



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 09:14 PM UTC

PDB ID : 3NSP / pdb_00003nsp
Title : Crystal structure of tetrameric RXRalpha-LBD
Authors : Zhang, H.; Hu, T.; Li, L.; Zhou, R.; Chen, L.; Hu, L.; Jiang, H.; Shen, X.
Deposited on : 2010-07-02
Resolution : 2.90 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

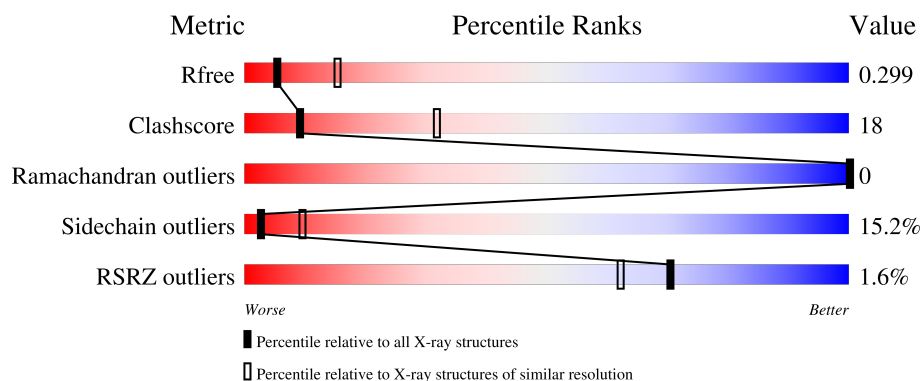
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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))
R_{free}	180053	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. 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	240	
1	B	240	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3074 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.

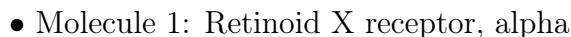
- Molecule 1 is a protein called Retinoid X receptor, alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	193	Total	C	N	O	S	0	0	0
			1526	983	264	270	9			
1	B	190	Total	C	N	O	S	0	0	0
			1514	976	263	266	9			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	19	Total	O	0	0
			19	19		
2	B	15	Total	O	0	0
			15	15		

- Molecule 1: Retinoid X receptor, alpha



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	114.83Å 100.27Å 47.16Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 – 2.90 15.00 – 2.90	Depositor EDS
% Data completeness (in resolution range)	91.1 (15.00-2.90) 90.3 (15.00-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.80 (at 2.91Å)	Xtriage
Refinement program	CNS, REFMAC 5.2.0019	Depositor
R, R_{free}	0.222 , 0.308 0.224 , 0.299	Depositor DCC
R_{free} test set	556 reflections (4.42%)	wwPDB-VP
Wilson B-factor (Å ²)	34.1	Xtriage
Anisotropy	0.030	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 39.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	3074	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.36% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ 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

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	0.93	0/1558	1.21	12/2106 (0.6%)
1	B	0.83	0/1546	1.08	7/2086 (0.3%)
All	All	0.88	0/3104	1.15	19/4192 (0.5%)

There are no bond length outliers.

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	277	PHE	N-CA-C	-13.08	95.28	112.68
1	A	276	LEU	CB-CA-C	-11.50	98.45	109.83
1	B	331	HIS	N-CA-C	8.41	128.71	110.80
1	A	264	PRO	N-CA-C	8.35	125.41	113.47
1	A	263	ASP	CA-C-N	8.13	127.42	118.97
1	A	263	ASP	C-N-CA	8.13	127.42	118.97
1	B	332	VAL	N-CA-C	7.34	118.58	108.89
1	A	275	GLN	N-CA-C	-6.21	101.08	110.28
1	A	306	ASN	N-CA-C	5.92	117.40	111.07
1	B	396	VAL	N-CA-C	5.82	116.60	110.72
1	B	274	LYS	N-CA-C	-5.78	104.89	111.07
1	A	264	PRO	CB-CA-C	-5.63	104.10	113.06
1	A	343	GLY	N-CA-C	-5.59	107.73	114.66
1	B	396	VAL	CB-CA-C	-5.43	104.73	112.22
1	A	327	ALA	CB-CA-C	-5.39	99.70	110.42
1	B	442	ILE	N-CA-C	5.38	115.58	110.42
1	A	275	GLN	CA-C-N	-5.04	118.95	126.86
1	A	275	GLN	C-N-CA	-5.04	118.95	126.86
1	B	444	ASP	N-CA-C	-5.02	108.42	114.75

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	1526	0	1567	65	0
1	B	1514	0	1551	47	0
2	A	19	0	0	2	0
2	B	15	0	0	1	0
All	All	3074	0	3118	112	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 18.

