W O R L D W I D E

wwPDB

P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

Feb 1, 2016 – 02:47 AM GMT

PDB ID	:	2IQH
Title	:	Influenza A virus nucleoprotein NP at 3.2A resolution
Authors	:	Ye, Q.; Tao, Y.J.
Deposited on	:	2006-10-13
Resolution	:	3.20 Å(reported)

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

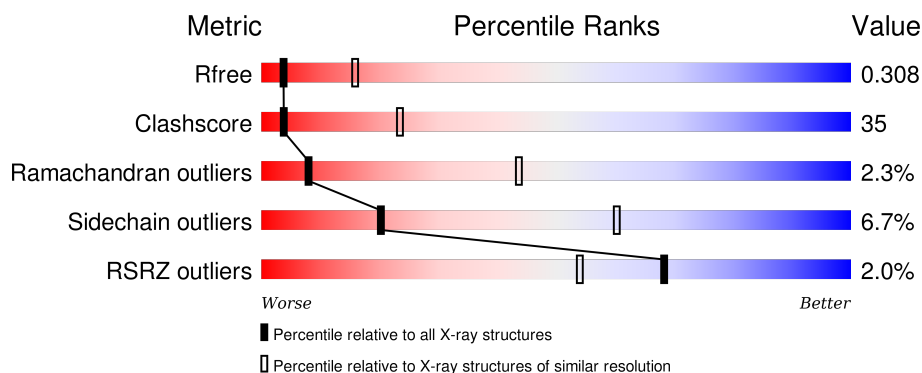|		
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, 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 3.20 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}	91344	1124 (3.24-3.16)
Clashscore	102246	1024 (3.22-3.18)
Ramachandran outliers	100387	1004 (3.22-3.18)
Sidechain outliers	100360	1003 (3.22-3.18)
RSRZ outliers	91569	1129 (3.24-3.16)

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	499	
1	B	499	
1	C	499	

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 10162 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 Nucleocapsid protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	426	Total	C	N	O	S	8	0	0
			3358	2084	623	625	26			
1	B	426	Total	C	N	O	S	8	0	0
			3358	2084	623	625	26			
1	C	436	Total	C	N	O	S	8	0	0
			3446	2137	642	641	26			

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	499	LEU	-	EXPRESSION TAG	UNP Q1I2B5
A	500	GLU	-	EXPRESSION TAG	UNP Q1I2B5
A	501	HIS	-	EXPRESSION TAG	UNP Q1I2B5
A	502	HIS	-	EXPRESSION TAG	UNP Q1I2B5
A	503	HIS	-	EXPRESSION TAG	UNP Q1I2B5
A	504	HIS	-	EXPRESSION TAG	UNP Q1I2B5
A	505	HIS	-	EXPRESSION TAG	UNP Q1I2B5
A	506	HIS	-	EXPRESSION TAG	UNP Q1I2B5
B	499	LEU	-	EXPRESSION TAG	UNP Q1I2B5
B	500	GLU	-	EXPRESSION TAG	UNP Q1I2B5
B	501	HIS	-	EXPRESSION TAG	UNP Q1I2B5
B	502	HIS	-	EXPRESSION TAG	UNP Q1I2B5
B	503	HIS	-	EXPRESSION TAG	UNP Q1I2B5
B	504	HIS	-	EXPRESSION TAG	UNP Q1I2B5
B	505	HIS	-	EXPRESSION TAG	UNP Q1I2B5
B	506	HIS	-	EXPRESSION TAG	UNP Q1I2B5
C	499	LEU	-	EXPRESSION TAG	UNP Q1I2B5
C	500	GLU	-	EXPRESSION TAG	UNP Q1I2B5
C	501	HIS	-	EXPRESSION TAG	UNP Q1I2B5
C	502	HIS	-	EXPRESSION TAG	UNP Q1I2B5
C	503	HIS	-	EXPRESSION TAG	UNP Q1I2B5
C	504	HIS	-	EXPRESSION TAG	UNP Q1I2B5
C	505	HIS	-	EXPRESSION TAG	UNP Q1I2B5

