Full wwPDB X-ray Structure Validation Report ⓘ

Nov 28, 2023 – 02:16 AM EST

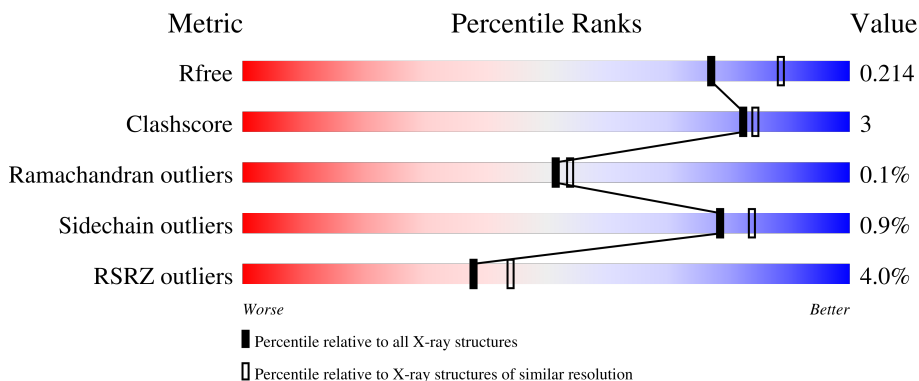|		
PDB ID	:	8UZO
Title	:	Crystal Structure of Betaine aldehyde dehydrogenase (BetB) from Klebsiella aerogenes (ADP bound)
Authors	:	Seattle Structural Genomics Center for Infectious Disease; Seattle Structural Genomics Center for Infectious Disease (SSGCID)
Deposited on	:	2023-11-15
Resolution	:	2.10 Å(reported)

---

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 2.10 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
Rfree		0.214
Clashscore		3
Ramachandran outliers		0.1%
Sidechain outliers		0.9%
RSRZ outliers		4.0%

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))
R$_{free}$	130704	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	499	% 92% 5% •
1	B	499	% 92% 6% •
1	C	499	2% 93% • •
1	D	499	12% 88% 9% •

2　Entry composition　ⓘ

There are 4 unique types of molecules in this entry. The entry contains 15572 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 Betaine aldehyde dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	488	Total	C	N	O	S	0	10	0
			3755	2373	648	717	17			
1	B	488	Total	C	N	O	S	0	8	0
			3737	2363	644	712	18			
1	C	488	Total	C	N	O	S	0	8	0
			3738	2364	645	712	17			
1	D	486	Total	C	N	O	S	0	7	0
			3711	2349	639	707	16			

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	MET	-	expression tag	UNP A0A447LC14
A	-7	ALA	-	expression tag	UNP A0A447LC14
A	-6	HIS	-	expression tag	UNP A0A447LC14
A	-5	HIS	-	expression tag	UNP A0A447LC14
A	-4	HIS	-	expression tag	UNP A0A447LC14
A	-3	HIS	-	expression tag	UNP A0A447LC14
A	-2	HIS	-	expression tag	UNP A0A447LC14
A	-1	HIS	-	expression tag	UNP A0A447LC14
A	0	HIS	-	expression tag	UNP A0A447LC14
A	62	ALA	VAL	engineered mutation	UNP A0A447LC14
A	485	PRO	GLN	engineered mutation	UNP A0A447LC14
B	-8	MET	-	expression tag	UNP A0A447LC14
B	-7	ALA	-	expression tag	UNP A0A447LC14
B	-6	HIS	-	expression tag	UNP A0A447LC14
B	-5	HIS	-	expression tag	UNP A0A447LC14
B	-4	HIS	-	expression tag	UNP A0A447LC14
B	-3	HIS	-	expression tag	UNP A0A447LC14
B	-2	HIS	-	expression tag	UNP A0A447LC14
B	-1	HIS	-	expression tag	UNP A0A447LC14
B	0	HIS	-	expression tag	UNP A0A447LC14
B	62	ALA	VAL	engineered mutation	UNP A0A447LC14

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	485	PRO	GLN	engineered mutation	UNP A0A447LC14
C	-8	MET	-	expression tag	UNP A0A447LC14
C	-7	ALA	-	expression tag	UNP A0A447LC14
C	-6	HIS	-	expression tag	UNP A0A447LC14
C	-5	HIS	-	expression tag	UNP A0A447LC14
C	-4	HIS	-	expression tag	UNP A0A447LC14
C	-3	HIS	-	expression tag	UNP A0A447LC14
C	-2	HIS	-	expression tag	UNP A0A447LC14
C	-1	HIS	-	expression tag	UNP A0A447LC14
C	0	HIS	-	expression tag	UNP A0A447LC14
C	62	ALA	VAL	engineered mutation	UNP A0A447LC14
C	485	PRO	GLN	engineered mutation	UNP A0A447LC14
D	-8	MET	-	expression tag	UNP A0A447LC14
D	-7	ALA	-	expression tag	UNP A0A447LC14
D	-6	HIS	-	expression tag	UNP A0A447LC14
D	-5	HIS	-	expression tag	UNP A0A447LC14
D	-4	HIS	-	expression tag	UNP A0A447LC14
D	-3	HIS	-	expression tag	UNP A0A447LC14
D	-2	HIS	-	expression tag	UNP A0A447LC14
D	-1	HIS	-	expression tag	UNP A0A447LC14
D	0	HIS	-	expression tag	UNP A0A447LC14
D	62	ALA	VAL	engineered mutation	UNP A0A447LC14
D	485	PRO	GLN	engineered mutation	UNP A0A447LC14

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$) (labeled as "Ligand of Interest" by depositor).
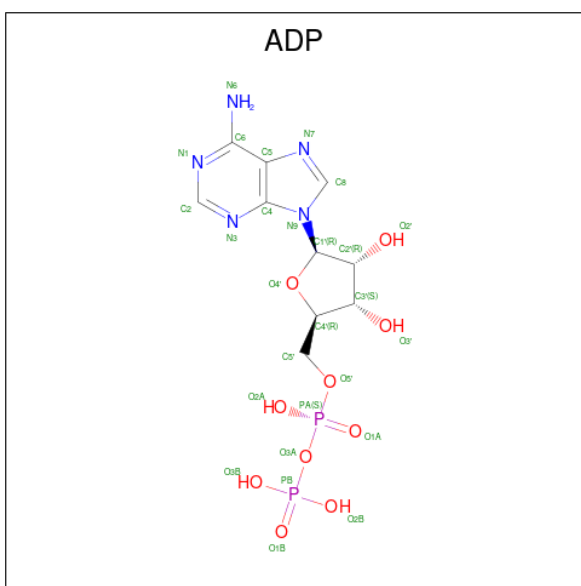
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 27	C 10	N 5	O 10	P 2	0	0
2	B	1	Total 27	C 10	N 5	O 10	P 2	0	0
2	C	1	Total 27	C 10	N 5	O 10	P 2	0	0
2	D	1	Total 27	C 10	N 5	O 10	P 2	0	0

