wwPDB EM Validation Summary Report ⓘ

Feb 19, 2025 – 08:07 PM JST

PDB ID	:	8XXU
EMDB ID	:	EMD-38761
Title	:	Cryo-EM Structure of the Prostaglandin D2 Receptor 2 Coupled to G Protein
Authors	:	Xu, J.; Xu, Y.; Wu, C.; Xu, H.E.
Deposited on	:	2024-01-19
Resolution	:	2.54 Å(reported)

This is a wwPDB EM Validation Summary 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/EMValidationReportHelp
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:

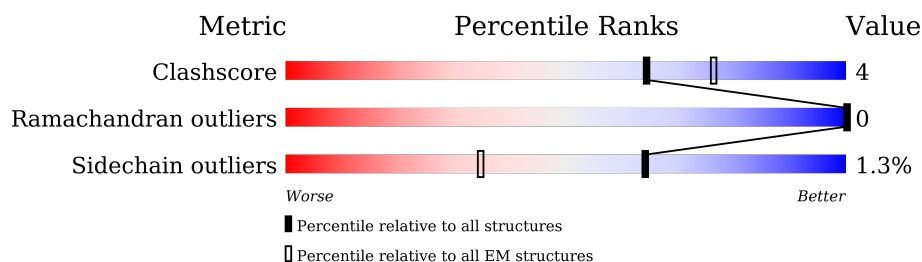|		
EMDB validation analysis	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41.2

1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 2.54 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	Percentile Ranks	Value
Clashscore		4
Ramachandran outliers		0
Sidechain outliers		1.3%

Worse *Better*

▮ Percentile relative to all structures
▯ Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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%

Mol	Chain	Length	Quality of chain
1	A	346	81% 10% 9%
2	B	354	58% 5% 36%
3	C	345	88% 9% •
4	D	71	75% 7% 18%
5	E	248	87% 6% 7%

2   Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 9080 atoms, of which 80 are hydrogens and 0 are deuteriums.

In the tables below, 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 Prostaglandin D2 receptor 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	316	Total 2328	C 1505	N 423	O 387	S 13	0	0

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(i) subunit alpha-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	225	Total 1812	C 1155	N 303	O 341	S 13	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	47	ASN	SER	engineered mutation	UNP P63096
B	203	ALA	GLY	engineered mutation	UNP P63096
B	245	ALA	GLU	engineered mutation	UNP P63096
B	326	SER	ALA	engineered mutation	UNP P63096

- Molecule 3 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	337	Total 2592	C 1599	N 466	O 506	S 21	0	0

There are 6 discrepancies between the modelled and reference sequences:

| Chain	Residue	Modelled	Actual	Comment	Reference
C	-4	MET	-	initiating methionine	UNP P62873
C	-3	GLY	-	expression tag	UNP P62873
C	-2	SER	-	expression tag	UNP P62873
C	-1	LEU	-	expression tag	UNP P62873
C	0	LEU	-	expression tag	UNP P62873
C	1	GLN	-	expression tag	UNP P62873

- Molecule 4 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	58	447	280	79	85	3	0	0

- Molecule 5 is a protein called scFv16.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	E	230	1764	1119	293	342	10	0	0

- Molecule 6 is [(2 {R})-1-hexadecanoyloxy-3-[oxidanyl-[(2 {S},3 {R},5 {R},6 {S})-2,3,4,5, 6-pentakis(oxidanyl)cyclohexyl]oxy-phosphoryl]oxy-propan-2-yl] ({Z})-octadec-9-enoate (three-letter code: A1D5Q) (formula: $C_{43}H_{81}O_{13}P$).
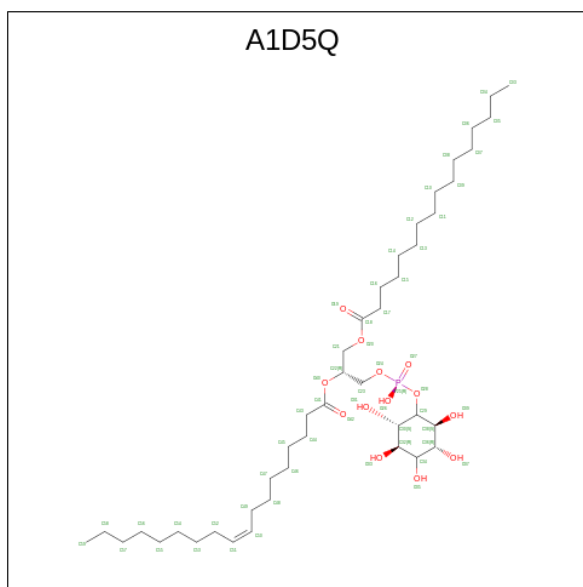

