



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 06:15 AM UTC

PDB ID : 1BP2 / pdb_00001bp2
Title : STRUCTURE OF BOVINE PANCREATIC PHOSPHOLIPASE A2 AT 1.7
ANGSTROMS RESOLUTION
Authors : Dijkstra, B.W.; Kalk, K.H.; Hol, W.G.J.; Drenth, J.
Deposited on : 1981-04-06
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 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

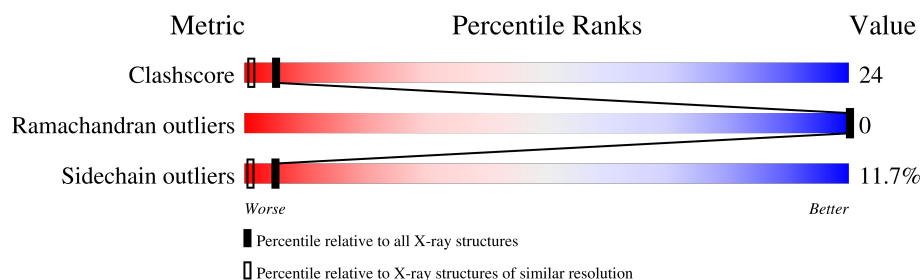
1 Overall quality at a glance

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	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (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 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	123	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	MPD	A	125	X	X	X	-
3	MPD	A	126	X	X	X	-

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 1080 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 PHOSPHOLIPASE A2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	123	Total	C	N	O	S	0	0	0
			957	586	164	192	15			

- Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Ca	0	0
			1	1		

- Molecule 3 is (4S)-2-METHYL-2,4-PENTANEDIOL (CCD ID: MPD) (formula: C₆H₁₄O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			8	6	2		
3	A	1	Total	C	O	0	0
			8	6	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	106	Total 106	O 106	0	0

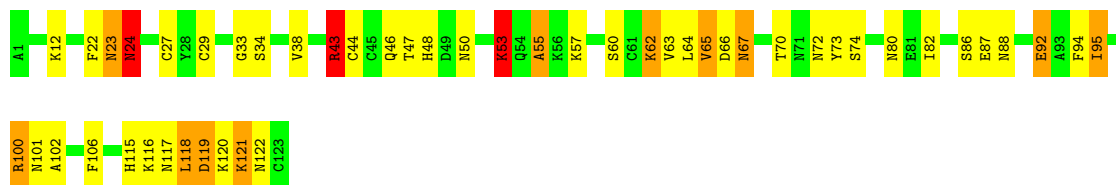
3 Residue-property plots

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: PHOSPHOLIPASE A2

Chain A: 



4 Data and refinement statistics

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

Property	Value
Space group	P 21 21 21
Cell constants a, b, c, α , β , γ	47.07Å 64.45Å 38.15Å 90.00° 90.00° 90.00°
Resolution (Å)	(Not available) – 1.70
% Data completeness (in resolution range)	(Not available) ((Not available)-1.70)
R_{merge}	(Not available)
R_{sym}	(Not available)
Refinement program	AGARWAL FAST-FOURIER TRANSFORM LEAST-SQUARES PROCED
R, R_{free}	0.171 , (Not available)
Estimated twinning fraction	No twinning to report.
Total number of atoms	1080
Average B, all atoms (Å ²)	13.0

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CA, MPD

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	0.96	0/976	1.87	23/1317 (1.7%)

There are no bond length outliers.

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	67	ASN	CA-CB-CG	14.64	127.24	112.60
1	A	22	PHE	CA-CB-CG	-9.88	103.92	113.80
1	A	94	PHE	CA-CB-CG	-8.03	105.78	113.80
1	A	23	ASN	CA-CB-CG	-7.90	104.70	112.60
1	A	119	ASP	CA-CB-CG	-7.39	105.21	112.60
1	A	115	HIS	CA-CB-CG	-6.96	106.84	113.80
1	A	24	ASN	OD1-CG-ND2	6.66	129.26	122.60
1	A	80	ASN	CA-CB-CG	-6.29	106.31	112.60
1	A	24	ASN	CA-CB-CG	-5.98	106.62	112.60
1	A	122	ASN	CA-CB-CG	-5.97	106.62	112.60
1	A	95	ILE	CA-CB-CG1	5.93	120.48	110.40
1	A	120	LYS	CA-C-O	5.92	126.55	119.10
1	A	43	ARG	NE-CZ-NH2	5.83	124.44	119.20
1	A	100	ARG	CA-CB-CG	-5.72	102.66	114.10
1	A	92	GLU	CB-CA-C	5.61	121.01	110.63
1	A	100	ARG	CD-NE-CZ	-5.44	116.79	124.40
1	A	117	ASN	CA-CB-CG	-5.16	107.44	112.60
1	A	66	ASP	CA-CB-CG	-5.14	107.46	112.60
1	A	53	LYS	CB-CA-C	-5.14	102.26	110.79
1	A	55	ALA	O-C-N	5.14	128.23	122.22
1	A	24	ASN	CB-CA-C	-5.10	104.24	112.09
1	A	29	CYS	CA-C-N	-5.01	114.61	122.92
1	A	29	CYS	C-N-CA	-5.01	114.61	122.92

