WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Aug 15, 2023 – 03:53 PM EDT

PDB ID : 1XPM

Title : Crystal Structure of Staphylococcus aureus HMG-COA Synthase with HMG-CoA and Acetoacetyl-COA and Acetylated Cysteine

Authors : Theisen, M.J.; Misra, I.; Saadat, D.; Campobasso, N.; Miziorko, H.M.; Harrison, D.H.T.

Deposited on : 2004-10-08

Resolution : 1.60 Å(reported)

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

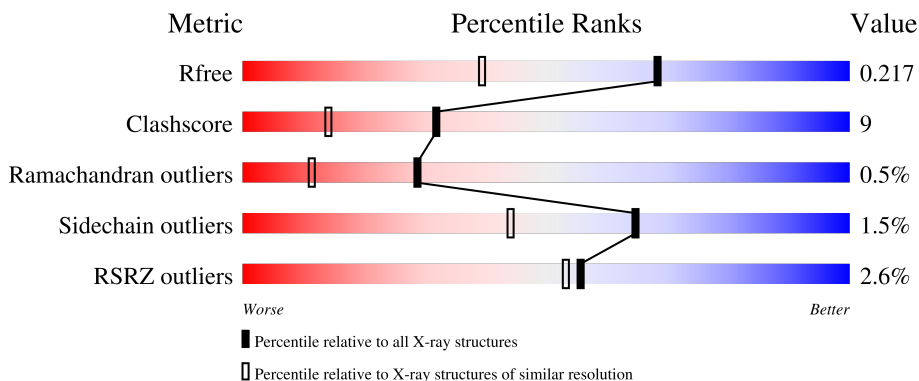|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

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
Rfree		0.217
Clashscore		9
Ramachandran outliers		0.5%
Sidechain outliers		1.5%
RSRZ outliers		2.6%

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	3398 (1.60-1.60)
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)
RSRZ outliers	127900	3321 (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% 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	397	3% — 84% — 13% · ·
1	B	397	2% — 84% — 13% · ·
1	C	397	3% — 86% — 11% · ·
1	D	397	3% — 87% — 11% · ·

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 15324 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 3-hydroxy-3-methylglutaryl CoA synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	389	Total	C	N	O	S	0	33	0
			3458	2202	576	664	16			
1	B	389	Total	C	N	O	S	0	33	0
			3431	2188	569	658	16			
1	C	389	Total	C	N	O	S	0	33	0
			3425	2184	571	654	16			
1	D	389	Total	C	N	O	S	0	33	0
			3439	2191	571	661	16			

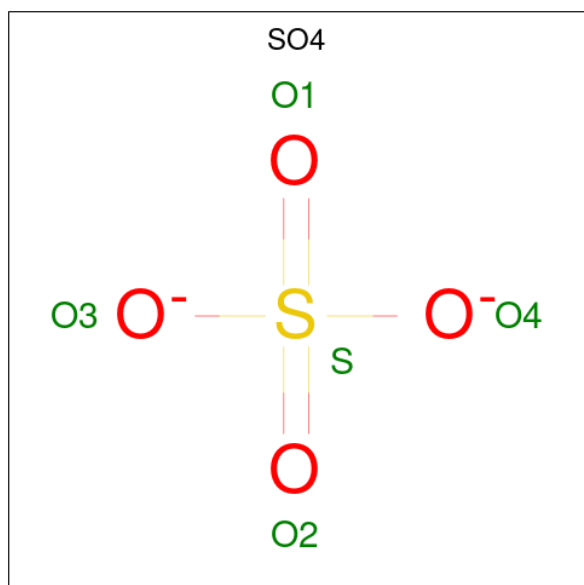There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP Q79ZY6
A	2	ALA	-	cloning artifact	UNP Q79ZY6
A	111	SCY	CYS	microheterogeneity	UNP Q79ZY6
A	389	LEU	-	cloning artifact	UNP Q79ZY6
A	390	GLU	-	cloning artifact	UNP Q79ZY6
A	391	HIS	-	expression tag	UNP Q79ZY6
A	392	HIS	-	expression tag	UNP Q79ZY6
A	393	HIS	-	expression tag	UNP Q79ZY6
A	394	HIS	-	expression tag	UNP Q79ZY6
A	395	HIS	-	expression tag	UNP Q79ZY6
A	396	HIS	-	expression tag	UNP Q79ZY6
B	1	MET	-	initiating methionine	UNP Q79ZY6
B	2	ALA	-	cloning artifact	UNP Q79ZY6
B	111	SCY	CYS	microheterogeneity	UNP Q79ZY6
B	389	LEU	-	cloning artifact	UNP Q79ZY6
B	390	GLU	-	cloning artifact	UNP Q79ZY6
B	391	HIS	-	expression tag	UNP Q79ZY6
B	392	HIS	-	expression tag	UNP Q79ZY6
B	393	HIS	-	expression tag	UNP Q79ZY6
B	394	HIS	-	expression tag	UNP Q79ZY6
B	395	HIS	-	expression tag	UNP Q79ZY6

