



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 08:37 PM UTC

PDB ID : 1VXR / pdb_00001vxr
Title : O-ETHYLMETHYLPHOSPHONYLATED ACETYLCHOLINESTERASE
OBTAINED BY REACTION WITH O-ETHYL-S-[2-[BIS(1-METHYLETHYL)
AMINO]ETHYL] METHYLPHOSPHONOTHIOATE (VX)
Authors : Millard, C.B.; Koellner, G.; Silman, I.; Sussman, J.L.
Deposited on : 1999-04-21
Resolution : 2.20 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

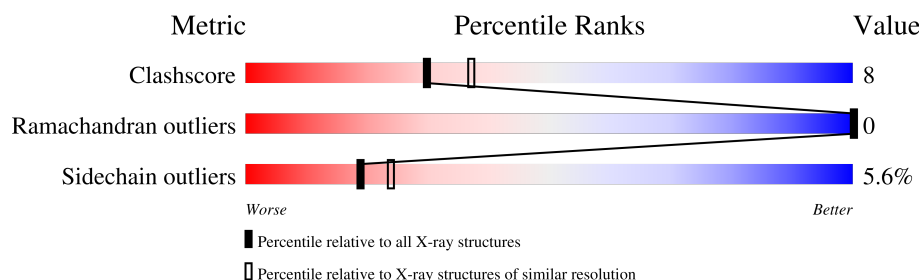
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 Å.

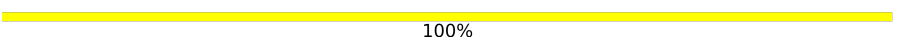
Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)

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	537	 75% 20% ...
2	B	2	 100%

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	NAG	A	9010	X	-	-	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 4655 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 PROTEIN (ACETYLCHOLINESTERASE).

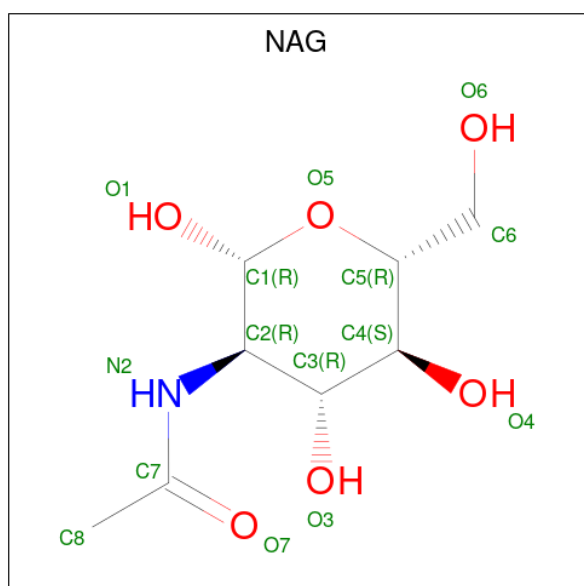
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	532	Total	C	N	O	S	0	0	0
			4244	2721	720	781	22			

- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



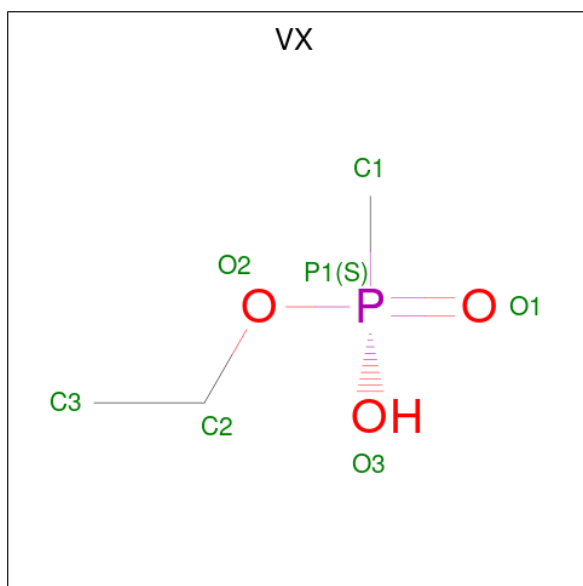
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



