



# Full wwPDB X-ray Structure Validation Report ⓘ

May 26, 2020 – 11:21 am BST

PDB ID : 1D2O  
Title : CRYSTAL STRUCTURE OF A SINGLE B REPEAT UNIT (B1) OF COLLAGEN BINDING SURFACE PROTEIN (CNA) OF STAPHYLOCOCCUS AUREUS.  
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Deposited on : 1999-09-25  
Resolution : 2.00 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](mailto: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.

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

MolProbity : 4.02b-467  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

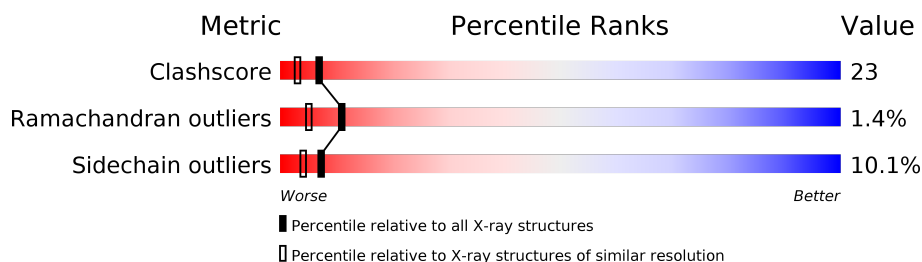
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	187	 66% 27% 6% .
1	B	187	 64% 31% . .

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3079 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 COLLAGEN ADHESIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	187	Total	C	N	O	S	0	0	0
			1497	926	250	320	1			
1	B	187	Total	C	N	O	S	0	0	0
			1497	926	250	320	1			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	539	SER	ILE	CONFLICT	UNP Q53654
A	540	ILE	SER	CONFLICT	UNP Q53654
A	715	THR	VAL	CONFLICT	UNP Q53654
B	539	SER	ILE	CONFLICT	UNP Q53654
B	540	ILE	SER	CONFLICT	UNP Q53654
B	715	THR	VAL	CONFLICT	UNP Q53654

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	38	Total	O	0	0
			38	38		
2	B	47	Total	O	0	0
			47	47		

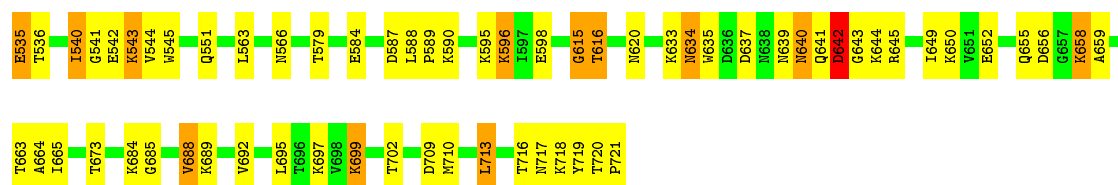
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

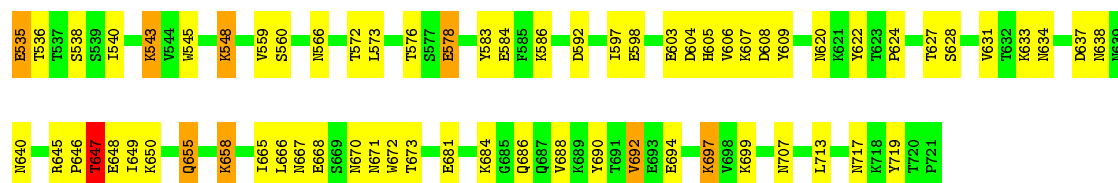
#### • Molecule 1: COLLAGEN ADHESIN

Chain A: 



#### • Molecule 1: COLLAGEN ADHESIN

Chain B: 



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	96.91Å 101.54Å 121.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.00	Depositor
% Data completeness (in resolution range)	87.8 (20.00-2.00)	Depositor
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	CNS, XTALVIEW	Depositor
R, $R_{free}$	0.212 , 0.256	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3079	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

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	0.35	0/1524	0.61	0/2067
1	B	0.35	0/1524	0.60	0/2067
All	All	0.35	0/3048	0.60	0/4134

There are no bond length outliers.

There are no bond angle outliers.

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	1497	0	1438	69	0
1	B	1497	0	1438	70	0
2	A	38	0	0	0	0
2	B	47	0	0	0	0
All	All	3079	0	2876	135	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 23.

