WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Jun 12, 2024 – 09:41 PM EDT

PDB ID	:	1BCS
Title	:	COMPLEX OF THE WHEAT SERINE CARBOXYPEPTIDASE, CPDW-II, WITH THE MICROBIAL PEPTIDE ALDEHYDE INHIBITOR, CHYMO-STATIN, AND ARGININE AT 100 DEGREES KELVIN
Authors	:	Bullock, T.L.; Remington, S.J.
Deposited on	:	1995-11-03
Resolution	:	2.08 Å(reported)

The following versions of software and data (see references (i)) 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)	:	2.36.2

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 2.08 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.
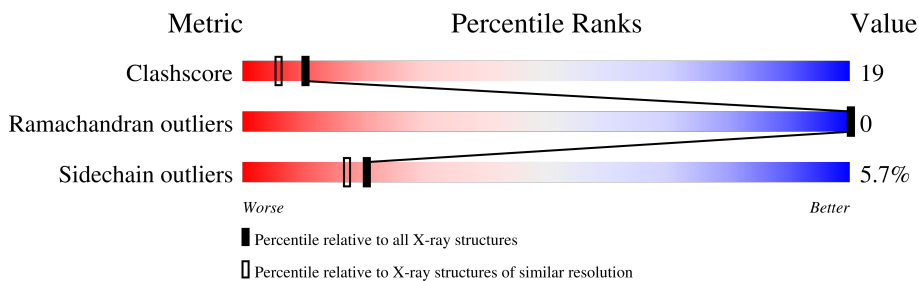
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	6738 (2.10-2.06)
Ramachandran outliers	138981	6663 (2.10-2.06)
Sidechain outliers	138945	6664 (2.10-2.06)

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	263	63% · · · 27% · · 5% · ·
2	B	160	62% · · · 27% · · 6% · ·
3	C	4	50% · · 25% · · 25%
4	D	3	100%
5	E	2	50% · · 50%

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
4	NAG	D	1	-	-	X	-
4	NDG	D	3	X	-	-	-
5	NAG	E	1	-	-	X	-
5	NAG	E	2	X	-	-	-
7	NAG	A	1131	X	-	X	-

2 Entry composition (i)

There are 10 unique types of molecules in this entry. The entry contains 3731 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 SERINE CARBOXYPEPTIDASE II.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	255	Total	C	N	O	S	0	0	0
			1999	1280	334	378	7			

- Molecule 2 is a protein called SERINE CARBOXYPEPTIDASE II.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	153	Total	C	N	O	S	0	0	0
			1202	771	207	218	6			

- Molecule 3 is a protein called CHYMOSTATIN A.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	4	Total	C	N	O	0	0	0
			44	31	7	6			

- Molecule 4 is an oligosaccharide called alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-alpha-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	D	3	Total	C	N	O	0	0	0
			38	22	2	14			

- Molecule 5 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.
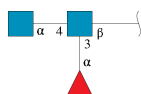
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
5	E	2	28	16	2	10	0	0	0

- Molecule 6 is ARGININE (three-letter code: ARG) (formula: $C_6H_{15}N_4O_2$).
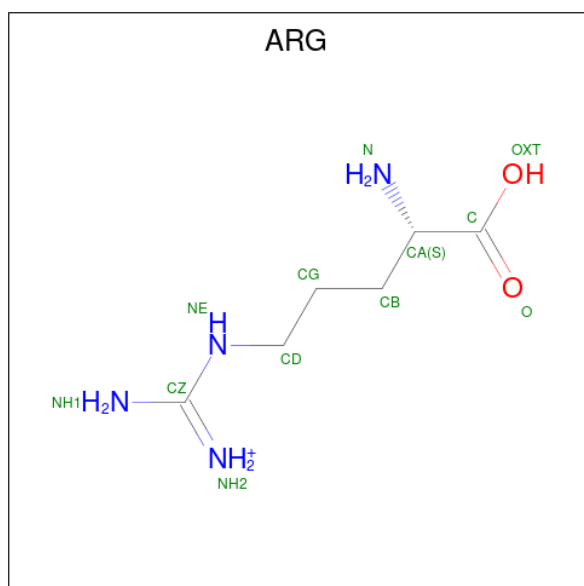
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
6	A	1	12	6	4	2	0	0

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).

