



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 12:46 PM UTC

PDB ID : 1AWH / pdb_00001awh
Title : NOVEL COVALENT THROMBIN INHIBITOR FROM PLANT EXTRACT
Authors : Jhoti, H.; Cleasby, A.; Wonacott, A.
Deposited on : 1997-10-02
Resolution : 3.00 Å(reported)

This is a wwPDB X-ray Structure 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/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
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
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

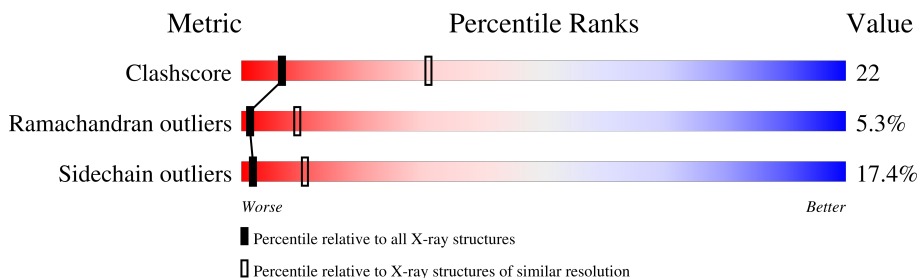
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)

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	36	19% 17% 53% 11%
1	C	36	17% 42% 28% 14%
2	B	259	28% 50% 17% 5%
2	D	259	27% 47% 22% .

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 4840 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.

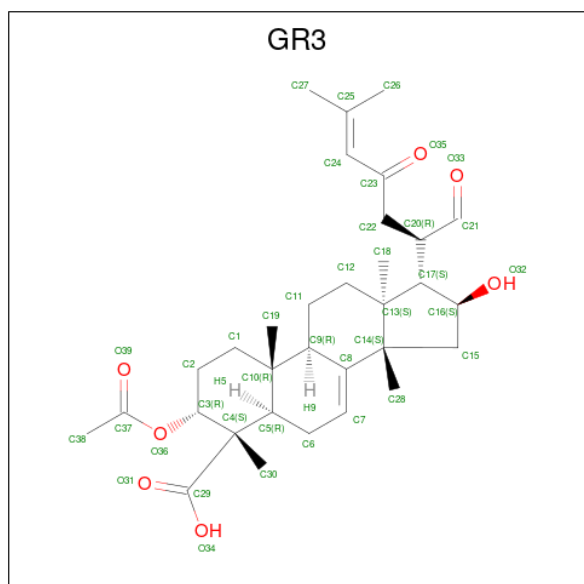
- Molecule 1 is a protein called ALPHA THROMBIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	36	Total	C	N	O	S	0	0	0
			287	177	48	61	1			
1	C	36	Total	C	N	O	S	0	0	0
			287	177	48	61	1			

- Molecule 2 is a protein called ALPHA THROMBIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	259	Total	C	N	O	S	0	0	0
			2093	1334	370	375	14			
2	D	259	Total	C	N	O	S	0	0	0
			2093	1334	370	375	14			

- Molecule 3 is 3-ACETOXY-17-(1-FORMYL-5-METHYL-3-OXO-HEX-4-ENYL)-16-HYDROXY-4,10,13,14-TETRAMETHYL-2,3,4,5,6,9,10,11,12,13,14,15,16,17-TETRADECAHYDRO-1H-CYCLOPENTA[A]PHENANTHRENE-4-CARBOXYLIC ACID (CCD ID: GR3) (formula: C₃₂H₄₆O₇).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			39	32	7		
3	D	1	Total	C	O	0	0
			39	32	7		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	O	0	0
			1	1		
4	D	1	Total	O	0	0
			1	1		

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.

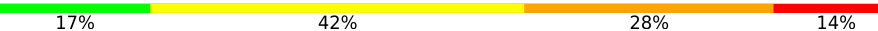
Note EDS was not executed.

