	14	28
All	All	342/441 (78%)	317 (93%)	25 (7%)	14	27

5 of 25 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	15	LEU
2	D	76	ARG
2	F	148	CYS
2	D	49	ASN
2	D	103	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	64	HIS
2	F	129	ASN
2	D	105	GLN
2	B	129	ASN
2	D	65	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)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains (i)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.