



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 29, 2023 – 12:13 PM EDT

PDB ID : 8GM9  
Title : Structure of Citrate Synthase(CitA) in Mycobacterium Tuberculosis  
Authors : Pathirage, R.; Ronning, D.; Favrot, L.  
Deposited on : 2023-03-24  
Resolution : 2.40 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.

The types of validation reports are described at

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

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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  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

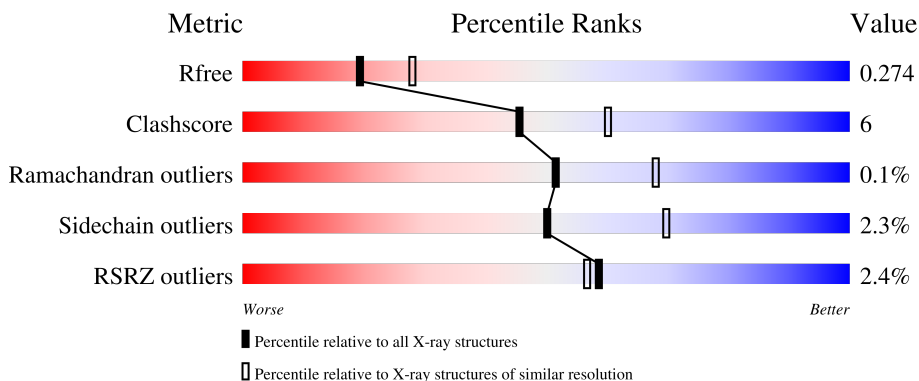
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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))
$R_{free}$	130704	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	379	
1	B	379	
1	C	379	
1	D	379	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	EDO	A	403	-	-	-	X
2	EDO	C	403	-	-	-	X
4	AKR	A	406	-	X	-	-
4	AKR	B	404	-	X	-	-
4	AKR	C	404	-	X	-	-
4	AKR	D	404	-	X	-	-

## 2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 11239 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 citrate synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	365	2766	1742	502	509	13	0	0	0
1	B	356	2697	1697	488	499	13	0	0	0
1	C	353	2675	1688	483	491	13	0	0	0
1	D	367	2794	1757	509	515	13	0	1	0

There are 24 discrepancies between the modelled and reference sequences:

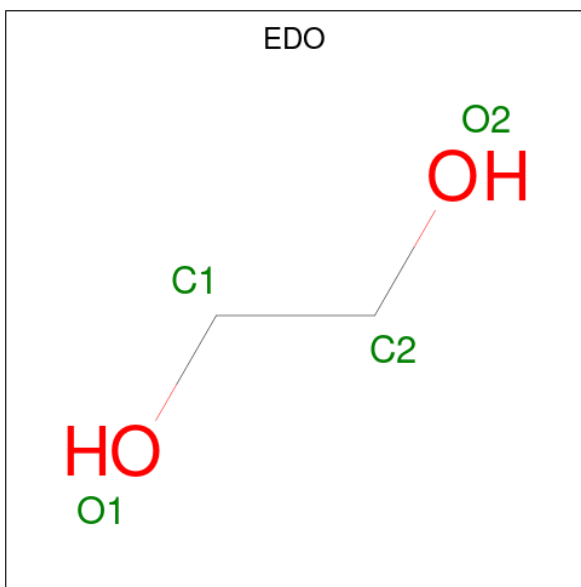
Chain	Residue	Modelled	Actual	Comment	Reference
A	374	HIS	-	expression tag	UNP A0A045JB88
A	375	HIS	-	expression tag	UNP A0A045JB88
A	376	HIS	-	expression tag	UNP A0A045JB88
A	377	HIS	-	expression tag	UNP A0A045JB88
A	378	HIS	-	expression tag	UNP A0A045JB88
A	379	HIS	-	expression tag	UNP A0A045JB88
B	374	HIS	-	expression tag	UNP A0A045JB88
B	375	HIS	-	expression tag	UNP A0A045JB88
B	376	HIS	-	expression tag	UNP A0A045JB88
B	377	HIS	-	expression tag	UNP A0A045JB88
B	378	HIS	-	expression tag	UNP A0A045JB88
B	379	HIS	-	expression tag	UNP A0A045JB88
C	374	HIS	-	expression tag	UNP A0A045JB88
C	375	HIS	-	expression tag	UNP A0A045JB88
C	376	HIS	-	expression tag	UNP A0A045JB88
C	377	HIS	-	expression tag	UNP A0A045JB88
C	378	HIS	-	expression tag	UNP A0A045JB88
C	379	HIS	-	expression tag	UNP A0A045JB88
D	374	HIS	-	expression tag	UNP A0A045JB88
D	375	HIS	-	expression tag	UNP A0A045JB88
D	376	HIS	-	expression tag	UNP A0A045JB88

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Chain	Residue	Modelled	Actual	Comment	Reference
D	377	HIS	-	expression tag	UNP A0A045JB88
D	378	HIS	-	expression tag	UNP A0A045JB88
D	379	HIS	-	expression tag	UNP A0A045JB88