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	957	0	885	46	5
2	A	1	0	0	0	0
3	A	16	0	24	19	0
4	A	106	0	0	1	6
All	All	1080	0	909	46	6

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 24.

All (46) 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:47:THR:HG22	3:A:125:MPD:C4	1.87	1.04
1:A:47:THR:HG22	3:A:125:MPD:H4	1.03	1.02
1:A:119:ASP:OD1	1:A:121:LYS:HE2	1.72	0.88
1:A:101:ASN:HD22	3:A:125:MPD:H53	1.36	0.87
1:A:47:THR:CG2	3:A:125:MPD:H4	1.97	0.87
1:A:43:ARG:NH1	1:A:46:GLN:OE1	2.12	0.82
1:A:74:SER:H	1:A:88:ASN:HD21	1.26	0.82
1:A:43:ARG:NH1	1:A:46:GLN:HB3	1.96	0.80
1:A:106:PHE:CZ	3:A:126:MPD:H11	2.16	0.79
1:A:102:ALA:HA	3:A:125:MPD:H13	1.64	0.78
1:A:43:ARG:HH12	1:A:46:GLN:HB3	1.48	0.76
1:A:106:PHE:HZ	3:A:126:MPD:H11	1.50	0.76
1:A:106:PHE:CE2	3:A:126:MPD:C1	2.69	0.75
1:A:43:ARG:HH11	1:A:43:ARG:HG2	1.54	0.71
1:A:106:PHE:CZ	3:A:126:MPD:C1	2.77	0.68
1:A:101:ASN:HD22	3:A:125:MPD:C5	2.07	0.68
1:A:106:PHE:HE2	3:A:126:MPD:C1	2.13	0.61
1:A:44:CYS:O	3:A:125:MPD:H11	2.00	0.60
1:A:43:ARG:CZ	1:A:46:GLN:OE1	2.49	0.60

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:43:ARG:NH1	1:A:43:ARG:HG2	2.15	0.58
1:A:48:HIS:CA	3:A:125:MPD:C2	2.82	0.58
1:A:43:ARG:HH12	1:A:46:GLN:CB	2.16	0.57
1:A:106:PHE:HE2	3:A:126:MPD:H12	1.69	0.57
1:A:47:THR:CG2	3:A:125:MPD:C4	2.71	0.56
1:A:48:HIS:HA	3:A:125:MPD:C2	2.38	0.54
1:A:101:ASN:HD22	3:A:125:MPD:HO4	1.68	0.54
1:A:38:VAL:HG11	1:A:118:LEU:HD11	1.90	0.53
1:A:27:CYS:O	1:A:33:GLY:HA2	2.10	0.52
1:A:65:VAL:HG22	1:A:65:VAL:O	2.10	0.51
1:A:23:ASN:ND2	1:A:24:ASN:H	2.11	0.49
1:A:55:ALA:HB1	1:A:95:ILE:HD11	1.95	0.48
1:A:43:ARG:HH11	1:A:43:ARG:CG	2.23	0.48
1:A:73:TYR:HB3	1:A:92:GLU:HB2	1.95	0.48
1:A:23:ASN:ND2	1:A:24:ASN:N	2.61	0.48
1:A:48:HIS:HB2	3:A:125:MPD:C2	2.44	0.48
1:A:102:ALA:CA	3:A:125:MPD:H13	2.39	0.47
1:A:65:VAL:O	1:A:65:VAL:CG2	2.62	0.47
1:A:116:LYS:NZ	4:A:204:HOH:O	2.24	0.47
1:A:50:ASN:HA	1:A:53:LYS:HG3	1.98	0.45
1:A:12:LYS:HG2	1:A:82:ILE:HD11	2.01	0.43
1:A:23:ASN:HD22	1:A:24:ASN:H	1.65	0.43
1:A:67:ASN:HB3	1:A:70:THR:OG1	2.18	0.42
1:A:12:LYS:HA	1:A:12:LYS:HD2	1.70	0.42
1:A:64:LEU:HA	1:A:64:LEU:HD23	1.70	0.42
1:A:82:ILE:O	1:A:100:ARG:NH1	2.54	0.41
1:A:62:LYS:HZ3	1:A:62:LYS:HG2	1.48	0.40

