Full wwPDB X-ray Structure Validation Report ⓘ

May 21, 2020 – 11:53 pm BST

PDB ID	:	1HBQ
Title	:	CRYSTAL STRUCTURE OF LIGANDED AND UNLIGANDED FORMS OF BOVINE PLASMA RETINOL-BINDING PROTEIN
Authors	:	Zanotti, G.; Monaco, H.L.
Deposited on	:	1993-02-05
Resolution	:	1.70 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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:

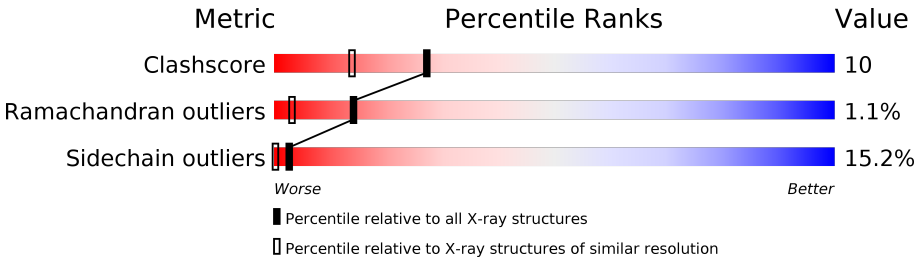
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 1.70 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	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)

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	183	62% 25% 8%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 1588 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 RETINOL BINDING PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	177	Total	C	N	O	S	0	0	1
			1422	894	248	270	10			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	52	GLN	HIS	CONFLICT	UNP P18902
A	175	ASN	ASP	CONFLICT	UNP P18902

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	166	Total	O	0	0
			166	166		

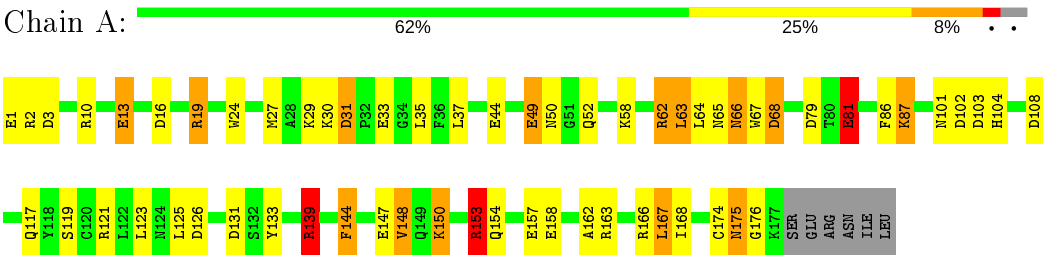
3 Residue-property plots (i)

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: RETINOL BINDING PROTEIN

Chain A:



4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	46.55Å 48.97Å 76.87Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 1.70	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-1.70)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.196 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1588	wwPDB-VP
Average B, all atoms (Å^2)	20.0	wwPDB-VP

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	0.91	9/1455 (0.6%)	1.78	30/1965 (1.5%)

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	147	GLU	CD-OE2	7.11	1.33	1.25
1	A	13	GLU	CD-OE2	6.68	1.32	1.25
1	A	33	GLU	CD-OE2	6.26	1.32	1.25
1	A	157	GLU	CD-OE1	6.22	1.32	1.25
1	A	49	GLU	CD-OE1	5.98	1.32	1.25
1	A	112	GLU	CD-OE1	5.63	1.31	1.25
1	A	1	GLU	CD-OE2	5.28	1.31	1.25
1	A	44	GLU	CD-OE2	5.18	1.31	1.25
1	A	81	GLU	CD-OE2	5.12	1.31	1.25

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	121	ARG	NE-CZ-NH1	20.75	130.67	120.30
1	A	139	ARG	NE-CZ-NH1	17.55	129.08	120.30
1	A	121	ARG	NE-CZ-NH2	-13.10	113.75	120.30
1	A	139	ARG	NE-CZ-NH2	-11.21	114.70	120.30
1	A	67	TRP	CB-CA-C	-11.03	88.33	110.40
1	A	139	ARG	CD-NE-CZ	9.79	137.30	123.60
1	A	3	ASP	CB-CG-OD1	9.31	126.68	118.30
1	A	68	ASP	CB-CG-OD2	-8.81	110.37	118.30
1	A	176	GLY	O-C-N	8.56	136.39	122.70
1	A	176	GLY	CA-C-O	-8.29	105.67	120.60
1	A	144	PHE	CB-CA-C	-8.02	94.36	110.40
1	A	79	ASP	CB-CG-OD1	-7.84	111.24	118.30
1	A	31	ASP	CB-CG-OD2	7.72	125.25	118.30
1	A	3	ASP	CB-CG-OD2	-7.40	111.64	118.30
1	A	16	ASP	CB-CG-OD2	7.39	124.96	118.30