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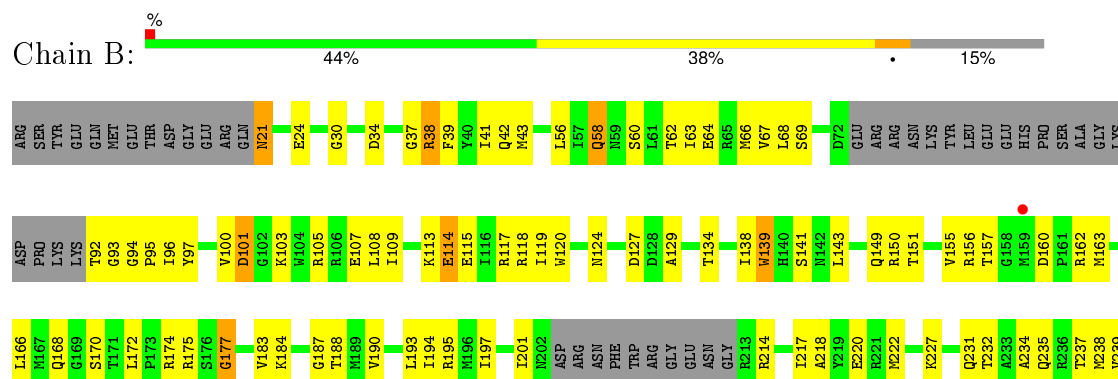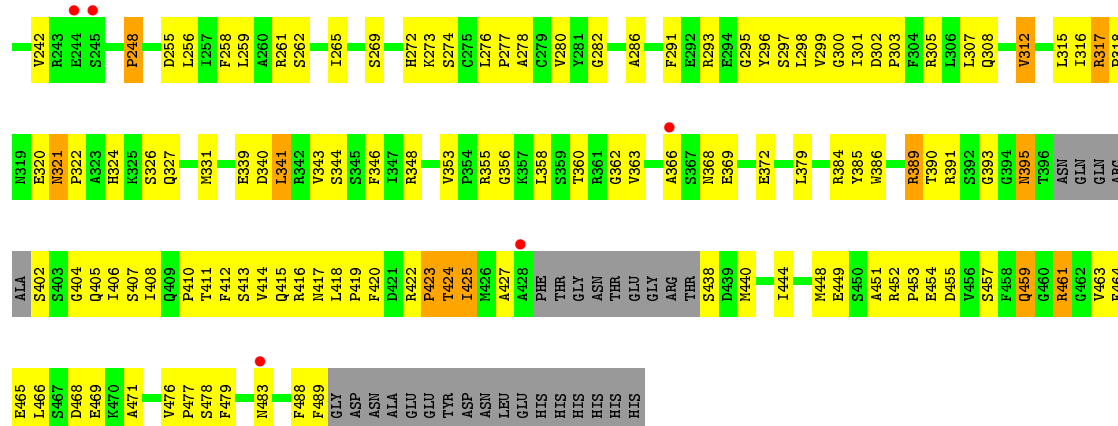| Chain	Residue	Modelled	Actual	Comment	Reference
C	506	HIS	-	EXPRESSION TAG	UNP Q1I2B5

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.
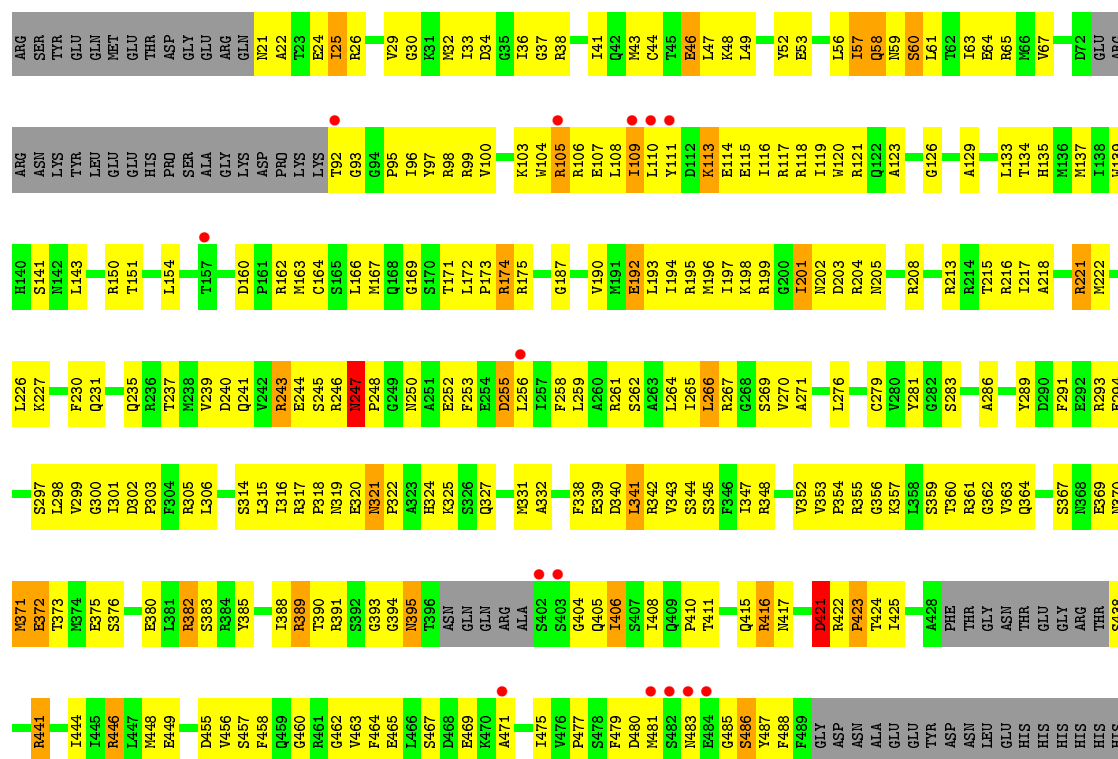
- Molecule 1: Nucleocapsid protein