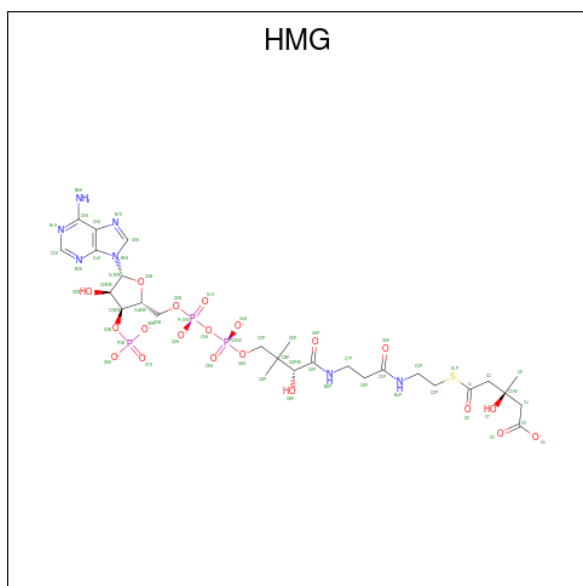*Continued on next page...*

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Chain	Residue	Modelled	Actual	Comment	Reference
B	396	HIS	-	expression tag	UNP Q79ZY6
C	1	MET	-	initiating methionine	UNP Q79ZY6
C	2	ALA	-	cloning artifact	UNP Q79ZY6
C	111	SCY	CYS	microheterogeneity	UNP Q79ZY6
C	389	LEU	-	cloning artifact	UNP Q79ZY6
C	390	GLU	-	cloning artifact	UNP Q79ZY6
C	391	HIS	-	expression tag	UNP Q79ZY6
C	392	HIS	-	expression tag	UNP Q79ZY6
C	393	HIS	-	expression tag	UNP Q79ZY6
C	394	HIS	-	expression tag	UNP Q79ZY6
C	395	HIS	-	expression tag	UNP Q79ZY6
C	396	HIS	-	expression tag	UNP Q79ZY6
D	1	MET	-	initiating methionine	UNP Q79ZY6
D	2	ALA	-	cloning artifact	UNP Q79ZY6
D	111	SCY	CYS	microheterogeneity	UNP Q79ZY6
D	389	LEU	-	cloning artifact	UNP Q79ZY6
D	390	GLU	-	cloning artifact	UNP Q79ZY6
D	391	HIS	-	expression tag	UNP Q79ZY6
D	392	HIS	-	expression tag	UNP Q79ZY6
D	393	HIS	-	expression tag	UNP Q79ZY6
D	394	HIS	-	expression tag	UNP Q79ZY6
D	395	HIS	-	expression tag	UNP Q79ZY6
D	396	HIS	-	expression tag	UNP Q79ZY6

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).
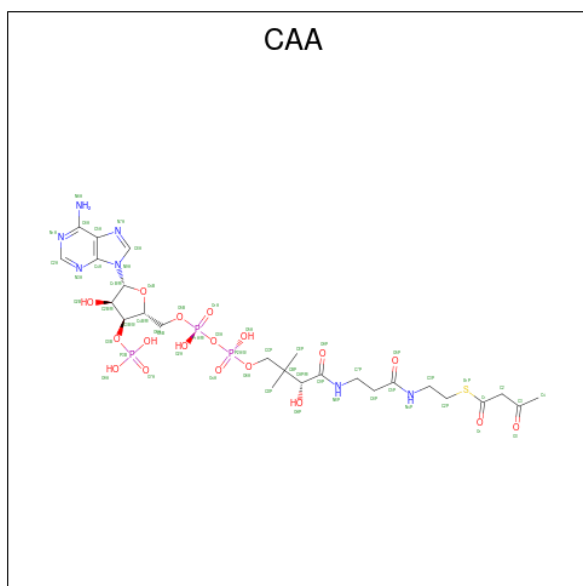
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total 5	O 4	S 1	0	0
2	A	1	Total 5	O 4	S 1	0	0
2	B	1	Total 5	O 4	S 1	0	0
2	B	1	Total 5	O 4	S 1	0	0
2	C	1	Total 5	O 4	S 1	0	0
2	C	1	Total 5	O 4	S 1	0	0
2	D	1	Total 5	O 4	S 1	0	0
2	D	1	Total 5	O 4	S 1	0	0

- Molecule 3 is 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A (three-letter code: HMG) (formula: $C_{27}H_{39}N_7O_{20}P_3S$).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total 58	C 27	N 7	O 20	P 3	S 1	0	1
3	B	1	Total 58	C 27	N 7	O 20	P 3	S 1	0	1
3	C	1	Total 58	C 27	N 7	O 20	P 3	S 1	0	1

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Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	D	1	Total	C	N	O	P	S	0	1
			58	27	7	20	3	1		

- Molecule 4 is ACETOACETYL-COENZYME A (three-letter code: CAA) (formula: $C_{25}H_{40}N_7O_{18}P_3S$).

| Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	S	0	1
			54	25	7	18	3	1		
4	B	1	Total	C	N	O	P	S	0	1
			54	25	7	18	3	1		
4	C	1	Total	C	N	O	P	S	0	1
			54	25	7	18	3	1		
4	D	1	Total	C	N	O	P	S	0	1
			54	25	7	18	3	1		

- Molecule 5 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	265	Total	O	0	1
			265	265		
5	B	277	Total	O	0	1
			277	277		
5	C	278	Total	O	0	1
			278	278		
5	D	263	Total	O	0	1
			263	263		