All (6) 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)
1:A:87:GLU:O	4:A:140:HOH:O[3_656]	0.31	1.89
1:A:87:GLU:C	4:A:140:HOH:O[3_656]	1.23	0.97
1:A:67:ASN:CG	4:A:138:HOH:O[2_555]	1.71	0.49
1:A:67:ASN:OD1	4:A:138:HOH:O[2_555]	1.99	0.21
4:A:169:HOH:O	4:A:198:HOH:O[2_555]	1.99	0.21
1:A:121:LYS:CB	4:A:179:HOH:O[2_554]	2.08	0.12

5.3 Torsion angles

5.3.1 Protein backbone

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	121/123 (98%)	118 (98%)	3 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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	111/111 (100%)	98 (88%)	13 (12%)	5	1

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	ASN
1	A	34	SER
1	A	43	ARG
1	A	53	LYS
1	A	57	LYS
1	A	60	SER
1	A	62	LYS
1	A	63	VAL
1	A	65	VAL
1	A	72	ASN
1	A	86	SER
1	A	118	LEU
1	A	121	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	23	ASN
1	A	72	ASN
1	A	88	ASN
1	A	101	ASN
1	A	112	ASN
1	A	122	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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 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	MPD	A	126	-	7,7,7	2.65	4 (57%)	9,10,10	19.12	7 (77%)
3	MPD	A	125	-	7,7,7	3.78	6 (85%)	9,10,10	19.13	4 (44%)

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
3	MPD	A	126	-	1/1/2/2	3/5/5/5	-
3	MPD	A	125	-	1/1/2/2	3/5/5/5	-

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	125	MPD	C1-C2	6.20	1.70	1.52
3	A	126	MPD	C5-C4	4.38	1.69	1.51
3	A	125	MPD	C5-C4	4.12	1.68	1.51
3	A	125	MPD	C3-C4	3.87	1.73	1.51
3	A	126	MPD	C1-C2	3.31	1.62	1.52
3	A	125	MPD	O4-C4	3.31	1.56	1.43
3	A	126	MPD	O4-C4	3.17	1.56	1.43
3	A	125	MPD	O2-C2	-2.92	1.37	1.44
3	A	126	MPD	C3-C4	2.65	1.67	1.51
3	A	125	MPD	C3-C2	-2.50	1.46	1.54

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	125	MPD	O2-C2-CM	-34.19	1.43	107.99
3	A	126	MPD	O2-C2-CM	-34.06	1.83	107.99
3	A	125	MPD	O2-C2-C3	-28.85	1.36	109.27
3	A	126	MPD	O2-C2-C3	-28.82	1.45	109.27
3	A	126	MPD	CM-C2-C3	-25.45	0.38	110.20
3	A	125	MPD	CM-C2-C3	-25.43	0.47	110.20
3	A	125	MPD	O4-C4-C5	-25.28	0.62	109.45
3	A	126	MPD	O4-C4-C5	-25.12	1.33	109.45
3	A	126	MPD	CM-C2-C1	-2.78	104.39	110.63
3	A	126	MPD	C5-C4-C3	-2.46	100.24	111.67
3	A	126	MPD	O4-C4-C3	-2.46	101.56	111.35

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	A	125	MPD	C4
3	A	126	MPD	C4

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	125	MPD	O2-C2-C3-C4
3	A	126	MPD	C1-C2-C3-C4
3	A	126	MPD	C2-C3-C4-C5
3	A	125	MPD	C2-C3-C4-O4
3	A	126	MPD	C2-C3-C4-O4
3	A	125	MPD	C1-C2-C3-C4

There are no ring outliers.

2 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	126	MPD	6	0
3	A	125	MPD	13	0

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

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.