All (135) 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:B:543:LYS:NZ	1:B:620:ASN:HD22	1.56	1.02

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:543:LYS:HZ2	1:B:620:ASN:HD22	1.04	0.95
1:A:543:LYS:HB2	1:A:543:LYS:NZ	1.88	0.89
1:B:605:HIS:HE1	1:B:627:THR:HG21	1.41	0.83
1:B:633:LYS:HZ3	1:B:717:ASN:CG	1.83	0.83
1:A:543:LYS:CE	1:A:620:ASN:HD22	1.92	0.82
1:B:605:HIS:CE1	1:B:627:THR:HG21	2.16	0.81
1:A:543:LYS:HZ1	1:A:620:ASN:ND2	1.79	0.81
1:A:543:LYS:NZ	1:A:620:ASN:ND2	2.29	0.81
1:B:609:TYR:O	1:B:627:THR:HG22	1.80	0.81
1:B:633:LYS:HE3	1:B:649:ILE:HD13	1.61	0.81
1:B:543:LYS:NZ	1:B:620:ASN:ND2	2.29	0.78
1:A:543:LYS:HB2	1:A:543:LYS:HZ2	1.51	0.76
1:B:684:LYS:HA	1:B:684:LYS:HE2	1.66	0.76
1:B:650:LYS:HG2	1:B:665:ILE:HG12	1.66	0.76
1:B:646:PRO:O	1:B:647:THR:HB	1.86	0.75
1:A:650:LYS:HG3	1:A:665:ILE:HG13	1.69	0.74
1:A:566:ASN:HD21	1:A:598:GLU:H	1.38	0.71
1:A:566:ASN:ND2	1:A:598:GLU:H	1.89	0.69
1:A:543:LYS:NZ	1:A:620:ASN:HD22	1.89	0.69
1:B:543:LYS:HD2	1:B:559:VAL:HG21	1.73	0.69
1:A:543:LYS:CE	1:A:620:ASN:ND2	2.56	0.68
1:A:543:LYS:HZ2	1:A:543:LYS:CB	2.07	0.67
1:B:633:LYS:NZ	1:B:717:ASN:HB2	2.10	0.67
1:B:572:THR:HG22	1:B:573:LEU:N	2.10	0.66
1:A:641:GLN:O	1:A:642:ASP:HB2	1.96	0.66
1:A:543:LYS:HZ1	1:A:620:ASN:HD22	1.43	0.65
1:A:697:LYS:NZ	1:A:699:LYS:HZ2	1.95	0.65
1:A:656:ASP:O	1:A:658:LYS:HD3	1.97	0.65
1:B:633:LYS:HB3	1:B:672:TRP:HB3	1.79	0.65
1:A:655:GLN:HG3	1:A:688:VAL:HG21	1.79	0.64
1:B:543:LYS:CE	1:B:620:ASN:HD22	2.10	0.64
1:B:543:LYS:HE3	1:B:620:ASN:ND2	2.13	0.64
1:A:697:LYS:NZ	1:A:699:LYS:NZ	2.46	0.64
1:B:633:LYS:NZ	1:B:717:ASN:CG	2.51	0.63
1:B:699:LYS:HD2	1:B:699:LYS:N	2.14	0.63
1:A:615:GLY:O	1:A:616:THR:HB	1.99	0.63
1:B:566:ASN:ND2	1:B:598:GLU:HB2	2.14	0.63
1:A:551:GLN:HE22	1:B:665:ILE:HD12	1.64	0.62
1:A:634:ASN:HB3	1:A:716:THR:HG22	1.81	0.62
1:B:543:LYS:CE	1:B:620:ASN:ND2	2.62	0.62
1:B:543:LYS:HZ2	1:B:620:ASN:ND2	1.87	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:541:GLY:HA3	1:A:616:THR:HG23	1.82	0.62
1:B:573:LEU:HD23	1:B:583:TYR:HB2	1.81	0.62
1:B:592:ASP:HB2	1:B:597:ILE:HD11	1.82	0.61
1:A:540:ILE:HG22	1:A:584:GLU:HB2	1.83	0.61
1:A:543:LYS:HE2	1:A:620:ASN:ND2	2.15	0.61
1:A:595:LYS:HE2	1:A:639:ASN:ND2	2.17	0.60
1:A:642:ASP:O	1:A:644:LYS:N	2.35	0.60
1:B:622:TYR:CZ	1:B:624:PRO:HG3	2.36	0.60
1:A:543:LYS:HE2	1:A:620:ASN:HD22	1.67	0.59
1:B:606:VAL:CG2	1:B:609:TYR:HB2	2.32	0.59
1:B:633:LYS:HZ3	1:B:717:ASN:CB	2.16	0.59
1:A:663:THR:HG22	1:A:664:ALA:N	2.18	0.58
1:B:607:LYS:HD3	1:B:681:GLU:OE2	2.03	0.57
1:B:637:ASP:HB3	1:B:719:TYR:HB2	1.86	0.57
1:A:590:LYS:O	1:A:596:LYS:HD2	2.04	0.57
1:B:548:LYS:HB2	1:B:548:LYS:NZ	2.20	0.56
1:B:646:PRO:O	1:B:647:THR:CB	2.53	0.55
1:A:665:ILE:HD12	1:A:665:ILE:N	2.21	0.55
1:B:697:LYS:HB3	1:B:699:LYS:NZ	2.22	0.55
1:A:541:GLY:CA	1:A:616:THR:HG23	2.37	0.55
1:A:719:TYR:CZ	1:A:721:PRO:HG3	2.41	0.55
1:B:633:LYS:NZ	1:B:717:ASN:CB	2.70	0.55
1:B:633:LYS:HE2	1:B:694:GLU:OE2	2.07	0.54
1:A:655:GLN:HG3	1:A:688:VAL:CG2	2.36	0.54
1:A:697:LYS:HZ1	1:A:699:LYS:NZ	2.07	0.53
1:B:572:THR:HG22	1:B:573:LEU:H	1.72	0.53
1:B:540:ILE:CG2	1:B:584:GLU:HG3	2.39	0.53