• Molecule 1: ALPHA THROMBIN

Chain A:  19% 17% 53% 11%



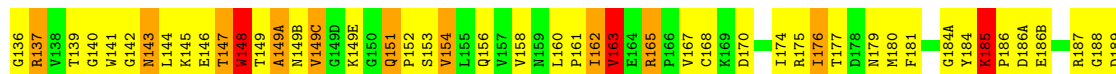
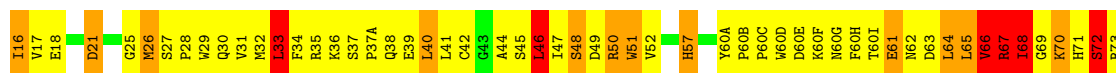
• Molecule 1: ALPHA THROMBIN

Chain C:  17% 42% 28% 14%

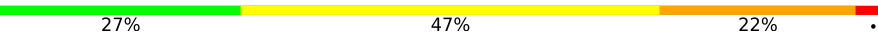


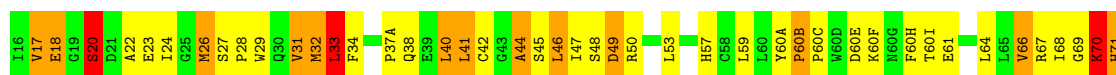
• Molecule 2: ALPHA THROMBIN

Chain B:  28% 50% 17% 5%



• Molecule 2: ALPHA THROMBIN

Chain D:  27% 47% 22% .



S72	R73	T74	R75	Y76	E77	R77A	E80	K81	I82	L85	E86	K87	I88	H91	P92	R93	Y94	N95	W96	R97	L99	D100	R101	D102	I103	A104	L105	M106	K107	L108	K109	K110	P111	V112	A113	F114	S115	D116	Y117	I118	H119	P120	V121	C122	L123	P124	D125	R126	E127	T128	A129	A129A	S129B	L129C	L130	
Q131	Y134	K135	G136	R137	V138	T139	G140	W141	G142	M143	E146	T147	W148	T149	A149A	N149B	V149C	G149D	K149E	G150	Q151	P152	S153	V154	V157	V158	N159	L160	P161	I162	V163	E164	R165	P166	V167	C168	K169	T172	R173	I174	R175	I176	T177	D178	W179	M180	F181	C182	Y184	K185	P186	D186A	E186B			
R187	G188	D189	A190	C191	E192	S195	G196	G197	P198	F199	V200	W201	K202	F204A	N204B	N205	R206	W207	Y208	Q209	N210	G211	I212	V213	S214	W215	G216	E217	D221A	R221	D222	G223	K224	Y225	G226	F227	Y228	T229	H230	V231	F232	R233	L234	K235	K236	W237	I238	Q239	K240	V241	I242	D243	Q244	F245	G246	E247

4 Data and refinement statistics

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	65.60Å 102.80Å 119.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 3.00	Depositor
% Data completeness (in resolution range)	(Not available) (10.00-3.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.12	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.202 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4840	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

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: GR3

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	1.30	0/290	2.24	20/384 (5.2%)
1	C	1.39	1/290 (0.3%)	2.30	20/384 (5.2%)
2	B	1.32	4/2148 (0.2%)	2.37	147/2903 (5.1%)
2	D	1.33	6/2148 (0.3%)	2.43	164/2903 (5.6%)
All	All	1.33	11/4876 (0.2%)	2.39	351/6574 (5.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	7
1	C	0	4
2	B	0	9
2	D	0	9
All	All	0	29

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	71	HIS	ND1-CE1	5.93	1.38	1.32
2	B	195	SER	CB-OG	-5.87	1.30	1.42
1	C	14(J)	TYR	CA-C	5.75	1.60	1.53
2	B	71	HIS	CE1-NE2	5.58	1.38	1.32
2	D	195	SER	CB-OG	-5.54	1.31	1.42

The worst 5 of 351 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	77(A)	ARG	N-CA-C	11.81	123.85	110.97
2	B	205	ASN	CA-CB-CG	-11.20	101.40	112.60
2	D	76	TYR	CA-C-N	-10.80	108.40	122.77
2	D	76	TYR	C-N-CA	-10.80	108.40	122.77
2	D	77(A)	ARG	N-CA-C	10.50	122.42	110.97

There are no chirality outliers.