- Molecule 3 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Na 1	0	0
3	B	1	Total 1	Na 1	0	0
3	C	1	Total 1	Na 1	0	0
3	D	1	Total 1	Na 1	0	0

- Molecule 4 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	154	Total 154	O 154	0	0
4	B	150	Total 150	O 150	0	0
4	C	138	Total 138	O 138	0	0
4	D	77	Total 77	O 77	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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). 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.
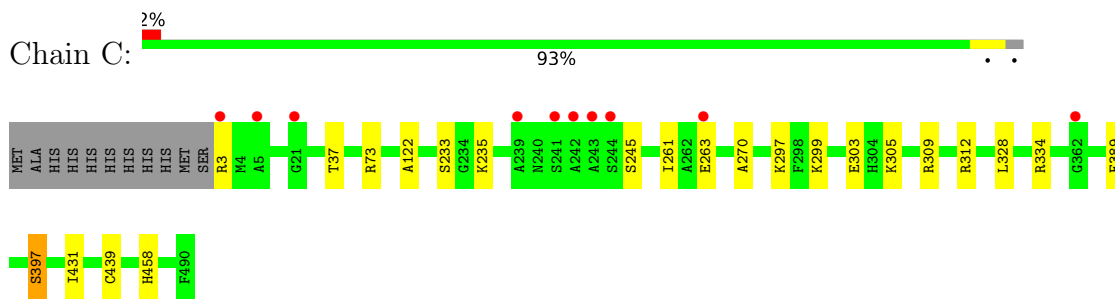
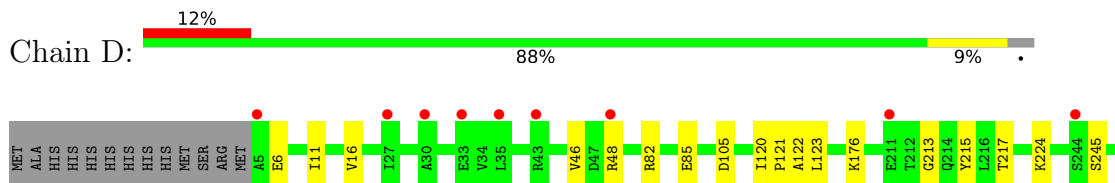• Molecule 1: Betaine aldehyde dehydrogenase
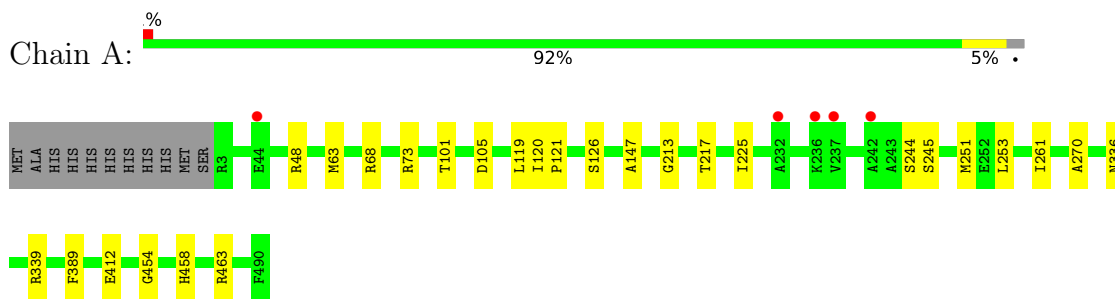
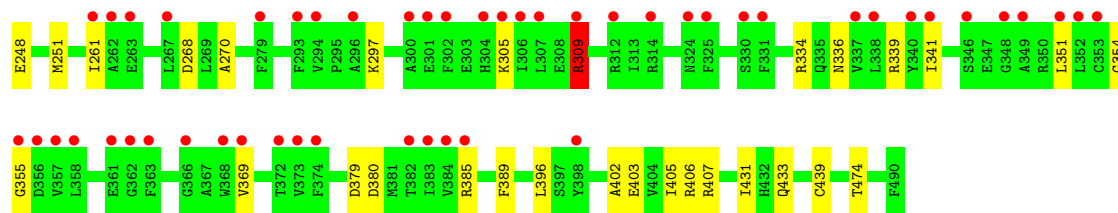• Molecule 1: Betaine aldehyde dehydrogenase
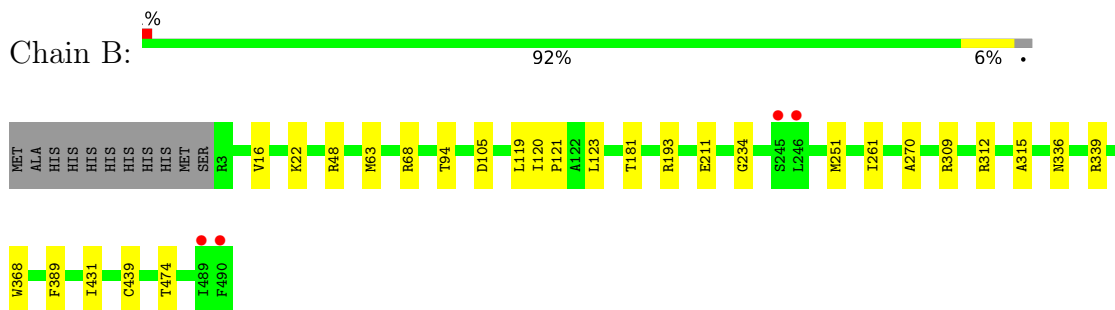
• Molecule 1: Betaine aldehyde dehydrogenase

• Molecule 1: Betaine aldehyde dehydrogenase

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	83.80Å 100.58Å 123.75Å 90.00° 95.90° 90.00°	Depositor
Resolution (Å)	83.36 – 2.10 123.10 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.3 (83.36-2.10) 99.3 (123.10-2.10)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.83 (at 2.10Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.187 , 0.213 0.190 , 0.214	Depositor DCC
R_{free} test set	5854 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å^2)	37.3	Xtriage
Anisotropy	0.496	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 44.4	EDS
L-test for twinning[2]	$< |L| > = 0.51, < L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	15572	wwPDB-VP
Average B, all atoms (Å^2)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.24% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[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: NA, ADP

