Full wwPDB X-ray Structure Validation Report (i)

Dec 2, 2024 – 09:12 AM EST

PDB ID	:	154L
Title	:	THE REFINED STRUCTURES OF GOOSE LYSOZYME AND ITS COMPLEX WITH A BOUND TRISACCHARIDE SHOW THAT THE "GOOSE-TYPE LYSOZYMES LACK A CATALYTIC ASPARTATE
Authors	:	Weaver, L.H.; Gruetter, M.G.; Matthews, B.W.
Deposited on	:	1994-05-05
Resolution	:	1.60 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

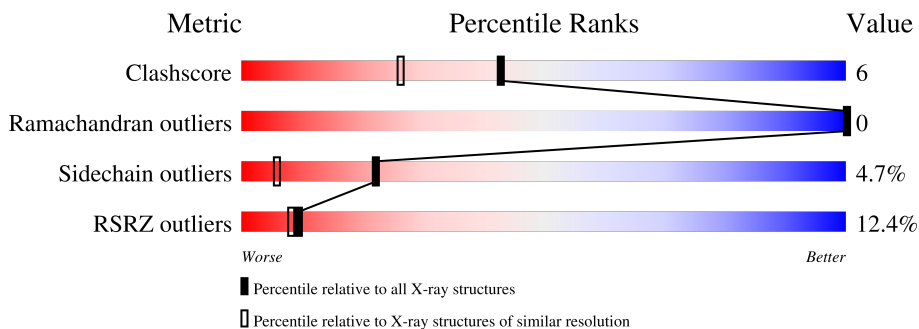|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

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 1.60 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		6
Ramachandran outliers		0
Sidechain outliers		4.7%
RSRZ outliers		12.4%

Worse　　　　　　　　　　　　　　　*Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	180529	4682 (1.60-1.60)
Ramachandran outliers	177936	4583 (1.60-1.60)
Sidechain outliers	177891	4582 (1.60-1.60)
RSRZ outliers	164620	4272 (1.60-1.60)

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%

| Mol	Chain	Length	Quality of chain
1	A	185	12% ▬▬ 82% ▬▬▬▬▬▬▬▬▬ 14% · ·
2	B	3	100%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 1639 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 GOOSE LYSOZYME.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	185	Total	C	N	O	S	0	0	0
			1432	891	264	270	7			

- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.
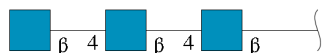
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	3	Total	C	N	O	0	0	0
			43	24	3	16			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	164	Total	O	0	0
			164	164		

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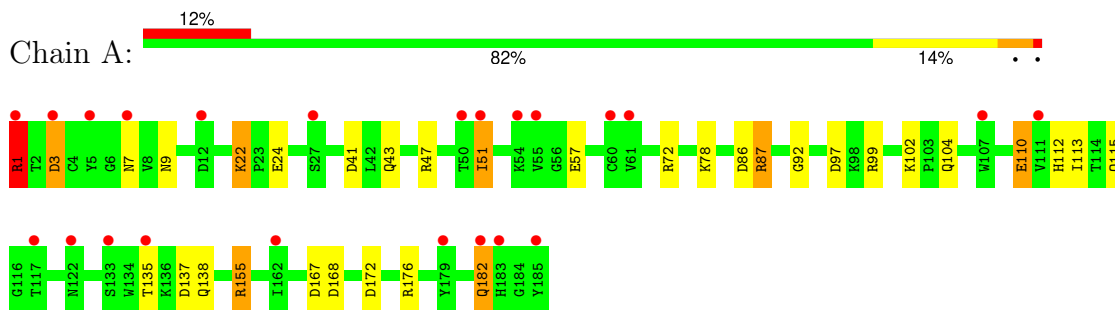
• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	38.30Å 65.40Å 44.70Å 90.00° 117.00° 90.00°	Depositor
Resolution (Å)	6.00 – 1.60 6.00 – 1.60	Depositor EDS
% Data completeness (in resolution range)	(Not available) (6.00-1.60) 74.1 (6.00-1.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	90275.00 (at 1.57Å)	Xtriage
Refinement program	TNT	Depositor
R, R_{free}	0.159 , (Not available) 0.304 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	12.6	Xtriage
Anisotropy	0.204	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.54 , 70.2	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.029 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.85	EDS
Total number of atoms	1639	wwPDB-VP
Average B, all atoms (Å^2)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.02% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