All (112) 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:334:ARG:C	1:A:335:ASN:OD1	2.00	1.03
1:A:326:LEU:HD21	1:A:332:VAL:CG2	1.95	0.96
1:A:326:LEU:HD21	1:A:332:VAL:HG21	1.49	0.94
1:B:442:ILE:O	1:B:446:PRO:HD3	1.70	0.92
1:B:442:ILE:O	1:B:446:PRO:CD	2.21	0.89
1:A:316:ARG:HG2	1:A:325:LEU:HD23	1.56	0.85
1:A:369:CYS:CB	1:A:400:LEU:HD13	2.10	0.81
1:B:287:PRO:O	1:B:288:HIS:HB2	1.80	0.81
1:B:456:GLU:H	1:B:456:GLU:CD	1.88	0.80
1:A:275:GLN:O	1:A:276:LEU:HB2	1.81	0.80
1:A:275:GLN:O	1:A:276:LEU:CB	2.31	0.77
1:B:307:GLU:HG2	1:B:425:LEU:HG	1.66	0.77
1:B:362:MET:HE3	1:B:367:LEU:HB2	1.68	0.75
1:B:446:PRO:O	1:B:450:PHE:HB2	1.86	0.75
1:A:369:CYS:HB2	1:A:400:LEU:HD13	1.67	0.75
1:A:327:ALA:O	2:A:30:HOH:O	2.05	0.74
1:B:288:HIS:HD2	1:B:291:GLU:OE1	1.74	0.70
1:B:357:MET:HE2	1:B:362:MET:HE1	1.75	0.69
1:A:390:GLU:O	1:A:394:GLU:HG3	1.91	0.69
1:B:411:GLN:HE22	1:B:414:ARG:HH11	1.41	0.68
1:B:322:ASP:OD1	1:B:333:HIS:ND1	2.28	0.67
1:B:444:ASP:N	1:B:444:ASP:OD1	2.25	0.67
1:A:326:LEU:O	1:A:327:ALA:HB3	1.95	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:460:GLN:O	1:B:461:MET:SD	2.52	0.67
1:B:443:GLY:C	1:B:444:ASP:OD1	2.38	0.66
1:A:390:GLU:OE2	2:A:28:HOH:O	2.15	0.64
1:A:335:ASN:OD1	1:A:335:ASN:N	2.29	0.64
1:A:445:THR:HB	1:A:446:PRO:HD3	1.80	0.63
1:A:326:LEU:HD22	1:A:441:LEU:HG	1.80	0.63
1:B:377:ASN:HA	1:B:393:ARG:NH2	2.15	0.62
1:A:454:MET:C	1:A:455:LEU:HG	2.25	0.61
1:A:341:GLY:HA3	1:A:435:HIS:CE1	2.36	0.61
1:B:331:HIS:CD2	1:B:331:HIS:C	2.80	0.60
1:B:320:VAL:HG21	1:B:331:HIS:HE1	1.65	0.60
1:B:442:ILE:O	1:B:446:PRO:HD2	2.02	0.60
1:B:451:LEU:O	1:B:455:LEU:HD13	2.02	0.59
1:A:313:PHE:HA	1:A:316:ARG:NH1	2.18	0.59
1:A:326:LEU:CD2	1:A:332:VAL:CG2	2.79	0.58
1:B:370:LEU:HD21	1:B:418:LEU:HB3	1.85	0.58
1:A:439:PHE:C	1:A:439:PHE:CD1	2.81	0.58
1:B:273:ASP:HA	1:B:276:LEU:HB2	1.85	0.58
1:B:394:GLU:HA	1:B:397:TYR:CE2	2.40	0.57
1:B:320:VAL:HG22	1:B:321:LYS:H	1.70	0.56
1:A:295:ASP:O	1:A:299:ILE:HG13	2.07	0.55
1:A:333:HIS:O	1:A:335:ASN:OD1	2.25	0.54
1:B:394:GLU:HG2	1:B:397:TYR:OH	2.07	0.54
1:A:411:GLN:HE22	1:A:414:ARG:HH11	1.55	0.53
1:B:313:PHE:C	1:B:313:PHE:CD1	2.88	0.52
1:B:377:ASN:HA	1:B:393:ARG:HH21	1.75	0.52
1:A:264:PRO:HG2	1:A:265:VAL:N	2.25	0.52
1:A:333:HIS:C	1:A:335:ASN:OD1	2.53	0.51
1:B:407:LYS:NZ	2:B:27:HOH:O	2.39	0.51
1:B:421:ARG:HH11	1:B:421:ARG:HG2	1.74	0.51
1:A:326:LEU:O	1:A:328:THR:N	2.43	0.51
1:A:334:ARG:O	1:A:335:ASN:OD1	2.27	0.51
1:A:326:LEU:O	1:A:328:THR:OG1	2.30	0.50
1:A:332:VAL:HG12	1:A:333:HIS:H	1.76	0.50
1:B:373:ILE:HD11	1:B:397:TYR:HB3	1.95	0.49
1:B:443:GLY:O	1:B:447:ILE:HD13	2.12	0.49