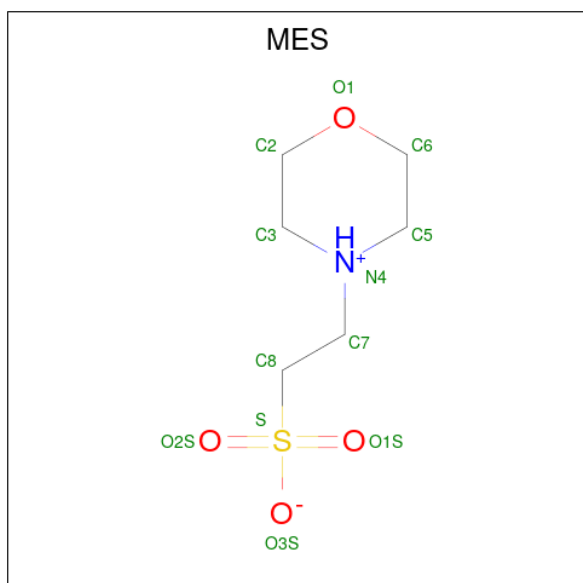
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 4 is O-ETHYLMETHYLPHOSPHONIC ACID ESTER GROUP (CCD ID: VX) (formula: $C_3H_9O_3P$).



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

- Molecule 5 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: $C_6H_{13}NO_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
5	A	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 6 is water.

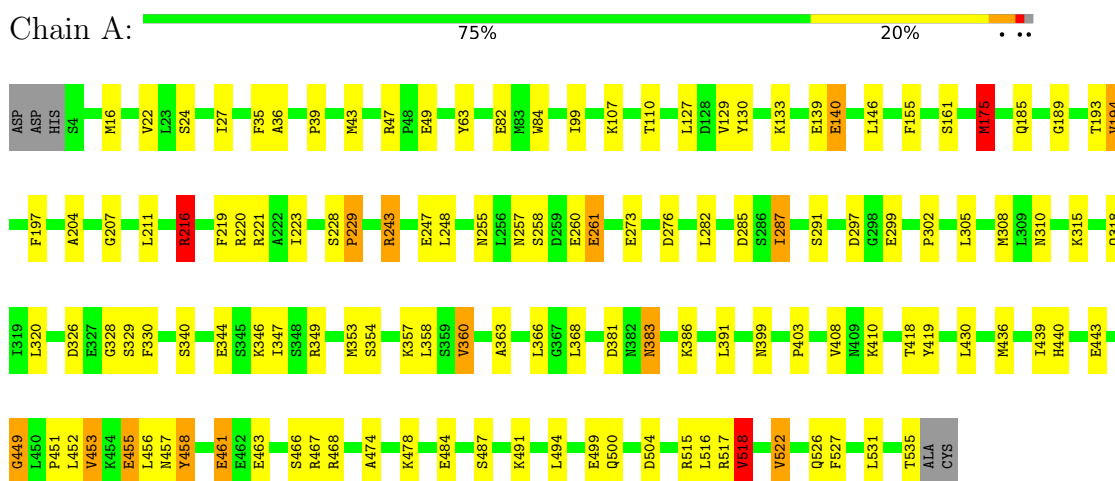
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	339	Total	O	0	0
			339	339		

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: PROTEIN (ACETYLCHOLINESTERASE)



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



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	112.84Å 112.84Å 137.36Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 2.20	Depositor
% Data completeness (in resolution range)	89.9 (30.00-2.20)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.189 , 0.230	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4655	wwPDB-VP
Average B, all atoms (Å ²)	38.0	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: MES, NAG, VX

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	1.19	8/4367 (0.2%)	1.28	36/5929 (0.6%)

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	1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	175	MET	SD-CE	-10.34	1.53	1.79
1	A	439	ILE	CA-CB	-7.30	1.46	1.54
1	A	353	MET	SD-CE	7.29	1.97	1.79
1	A	436	MET	SD-CE	7.06	1.97	1.79
1	A	347	ILE	CA-CB	5.97	1.61	1.54
1	A	194	VAL	CA-CB	5.31	1.60	1.54
1	A	204	ALA	CA-C	5.25	1.59	1.52
1	A	99	ILE	CA-CB	5.16	1.61	1.54

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	291	SER	N-CA-C	9.45	121.27	110.97
1	A	518	VAL	CB-CA-C	-9.42	99.91	111.97
1	A	216	ARG	N-CA-C	8.78	121.80	111.71
1	A	443	GLU	N-CA-C	-8.49	103.05	113.50
1	A	285	ASP	N-CA-C	-7.62	96.86	108.67