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: NAG

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	1.10	3/1458 (0.2%)	1.45	23/1960 (1.2%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	57	GLU	CD-OE1	7.76	1.34	1.25
1	A	24	GLU	CD-OE2	6.50	1.32	1.25
1	A	110	GLU	CD-OE2	5.02	1.31	1.25

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	86	ASP	CB-CG-OD2	-10.85	108.53	118.30
1	A	97	ASP	CB-CG-OD2	-9.65	109.61	118.30
1	A	86	ASP	CB-CG-OD1	9.30	126.67	118.30
1	A	99	ARG	NE-CZ-NH2	-8.30	116.15	120.30
1	A	41	ASP	CB-CG-OD1	-8.00	111.10	118.30
1	A	97	ASP	CB-CG-OD1	7.56	125.10	118.30
1	A	3	ASP	CB-CG-OD2	-7.54	111.51	118.30
1	A	3	ASP	CB-CG-OD1	7.11	124.70	118.30
1	A	176	ARG	NE-CZ-NH1	7.08	123.84	120.30
1	A	41	ASP	CB-CG-OD2	6.96	124.56	118.30
1	A	155	ARG	NE-CZ-NH1	-6.88	116.86	120.30
1	A	87	ARG	NE-CZ-NH1	6.79	123.69	120.30
1	A	176	ARG	NE-CZ-NH2	-6.50	117.05	120.30
1	A	47	ARG	NE-CZ-NH2	-6.30	117.15	120.30
1	A	168	ASP	CB-CG-OD2	6.10	123.79	118.30
1	A	87	ARG	NE-CZ-NH2	-5.79	117.41	120.30
1	A	155	ARG	NE-CZ-NH2	5.73	123.17	120.30
1	A	182	GLN	N-CA-CB	-5.65	100.43	110.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	167	ASP	CB-CG-OD2	5.31	123.08	118.30
1	A	172	ASP	CB-CG-OD2	5.24	123.02	118.30
1	A	137	ASP	CB-CG-OD1	-5.21	113.61	118.30
1	A	72	ARG	NE-CZ-NH1	5.10	122.85	120.30
1	A	1	ARG	CA-CB-CG	-5.05	102.28	113.40

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	1432	0	1425	18	0
2	B	43	0	39	0	0
3	A	164	0	0	4	0
All	All	1639	0	1464	18	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 6.

All (18) 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:51:ILE:CD1	1:A:113:ILE:HD12	2.02	0.88
1:A:51:ILE:HD13	1:A:113:ILE:HD12	1.64	0.78
1:A:135:THR:H	1:A:138:GLN:HE21	1.33	0.78
1:A:22:LYS:HE3	3:A:454:HOH:O	1.85	0.77
1:A:1:ARG:HH21	1:A:3:ASP:HB3	1.58	0.68
1:A:51:ILE:HD11	1:A:113:ILE:HD12	1.79	0.64
1:A:51:ILE:HD11	1:A:110:GLU:HA	1.81	0.63
1:A:43:GLN:HG2	3:A:318:HOH:O	2.05	0.56
1:A:1:ARG:NH1	1:A:1:ARG:HB2	2.20	0.56
1:A:104:GLN:H	1:A:115:GLN:HE22	1.56	0.54
1:A:7:ASN:OD1	1:A:9:ASN:HB2	2.10	0.52
1:A:155:ARG:NE	3:A:433:HOH:O	2.38	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:155:ARG:HD3	3:A:432:HOH:O	2.12	0.48
1:A:104:GLN:H	1:A:115:GLN:NE2	2.11	0.47
1:A:135:THR:H	1:A:138:GLN:NE2	2.09	0.45
1:A:1:ARG:HB2	1:A:1:ARG:HH11	1.82	0.43
1:A:92:GLY:HA3	1:A:112:HIS:CE1	2.54	0.42
1:A:51:ILE:HD13	1:A:113:ILE:CD1	2.43	0.41

