Full wwPDB X-ray Structure Validation Report ⓘ

Dec 17, 2023 – 11:33 AM EST

PDB ID	:	1B2H
Title	:	Oligo-Peptide Binding Protein Complexed with Lysyl-Ornithyl-Lysine
Authors	:	Davies, T.G.; Tame, J.R.H.
Deposited on	:	1998-11-16
Resolution	:	1.90 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 types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

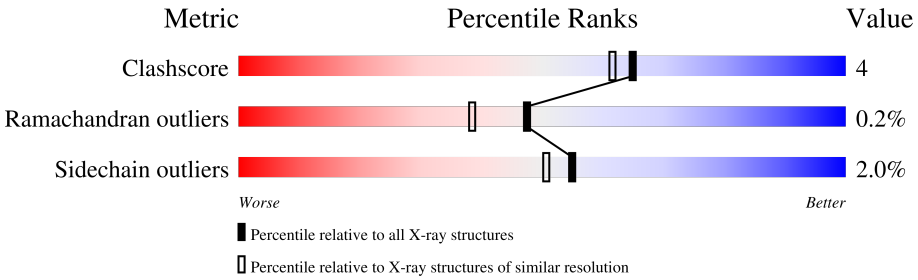
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 1.90 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	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)

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 of 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	517	86% 12% ••
2	B	3	100%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 4585 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.

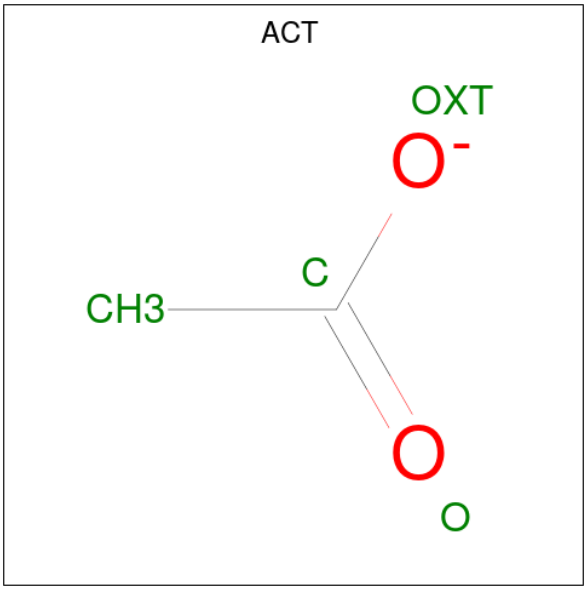
- Molecule 1 is a protein called PERIPLASMIC OLIGOPEPTIDE-BINDING PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	517	4170	2667	700	798	5	35	3	0

- Molecule 2 is a protein called LYS-ORN-LYS.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	3	27	17	6	4	0	0	0

- Molecule 3 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	A	1	4	2	2	0	0

- Molecule 4 is URANIUM ATOM (three-letter code: U1) (formula: U).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	8	Total U 8 8	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	373	Total O 373 373	0	0
5	B	3	Total O 3 3	0	0

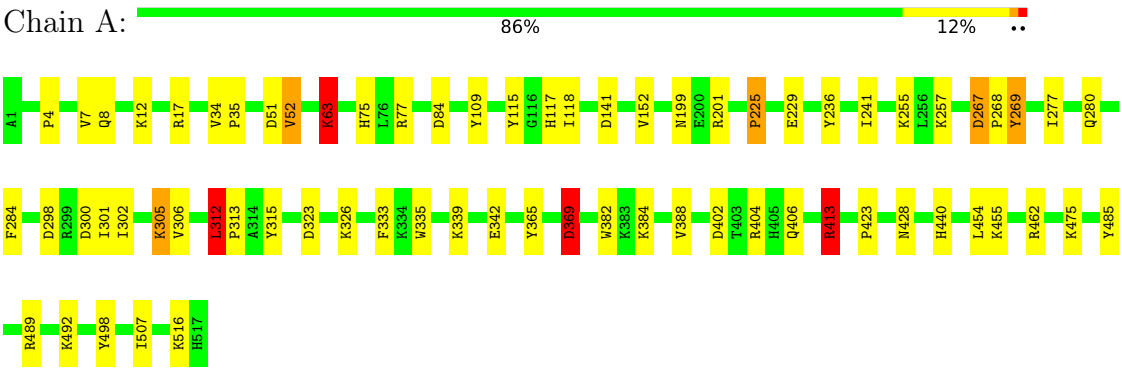
3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide 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.