NAG

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 8 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

GOL

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

- Molecule 9 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).

ACT

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	B	1	Total 4	C 2	O 2	0	0

- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	226	Total 226	O 226	0	0
10	B	157	Total 157	O 157	0	0
10	C	1	Total 1	O 1	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: SERINE CARBOXYPEPTIDASE II

Chain A:

• Molecule 2: SERINE CARBOXYPEPTIDASE II

Chain B:

• Molecule 3: CHYMOSTATIN A

Chain C:

• Molecule 4: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-alpha-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:

• Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-gluc opyranose

Chain E:

50%   50%

MAG1 MAG2

4 Data and refinement statistics ⓘ

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

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α, β, γ	95.40Å 95.40Å 208.30Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.00 – 2.08	Depositor
% Data completeness (in resolution range)	(Not available) (33.00-2.08)	Depositor
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	TNT	Depositor
R, R_{free}	0.174 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3731	wwPDB-VP
Average B, all atoms (Å^2)	30.0	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: NAG, CSI, FUC, NDG, PHA, ACT, GOL

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	1.13	11/2062 (0.5%)	1.63	36/2814 (1.3%)
2	B	1.10	4/1242 (0.3%)	1.83	30/1702 (1.8%)
3	C	1.10	0/19	1.36	0/21
All	All	1.12	15/3323 (0.5%)	1.71	66/4537 (1.5%)

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
3	C	1	0

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	208	GLU	CD-OE1	8.44	1.34	1.25
2	B	398	GLU	CD-OE2	7.63	1.34	1.25
1	A	81	GLU	CD-OE1	7.49	1.33	1.25
1	A	232	GLU	CD-OE1	6.67	1.32	1.25
1	A	154	GLU	CD-OE2	6.63	1.32	1.25

The worst 5 of 66 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	114	ARG	NE-CZ-NH1	19.18	129.89	120.30
2	B	393	ARG	NE-CZ-NH2	-16.96	111.82	120.30
2	B	329	ARG	NE-CZ-NH1	16.47	128.54	120.30
2	B	393	ARG	NE-CZ-NH1	16.37	128.49	120.30
2	B	329	ARG	NE-CZ-NH2	-16.15	112.22	120.30

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	C	2	CSI	CB

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	1999	0	1853	74	0
2	B	1202	0	1135	55	0
3	C	44	0	36	3	0
4	D	38	0	33	9	0
5	E	28	0	24	10	0
6	A	12	0	12	1	0
7	A	14	0	13	7	0
8	A	6	0	8	1	0
9	B	4	0	3	1	0
10	A	226	0	0	5	0
10	B	157	0	0	6	0
10	C	1	0	0	0	0
All	All	3731	0	3117	121	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 19.

The worst 5 of 121 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:173:MET:HE1	2:B:414:PHE:HB2	1.42	1.01
1:A:0:ARG:HG3	1:A:17:TYR:CE2	2.08	0.88
1:A:113:ASN:ND2	7:A:1131:NAG:N2	2.26	0.83
1:A:5:PRO:HG2	2:B:284:VAL:HG12	1.64	0.78
2:B:374:ASP:HB3	10:B:3066:HOH:O	1.85	0.76

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 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	253/263 (96%)	243 (96%)	10 (4%)	0	100	100
2	B	151/160 (94%)	142 (94%)	9 (6%)	0	100	100
3	C	1/4 (25%)	1 (100%)	0	0	100	100
All	All	405/427 (95%)	386 (95%)	19 (5%)	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	205/215 (95%)	191 (93%)	14 (7%)	16	12
2	B	123/133 (92%)	118 (96%)	5 (4%)	30	30
3	C	2/2 (100%)	2 (100%)	0	100	100
All	All	330/350 (94%)	311 (94%)	19 (6%)	20	16

5 of 19 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	264	SER
2	B	418	LYS
2	B	419	PRO
2	B	284	VAL
1	A	170	LYS

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	B	308	HIS
2	B	285	GLN
1	A	233	GLN
1	A	217	HIS
1	A	247	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)