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	183/185 (99%)	179 (98%)	4 (2%)	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	149/149 (100%)	142 (95%)	7 (5%)	22	6

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	ARG
1	A	22	LYS
1	A	51	ILE
1	A	78	LYS
1	A	87	ARG
1	A	102	LYS
1	A	182	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	9	ASN
1	A	82	ASN
1	A	104	GLN
1	A	115	GLN
1	A	128	GLN
1	A	138	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 ⓘ

3 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	15,15,15	1.10	0	21,21,21	2.87	6 (28%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
2	NAG	B	2	2	14,14,15	1.00	1 (7%)	17,19,21	1.85	2 (11%)
2	NAG	B	3	2	14,14,15	0.68	0	17,19,21	1.64	4 (23%)

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	-	4/6/26/26	0/1/1/1
2	NAG	B	2	2	-	0/6/23/26	0/1/1/1
2	NAG	B	3	2	-	0/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2	NAG	C2-N2	2.01	1.49	1.46

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	1	NAG	O7-C7-C8	-10.53	103.31	122.05
2	B	2	NAG	O6-C6-C5	-5.32	93.21	111.33
2	B	3	NAG	C1-O5-C5	4.81	118.63	112.19
2	B	1	NAG	C1-C2-C3	4.57	116.78	110.54
2	B	1	NAG	C3-C2-N2	4.16	118.28	110.62
2	B	2	NAG	C2-N2-C7	-3.34	118.42	122.90
2	B	1	NAG	O7-C7-N2	2.64	126.64	121.98
2	B	3	NAG	O5-C5-C6	-2.49	102.82	107.66
2	B	1	NAG	O5-C1-C2	2.45	111.98	109.52
2	B	3	NAG	O4-C4-C3	-2.37	104.78	110.38
2	B	3	NAG	C2-N2-C7	-2.30	119.81	122.90
2	B	1	NAG	O1-C1-O5	-2.20	103.89	110.41

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	1	NAG	C8-C7-N2-C2
2	B	1	NAG	C4-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
2	B	1	NAG	O7-C7-N2-C2
2	B	1	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.