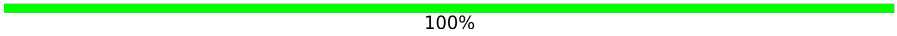
• Molecule 1: PERIPLASMIC OLIGOPEPTIDE-BINDING PROTEIN

Chain A:



• Molecule 2: LYS-ORN-LYS

Chain B:



There are no outlier residues recorded for this chain.

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	109.66Å 76.12Å 70.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.90	Depositor
% Data completeness (in resolution range)	98.5 (20.00-1.90)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC	Depositor
R, R_{free}	0.180 , 0.220	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4585	wwPDB-VP
Average B, all atoms (Å^2)	28.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: U1, ORN, ACT

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	0.83	9/4296 (0.2%)	1.26	29/5858 (0.5%)
2	B	0.66	0/17	0.88	0/16
All	All	0.83	9/4313 (0.2%)	1.26	29/5874 (0.5%)

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	342	GLU	CG-CD	21.59	1.84	1.51
1	A	63	LYS	CG-CD	18.21	2.14	1.52
1	A	300	ASP	CB-CG	17.13	1.87	1.51
1	A	8	GLN	CG-CD	13.64	1.82	1.51
1	A	312	LEU	CG-CD2	11.97	1.96	1.51
1	A	312	LEU	CG-CD1	-9.23	1.17	1.51
1	A	516	LYS	CD-CE	8.97	1.73	1.51
1	A	12	LYS	CG-CD	-5.36	1.34	1.52
1	A	384	LYS	CG-CD	-5.14	1.34	1.52

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	312	LEU	CB-CG-CD1	25.02	153.53	111.00
1	A	300	ASP	CB-CG-OD1	18.23	134.71	118.30
1	A	300	ASP	CB-CG-OD2	-17.15	102.87	118.30
1	A	201	ARG	NE-CZ-NH2	9.34	124.97	120.30
1	A	63	LYS	CB-CG-CD	-8.76	88.83	111.60
1	A	369	ASP	CA-CB-CG	7.94	130.87	113.40
1	A	326	LYS	CA-CB-CG	7.79	130.54	113.40
1	A	84	ASP	CB-CG-OD1	7.76	125.28	118.30
1	A	462	ARG	NE-CZ-NH1	7.43	124.02	120.30
1	A	77	ARG	NE-CZ-NH2	6.91	123.75	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	109	TYR	CB-CG-CD1	6.65	124.99	121.00
1	A	269	TYR	CB-CG-CD2	-6.52	117.09	121.00
1	A	201	ARG	CD-NE-CZ	6.47	132.65	123.60
1	A	475	LYS	CA-CB-CG	6.41	127.49	113.40
1	A	109	TYR	CB-CG-CD2	-6.34	117.19	121.00
1	A	312	LEU	CB-CG-CD2	-6.20	100.45	111.00
1	A	269	TYR	CB-CG-CD1	6.18	124.71	121.00
1	A	404	ARG	NE-CZ-NH2	-6.05	117.27	120.30
1	A	51	ASP	CB-CG-OD2	6.00	123.69	118.30
1	A	8	GLN	CG-CD-OE1	5.77	133.15	121.60
1	A	485	TYR	CB-CA-C	-5.69	99.02	110.40
1	A	8	GLN	CB-CG-CD	-5.53	97.22	111.60
1	A	17	ARG	NE-CZ-NH1	5.44	123.02	120.30
1	A	267	ASP	CB-CG-OD1	5.41	123.17	118.30
1	A	413	ARG	NE-CZ-NH2	-5.39	117.60	120.30
1	A	141	ASP	CB-CG-OD2	5.17	122.96	118.30
1	A	8	GLN	CG-CD-NE2	-5.13	104.39	116.70
1	A	485	TYR	CA-CB-CG	5.13	123.14	113.40
1	A	413	ARG	CB-CG-CD	5.08	124.81	111.60

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	4170	0	4078	34	0
2	B	27	0	38	0	0
3	A	4	0	3	0	0
4	A	8	0	0	0	1
5	A	373	0	0	5	2
5	B	3	0	0	0	0
All	All	4585	0	4119	34	2

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 4.