| Mol	Chain	Residues	Atoms					AltConf
			Total	C	H	O	P	
6	A	1	137	43	80	13	1	0

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.
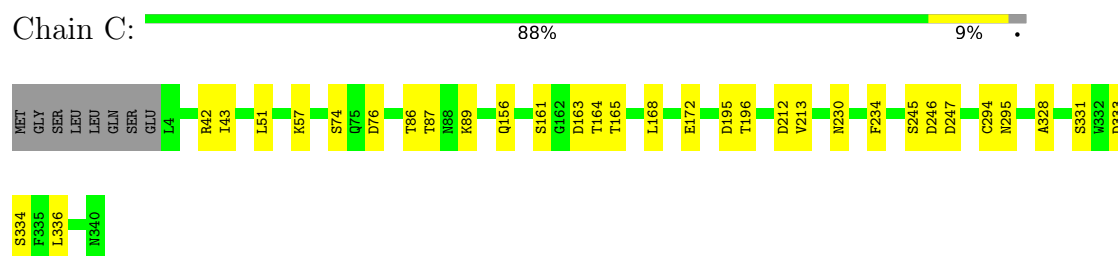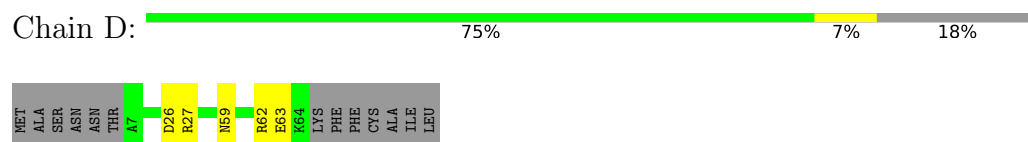
• Molecule 1: Prostaglandin D2 receptor 2