Oligosaccharide Chain B

Bond lengths

Bond angles

Torsions

Rings
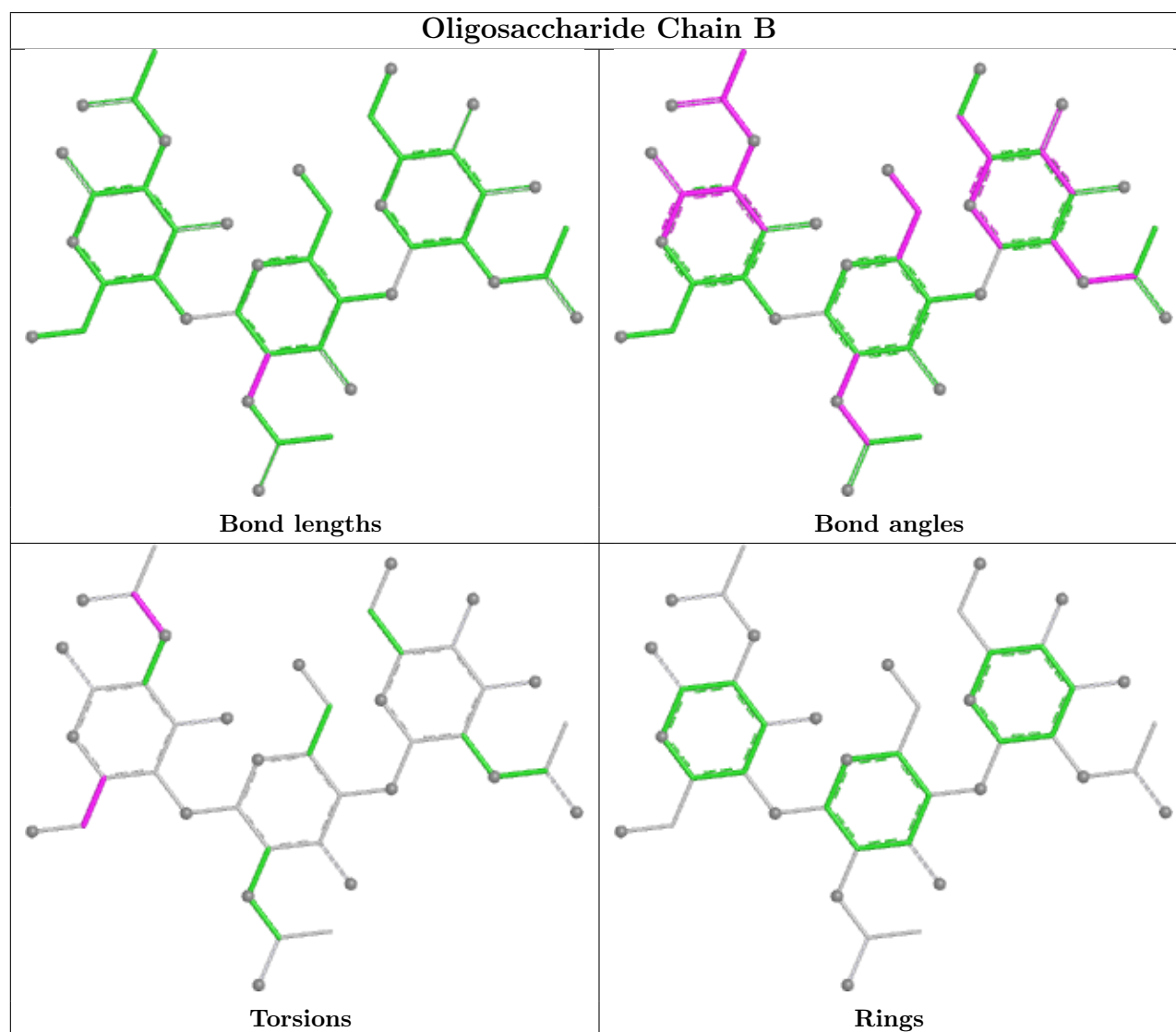
5.6 Ligand geometry ⓘ

There are no ligands in this entry.

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 ⓘ

Warning: The R factor obtained from EDS is 0.3099, which does not match the depositor's R factor of 0.159. Please interpret the results in this section carefully.

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å²)	Q<0.9
1	A	185/185 (100%)	1.08	23 (12%) 9 8	7, 16, 31, 47	0

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	ARG	4.8
1	A	60	CYS	3.2
1	A	50	THR	3.1
1	A	55	VAL	3.0
1	A	179	TYR	3.0
1	A	5	TYR	3.0
1	A	185	TYR	2.9
1	A	107	TRP	2.8
1	A	111	VAL	2.6
1	A	54	LYS	2.6
1	A	61	VAL	2.3
1	A	27	SER	2.3
1	A	182	GLN	2.2
1	A	135	THR	2.2
1	A	133	SER	2.1
1	A	3	ASP	2.1
1	A	7	ASN	2.1
1	A	122	ASN	2.1
1	A	117	THR	2.1
1	A	162	ILE	2.1
1	A	183	HIS	2.0
1	A	12	ASP	2.0
1	A	51	ILE	2.0