All (34) 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:498:TYR:HE2	1:A:507:ILE:HD11	1.61	0.65
1:A:382:TRP:HB3	1:A:388:VAL:CG2	2.30	0.61
1:A:280:GLN:HG3	1:A:440:HIS:HB3	1.82	0.60
1:A:298:ASP:O	1:A:302:ILE:HD12	2.02	0.59
1:A:301:ILE:HA	1:A:305:LYS:HG3	1.83	0.58
1:A:498:TYR:CE2	1:A:507:ILE:HD11	2.42	0.55
1:A:402[B]:ASP:OD2	5:A:897:HOH:O	2.18	0.55
1:A:489:ARG:NH1	1:A:498:TYR:OH	2.39	0.55
1:A:402[A]:ASP:OD2	1:A:406:GLN:OE1	2.26	0.53
1:A:255:LYS:HD3	5:A:859:HOH:O	2.08	0.53
1:A:115:TYR:CE1	1:A:428:ASN:HB3	2.44	0.52
1:A:4:PRO:O	1:A:7:VAL:HG13	2.10	0.51
1:A:152:VAL:HG22	1:A:454:LEU:HD13	1.94	0.50
1:A:365:TYR:HB2	1:A:413:ARG:HG2	1.94	0.50
1:A:280:GLN:HG2	5:A:879:HOH:O	2.13	0.48
1:A:52:VAL:HG22	5:A:792:HOH:O	2.14	0.48
1:A:63:LYS:HG2	1:A:75:HIS:HB2	1.95	0.48
1:A:302:ILE:HA	1:A:306:VAL:HG13	1.97	0.46
1:A:229:GLU:OE1	1:A:369:ASP:HB2	2.16	0.44
1:A:315:TYR:HB3	1:A:333:PHE:CD1	2.53	0.44
1:A:199:ASN:HD22	1:A:199:ASN:HA	1.61	0.43
1:A:115:TYR:CD1	1:A:428:ASN:HB3	2.53	0.43
1:A:117:HIS:HE1	5:A:849:HOH:O	2.02	0.43
1:A:257:LYS:HD2	1:A:257:LYS:HA	1.83	0.43
1:A:267:ASP:HB3	1:A:268:PRO:HD2	2.01	0.43
1:A:312:LEU:HA	1:A:313:PRO:HD3	1.96	0.42
1:A:365:TYR:CB	1:A:413:ARG:HG2	2.49	0.42
1:A:277:ILE:CG2	1:A:284:PHE:HB3	2.50	0.41
1:A:34:VAL:HB	1:A:35:PRO:HD3	2.02	0.41
1:A:323:ASP:O	1:A:423:PRO:HD3	2.20	0.41
1:A:335:TRP:CE2	1:A:339:LYS:HE2	2.56	0.40
1:A:236:TYR:HA	1:A:241:ILE:HB	2.03	0.40
1:A:236:TYR:CE1	1:A:492:LYS:HE3	2.56	0.40
1:A:118:ILE:HD12	1:A:118:ILE:N	2.36	0.40

All (2) 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)
5:A:626:HOH:O	5:A:745:HOH:O[3_545]	2.13	0.07
4:A:520:U1:U	5:A:591:HOH:O[3_545]	2.14	0.06

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	518/517 (100%)	505 (98%)	12 (2%)	1 (0%)	47 38

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	225	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 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	458/455 (101%)	449 (98%)	9 (2%)	55 51
2	B	2/2 (100%)	2 (100%)	0	100 100
All	All	460/457 (101%)	451 (98%)	9 (2%)	55 51

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	VAL

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Mol	Chain	Res	Type
1	A	63	LYS
1	A	225	PRO
1	A	269	TYR
1	A	305	LYS
1	A	312	LEU
1	A	369	ASP
1	A	413	ARG
1	A	455	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	55	HIS
1	A	117	HIS
1	A	195	ASN
1	A	199	ASN
1	A	279	ASN
1	A	304	ASN
1	A	308	ASN
1	A	406	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)

1 non-standard protein/DNA/RNA residue is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	ORN	B	2	2	6,7,8	0.77	0	2,7,9	0.12	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	ORN	B	2	2	-	0/5/6/8	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 9 ligands modelled in this entry, 8 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	ACT	A	518	-	3,3,3	1.05	0	3,3,3	0.73	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.