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.
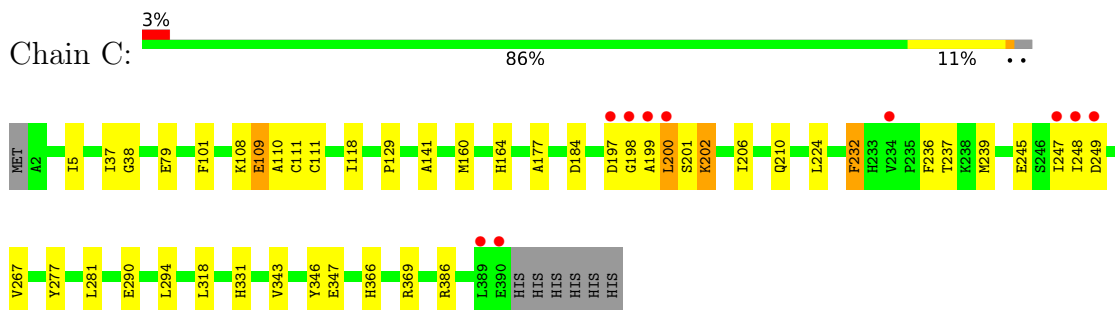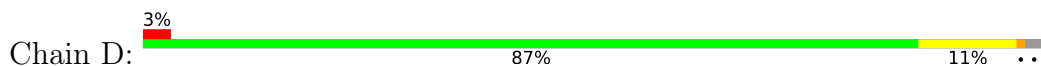
- Molecule 1: 3-hydroxy-3-methylglutaryl CoA synthase
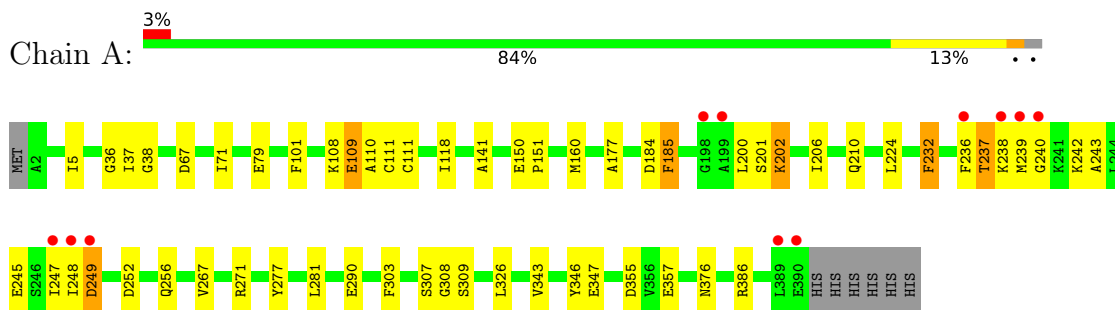
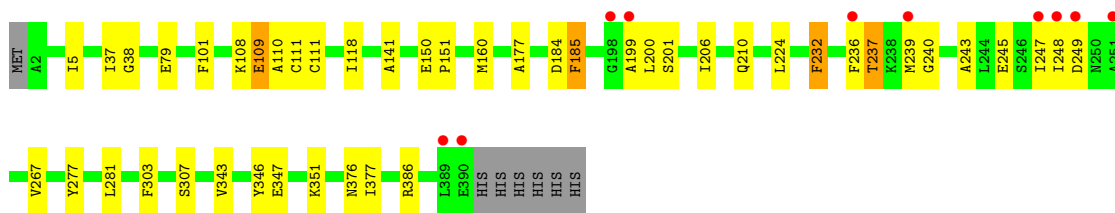- Molecule 1: 3-hydroxy-3-methylglutaryl CoA synthase
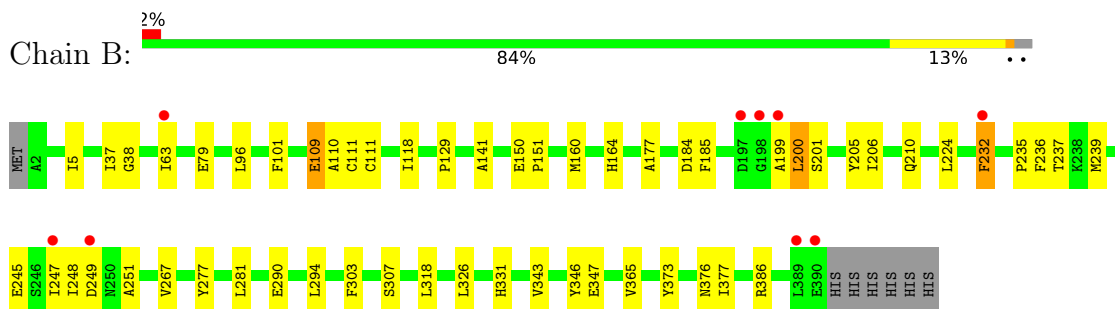
- Molecule 1: 3-hydroxy-3-methylglutaryl CoA synthase

- Molecule 1: 3-hydroxy-3-methylglutaryl CoA synthase

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	65.12Å 118.77Å 121.30Å 90.00° 90.08° 90.00°	Depositor
Resolution (Å)	15.00 – 1.60 24.96 – 1.60	Depositor EDS
% Data completeness (in resolution range)	(Not available) (15.00-1.60) 89.1 (24.96-1.60)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	0.08	Depositor
$< I/\sigma(I) >$ [1]	3.16 (at 1.60Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.210 , 0.226 0.201 , 0.217	Depositor DCC
R_{free} test set	10669 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å^2)	18.9	Xtriage
Anisotropy	0.529	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 30.4	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.000 for -h,l,k 0.000 for -h,-l,-k 0.459 for h,-k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	15324	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 46.36 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.1581e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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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 ⓘ