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	0.33	0/3842	0.56	0/5209
1	B	0.32	0/3826	0.57	0/5185
1	C	0.31	0/3824	0.56	0/5184
1	D	0.32	0/3797	0.56	0/5149
All	All	0.32	0/15289	0.57	0/20727

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
1	B	0	1
1	D	0	1
All	All	0	3

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	48	ARG	Sidechain
1	B	193	ARG	Sidechain
1	D	309	ARG	Sidechain

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	3755	0	3740	15	0
1	B	3737	0	3740	15	0
1	C	3738	0	3735	18	0
1	D	3711	0	3711	34	0
2	A	27	0	12	0	0
2	B	27	0	12	0	0
2	C	27	0	12	0	0
2	D	27	0	12	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	154	0	0	0	0
4	B	150	0	0	0	0
4	C	138	0	0	0	0
4	D	77	0	0	0	0
All	All	15572	0	14974	76	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 3.

All (76) 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:D:16:VAL:HG21	1:D:48:ARG:NH1	2.14	0.62
1:C:261[A]:ILE:HG12	1:C:270:ALA:HB1	1.82	0.62
1:C:309:ARG:HG3	1:C:312:ARG:NH2	2.16	0.61
1:A:244:SER:O	1:C:235:LYS:NZ	2.34	0.60
1:C:309:ARG:HG3	1:C:312:ARG:HH21	1.65	0.60
1:C:3:ARG:NH2	1:C:37:THR:OG1	2.35	0.58
1:B:16:VAL:HG21	1:B:48:ARG:HH22	1.69	0.57
1:B:16:VAL:HG21	1:B:48:ARG:NH2	2.20	0.57
1:D:305:LYS:HB3	1:D:309:ARG:HH21	1.70	0.57
1:D:380:ASP:HA	1:D:385:ARG:HE	1.70	0.56
1:D:268:ASP:HA	1:D:309:ARG:HH22	1.70	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:16:VAL:HG21	1:D:48:ARG:HH12	1.71	0.55
1:A:147:ALA:HB3	1:A:225:ILE:HD13	1.89	0.55
1:B:22:LYS:NZ	1:B:211:GLU:OE1	2.32	0.55
1:D:46:VAL:HG21	1:D:215:TYR:HB2	1.89	0.55
1:B:431:ILE:HD12	1:B:439:CYS:HB3	1.90	0.54
1:C:261[B]:ILE:HD12	1:C:270:ALA:HB1	1.91	0.53
1:A:412:GLU:OE1	1:A:458:HIS:ND1	2.43	0.51
1:C:431:ILE:HD12	1:C:439:CYS:HB3	1.91	0.51
1:B:63:MET:O	1:B:68:ARG:NH1	2.45	0.50
1:C:263:GLU:CD	1:C:297:LYS:HD3	2.32	0.50
1:B:119:LEU:HD21	1:C:122:ALA:HB2	1.93	0.50
1:D:380:ASP:HB2	1:D:385:ARG:NH2	2.27	0.50
1:A:336:ASN:OD1	1:A:339:ARG:NH2	2.41	0.50
1:C:305:LYS:O	1:C:309:ARG:HD3	2.12	0.49
1:A:458:HIS:NE2	1:C:245:SER:HB2	2.27	0.49
1:D:431:ILE:HD12	1:D:439:CYS:HB3	1.96	0.48
1:D:213:GLY:O	1:D:217:THR:HG23	2.14	0.47
1:B:309:ARG:HG2	1:B:312:ARG:HH21	1.80	0.47
1:C:328:LEU:HD12	1:C:334:ARG:HA	1.95	0.47
1:D:120:ILE:HB	1:D:121:PRO:HD3	1.96	0.47
1:D:380:ASP:HA	1:D:385:ARG:HH21	1.79	0.47
1:A:261[B]:ILE:HD12	1:A:270:ALA:HB1	1.97	0.47
1:A:245:SER:HB2	1:C:458:HIS:NE2	2.30	0.47
1:B:123:LEU:HD21	1:B:474:THR:HG21	1.97	0.46
1:B:94:THR:HG22	1:B:181:THR:HG21	1.98	0.46
1:C:299:LYS:NZ	1:C:303:GLU:OE2	2.49	0.46
1:D:379:ASP:OD2	1:D:407:ARG:NE	2.49	0.45
1:D:11:ILE:HG21	1:D:48:ARG:HG2	1.98	0.45
1:D:268:ASP:HA	1:D:309:ARG:NH2	2.32	0.44
1:A:119:LEU:HD21	1:D:122:ALA:HB2	1.99	0.44
1:A:101:THR:HG22	1:A:105:ASP:OD2	2.18	0.44
1:D:403:GLU:HG2	1:D:407:ARG:HD3	1.99	0.44
1:D:380:ASP:CB	1:D:385:ARG:HH21	2.30	0.44
1:D:380:ASP:HA	1:D:385:ARG:NE	2.31	0.43
1:B:261[B]:ILE:HD12	1:B:270:ALA:HB1	2.01	0.43
1:D:396:LEU:N	1:D:396:LEU:HD12	2.33	0.43
1:A:213:GLY:O	1:A:217:THR:HG23	2.19	0.43
1:A:251:MET:HE3	1:A:253:LEU:HD21	2.01	0.43
1:B:234:GLY:HA3	1:B:251:MET:HE3	2.01	0.42
1:D:405:ILE:HD13	1:D:433:GLN:OE1	2.18	0.42
1:B:120:ILE:HB	1:B:121:PRO:HD3	2.00	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:380:ASP:O	1:D:385:ARG:CZ	2.67	0.42
1:D:224:LYS:HZ2	1:D:248:GLU:HG2	1.84	0.42
1:D:334:ARG:HG3	1:D:369:VAL:CG2	2.50	0.42
1:D:402:ALA:O	1:D:406:ARG:HG3	2.19	0.42
1:D:261[B]:ILE:HD12	1:D:270:ALA:HB1	2.01	0.42
1:A:63:MET:O	1:A:68:ARG:NH1	2.51	0.42
1:D:351:LEU:HD21	1:D:354:GLY:O	2.20	0.42
1:D:380:ASP:HA	1:D:385:ARG:NH2	2.34	0.41
1:D:341:ILE:HG21	1:D:355:GLY:HA2	2.02	0.41
1:B:336:ASN:OD1	1:B:339:ARG:NH2	2.38	0.41
1:B:119:LEU:CD2	1:C:122:ALA:HB2	2.50	0.41
1:D:123:LEU:HD21	1:D:474:THR:HG21	2.03	0.41
1:D:403:GLU:OE2	1:D:407:ARG:NH1	2.51	0.41
1:A:454:GLY:HA3	1:A:463:ARG:HD3	2.03	0.41
1:C:299:LYS:HD2	1:C:397:SER:HB2	2.03	0.41
1:C:309:ARG:CG	1:C:312:ARG:HH21	2.32	0.41
1:D:406:ARG:HE	1:D:406:ARG:HB2	1.64	0.41
1:A:120:ILE:HB	1:A:121:PRO:HD3	2.03	0.41
1:B:315:ALA:HB1	1:B:368:TRP:CZ3	2.56	0.41
1:D:82[B]:ARG:NH2	1:D:85:GLU:OE2	2.54	0.40
1:D:336:ASN:OD1	1:D:339:ARG:NH1	2.55	0.40
1:D:380:ASP:CB	1:D:385:ARG:NH2	2.84	0.40