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	#$\|Z\| > 2$
3	PHA	C	4	3,1	10,11,11	1.81	1 (10%)	10,13,13	0.95	1 (10%)

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	PHA	C	4	3,1	-	0/5/6/6	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	4	PHA	O-C	5.22	1.40	1.19

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	4	PHA	CG-CB-CA	-2.02	110.01	114.10

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	4	PHA	1	0

5.5 Carbohydrates ⓘ

5 monosaccharides 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	#$|Z| > 2$
4	NAG	D	1	4	14,14,15	1.28	2 (14%)	17,19,21	2.47	7 (41%)
4	FUC	D	2	4	10,10,11	3.22	4 (40%)	14,14,16	3.35	7 (50%)
4	NDG	D	3	4	14,14,15	0.88	0	17,19,21	3.97	6 (35%)
5	NAG	E	1	5	14,14,15	0.55	0	17,19,21	2.97	9 (52%)
5	NAG	E	2	5	14,14,15	1.97	4 (28%)	17,19,21	3.76	9 (52%)

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
4	NAG	D	1	4	-	2/6/23/26	0/1/1/1
4	FUC	D	2	4	-	-	0/1/1/1
4	NDG	D	3	4	1/1/5/7	5/6/23/26	0/1/1/1
5	NAG	E	1	5	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	E	2	5	2/2/5/7	5/6/23/26	0/1/1/1

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	2	FUC	O5-C1	7.73	1.56	1.43
4	D	2	FUC	O5-C5	4.92	1.54	1.43
5	E	2	NAG	C1-C2	3.67	1.57	1.52
5	E	2	NAG	C4-C3	3.23	1.60	1.52
5	E	2	NAG	C2-N2	3.22	1.51	1.46

The worst 5 of 38 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	E	2	NAG	O6-C6-C5	12.10	152.81	111.29
4	D	3	NDG	O6-C6-C5	11.48	150.68	111.29
4	D	3	NDG	O5-C1-C2	-8.45	97.95	111.29
4	D	2	FUC	O3-C3-C2	7.98	125.27	109.99
4	D	2	FUC	C2-C3-C4	-6.85	99.04	110.89

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
4	D	3	NDG	C2
5	E	2	NAG	C5
5	E	2	NAG	C2

5 of 14 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	D	3	NDG	C8-C7-N2-C2
4	D	3	NDG	O7-C7-N2-C2
5	E	1	NAG	C8-C7-N2-C2
5	E	1	NAG	O7-C7-N2-C2
5	E	2	NAG	C1-C2-N2-C7

There are no ring outliers.

5 monomers are involved in 19 short contacts:

| Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	3	NDG	3	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	1	NAG	7	0
5	E	2	NAG	4	0
5	E	1	NAG	10	0
4	D	2	FUC	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