1:B:607:LYS:O	1:B:608:ASP:HB2	2.10	0.52
1:B:655:GLN:HG2	1:B:688:VAL:HG11	1.91	0.52
1:B:670:ASN:O	1:B:671:ASN:HB2	2.09	0.52
1:A:697:LYS:HZ2	1:A:699:LYS:HZ2	1.55	0.52
1:A:710:MET:HA	1:A:713:LEU:HD13	1.91	0.52
1:B:566:ASN:ND2	1:B:598:GLU:H	2.08	0.52
1:B:648:GLU:HG2	1:B:667:ASN:HB3	1.91	0.52
1:A:685:GLY:HA3	1:B:658:LYS:HG2	1.92	0.52
1:B:540:ILE:HG23	1:B:584:GLU:HG3	1.91	0.52
1:A:640:ASN:HD21	1:A:645:ARG:H	1.56	0.52
1:A:551:GLN:NE2	1:B:665:ILE:HD12	2.25	0.51
1:B:640:ASN:HD21	1:B:645:ARG:H	1.58	0.51
1:A:595:LYS:HG2	1:A:596:LYS:N	2.25	0.51
1:B:548:LYS:HB2	1:B:548:LYS:HZ3	1.76	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:633:LYS:NZ	1:B:717:ASN:OD1	2.40	0.50
1:A:650:LYS:NZ	1:A:663:THR:HG21	2.27	0.50
1:A:641:GLN:O	1:A:642:ASP:CB	2.60	0.50
1:A:543:LYS:HZ3	1:A:543:LYS:HB2	1.70	0.50
1:B:543:LYS:HE3	1:B:603:GLU:OE2	2.11	0.49
1:B:572:THR:CG2	1:B:573:LEU:N	2.75	0.49
1:A:540:ILE:N	1:A:540:ILE:HD13	2.27	0.49
1:A:697:LYS:HZ2	1:A:699:LYS:NZ	2.10	0.49
1:B:543:LYS:HD3	1:B:545:TRP:CZ2	2.48	0.49
1:A:702:THR:CG2	1:A:718:LYS:HB3	2.43	0.47
1:B:670:ASN:O	1:B:673:THR:HG22	2.14	0.47
1:A:535:GLU:N	1:A:535:GLU:OE1	2.48	0.47
1:B:535:GLU:OE1	1:B:536:THR:N	2.48	0.47
1:B:566:ASN:HD22	1:B:598:GLU:HB2	1.78	0.47
1:B:566:ASN:HD21	1:B:598:GLU:H	1.62	0.47
1:A:543:LYS:HE3	1:A:545:TRP:CE2	2.50	0.46
1:B:655:GLN:HG3	1:B:690:TYR:CE1	2.51	0.46
1:B:560:SER:HB2	1:B:604:ASP:HB2	1.97	0.46
1:A:635:TRP:CD2	1:A:645:ARG:HD2	2.50	0.46
1:A:634:ASN:O	1:A:716:THR:HA	2.16	0.46
1:A:633:LYS:HD3	1:A:649:ILE:HD13	1.97	0.45
1:A:637:ASP:HB3	1:A:719:TYR:HB2	1.99	0.45
1:A:637:ASP:OD1	1:A:639:ASN:O	2.35	0.45
1:A:634:ASN:HD22	1:A:635:TRP:N	2.15	0.45
1:B:627:THR:HB	1:B:628:SER:H	1.59	0.45
1:B:631:VAL:HA	1:B:713:LEU:O	2.17	0.45
1:A:664:ALA:C	1:A:665:ILE:HD12	2.38	0.45
1:A:535:GLU:O	1:A:589:PRO:HA	2.17	0.44
1:B:692:VAL:H	1:B:707:ASN:HD21	1.65	0.44
1:B:572:THR:CG2	1:B:573:LEU:H	2.30	0.44
1:A:615:GLY:O	1:A:616:THR:CB	2.66	0.44
1:B:603:GLU:CD	1:B:620:ASN:HD21	2.21	0.43
1:A:684:LYS:H	1:B:655:GLN:NE2	2.16	0.43
1:A:633:LYS:HZ1	1:A:717:ASN:CG	2.21	0.43
1:A:633:LYS:HD3	1:A:649:ILE:CD1	2.49	0.43
1:A:536:THR:HA	1:A:588:LEU:O	2.18	0.43
1:B:707:ASN:HD22	1:B:713:LEU:HD22	1.82	0.43
1:A:709:ASP:O	1:A:713:LEU:HD13	2.18	0.43
1:B:540:ILE:HG22	1:B:584:GLU:HB2	2.01	0.43
1:A:702:THR:HG22	1:A:718:LYS:HB3	2.01	0.43
1:A:663:THR:CG2	1:A:664:ALA:N	2.82	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:606:VAL:HG23	1:B:609:TYR:HB2	1.99	0.42
1:A:635:TRP:CG	1:A:645:ARG:HD2	2.54	0.42
1:A:637:ASP:O	1:A:639:ASN:O	2.38	0.42
1:B:538:SER:HB2	1:B:586:LYS:HA	2.01	0.42
1:A:652:GLU:OE2	1:A:659:ALA:HB1	2.20	0.42
1:B:633:LYS:CE	1:B:649:ILE:HD13	2.41	0.41
1:B:576:THR:OG1	1:B:578:GLU:HB2	2.21	0.41
1:A:658:LYS:HE3	1:A:658:LYS:HB2	1.88	0.40
1:A:634:ASN:HD22	1:A:634:ASN:C	2.25	0.40
1:A:656:ASP:OD1	1:A:689:LYS:HE2	2.21	0.40
1:B:645:ARG:HA	1:B:646:PRO:HD3	1.76	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	185/187 (99%)	170 (92%)	11 (6%)	4 (2%)	6	2
1	B	185/187 (99%)	174 (94%)	10 (5%)	1 (0%)	29	23
All	All	370/374 (99%)	344 (93%)	21 (6%)	5 (1%)	11	5