Chain A:
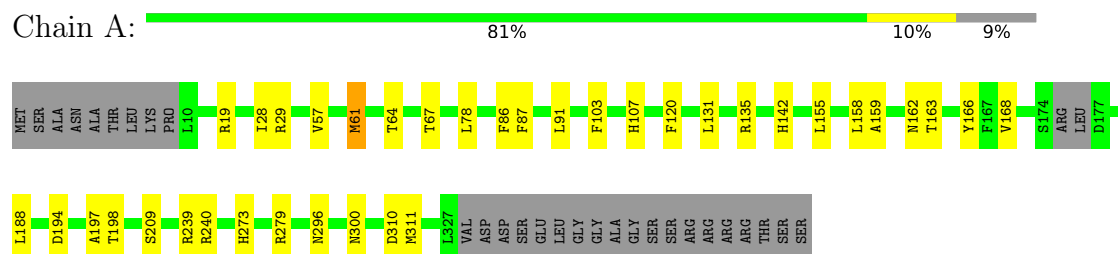
• Molecule 2: Guanine nucleotide-binding protein G(i) subunit alpha-1
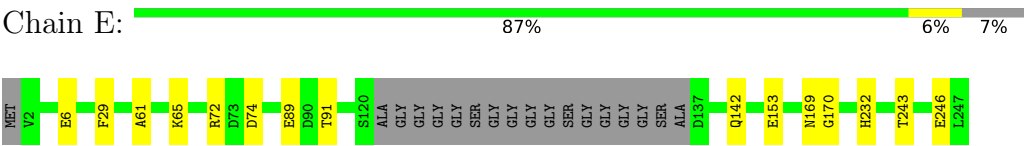
Chain B:
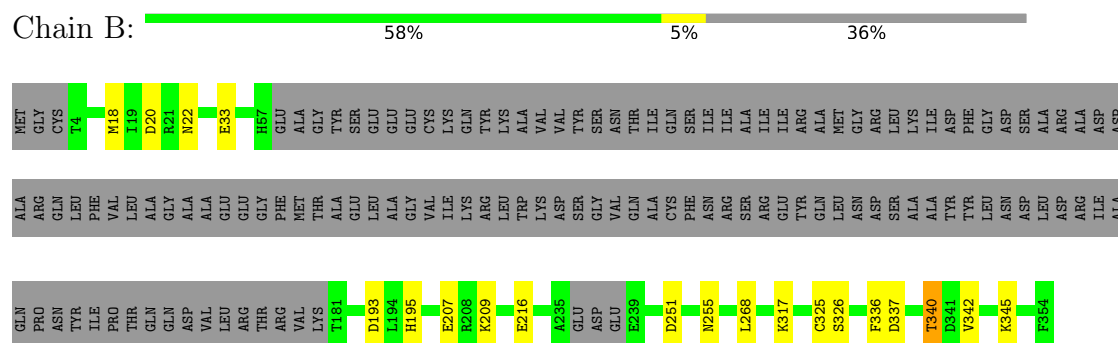
• Molecule 3: Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1

Chain C:

• Molecule 4: Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2

Chain D:

• Molecule 5: scFv16

Chain E:

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	257025	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	5000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor

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: A1D5Q

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	0.26	0/2381	0.40	0/3254
2	B	0.34	0/1842	0.44	0/2472
3	C	0.24	0/2639	0.43	0/3577
4	D	0.24	0/453	0.36	0/610
5	E	0.25	0/1807	0.42	0/2450
All	All	0.27	0/9122	0.42	0/12363

There are no bond length outliers.

There are no bond angle outliers.

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	2328	0	2269	19	0
2	B	1812	0	1813	19	0
3	C	2592	0	2499	20	0
4	D	447	0	460	3	0
5	E	1764	0	1704	10	0
6	A	57	80	0	1	0
All	All	9000	80	8745	69	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 4.

The worst 5 of 69 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)
2:B:336:PHE:O	2:B:340:THR:HG22	1.46	1.14
2:B:337:ASP:O	2:B:340:THR:HG23	1.61	1.00
2:B:337:ASP:HA	2:B:340:THR:CG2	2.09	0.81
2:B:251:ASP:OD1	2:B:255:ASN:ND2	2.19	0.76
3:C:331:SER:OG	3:C:333:ASP:OD2	2.09	0.70

There are no symmetry-related clashes.

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 PDB entries followed by that with respect to all EM entries.

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	312/346 (90%)	305 (98%)	7 (2%)	0	100	100
2	B	219/354 (62%)	219 (100%)	0	0	100	100
3	C	335/345 (97%)	332 (99%)	3 (1%)	0	100	100
4	D	56/71 (79%)	56 (100%)	0	0	100	100
5	E	226/248 (91%)	225 (100%)	1 (0%)	0	100	100
All	All	1148/1364 (84%)	1137 (99%)	11 (1%)	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 PDB entries followed by that with respect to all EM entries.