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	496/499 (99%)	485 (98%)	11 (2%)	0	100	100
1	B	494/499 (99%)	485 (98%)	9 (2%)	0	100	100
1	C	494/499 (99%)	483 (98%)	11 (2%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	491/499 (98%)	480 (98%)	10 (2%)	1 (0%)	47	49
All	All	1975/1996 (99%)	1933 (98%)	41 (2%)	1 (0%)	51	54

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	6	GLU

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	392/394 (100%)	389 (99%)	3 (1%)	81	86
1	B	391/394 (99%)	389 (100%)	2 (0%)	88	92
1	C	390/394 (99%)	387 (99%)	3 (1%)	81	86
1	D	387/394 (98%)	380 (98%)	7 (2%)	59	65
All	All	1560/1576 (99%)	1545 (99%)	15 (1%)	78	82

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	126[A]	SER
1	A	126[B]	SER
1	A	389	PHE
1	B	105	ASP
1	B	389	PHE
1	C	233	SER
1	C	389	PHE
1	C	397	SER
1	D	105	ASP
1	D	176	LYS
1	D	245	SER
1	D	251	MET
1	D	297	LYS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	D	309	ARG
1	D	389	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 for Mogul analysis.

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	ADP	C	501	-	24,29,29	0.66	0	29,45,45	0.83	1 (3%)
2	ADP	B	501	-	24,29,29	0.66	0	29,45,45	0.82	1 (3%)
2	ADP	D	501	-	24,29,29	0.66	0	29,45,45	0.83	1 (3%)
2	ADP	A	501	-	24,29,29	0.67	0	29,45,45	0.84	1 (3%)

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	ADP	C	501	-	-	0/12/32/32	0/3/3/3
2	ADP	B	501	-	-	1/12/32/32	0/3/3/3
2	ADP	D	501	-	-	2/12/32/32	0/3/3/3
2	ADP	A	501	-	-	2/12/32/32	0/3/3/3

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	501	ADP	C5-C6-N6	2.17	123.65	120.35
2	A	501	ADP	C5-C6-N6	2.15	123.62	120.35
2	B	501	ADP	C5-C6-N6	2.14	123.61	120.35
2	C	501	ADP	C5-C6-N6	2.06	123.48	120.35

There are no chirality outliers.

All (5) torsion outliers are listed below:

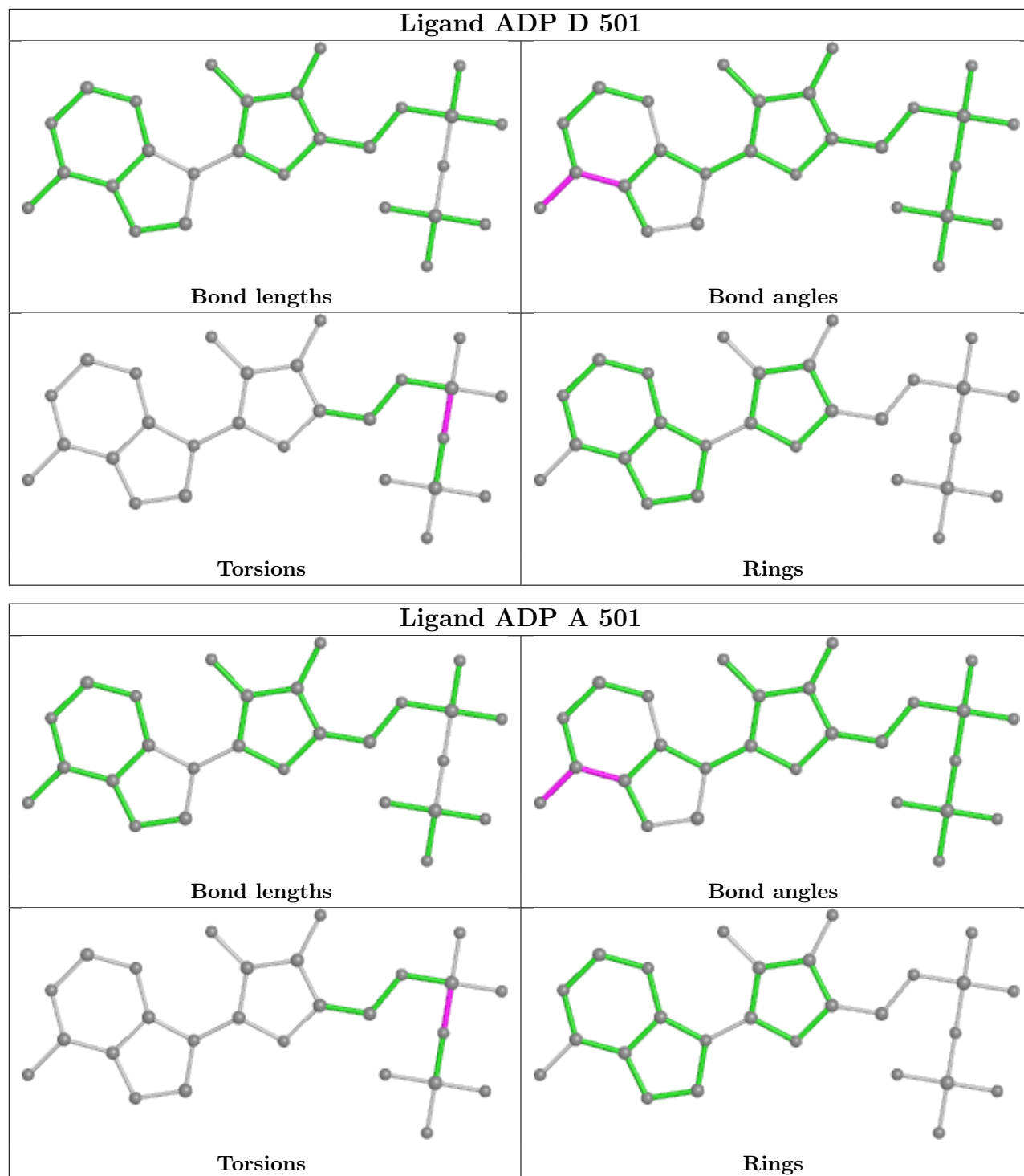| Mol	Chain	Res	Type	Atoms
2	A	501	ADP	PB-O3A-PA-O1A
2	D	501	ADP	PB-O3A-PA-O1A
2	D	501	ADP	PB-O3A-PA-O2A
2	A	501	ADP	PB-O3A-PA-O2A
2	B	501	ADP	C5'-O5'-PA-O1A