5.1   Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: SCY, SO4, CAA, HMG

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	4.51	9/3586 (0.3%)	1.33	15/4857 (0.3%)
1	B	1.09	3/3547 (0.1%)	0.66	3/4808 (0.1%)
1	C	1.72	6/3543 (0.2%)	0.84	6/4801 (0.1%)
1	D	1.13	3/3564 (0.1%)	0.66	3/4831 (0.1%)
All	All	2.54	21/14240 (0.1%)	0.91	27/19297 (0.1%)

The worst 5 of 21 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	202[A]	LYS	CD-CE	147.32	5.19	1.51
1	A	202[B]	LYS	CD-CE	147.32	5.19	1.51
1	A	202[C]	LYS	CD-CE	147.32	5.19	1.51
1	C	202[A]	LYS	CG-CD	44.16	3.02	1.52
1	C	202[B]	LYS	CG-CD	44.16	3.02	1.52

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	249[A]	ASP	OD1-CG-OD2	-30.98	64.44	123.30
1	A	249[B]	ASP	OD1-CG-OD2	-30.98	64.44	123.30
1	A	249[C]	ASP	OD1-CG-OD2	-30.98	64.44	123.30
1	A	249[A]	ASP	CB-CG-OD2	-22.70	97.87	118.30
1	A	249[B]	ASP	CB-CG-OD2	-22.70	97.87	118.30

There are no chirality outliers.

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	3458	0	3310	65	0
1	B	3431	0	3252	62	0
1	C	3425	0	3257	57	0
1	D	3439	0	3277	48	0
2	A	10	0	0	0	0
2	B	10	0	0	0	0
2	C	10	0	0	0	0
2	D	10	0	0	0	0
3	A	58	0	39	5	0
3	B	58	0	39	1	0
3	C	58	0	39	4	0
3	D	58	0	39	2	0
4	A	54	0	36	0	0
4	B	54	0	36	0	0
4	C	54	0	36	4	0
4	D	54	0	36	1	0
5	A	265	0	0	6	0
5	B	277	0	0	4	0
5	C	278	0	0	5	0
5	D	263	0	0	2	0
All	All	15324	0	13396	238	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 9.

The worst 5 of 238 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:C:118:ILE:HG21	1:C:160[C]:MET:HE2	1.51	0.93
1:B:386[C]:ARG:HD3	5:B:2630:HOH:O	1.84	0.76
1:B:118:ILE:HG21	1:B:160[C]:MET:HE2	1.68	0.75
1:A:202[C]:LYS:HG3	1:A:239[C]:MET:SD	2.27	0.74
1:D:236[B]:PHE:HE1	3:D:4401[B]:HMG:H3P2	1.55	0.70

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	450/397 (113%)	413 (92%)	33 (7%)	4 (1%)	17	4
1	B	448/397 (113%)	411 (92%)	36 (8%)	1 (0%)	47	26
1	C	448/397 (113%)	414 (92%)	27 (6%)	7 (2%)	9	1
1	D	449/397 (113%)	410 (91%)	35 (8%)	4 (1%)	17	4
All	All	1795/1588 (113%)	1648 (92%)	131 (7%)	16 (1%)	29	4

5 of 16 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	109	GLU
1	C	109	GLU
1	C	199[A]	ALA
1	C	199[B]	ALA
1	C	199[C]	ALA

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	356/326 (109%)	344 (97%)	12 (3%)	37	13
1	B	345/326 (106%)	337 (98%)	8 (2%)	50	25
1	C	345/326 (106%)	337 (98%)	8 (2%)	50	25
1	D	352/326 (108%)	346 (98%)	6 (2%)	60	38
All	All	1398/1304 (107%)	1364 (98%)	34 (2%)	65	24

5 of 34 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	109	GLU
1	D	185	PHE
1	D	232[C]	PHE
1	B	109	GLU
1	A	346	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	146	ASN
1	D	325	HIS
1	D	336	ASN
1	A	336	ASN
1	A	325	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

4 non-standard protein/DNA/RNA residues 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	$\#|Z| > 2$
1	SCY	D	111[A]	1	7,8,9	0.58	0	3,9,11	0.70	0
1	SCY	C	111[A]	1	7,8,9	0.56	0	3,9,11	0.70	0
1	SCY	B	111[A]	1	7,8,9	0.56	0	3,9,11	0.71	0
1	SCY	A	111[A]	1	7,8,9	0.58	0	3,9,11	0.71	0

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
1	SCY	D	111[A]	1	-	2/5/7/9	-
1	SCY	C	111[A]	1	-	2/5/7/9	-
1	SCY	B	111[A]	1	-	2/5/7/9	-
1	SCY	A	111[A]	1	-	2/5/7/9	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	111[A]	SCY	OCD-CD-SG-CB
1	B	111[A]	SCY	OCD-CD-SG-CB
1	C	111[A]	SCY	OCD-CD-SG-CB
1	D	111[A]	SCY	OCD-CD-SG-CB
1	D	111[A]	SCY	CE-CD-SG-CB

There are no ring outliers.