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	329	SER	N-CA-C	7.55	119.51	111.28
1	A	527	PHE	N-CA-C	7.38	118.97	111.07
1	A	282	LEU	CA-C-N	-7.23	112.25	119.56
1	A	282	LEU	C-N-CA	-7.23	112.25	119.56
1	A	276	ASP	N-CA-C	6.96	119.72	111.71
1	A	360	VAL	CA-C-N	6.94	128.51	119.84
1	A	360	VAL	C-N-CA	6.94	128.51	119.84
1	A	504	ASP	N-CA-C	-6.83	100.42	110.52
1	A	381	ASP	N-CA-C	6.64	120.97	113.01
1	A	257	ASN	N-CA-C	6.43	120.87	112.89
1	A	248	LEU	N-CA-C	-6.33	104.30	111.14
1	A	297	ASP	N-CA-C	6.24	121.06	113.38
1	A	522	VAL	N-CA-C	-6.01	104.65	110.72
1	A	491	LYS	N-CA-C	5.96	119.97	109.96
1	A	328	GLY	N-CA-C	5.67	122.75	115.32
1	A	193	THR	CA-C-N	-5.58	115.90	122.93
1	A	193	THR	C-N-CA	-5.58	115.90	122.93
1	A	229	PRO	N-CA-C	5.57	121.17	113.65
1	A	243	ARG	NE-CZ-NH2	-5.49	114.26	119.20
1	A	399	ASN	N-CA-C	5.38	119.91	113.23
1	A	518	VAL	N-CA-CB	5.38	116.85	110.55
1	A	287	ILE	CB-CG1-CD1	-5.35	102.57	113.80
1	A	326	ASP	N-CA-C	5.28	115.99	108.54
1	A	243	ARG	CG-CD-NE	-5.27	100.41	112.00
1	A	84	TRP	N-CA-C	-5.18	107.34	113.97
1	A	403	PRO	N-CA-C	-5.17	106.47	113.40
1	A	458	TYR	N-CA-C	-5.15	102.84	110.46
1	A	449	GLY	N-CA-C	5.10	122.76	114.90
1	A	155	PHE	N-CA-C	5.06	121.19	113.19
1	A	107	LYS	N-CA-C	-5.05	106.81	113.12
1	A	273	GLU	N-CA-C	-5.04	105.89	112.23

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	63	TYR	Sidechain

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	4244	0	4094	72	0
2	B	28	0	25	0	0
3	A	14	0	13	0	0
4	A	6	0	8	0	0
5	A	24	0	26	2	0
6	A	339	0	0	8	0
All	All	4655	0	4166	72	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 8.