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 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 ADP C 501

Bond lengths

Bond angles

Torsions

Rings

Ligand ADP B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand ADP D 501

Bond lengths

Bond angles

Torsions

Rings

Ligand ADP A 501

Bond lengths

Bond angles

Torsions

Rings
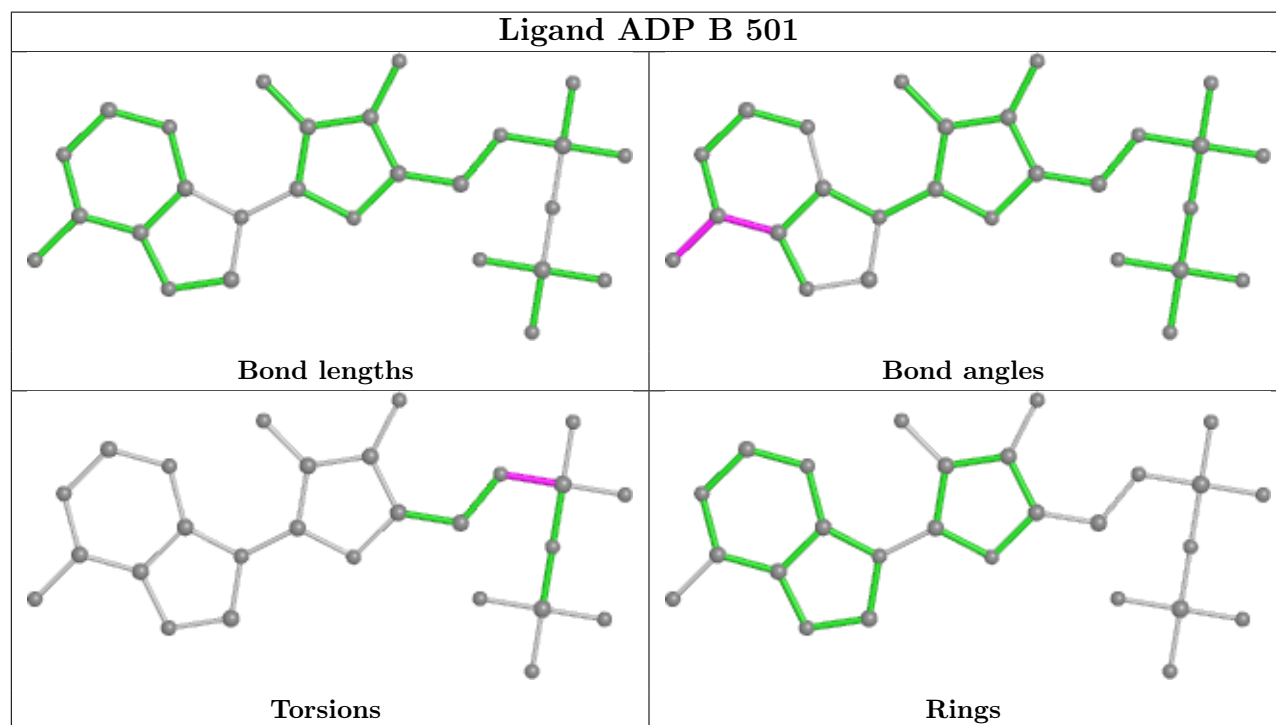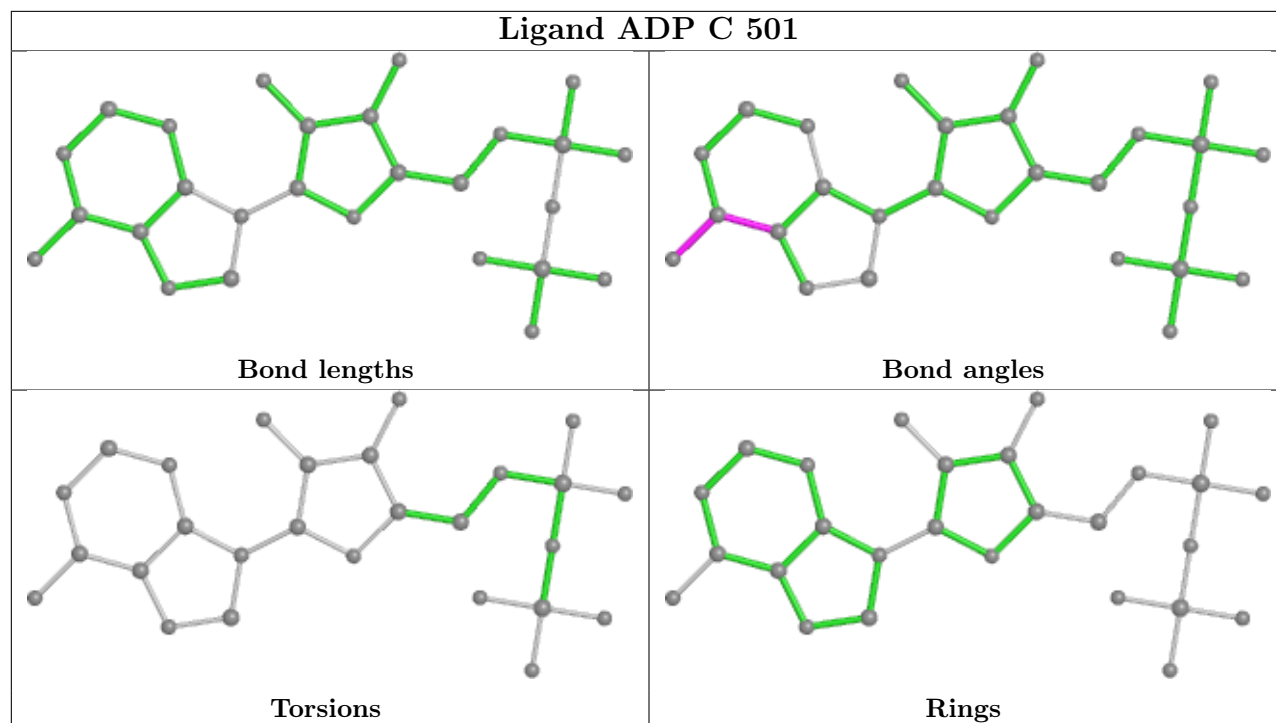
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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(Å^2)	Q<0.9
1	A	488/499 (97%)	0.01	5 (1%)	82	85	27, 42, 68, 98	0
1	B	488/499 (97%)	-0.04	4 (0%)	86	88	29, 43, 69, 100	0
1	C	488/499 (97%)	0.19	10 (2%)	65	69	26, 52, 79, 120	0
1	D	486/499 (97%)	0.70	59 (12%)	4	5	27, 67, 112, 135	0
All	All	1950/1996 (97%)	0.22	78 (4%)	38	44	26, 48, 96, 135	0