4 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	111[A]	SCY	3	0
1	C	111[A]	SCY	3	0
1	B	111[A]	SCY	3	0
1	A	111[A]	SCY	3	0

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

16 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	#$|Z| > 2$
2	SO4	C	3502	-	4,4,4	0.26	0	6,6,6	0.06	0
3	HMG	B	2401[B]	-	52,60,60	0.76	0	62,90,90	1.32	5 (8%)
2	SO4	B	2502	-	4,4,4	0.26	0	6,6,6	0.05	0
4	CAA	B	2402[A]	-	47,56,56	0.72	0	60,83,83	1.33	5 (8%)
2	SO4	A	1501	-	4,4,4	0.28	0	6,6,6	0.06	0
4	CAA	A	1402[A]	-	47,56,56	0.71	0	60,83,83	1.34	5 (8%)
2	SO4	B	2501	-	4,4,4	0.29	0	6,6,6	0.06	0
2	SO4	D	4502	-	4,4,4	0.25	0	6,6,6	0.05	0
3	HMG	A	1401[B]	-	52,60,60	0.76	0	62,90,90	1.30	5 (8%)
3	HMG	D	4401[B]	-	52,60,60	0.78	1 (1%)	62,90,90	1.09	4 (6%)
2	SO4	A	1502	-	4,4,4	0.25	0	6,6,6	0.06	0
3	HMG	C	3401[B]	-	52,60,60	0.77	0	62,90,90	1.32	5 (8%)
4	CAA	D	4402[A]	-	47,56,56	0.70	0	60,83,83	1.29	5 (8%)
2	SO4	C	3501	-	4,4,4	0.29	0	6,6,6	0.07	0
2	SO4	D	4501	-	4,4,4	0.28	0	6,6,6	0.07	0
4	CAA	C	3402[A]	-	47,56,56	0.70	0	60,83,83	1.34	5 (8%)

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	HMG	B	2401[B]	-	-	18/56/77/77	0/3/3/3
4	CAA	B	2402[A]	-	-	20/50/71/71	0/3/3/3
4	CAA	A	1402[A]	-	-	16/50/71/71	0/3/3/3
4	CAA	D	4402[A]	-	-	15/50/71/71	0/3/3/3
3	HMG	D	4401[B]	-	-	11/56/77/77	0/3/3/3
4	CAA	C	3402[A]	-	-	21/50/71/71	0/3/3/3
3	HMG	C	3401[B]	-	-	19/56/77/77	0/3/3/3
3	HMG	A	1401[B]	-	-	20/56/77/77	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	4401[B]	HMG	C1-S1P	2.19	1.81	1.76

The worst 5 of 39 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	B	2402[A]	CAA	P2A-O3A-P1A	-6.40	110.85	132.83
3	B	2401[B]	HMG	P1A-O3A-P2A	-6.39	110.89	132.83
4	A	1402[A]	CAA	P2A-O3A-P1A	-6.39	110.92	132.83
4	C	3402[A]	CAA	P2A-O3A-P1A	-6.34	111.08	132.83
3	C	3401[B]	HMG	P1A-O3A-P2A	-6.28	111.28	132.83

There are no chirality outliers.

5 of 140 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1401[B]	HMG	C5B-O5B-P1A-O3A
3	A	1401[B]	HMG	C5B-O5B-P1A-O1A
3	A	1401[B]	HMG	C5B-O5B-P1A-O2A
3	A	1401[B]	HMG	N8P-C9P-CAP-OAP
3	A	1401[B]	HMG	C3P-C2P-S1P-C1

There are no ring outliers.

6 monomers are involved in 17 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	2401[B]	HMG	1	0
3	A	1401[B]	HMG	5	0
3	D	4401[B]	HMG	2	0
3	C	3401[B]	HMG	4	0
4	D	4402[A]	CAA	1	0
4	C	3402[A]	CAA	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 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 HMG B 2401 (B)	
Bond lengths	Bond angles
Torsions	Rings

Ligand CAA B 2402 (A)	
Bond lengths	Bond angles
Torsions	Rings

Ligand CAA A 1402 (A)

Bond lengths

Bond angles

Torsions

Rings

Ligand HMG A 1401 (B)

Bond lengths

Bond angles

Torsions

Rings

Ligand HMG D 4401 (B)

Bond lengths

Bond angles

Torsions

Rings

Ligand HMG C 3401 (B)

Bond lengths

Bond angles

Torsions

Rings

Ligand CAA D 4402 (A)

Bond lengths

Bond angles

Torsions

Rings

Ligand CAA C 3402 (A)

Bond lengths

Bond angles

Torsions

Rings

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 ⓘ

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	388/397 (97%)	-0.16	11 (2%)	53	50	11, 19, 32, 43	2 (0%)
1	B	388/397 (97%)	-0.17	9 (2%)	60	59	11, 18, 31, 42	2 (0%)
1	C	388/397 (97%)	-0.16	10 (2%)	56	53	11, 18, 31, 42	3 (0%)
1	D	388/397 (97%)	-0.14	10 (2%)	56	53	11, 19, 32, 45	3 (0%)
All	All	1552/1588 (97%)	-0.16	40 (2%)	56	53	11, 19, 32, 45	10 (0%)

The worst 5 of 40 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	199[A]	ALA	8.6
1	B	199[A]	ALA	7.0
1	A	199[A]	ALA	6.9
1	D	199[A]	ALA	6.3
1	C	247[A]	ILE	5.2