All (72) 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:499:GLU:HG2	6:A:1276:HOH:O	1.81	0.79
1:A:455:GLU:CD	1:A:455:GLU:H	1.94	0.74
1:A:310:ASN:OD1	1:A:410:LYS:NZ	2.21	0.73
1:A:383:ASN:C	1:A:383:ASN:HD22	1.98	0.71
1:A:49:GLU:O	1:A:175:MET:HE1	1.94	0.66
1:A:139:GLU:O	1:A:140:GLU:HG2	1.97	0.64
1:A:110:THR:OG1	1:A:478:LYS:HG2	1.98	0.64
1:A:36:ALA:HB2	1:A:175:MET:HE2	1.79	0.64
1:A:468:ARG:HD3	6:A:1105:HOH:O	2.00	0.62
1:A:453:VAL:HG22	1:A:456:LEU:HG	1.82	0.61
1:A:216:ARG:HB3	1:A:315:LYS:HB2	1.83	0.60
1:A:344:GLU:OE1	1:A:346:LYS:HE3	2.03	0.58
1:A:139:GLU:C	1:A:140:GLU:HG2	2.28	0.58
1:A:260:GLU:H	1:A:260:GLU:CD	2.11	0.58
1:A:468:ARG:CD	6:A:1105:HOH:O	2.52	0.57
1:A:461:GLU:H	1:A:461:GLU:CD	2.12	0.56
1:A:452:LEU:HD22	1:A:463:GLU:HG3	1.88	0.56
1:A:357:LYS:NZ	6:A:1288:HOH:O	2.38	0.56
1:A:47:ARG:HG3	6:A:1198:HOH:O	2.05	0.55
1:A:522:VAL:HG13	1:A:526:GLN:OE1	2.07	0.55
1:A:531:LEU:C	1:A:531:LEU:HD23	2.32	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:197:PHE:HA	1:A:223:ILE:O	2.08	0.54
1:A:357:LYS:HD2	6:A:1288:HOH:O	2.09	0.53
1:A:223:ILE:HA	1:A:320:LEU:O	2.08	0.53
1:A:302:PRO:HD2	1:A:308:MET:SD	2.49	0.52
1:A:474:ALA:O	1:A:478:LYS:HG3	2.09	0.52
1:A:419:TYR:CZ	1:A:494:LEU:HD13	2.45	0.52
1:A:197:PHE:CB	1:A:223:ILE:HB	2.42	0.50
1:A:247:GLU:HG2	5:A:8010:MES:O1S	2.12	0.50
1:A:146:LEU:C	1:A:146:LEU:HD12	2.37	0.49
1:A:221:ARG:HD3	1:A:318:GLN:OE1	2.13	0.49
1:A:383:ASN:ND2	1:A:386:LYS:H	2.11	0.49
1:A:452:LEU:HD13	1:A:467:ARG:NH2	2.28	0.49
1:A:500:GLN:HE22	5:A:8020:MES:H52	1.80	0.47
1:A:211:LEU:CD1	1:A:305:LEU:HD22	2.44	0.47
1:A:408:VAL:HG23	1:A:418:THR:HG21	1.97	0.46
1:A:36:ALA:HB2	1:A:175:MET:CE	2.46	0.46
1:A:110:THR:CB	1:A:478:LYS:HG2	2.45	0.46
1:A:197:PHE:HB3	1:A:223:ILE:HB	1.98	0.46
1:A:456:LEU:O	1:A:457:ASN:HB2	2.15	0.45
1:A:39:PRO:HA	1:A:43:MET:HE2	1.99	0.45
1:A:320:LEU:C	1:A:320:LEU:HD23	2.42	0.45
1:A:517:ARG:HG2	1:A:517:ARG:NH1	2.31	0.44
1:A:255:ASN:CG	1:A:261:GLU:HG2	2.42	0.44
1:A:258:SER:HB2	1:A:260:GLU:OE1	2.17	0.44
1:A:408:VAL:CG2	1:A:418:THR:HG21	2.47	0.44
1:A:82:GLU:HG2	6:A:1171:HOH:O	2.17	0.44
1:A:366:LEU:HD23	1:A:535:THR:HG21	2.00	0.44
1:A:220:ARG:HG3	1:A:221:ARG:HG3	1.99	0.43
1:A:357:LYS:HD3	1:A:368:LEU:HD11	2.00	0.43
1:A:127:LEU:HD12	1:A:130:TYR:CE2	2.54	0.43
1:A:24:SER:O	1:A:24:SER:OG	2.30	0.43
1:A:35:PHE:O	1:A:175:MET:HE3	2.19	0.43
1:A:207:GLY:HA3	1:A:229:PRO:HD3	2.01	0.43
1:A:360:VAL:HG12	1:A:363:ALA:HB2	2.00	0.43
1:A:499:GLU:CG	6:A:1276:HOH:O	2.55	0.43
1:A:219:PHE:O	1:A:315:LYS:HE2	2.18	0.43
1:A:260:GLU:CD	1:A:260:GLU:N	2.77	0.43
1:A:517:ARG:HG2	1:A:517:ARG:HH11	1.84	0.43
1:A:451:PRO:HA	1:A:458:TYR:CD1	2.54	0.42
1:A:211:LEU:HD12	1:A:305:LEU:HD22	2.00	0.42
1:A:484:GLU:HB2	1:A:487:SER:CB	2.50	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:383:ASN:C	1:A:383:ASN:ND2	2.68	0.42
1:A:452:LEU:CD2	1:A:463:GLU:HG3	2.49	0.42
1:A:515:ARG:O	1:A:518:VAL:HG22	2.19	0.42
1:A:484:GLU:HB2	1:A:487:SER:HB2	2.02	0.42
1:A:185:GLN:HA	1:A:189:GLY:O	2.20	0.41
1:A:27:ILE:HD11	1:A:133:LYS:HB2	2.02	0.41
1:A:255:ASN:HB3	1:A:261:GLU:HG2	2.02	0.41
1:A:228:SER:HB2	1:A:229:PRO:HD2	2.01	0.41
1:A:366:LEU:CD2	1:A:535:THR:HG21	2.52	0.40
1:A:449:GLY:HA2	1:A:466:SER:OG	2.22	0.40

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	530/537 (99%)	503 (95%)	27 (5%)	0	100	100

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	465/469 (99%)	439 (94%)	26 (6%)	19	24