1:A:385:ASN:HD21	1:A:388:GLU:HG2	1.79	0.48
1:A:306:ASN:O	1:A:310:ILE:HG13	2.14	0.48
1:A:264:PRO:HG2	1:A:265:VAL:H	1.79	0.48
1:A:272:ALA:O	1:A:275:GLN:O	2.32	0.47
1:B:407:LYS:HD2	1:B:408:TYR:CE1	2.49	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:326:LEU:C	1:A:328:THR:H	2.22	0.47
1:B:411:GLN:HE22	1:B:414:ARG:NH1	2.10	0.47
1:A:326:LEU:C	1:A:328:THR:N	2.72	0.46
1:B:318:ILE:HD11	1:B:357:MET:HB3	1.98	0.46
1:A:317:SER:HG	1:A:325:LEU:H	1.61	0.46
1:A:345:ILE:O	1:A:349:VAL:HG23	2.16	0.46
1:B:449:THR:O	1:B:453:GLU:HG3	2.15	0.46
1:B:288:HIS:CD2	1:B:291:GLU:OE1	2.63	0.46
1:A:326:LEU:HD21	1:A:332:VAL:HG23	1.90	0.45
1:B:440:LYS:HB3	1:B:440:LYS:HE3	1.76	0.45
1:A:310:ILE:HA	1:A:313:PHE:CE2	2.51	0.45
1:A:288:HIS:HD2	1:A:291:GLU:OE1	2.00	0.45
1:A:326:LEU:CD2	1:A:332:VAL:HG23	2.47	0.45
1:A:445:THR:HB	1:A:446:PRO:CD	2.44	0.45
1:A:423:PRO:O	1:A:426:ARG:HB3	2.15	0.45
1:A:310:ILE:HA	1:A:313:PHE:CZ	2.52	0.44
1:B:313:PHE:C	1:B:313:PHE:HD1	2.26	0.44
1:B:322:ASP:OD1	1:B:333:HIS:CE1	2.71	0.44
1:A:314:SER:O	1:A:354:VAL:HG22	2.16	0.44
1:A:373:ILE:O	1:A:393:ARG:NH2	2.51	0.44
1:A:421:ARG:HD2	1:A:421:ARG:N	2.33	0.44
1:B:411:GLN:NE2	1:B:414:ARG:HH11	2.12	0.44
1:A:326:LEU:O	1:A:327:ALA:CB	2.61	0.43
1:A:385:ASN:ND2	1:A:388:GLU:HG2	2.34	0.43
1:A:307:GLU:HG2	1:A:425:LEU:HG	2.00	0.43
1:A:373:ILE:HD11	1:A:397:TYR:HB3	2.00	0.43
1:A:451:LEU:O	1:A:454:MET:SD	2.77	0.42
1:A:287:PRO:O	1:A:288:HIS:HB2	2.20	0.42
1:A:310:ILE:CD1	1:A:429:GLY:HA2	2.49	0.42
1:B:320:VAL:HG21	1:B:331:HIS:CE1	2.51	0.42
1:A:310:ILE:HG12	1:A:313:PHE:CZ	2.55	0.42
1:B:274:LYS:HG3	1:B:275:GLN:N	2.35	0.42
1:A:451:LEU:HD12	1:A:451:LEU:HA	1.68	0.41
1:A:305:TRP:CZ2	1:A:306:ASN:ND2	2.88	0.41
1:A:331:HIS:CD2	1:A:331:HIS:C	2.98	0.41
1:A:310:ILE:O	1:A:314:SER:HB2	2.21	0.41
1:A:326:LEU:HG	1:A:330:LEU:O	2.20	0.41
1:B:306:ASN:ND2	1:B:429:GLY:O	2.51	0.41
1:B:346:PHE:CD2	1:B:346:PHE:C	2.99	0.41
1:A:321:LYS:O	1:A:321:LYS:HG3	2.21	0.41
1:B:331:HIS:C	1:B:331:HIS:HD2	2.27	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:407:LYS:HG2	1:A:408:TYR:CE1	2.56	0.41
1:A:288:HIS:CD2	1:A:291:GLU:OE1	2.75	0.40
1:A:400:LEU:HD23	1:A:415:PHE:HE1	1.86	0.40
1:B:331:HIS:CD2	1:B:331:HIS:O	2.75	0.40
1:B:446:PRO:O	1:B:450:PHE:N	2.52	0.40
1:A:445:THR:O	1:A:446:PRO:C	2.63	0.40
1:B:422:LEU:N	1:B:423:PRO:CD	2.84	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	191/240 (80%)	180 (94%)	11 (6%)	0	100	100
1	B	186/240 (78%)	167 (90%)	19 (10%)	0	100	100
All	All	377/480 (78%)	347 (92%)	30 (8%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	166/207 (80%)	143 (86%)	23 (14%)	3	11