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

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
1	SCY	B	111[A]	9/10	0.95	0.10	12,14,22,22	9
1	SCY	C	111[A]	9/10	0.96	0.08	12,14,21,22	9
1	SCY	A	111[A]	9/10	0.97	0.07	13,14,22,23	9
1	SCY	D	111[A]	9/10	0.97	0.07	13,14,23,24	9

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	HMG	C	3401[B]	58/58	0.82	0.18	18,28,35,35	58
4	CAA	C	3402[A]	54/54	0.82	0.19	20,30,35,35	54
4	CAA	D	4402[A]	54/54	0.83	0.17	24,29,38,39	54
3	HMG	D	4401[B]	58/58	0.84	0.17	17,27,33,34	58
3	HMG	B	2401[B]	58/58	0.85	0.17	18,28,34,35	58
4	CAA	B	2402[A]	54/54	0.85	0.17	17,29,34,35	54
4	CAA	A	1402[A]	54/54	0.88	0.16	19,28,35,36	54
3	HMG	A	1401[B]	58/58	0.88	0.16	13,27,33,34	58
2	SO4	B	2501	5/5	0.90	0.16	36,37,40,40	0
2	SO4	C	3501	5/5	0.90	0.15	34,35,37,38	0
2	SO4	A	1502	5/5	0.92	0.14	75,75,75,75	0
2	SO4	D	4502	5/5	0.92	0.14	73,73,73,74	0
2	SO4	D	4501	5/5	0.93	0.11	38,38,39,40	0
2	SO4	A	1501	5/5	0.94	0.12	36,37,38,39	0
2	SO4	C	3502	5/5	0.94	0.20	78,78,79,79	0
2	SO4	B	2502	5/5	0.94	0.16	80,81,81,81	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 HMG C 3401 (B):

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
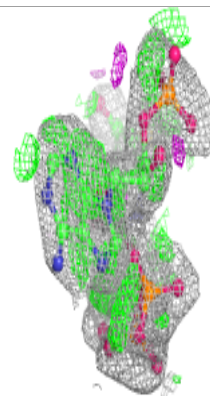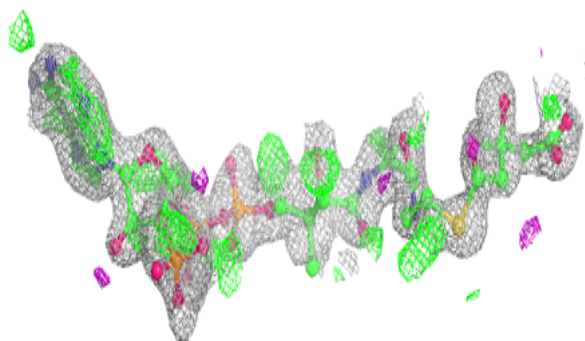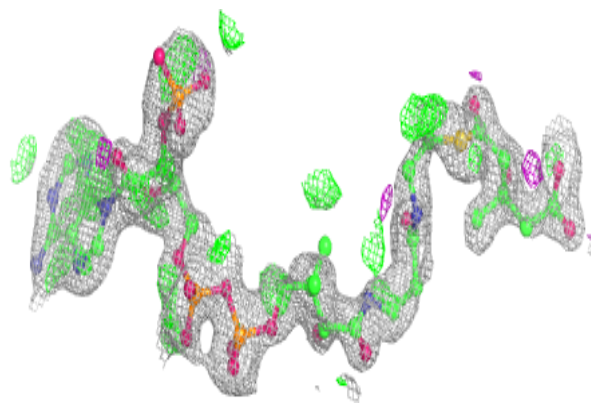
Electron density around CAA C 3402 (A):