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	16	MET
1	A	22	VAL
1	A	129	VAL
1	A	140	GLU
1	A	161	SER
1	A	175	MET
1	A	194	VAL
1	A	216	ARG
1	A	243	ARG
1	A	261	GLU
1	A	287	ILE
1	A	299	GLU
1	A	330	PHE
1	A	340	SER
1	A	349	ARG
1	A	354	SER
1	A	358	LEU
1	A	383	ASN
1	A	391	LEU
1	A	430	LEU
1	A	440	HIS
1	A	453	VAL
1	A	455	GLU
1	A	461	GLU
1	A	516	LEU
1	A	518	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	65	ASN
1	A	66	ASN
1	A	68	GLN
1	A	251	ASN
1	A	280	ASN
1	A	374	GLN
1	A	383	ASN
1	A	409	ASN
1	A	486	HIS
1	A	500	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 ⓘ

2 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
2	NAG	B	1	2,1	14,14,15	0.87	0	17,19,21	0.90	1 (5%)
2	NAG	B	2	2	14,14,15	1.34	2 (14%)	17,19,21	1.03	1 (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
2	NAG	B	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	B	2	2	-	2/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2	NAG	C1-C2	2.75	1.56	1.52
2	B	2	NAG	C4-C5	2.06	1.57	1.53

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2	NAG	C2-N2-C7	-2.94	118.96	122.90
2	B	1	NAG	C2-N2-C7	-2.13	120.05	122.90

There are no chirality outliers.

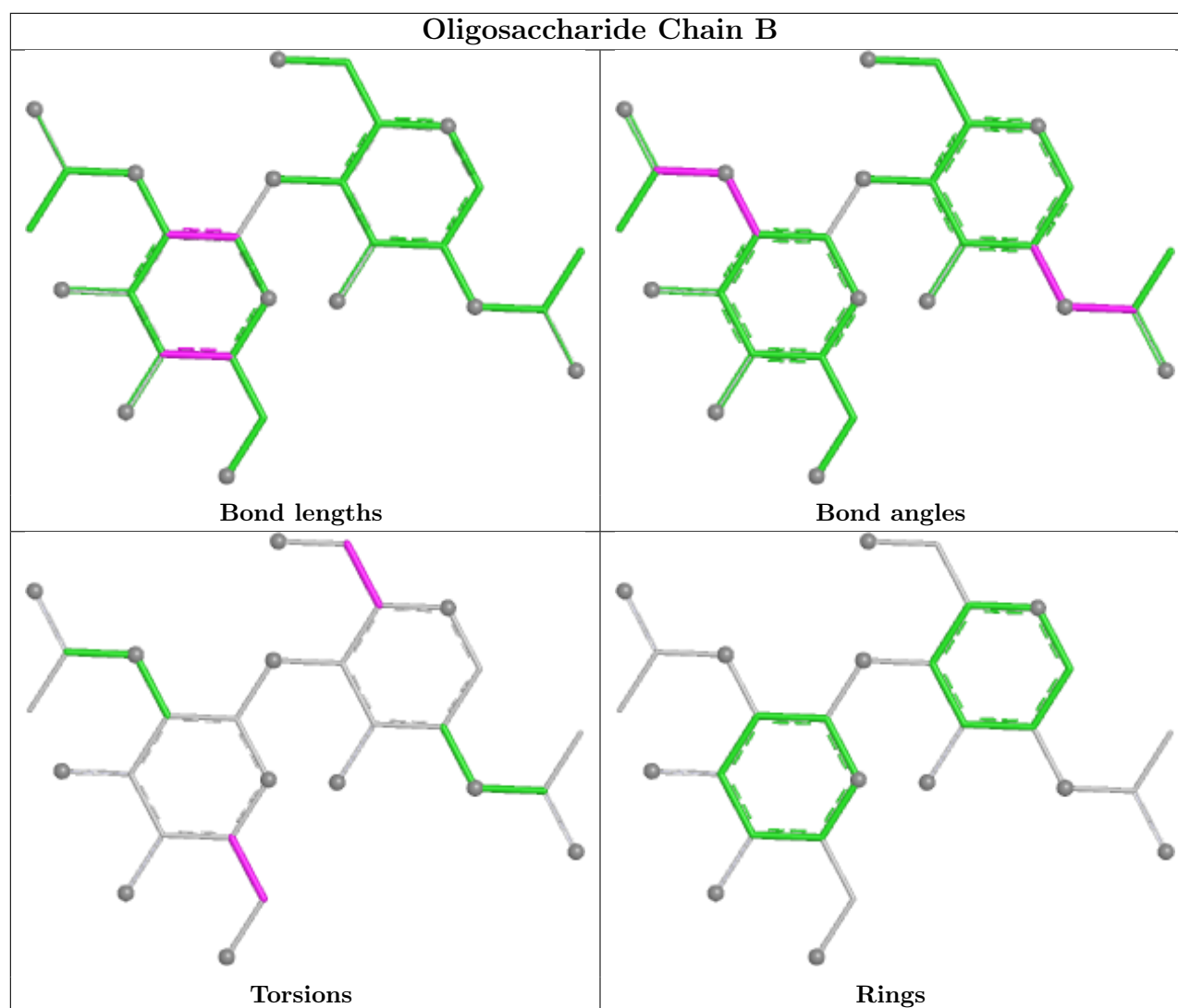
All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	1	NAG	O5-C5-C6-O6
2	B	1	NAG	C4-C5-C6-O6
2	B	2	NAG	C4-C5-C6-O6
2	B	2	NAG	O5-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

