



# Full wwPDB X-ray Structure Validation Report ⓘ

May 13, 2020 – 01:41 pm BST

PDB ID : 1BP2  
Title : STRUCTURE OF BOVINE PANCREATIC PHOSPHOLIPASE A2 AT 1.7  
ANGSTROMS RESOLUTION  
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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](mailto: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.

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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)  
Xtrriage (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

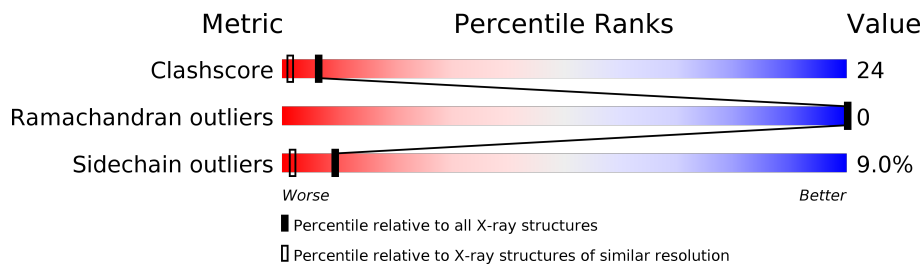
# 1 Overall quality at a glance

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  $\geq 3$ , 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.

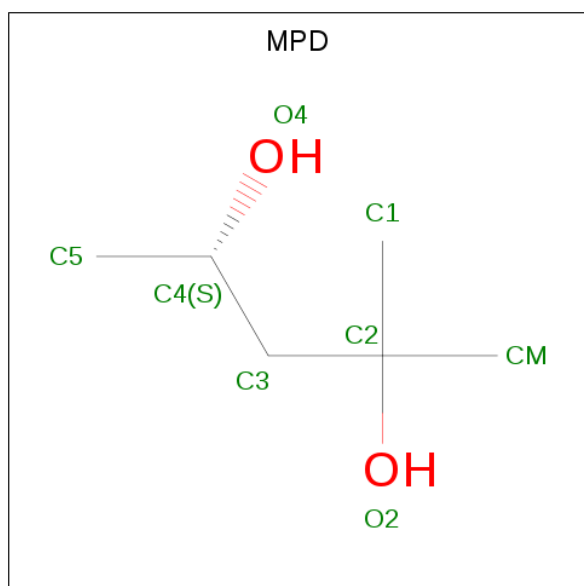
- Molecule 1 is a protein called PHOSPHOLIPASE A2.

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

- Molecule 2 is CALCIUM ION (three-letter code: 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 (three-letter code: MPD) (formula: C<sub>6</sub>H<sub>14</sub>O<sub>2</sub>).



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.

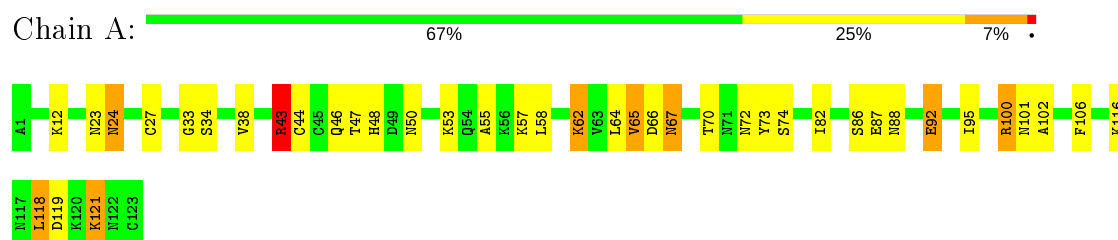
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
4	A	106	Total 106	O 106	0	0

### 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: PHOSPHOLIPASE A2



## 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, $\alpha$ , $\beta$ , $\gamma$	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 <sup>2</sup> )	13.0

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

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	0.79	0/976	1.52	7/1317 (0.5%)

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	43	ARG	NE-CZ-NH2	8.29	124.44	120.30
1	A	100	ARG	NE-CZ-NH2	-8.25	116.17	120.30
1	A	67	ASN	CA-CB-CG	6.29	127.24	113.40
1	A	66	ASP	CB-CG-OD2	-5.81	113.07	118.30
1	A	92	GLU	CB-CA-C	5.30	121.01	110.40
1	A	58	LEU	CB-CG-CD1	-5.20	102.15	111.00
1	A	43	ARG	CD-NE-CZ	5.18	130.85	123.60

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	957	0	885	45	5
2	A	1	0	0	0	0
3	A	16	0	24	18	0
4	A	106	0	0	1	6

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	1080	0	909	45	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 (45) 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
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: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:O	1:A:65:VAL:HG22	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

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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:HG2	1:A:62:LYS:HZ3	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 [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	121/123 (98%)	118 (98%)	3 (2%)	0	<b>100</b> <b>100</b>

There are no Ramachandran outliers to report.

### 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	111/111 (100%)	101 (91%)	10 (9%)	<b>9</b> <b>2</b>

All (10) 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	57	LYS
1	A	62	LYS
1	A	65	VAL
1	A	72	ASN
1	A	86	SER
1	A	118	LEU
1	A	121	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	6	ASN
1	A	23	ASN
1	A	72	ASN
1	A	88	ASN
1	A	101	ASN

### 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](#)

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	125	-	7,7,7	3.63	6 (85%)	9,10,10	18.64	4 (44%)
3	MPD	A	126	-	7,7,7	2.53	4 (57%)	9,10,10	18.64	7 (77%)

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	125	-	1/1/2/2	2/5/5/5	-
3	MPD	A	126	-	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	5.88	1.70	1.52
3	A	126	MPD	C5-C4	4.17	1.69	1.51
3	A	125	MPD	C5-C4	3.92	1.68	1.51
3	A	125	MPD	C3-C4	3.82	1.73	1.51
3	A	126	MPD	C1-C2	3.13	1.62	1.52
3	A	125	MPD	O4-C4	3.13	1.56	1.43
3	A	126	MPD	O4-C4	3.00	1.56	1.43
3	A	125	MPD	O2-C2	-2.80	1.37	1.44
3	A	126	MPD	C3-C4	2.62	1.67	1.51
3	A	125	MPD	C3-C2	-2.52	1.46	1.53

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	125	MPD	O2-C2-CM	-33.24	1.43	108.08
3	A	126	MPD	O2-C2-CM	-33.11	1.83	108.08
3	A	125	MPD	O2-C2-C3	-28.87	1.36	109.80
3	A	126	MPD	O2-C2-C3	-28.84	1.45	109.80
3	A	125	MPD	O4-C4-C5	-25.11	0.62	109.38
3	A	126	MPD	O4-C4-C5	-24.95	1.33	109.38
3	A	126	MPD	CM-C2-C3	-23.54	0.38	109.96
3	A	125	MPD	CM-C2-C3	-23.52	0.47	109.96
3	A	126	MPD	CM-C2-C1	-2.97	104.39	110.57
3	A	126	MPD	C5-C4-C3	-2.43	100.24	111.69
3	A	126	MPD	O4-C4-C3	-2.43	101.56	111.36

All (2) chirality outliers are listed below:

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

All (5) torsion outliers are listed below:

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

There are no ring outliers.

2 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	125	MPD	12	0
3	A	126	MPD	6	0

## 5.7 Other polymers [i](#)

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.