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
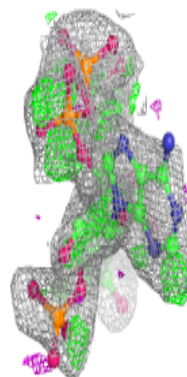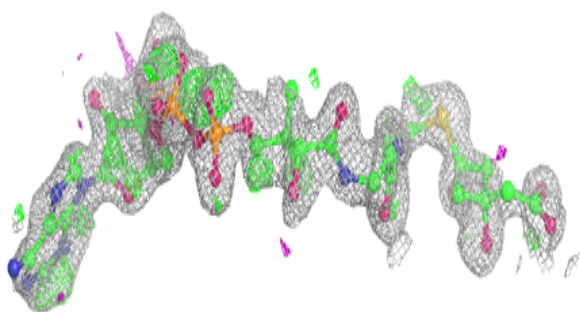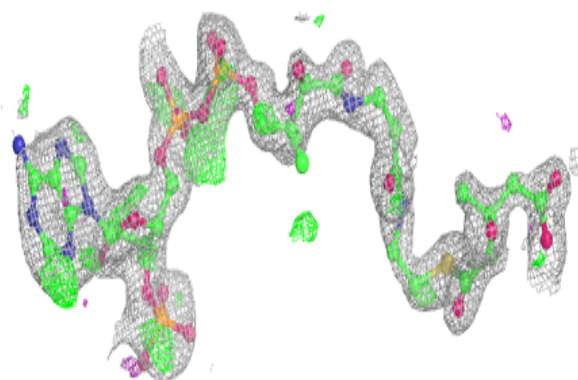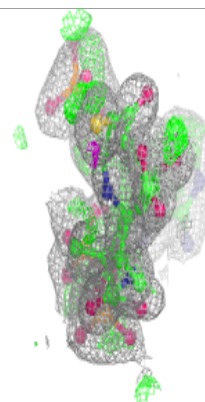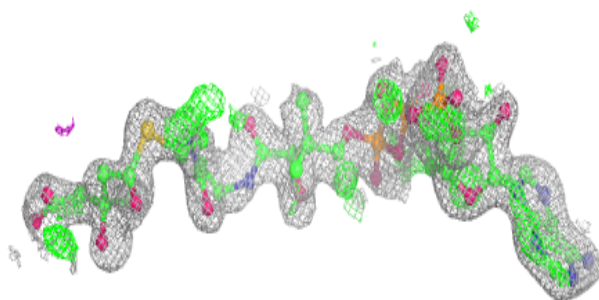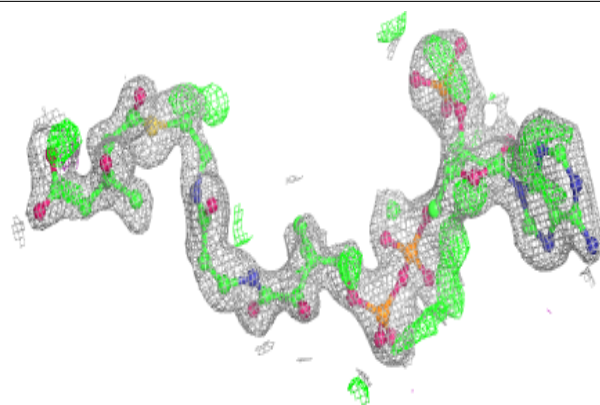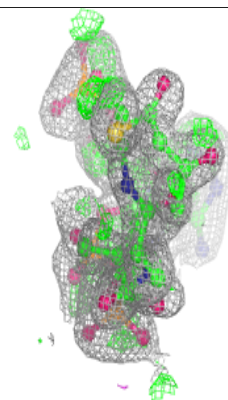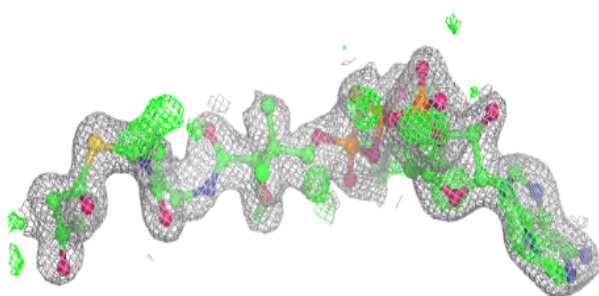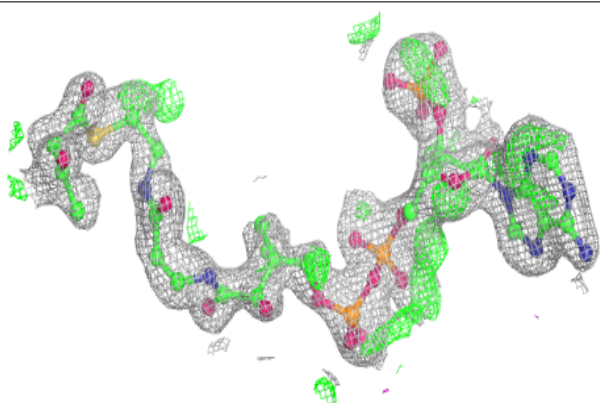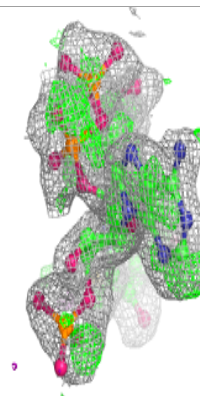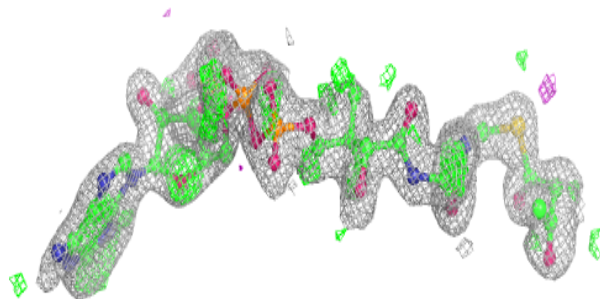$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
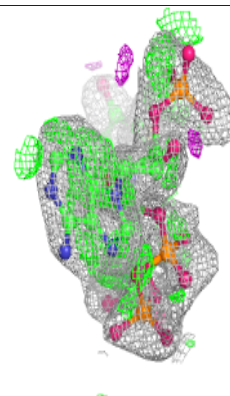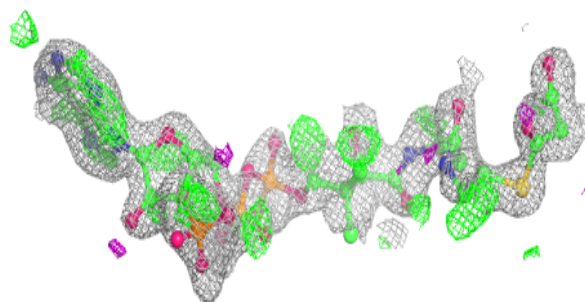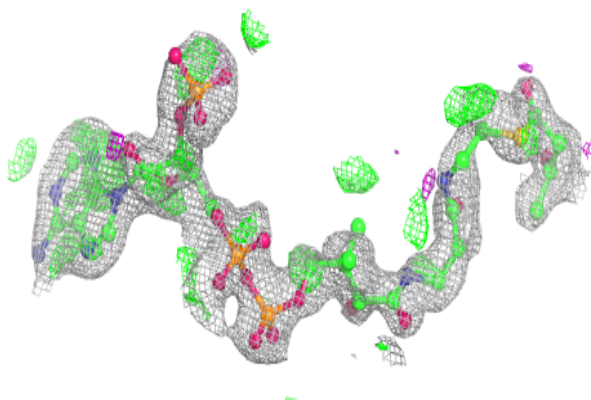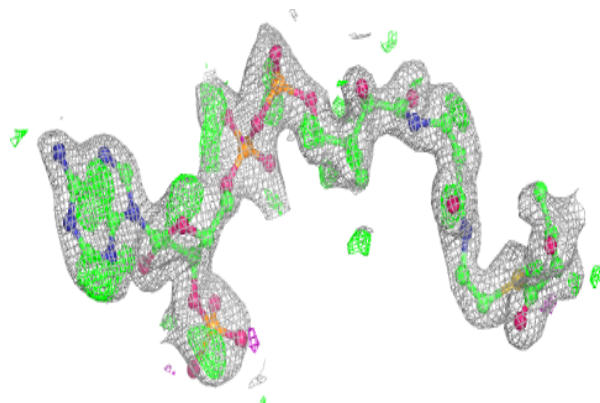
Electron density around CAA D 4402 (A):