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



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	$\# Z > 2$
4	VX	A	999	1	2,5,6	0.74	0	1,5,8	0.55	0
5	MES	A	8010	-	12,12,12	8.64	9 (75%)	15,16,16	1.96	4 (26%)
5	MES	A	8020	-	12,12,12	8.02	8 (66%)	15,16,16	2.18	6 (40%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	A	9010	1	14,14,15	1.30	1 (7%)	17,19,21	1.20	1 (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
4	VX	A	999	1	-	0/1/3/4	-
5	MES	A	8010	-	-	4/6/14/14	0/1/1/1
5	MES	A	8020	-	-	3/6/14/14	0/1/1/1
3	NAG	A	9010	1	1/1/5/7	2/6/23/26	0/1/1/1

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	8010	MES	C8-S	-21.80	1.47	1.77
5	A	8020	MES	C8-S	-20.10	1.49	1.77
5	A	8010	MES	O2S-S	11.92	1.78	1.45
5	A	8010	MES	O1S-S	11.81	1.78	1.45
5	A	8020	MES	O2S-S	11.45	1.77	1.45
5	A	8020	MES	O1S-S	11.07	1.76	1.45
5	A	8010	MES	O3S-S	9.44	1.82	1.47
5	A	8020	MES	O3S-S	8.21	1.78	1.47
5	A	8020	MES	C7-C8	-4.34	1.41	1.52
5	A	8010	MES	C7-C8	-4.20	1.41	1.52
5	A	8010	MES	C7-N4	-3.53	1.39	1.47
5	A	8020	MES	C7-N4	-3.11	1.40	1.47
3	A	9010	NAG	O5-C5	2.74	1.48	1.43
5	A	8020	MES	O1-C6	2.54	1.52	1.42
5	A	8020	MES	O1-C2	2.46	1.52	1.42
5	A	8010	MES	C3-C2	-2.33	1.41	1.50
5	A	8010	MES	C5-C6	-2.30	1.41	1.50
5	A	8010	MES	O1-C6	2.24	1.51	1.42

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	8020	MES	O1S-S-C8	4.70	113.83	106.73
5	A	8010	MES	O1S-S-C8	4.09	112.92	106.73
3	A	9010	NAG	C2-N2-C7	-3.52	118.19	122.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	8020	MES	O2S-S-C8	3.30	111.72	106.73
5	A	8010	MES	O2S-S-C8	3.01	111.28	106.73
5	A	8020	MES	O3S-S-C8	2.74	111.37	106.00
5	A	8020	MES	C8-C7-N4	2.50	121.82	112.36
5	A	8020	MES	O2S-S-O1S	-2.49	105.71	113.82
5	A	8010	MES	C8-C7-N4	2.35	121.27	112.36
5	A	8020	MES	O3S-S-O1S	-2.08	106.19	111.40
5	A	8010	MES	O3S-S-C8	2.08	110.07	106.00

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	A	9010	NAG	C1

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	8010	MES	C7-C8-S-O2S
5	A	8020	MES	C7-C8-S-O1S
5	A	8020	MES	C7-C8-S-O2S
3	A	9010	NAG	O5-C5-C6-O6
5	A	8010	MES	C7-C8-S-O3S
3	A	9010	NAG	C4-C5-C6-O6
5	A	8020	MES	C7-C8-S-O3S
5	A	8010	MES	N4-C7-C8-S
5	A	8010	MES	C7-C8-S-O1S

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	8010	MES	1	0
5	A	8020	MES	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.