All (78) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	5	ALA	5.5
1	D	363	PHE	5.0
1	D	304	HIS	4.8
1	D	351	LEU	4.7
1	C	362	GLY	4.5
1	D	374	PHE	4.4
1	D	338	LEU	4.3
1	D	356	ASP	4.1
1	B	490	PHE	4.0
1	D	373	VAL	4.0
1	D	341	ILE	3.9
1	D	383	ILE	3.9
1	D	368	TRP	3.8
1	D	353	CYS	3.8
1	D	352	LEU	3.8
1	D	358	LEU	3.8
1	B	489	ILE	3.6
1	D	398	TYR	3.6
1	D	262	ALA	3.5
1	D	279	PHE	3.5
1	D	337	VAL	3.5

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	D	331	PHE	3.4
1	C	242	ALA	3.4
1	D	312	ARG	3.4
1	D	366	GLY	3.4
1	D	372	THR	3.4
1	D	361	GLU	3.3
1	D	309	ARG	3.2
1	D	325	PHE	3.2
1	D	307	LEU	3.2
1	D	362	GLY	3.2
1	D	349	ALA	3.1
1	D	330	SER	3.1
1	A	242	ALA	3.1
1	D	355	GLY	3.0
1	D	33	GLU	3.0
1	D	357	VAL	3.0
1	D	244	SER	2.9
1	D	300	ALA	2.9
1	C	3	ARG	2.9
1	C	21	GLY	2.9
1	C	243	ALA	2.9
1	D	48	ARG	2.8
1	D	301	GLU	2.8
1	D	305	LYS	2.7
1	D	340	TYR	2.6
1	D	382	THR	2.6
1	D	384	VAL	2.6
1	A	237	VAL	2.6
1	D	27	ILE	2.6
1	D	296	ALA	2.4
1	A	44	GLU	2.4
1	C	263	GLU	2.4
1	D	30	ALA	2.4
1	B	245	SER	2.4
1	C	239	ALA	2.4
1	D	35	LEU	2.3
1	C	5	ALA	2.3
1	D	261[A]	ILE	2.3
1	D	346	SER	2.3
1	D	314	ARG	2.3
1	D	293	PHE	2.2
1	D	324	ASN	2.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	D	267	LEU	2.2
1	D	302	PHE	2.2
1	D	211	GLU	2.1
1	C	241	SER	2.1
1	C	244	SER	2.1
1	D	348	GLY	2.1
1	D	294	VAL	2.1
1	D	306	ILE	2.1
1	D	385	ARG	2.1
1	D	263	GLU	2.0
1	D	43	ARG	2.0
1	A	232	ALA	2.0
1	D	369	VAL	2.0
1	A	236	LYS	2.0
1	B	246	LEU	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 ⓘ
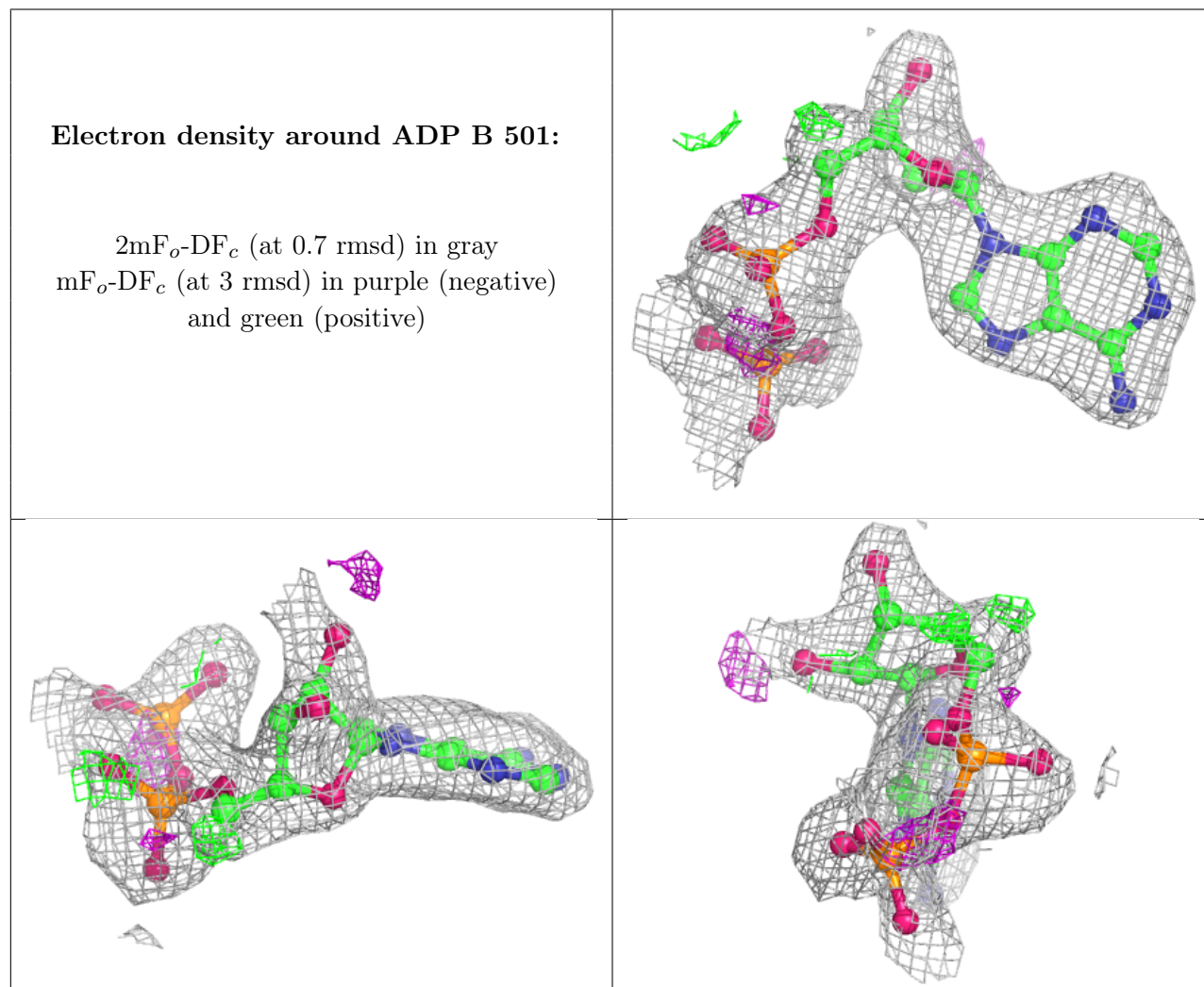
There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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
3	NA	D	502	1/1	0.78	0.12	78,78,78,78	0
2	ADP	B	501	27/27	0.82	0.20	56,72,101,126	0
3	NA	C	502	1/1	0.83	0.12	62,62,62,62	0
2	ADP	C	501	27/27	0.83	0.34	69,85,116,133	0
3	NA	B	502	1/1	0.85	0.07	48,48,48,48	0
2	ADP	A	501	27/27	0.88	0.19	50,70,109,123	0
2	ADP	D	501	27/27	0.89	0.16	67,78,101,113	0
3	NA	A	502	1/1	0.92	0.09	45,45,45,45	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around ADP B 501:

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

Electron density around ADP C 501:

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

Electron density around ADP A 501:

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

Electron density around ADP D 501:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
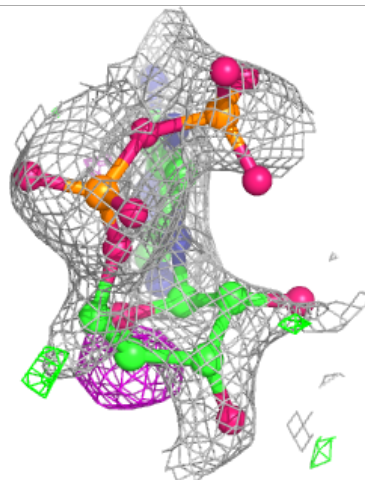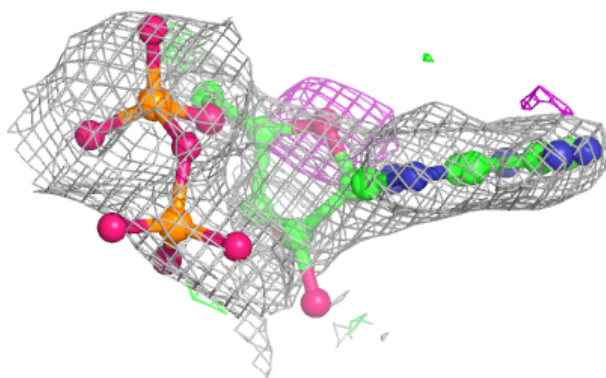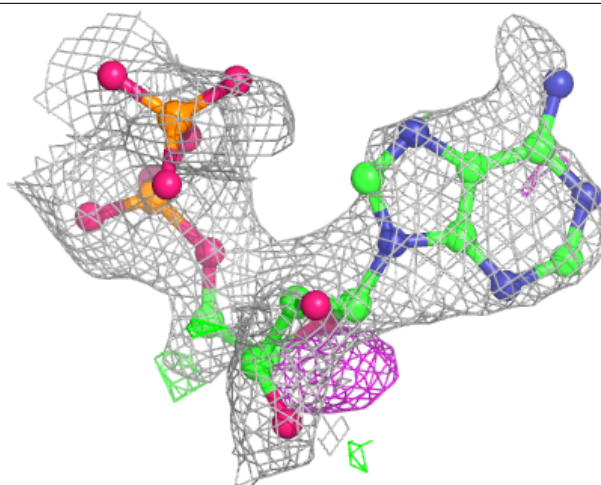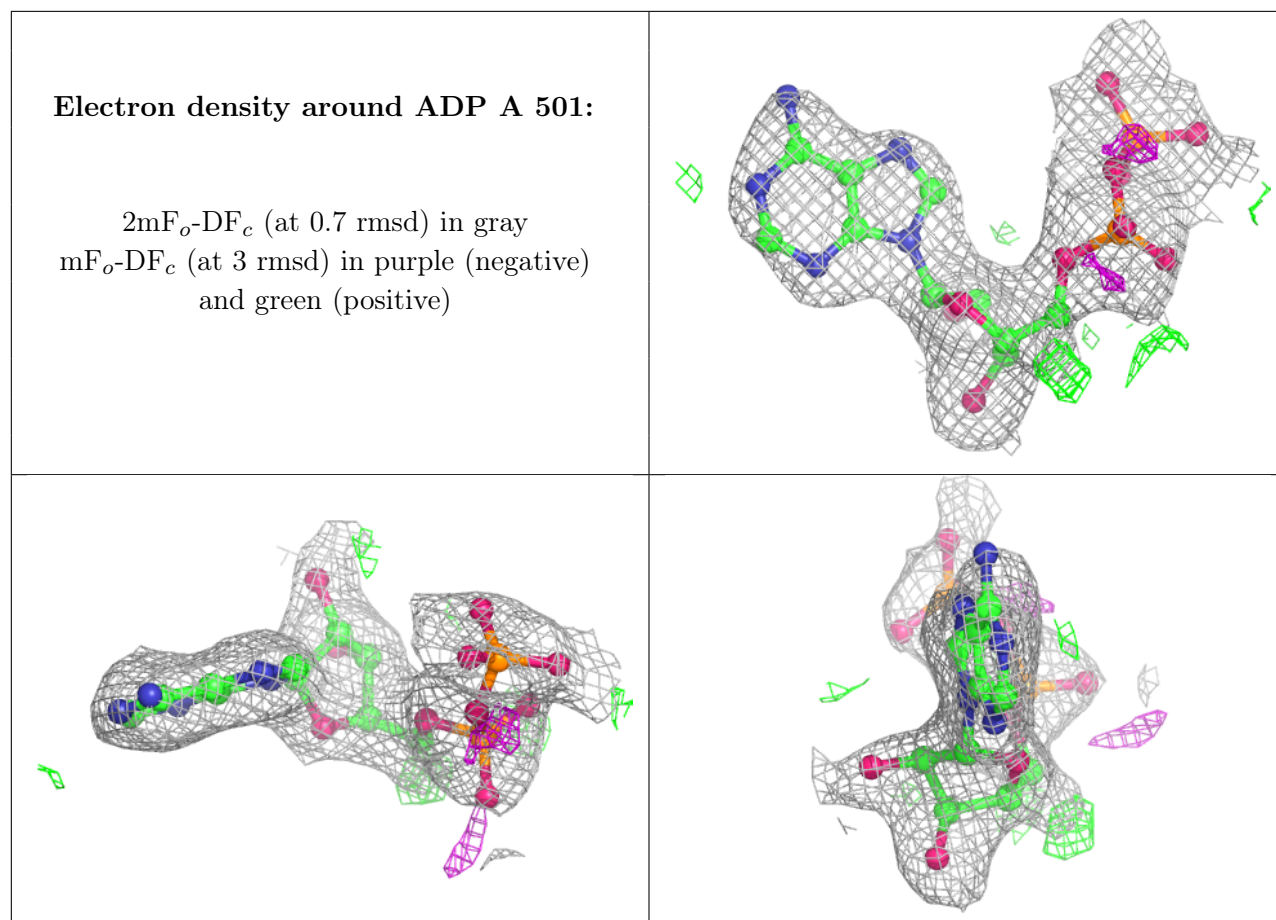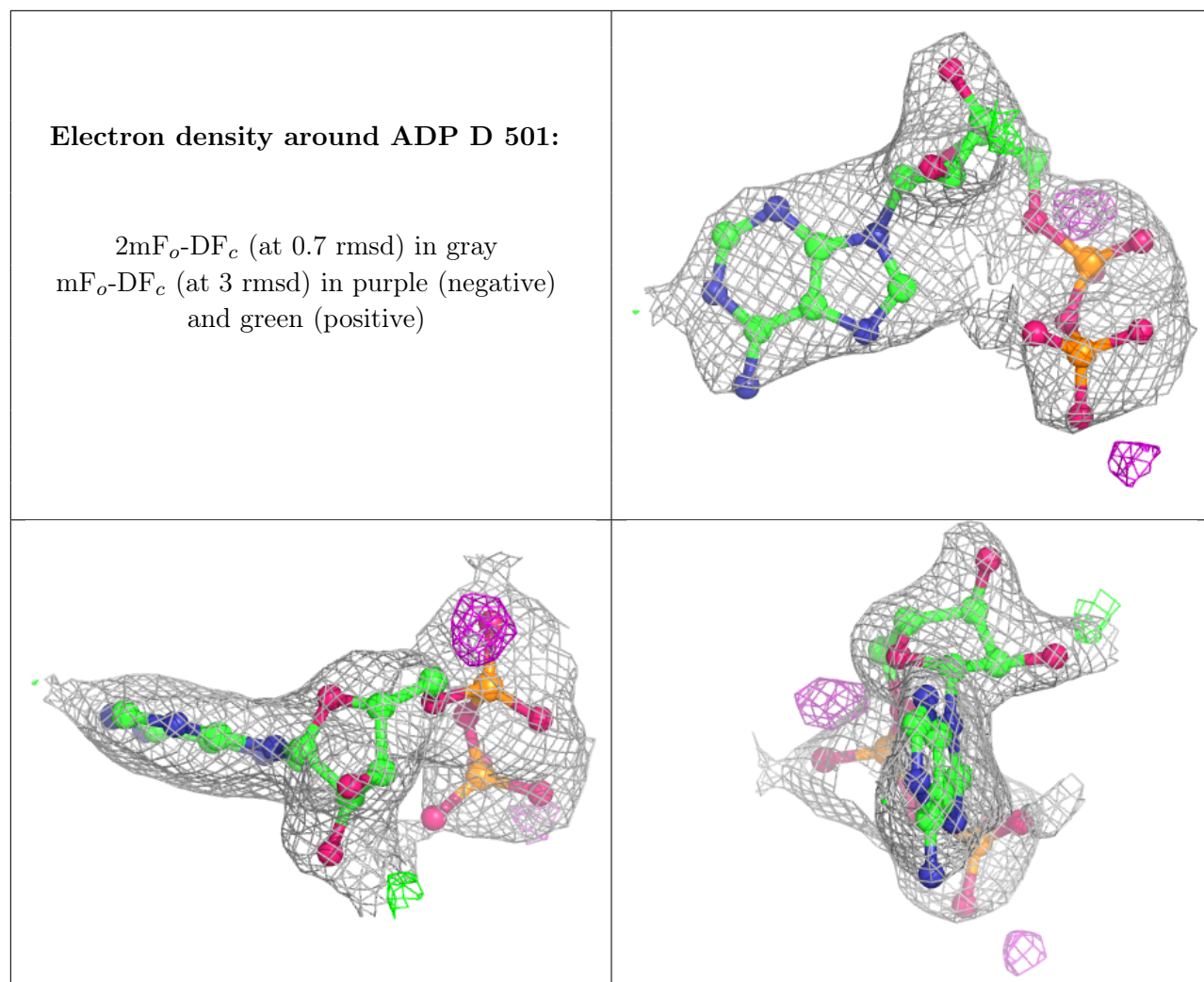
6.5 Other polymers (i)

There are no such residues in this entry.