5 of 29 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1(D)	GLY	Peptide
1	A	1(G)	PHE	Peptide
1	A	1(H)	THR	Peptide
1	A	14(J)	TYR	Peptide,Sidechain
1	A	14(L)	ASP	Peptide

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	287	0	278	24	0
1	C	287	0	278	21	0
2	B	2093	0	2063	86	0
2	D	2093	0	2063	92	0
3	B	39	0	44	5	0
3	D	39	0	44	4	0
4	B	1	0	0	0	0
4	D	1	0	0	0	0
All	All	4840	0	4770	207	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 22.

The worst 5 of 207 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:60(F):LYS:HG3	2:B:60(H):PHE:HE1	1.33	0.94

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:14(G):LEU:HB3	1:A:15:ARG:NE	1.90	0.87
2:D:230:HIS:CD2	2:D:233:ARG:HG2	2.16	0.80
2:D:200:VAL:HG12	2:D:209:GLN:HA	1.62	0.80
2:D:190:ALA:HB3	3:D:1:GR3:H262	1.64	0.80

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	34/36 (94%)	16 (47%)	10 (29%)	8 (24%)	0	0
1	C	34/36 (94%)	20 (59%)	9 (26%)	5 (15%)	0	0
2	B	257/259 (99%)	220 (86%)	32 (12%)	5 (2%)	6	30
2	D	257/259 (99%)	210 (82%)	34 (13%)	13 (5%)	1	10
All	All	582/590 (99%)	466 (80%)	85 (15%)	31 (5%)	1	9

5 of 31 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1(B)	ALA
1	A	14(K)	ILE
1	A	14(L)	ASP
2	B	62	ASN
2	B	93	ARG

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	31/31 (100%)	21 (68%)	10 (32%)	0	1
1	C	31/31 (100%)	23 (74%)	8 (26%)	0	3
2	B	225/225 (100%)	186 (83%)	39 (17%)	2	10
2	D	225/225 (100%)	193 (86%)	32 (14%)	3	16
All	All	512/512 (100%)	423 (83%)	89 (17%)	2	10

5 of 89 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	D	20	SER
2	D	108	LEU
2	D	27	SER
2	D	53	LEU
2	D	129(B)	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 8 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	230	HIS
2	D	159	ASN
2	D	143	ASN
2	D	131	GLN
2	D	151	GLN

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

2 ligands are 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$
3	GR3	B	1	2	42,42,42	1.10	3 (7%)	63,68,68	1.43	11 (17%)
3	GR3	D	1	2	42,42,42	1.08	3 (7%)	63,68,68	1.57	8 (12%)

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	GR3	B	1	2	-	7/24/99/99	0/4/4/4
3	GR3	D	1	2	-	5/24/99/99	0/4/4/4

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	1	GR3	C14-C8	-3.03	1.48	1.53
3	B	1	GR3	O34-C29	-2.65	1.20	1.30
3	B	1	GR3	C10-C5	-2.26	1.53	1.56
3	D	1	GR3	O34-C29	-2.24	1.22	1.30
3	B	1	GR3	C11-C9	-2.13	1.50	1.53

The worst 5 of 19 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	1	GR3	C15-C14-C8	5.08	120.99	117.18
3	B	1	GR3	C22-C20-C21	-4.71	98.83	109.66
3	D	1	GR3	C28-C14-C8	-4.54	101.65	107.86
3	D	1	GR3	C3-O36-C37	4.41	124.42	117.84
3	D	1	GR3	C22-C20-C21	-4.04	100.37	109.66

There are no chirality outliers.