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	228/293 (78%)	221 (97%)	7 (3%)	35	50
2	B	200/305 (66%)	197 (98%)	3 (2%)	60	76
3	C	280/287 (98%)	279 (100%)	1 (0%)	89	94
4	D	47/58 (81%)	47 (100%)	0	100	100
5	E	194/199 (98%)	193 (100%)	1 (0%)	86	93
All	All	949/1142 (83%)	937 (99%)	12 (1%)	64	79

5 of 12 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	193	ASP
2	B	317	LYS
5	E	232	HIS
2	B	340	THR
1	A	103	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	300	ASN
2	B	255	ASN
2	B	331	ASN
1	A	149	HIS
1	A	114	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 ⓘ

1 ligand 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	#$|Z| > 2$
6	A1D5Q	A	401	-	57,57,57	1.13	5 (8%)	67,69,69	1.03	4 (5%)

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
6	A1D5Q	A	401	-	-	26/52/76/76	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	401	A1D5Q	O20-C18	3.25	1.42	1.33
6	A	401	A1D5Q	O40-C41	2.94	1.42	1.34
6	A	401	A1D5Q	P25-O24	2.21	1.68	1.59
6	A	401	A1D5Q	O40-C22	-2.10	1.41	1.46
6	A	401	A1D5Q	P25-O28	2.07	1.65	1.60

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	A	401	A1D5Q	O40-C41-C43	3.63	119.33	111.50
6	A	401	A1D5Q	O20-C18-C17	3.37	122.48	111.91
6	A	401	A1D5Q	C38-C29-C30	2.33	114.20	110.85
6	A	401	A1D5Q	O20-C18-O19	-2.07	118.37	123.59

There are no chirality outliers.

5 of 26 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	401	A1D5Q	C23-O24-P25-O27
6	A	401	A1D5Q	C29-O28-P25-O24
6	A	401	A1D5Q	O19-C18-O20-C21
6	A	401	A1D5Q	C17-C18-O20-C21
6	A	401	A1D5Q	C23-O24-P25-O28

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	401	A1D5Q	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand A1D5Q A 401

Bond lengths   Bond angles

Torsions   Rings
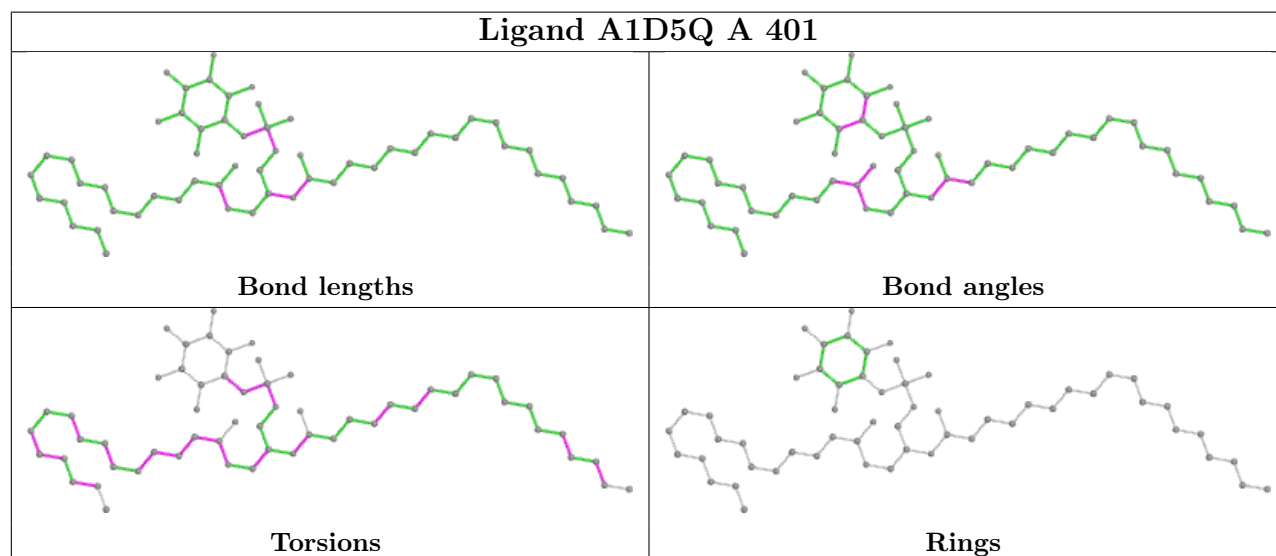
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.