Oligosaccharide Chain D

Bond lengths   Bond angles

Torsions   Rings

Oligosaccharide Chain E

Bond lengths	Bond angles

Torsions	Rings
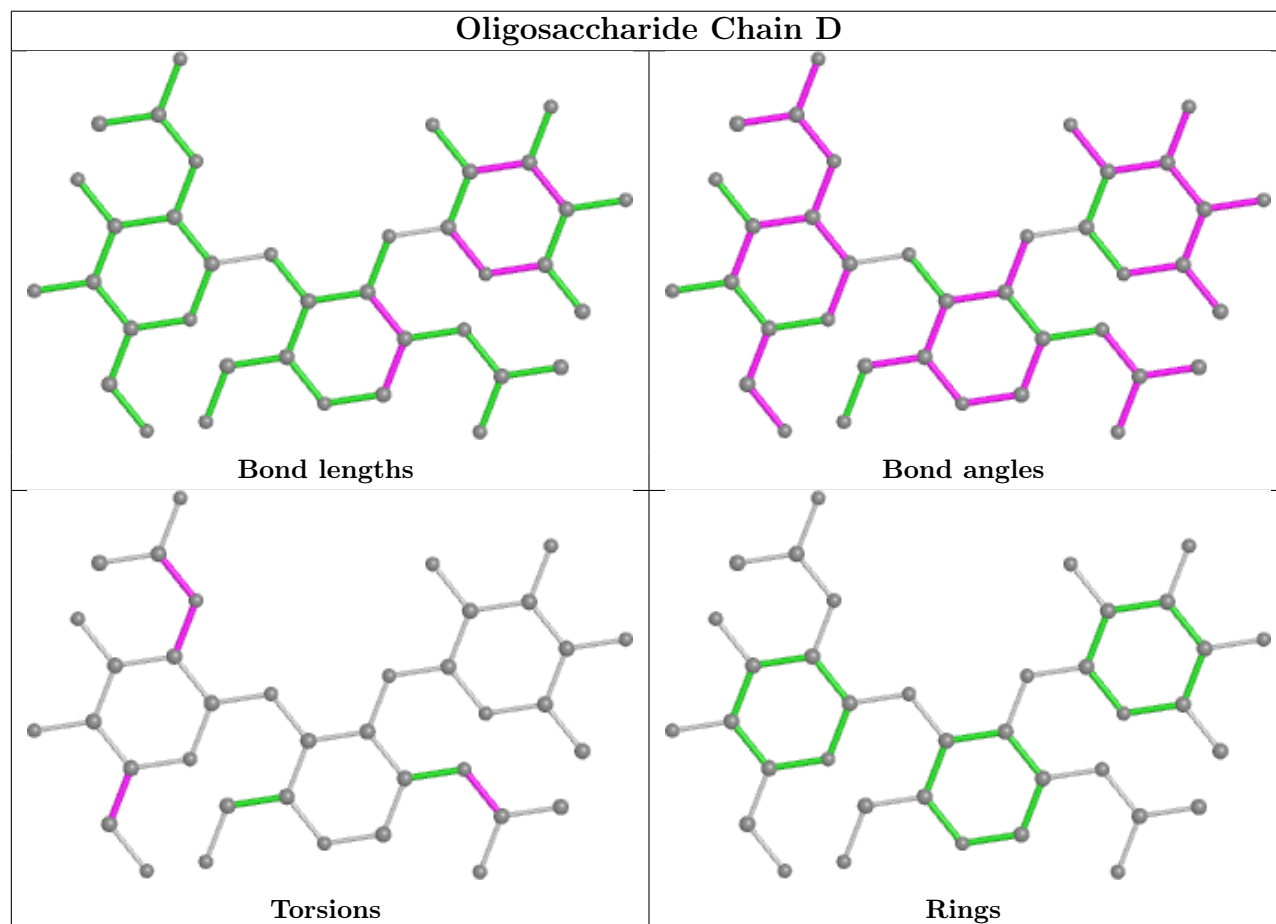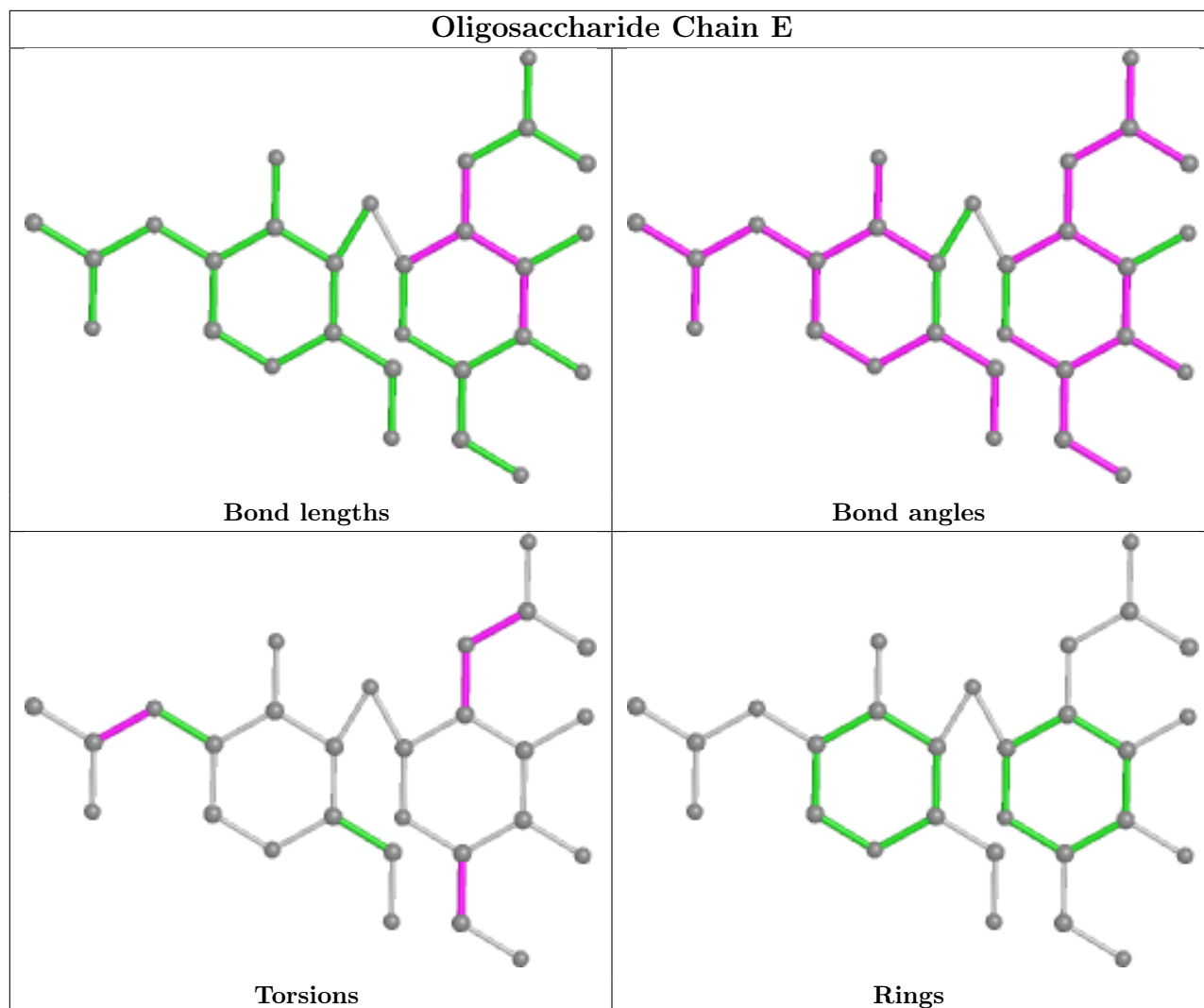
5.6 Ligand geometry (i)