5 of 12 torsion outliers are listed below:

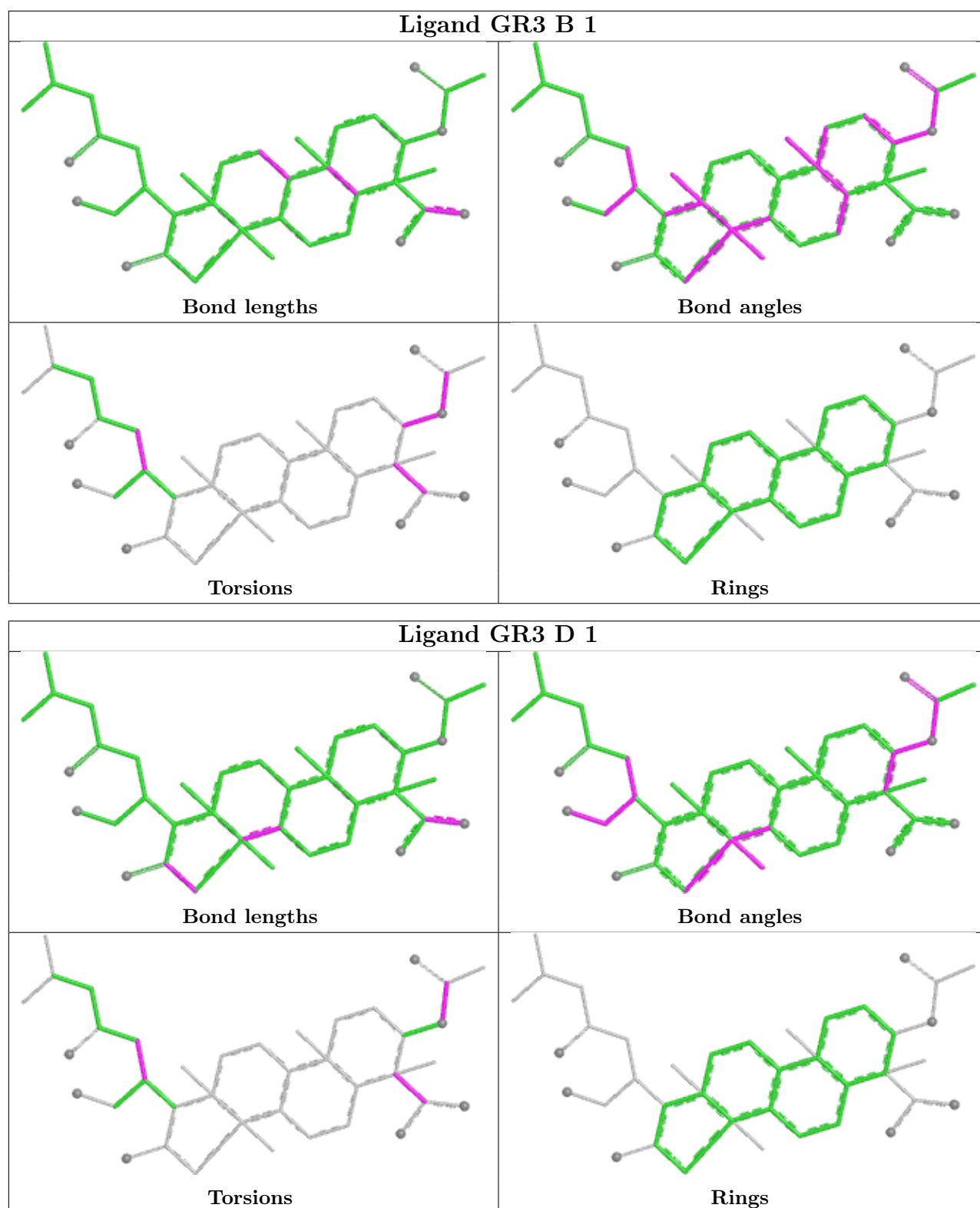
Mol	Chain	Res	Type	Atoms
3	B	1	GR3	O31-C29-C4-C3
3	B	1	GR3	O34-C29-C4-C3
3	B	1	GR3	C17-C20-C22-C23
3	B	1	GR3	C21-C20-C22-C23
3	D	1	GR3	C17-C20-C22-C23

There are no ring outliers.

2 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	1	GR3	5	0
3	D	1	GR3	4	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 than 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.



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.