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
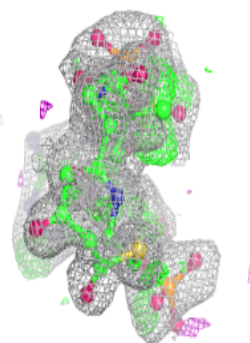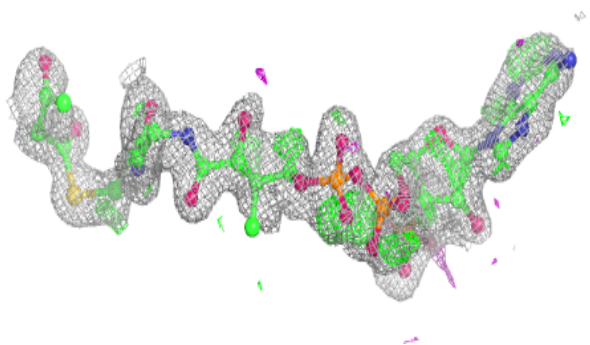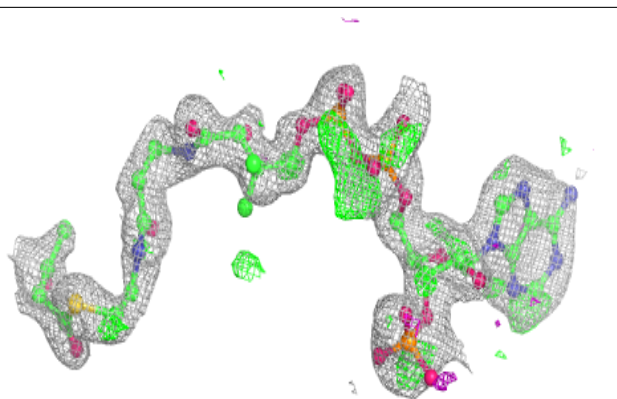
Electron density around HMG D 4401 (B):

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

Electron density around HMG B 2401 (B):

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

Electron density around CAA B 2402 (A):

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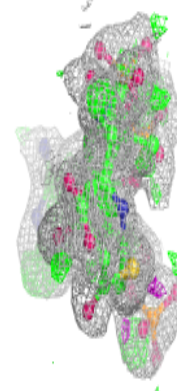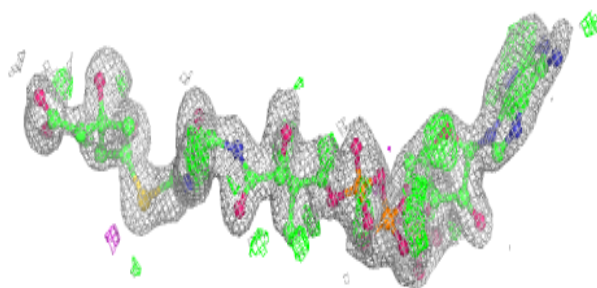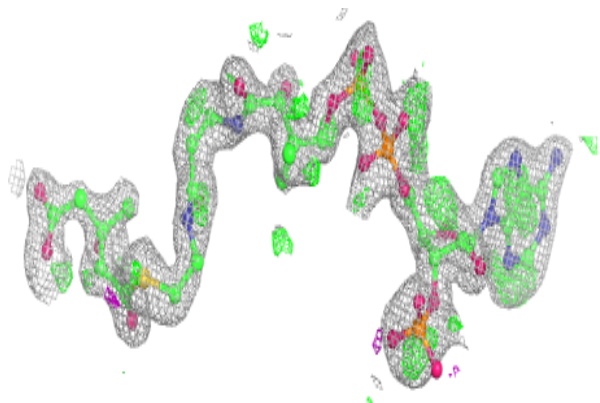mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around CAA A 1402 (A):

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

Electron density around HMG A 1401 (B):

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

6.5 Other polymers ⓘ

There are no such residues in this entry.