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	643	GLY
1	A	587	ASP
1	A	615	GLY
1	A	642	ASP
1	B	647	THR

### 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	169/169 (100%)	149 (88%)	20 (12%)	5	3
1	B	169/169 (100%)	155 (92%)	14 (8%)	11	7
All	All	338/338 (100%)	304 (90%)	34 (10%)	7	4

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	535	GLU
1	A	540	ILE
1	A	542	GLU
1	A	543	LYS
1	A	544	VAL
1	A	563	LEU
1	A	579	THR
1	A	596	LYS
1	A	616	THR
1	A	634	ASN
1	A	640	ASN
1	A	642	ASP
1	A	658	LYS
1	A	673	THR
1	A	688	VAL
1	A	692	VAL
1	A	695	LEU
1	A	699	LYS
1	A	713	LEU
1	A	720	THR
1	B	535	GLU
1	B	543	LYS
1	B	548	LYS
1	B	578	GLU
1	B	634	ASN
1	B	638	ASN
1	B	647	THR

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Mol	Chain	Res	Type
1	B	655	GLN
1	B	658	LYS
1	B	666	LEU
1	B	668	GLU
1	B	686	GLN
1	B	692	VAL
1	B	697	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	566	ASN
1	A	620	ASN
1	A	634	ASN
1	A	639	ASN
1	A	640	ASN
1	A	655	GLN
1	A	671	ASN
1	A	687	GLN
1	A	708	ASN
1	A	712	ASN
1	B	562	ASN
1	B	566	ASN
1	B	620	ASN
1	B	634	ASN
1	B	640	ASN
1	B	655	GLN
1	B	671	ASN
1	B	707	ASN
1	B	712	ASN

### 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 [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 5.7 Other polymers [i](#)

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 ⓘ

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.