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	164/207 (79%)	137 (84%)	27 (16%)	2	8
All	All	330/414 (80%)	280 (85%)	50 (15%)	3	9

All (50) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	264	PRO
1	A	266	THR
1	A	276	LEU
1	A	280	VAL
1	A	318	ILE
1	A	321	LYS
1	A	322	ASP
1	A	326	LEU
1	A	328	THR
1	A	331	HIS
1	A	332	VAL
1	A	335	ASN
1	A	346	PHE
1	A	351	THR
1	A	383	LEU
1	A	427	SER
1	A	436	LEU
1	A	439	PHE
1	A	444	ASP
1	A	451	LEU
1	A	452	MET
1	A	454	MET
1	A	455	LEU
1	B	273	ASP
1	B	274	LYS
1	B	276	LEU
1	B	290	SER
1	B	307	GLU
1	B	309	LEU
1	B	312	SER
1	B	313	PHE
1	B	314	SER
1	B	322	ASP
1	B	325	LEU
1	B	326	LEU
1	B	330	LEU

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Mol	Chain	Res	Type
1	B	336	SER
1	B	379	ASP
1	B	381	LYS
1	B	383	LEU
1	B	388	GLU
1	B	394	GLU
1	B	407	LYS
1	B	431	LYS
1	B	436	LEU
1	B	442	ILE
1	B	444	ASP
1	B	451	LEU
1	B	456	GLU
1	B	462	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	288	HIS
1	A	333	HIS
1	A	385	ASN
1	A	411	GLN
1	A	435	HIS
1	B	288	HIS
1	B	315	HIS
1	B	331	HIS
1	B	411	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	193/240 (80%)	-0.36	4 (2%) 63 54	6, 20, 43, 51	0
1	B	190/240 (79%)	-0.31	2 (1%) 78 71	4, 19, 40, 52	0
All	All	383/480 (79%)	-0.33	6 (1%) 70 62	4, 20, 43, 52	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	462	THR	3.8
1	A	327	ALA	2.8
1	A	455	LEU	2.3
1	A	337	ALA	2.2
1	B	458	PRO	2.2
1	A	388	GLU	2.1

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.