4 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	#$|Z| > 2$
8	GOL	A	450	-	5,5,5	0.52	0	5,5,5	0.51	0
9	ACT	B	461	-	3,3,3	1.02	0	3,3,3	0.95	0
7	NAG	A	1131	-	14,14,15	1.07	1 (7%)	17,19,21	2.39	6 (35%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
6	ARG	A	426	-	10,11,11	0.94	0	11,13,13	3.59	5 (45%)

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
8	GOL	A	450	-	-	4/4/4/4	-
7	NAG	A	1131	-	1/1/5/7	5/6/23/26	1/1/1/1
6	ARG	A	426	-	-	5/11/11/11	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	1131	NAG	O5-C1	-2.36	1.39	1.43

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	426	ARG	OXT-C-O	8.12	142.53	124.09
7	A	1131	NAG	O6-C6-C5	5.88	131.47	111.29
6	A	426	ARG	CB-CA-N	5.30	124.05	110.17
6	A	426	ARG	O-C-CA	-4.92	104.77	122.14
7	A	1131	NAG	C8-C7-N2	3.72	122.39	116.10

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
7	A	1131	NAG	C2

5 of 14 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	426	ARG	N-CA-CB-CG
7	A	1131	NAG	C8-C7-N2-C2
7	A	1131	NAG	O7-C7-N2-C2
8	A	450	GOL	O1-C1-C2-C3
7	A	1131	NAG	O5-C5-C6-O6

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	1131	NAG	C1-C2-C3-C4-C5-O5

4 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	A	450	GOL	1	0
9	B	461	ACT	1	0
7	A	1131	NAG	7	0
6	A	426	ARG	1	0

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.