- Molecule 1: Nucleocapsid protein

• Molecule 1: Nucleocapsid protein

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	122.10Å 135.10Å 195.18Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 3.20 42.96 – 3.15	Depositor EDS
% Data completeness (in resolution range)	100.0 (30.00-3.20) 99.1 (42.96-3.15)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.19 (at 3.12Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.271 , 0.318 0.252 , 0.308	Depositor DCC
R_{free} test set	1295 reflections (5.08%)	DCC
Wilson B-factor (Å^2)	84.7	Xtriage
Anisotropy	0.113	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 59.7	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.34$	Xtriage
Outliers	0 of 28076 reflections	Xtriage
F_o,F_c correlation	0.90	EDS
Total number of atoms	10162	wwPDB-VP
Average B, all atoms (Å^2)	75.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.45% 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 ⓘ

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	A	0.92	1/3411 (0.0%)	0.91	6/4585 (0.1%)
1	B	0.96	3/3411 (0.1%)	0.92	3/4585 (0.1%)
1	C	0.84	4/3503 (0.1%)	0.89	7/4710 (0.1%)
All	All	0.91	8/10325 (0.1%)	0.91	16/13880 (0.1%)

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

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	201	ILE	C-N	-13.49	1.03	1.34
1	C	201	ILE	C-N	-7.93	1.15	1.34
1	C	202	ASN	C-N	-7.90	1.15	1.34
1	B	312	VAL	CB-CG2	-5.81	1.40	1.52
1	C	247	ASN	CB-CG	5.78	1.64	1.51

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	416	ARG	NE-CZ-NH2	6.61	123.61	120.30
1	A	201	ILE	O-C-N	-6.18	112.82	122.70
1	C	221	ARG	NE-CZ-NH1	-6.17	117.21	120.30
1	C	201	ILE	O-C-N	-6.15	112.86	122.70
1	B	38	ARG	NE-CZ-NH2	-6.11	117.25	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	201	ILE	Mainchain

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	3358	0	3355	254	0
1	B	3358	0	3354	222	0
1	C	3446	0	3427	294	0
All	All	10162	0	10136	711	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 35.

The worst 5 of 711 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:111:TYR:HB3	1:A:116:ILE:HD11	1.46	0.95
1:B:100:VAL:CG2	1:B:105:ARG:HD3	1.98	0.94
1:A:58:GLN:HG3	1:A:315:LEU:HG	1.50	0.93
1:C:465:GLU:HG3	1:C:467:SER:H	1.32	0.92
1:C:353:VAL:HG22	1:C:354:PRO:HD2	1.52	0.92

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	416/499 (83%)	361 (87%)	50 (12%)	5 (1%)	16	60
1	B	416/499 (83%)	360 (86%)	43 (10%)	13 (3%)	5	34
1	C	428/499 (86%)	349 (82%)	68 (16%)	11 (3%)	7	40
All	All	1260/1497 (84%)	1070 (85%)	161 (13%)	29 (2%)	8	44

5 of 29 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	423	PRO
1	C	203	ASP
1	C	395	ASN
1	C	486	SER
1	A	233	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	A	362/425 (85%)	336 (93%)	26 (7%)	18	57
1	B	362/425 (85%)	342 (94%)	20 (6%)	27	68
1	C	370/425 (87%)	343 (93%)	27 (7%)	17	57
All	All	1094/1275 (86%)	1021 (93%)	73 (7%)	20	60

5 of 73 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	305	ARG
1	B	395	ASN
1	C	390	THR
1	B	368	ASN
1	B	459	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 36 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	308	GLN
1	B	395	ASN
1	C	370	ASN
1	B	311	GLN
1	B	415	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	425/499 (85%)	-0.00	6 (1%)	78	65	31, 69, 113, 124	0
1	B	425/499 (85%)	-0.02	6 (1%)	78	65	35, 68, 104, 126	0
1	C	435/499 (87%)	0.06	14 (3%)	51	36	39, 82, 118, 132	0
All	All	1285/1497 (85%)	0.01	26 (2%)	68	54	31, 73, 111, 132	0

The worst 5 of 26 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	403	SER	6.3
1	C	484	GLU	3.9
1	C	92	THR	3.9
1	C	482	SER	3.4
1	C	481	MET	3.0

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.