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	67	TRP	CA-CB-CG	7.10	127.19	113.70
1	A	68	ASP	CB-CG-OD1	6.89	124.50	118.30
1	A	126	ASP	CB-CG-OD2	-6.60	112.36	118.30
1	A	108	ASP	CB-CG-OD2	6.52	124.17	118.30
1	A	108	ASP	CB-CG-OD1	-6.50	112.45	118.30
1	A	102	ASP	CB-CG-OD2	-6.45	112.50	118.30
1	A	110	ASP	CB-CG-OD2	-6.03	112.87	118.30
1	A	131	ASP	CB-CG-OD2	5.92	123.63	118.30
1	A	119	SER	N-CA-CB	5.80	119.20	110.50
1	A	153	ARG	NE-CZ-NH1	5.74	123.17	120.30
1	A	102	ASP	CB-CG-OD1	5.74	123.46	118.30
1	A	79	ASP	CB-CG-OD2	5.71	123.43	118.30
1	A	131	ASP	CB-CG-OD1	-5.69	113.18	118.30
1	A	67	TRP	N-CA-CB	5.46	120.42	110.60
1	A	133	TYR	N-CA-CB	5.21	119.97	110.60

There are no chirality outliers.

There are no planarity outliers.

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	1422	0	1343	28	0
2	A	166	0	0	4	0
All	All	1588	0	1343	28	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 10.

All (28) 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:19:ARG:HH11	1:A:19:ARG:HG2	1.43	0.82
1:A:87:LYS:HE2	1:A:103:ASP:OD1	1.83	0.79
1:A:86:PHE:O	1:A:87:LYS:HE3	1.87	0.74

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:52:GLN:HG2	2:A:206:HOH:O	1.90	0.71
1:A:150:LYS:O	1:A:153:ARG:HG3	1.94	0.67
1:A:29:LYS:HB2	1:A:168:ILE:HD11	1.78	0.66
1:A:150:LYS:HG2	1:A:153:ARG:NH1	2.12	0.65
1:A:81:GLU:HB2	2:A:278:HOH:O	2.02	0.58
1:A:31:ASP:N	1:A:31:ASP:OD1	2.38	0.56
1:A:154:GLN:O	1:A:158:GLU:HG3	2.06	0.55
1:A:174:CYS:O	1:A:175:ASN:HB2	2.07	0.54
1:A:86:PHE:C	1:A:87:LYS:HE3	2.27	0.53
1:A:19:ARG:HH11	1:A:19:ARG:CG	2.20	0.52
1:A:2:ARG:HB3	2:A:197:HOH:O	2.11	0.50
1:A:13:GLU:H	1:A:13:GLU:CD	2.15	0.50
1:A:24:TRP:CZ3	1:A:139:ARG:HD2	2.47	0.49
1:A:63:LEU:O	1:A:66:ASN:N	2.44	0.49
1:A:63:LEU:HB3	1:A:65:ASN:OD1	2.13	0.49
1:A:162:ALA:O	1:A:163:ARG:HB2	2.14	0.47
1:A:144:PHE:HB3	1:A:148:VAL:HG22	2.00	0.44
1:A:167:LEU:HA	1:A:167:LEU:HD12	1.87	0.43
1:A:175:ASN:HA	1:A:175:ASN:HD22	1.49	0.42
1:A:24:TRP:CH2	1:A:139:ARG:HD2	2.55	0.42
1:A:62:ARG:HG2	1:A:68:ASP:OD1	2.20	0.42
1:A:63:LEU:HD22	1:A:63:LEU:HA	1.84	0.41
1:A:104:HIS:CE1	1:A:117:GLN:HG3	2.56	0.41
1:A:13:GLU:HB3	2:A:317:HOH:O	2.21	0.41
1:A:19:ARG:NH1	1:A:19:ARG:HG2	2.23	0.41

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	175/183 (96%)	168 (96%)	5 (3%)	2 (1%)	14 3

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	37	LEU
1	A	175	ASN

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	151/158 (96%)	128 (85%)	23 (15%)	3 0

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	ARG
1	A	19	ARG
1	A	27	MET
1	A	30	LYS
1	A	35	LEU
1	A	49	GLU
1	A	50	ASN
1	A	58	LYS
1	A	62	ARG
1	A	63	LEU
1	A	64	LEU
1	A	66	ASN
1	A	81	GLU
1	A	87	LYS
1	A	101	ASN
1	A	123	LEU
1	A	125	LEU
1	A	139	ARG
1	A	148	VAL
1	A	150	LYS
1	A	153	ARG
1	A	166	ARG
1	A	167	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	50	ASN
1	A	52	GLN
1	A	156	GLN
1	A	175	ASN

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

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.