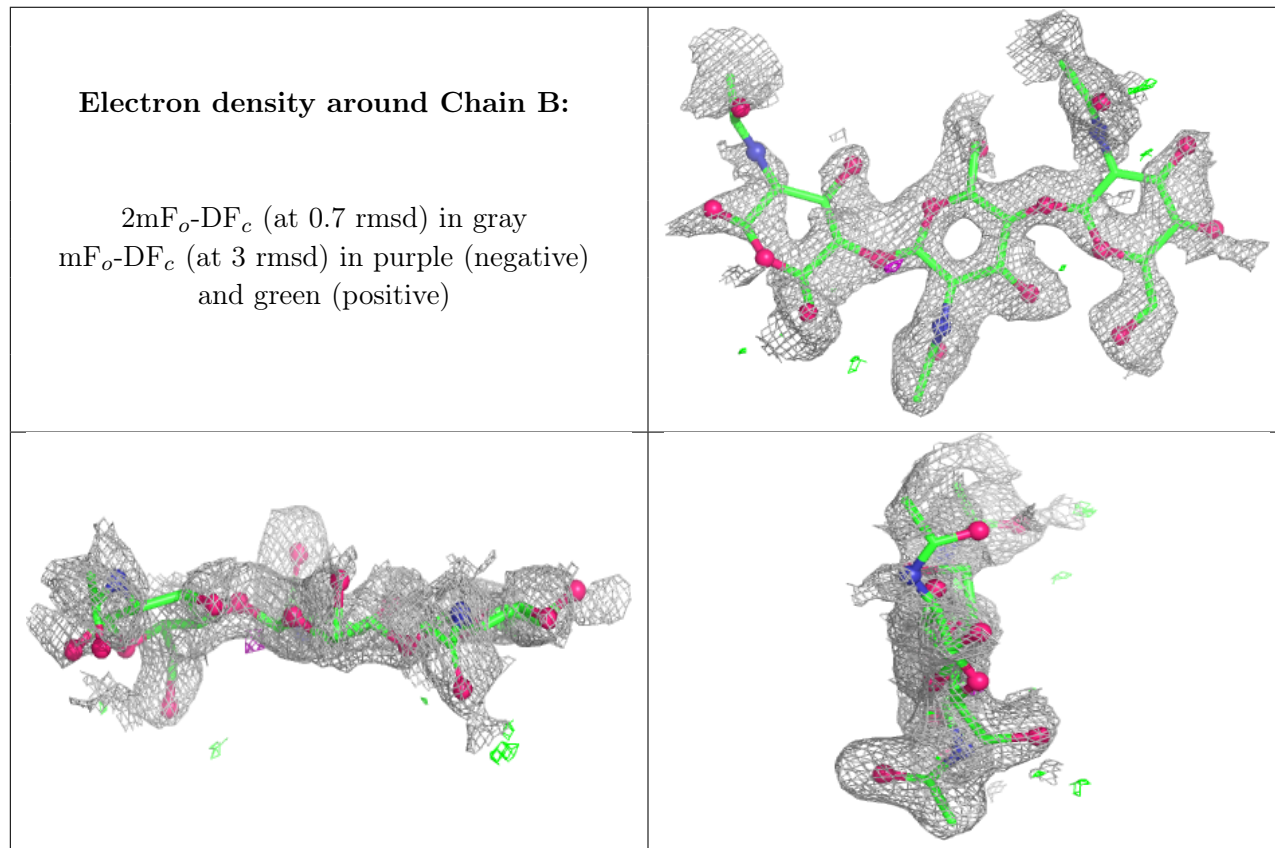## 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	NAG	B	1	15/15	0.60	0.16	28,40,50,51	0
2	NAG	B	3	14/15	0.67	0.13	29,38,47,47	0
2	NAG	B	2	14/15	0.79	0.12	20,31,37,38	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain B:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.