- Molecule 2 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



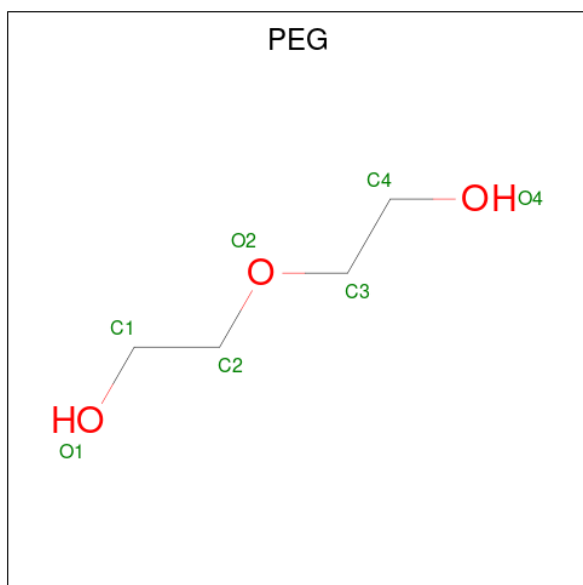
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O 4 2 2	0	0
2	A	1	Total C O 4 2 2	0	0
2	A	1	Total C O 4 2 2	0	0
2	A	1	Total C O 4 2 2	0	0
2	B	1	Total C O 4 2 2	0	0
2	B	1	Total C O 4 2 2	0	0
2	C	1	Total C O 4 2 2	0	0
2	C	1	Total C O 4 2 2	0	0
2	C	1	Total C O 4 2 2	0	0
2	D	1	Total C O 4 2 2	0	0

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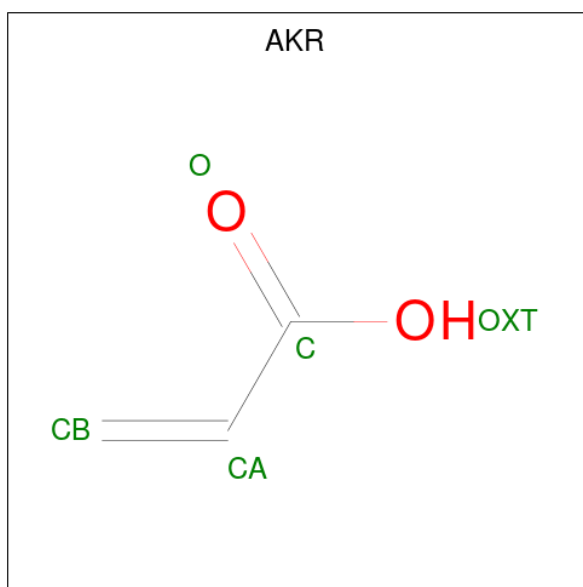
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	D	1	Total	C	O	0	0
			4	2	2		
2	D	1	Total	C	O	0	0
			4	2	2		

- Molecule 3 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 4 is ACRYLIC ACID (three-letter code: AKR) (formula: C<sub>3</sub>H<sub>4</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 5 3 2	0	0
4	B	1	Total C O 5 3 2	0	0
4	C	1	Total C O 5 3 2	0	0
4	D	1	Total C O 5 3 2	0	0

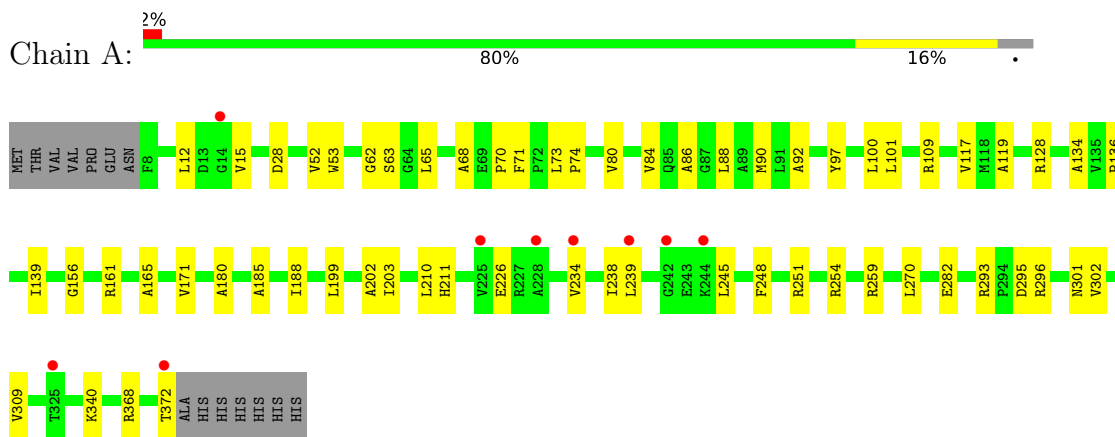
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	70	Total O 70 70	0	0
5	B	27	Total O 27 27	0	0
5	C	58	Total O 58 58	0	0
5	D	63	Total O 63 63	0	0

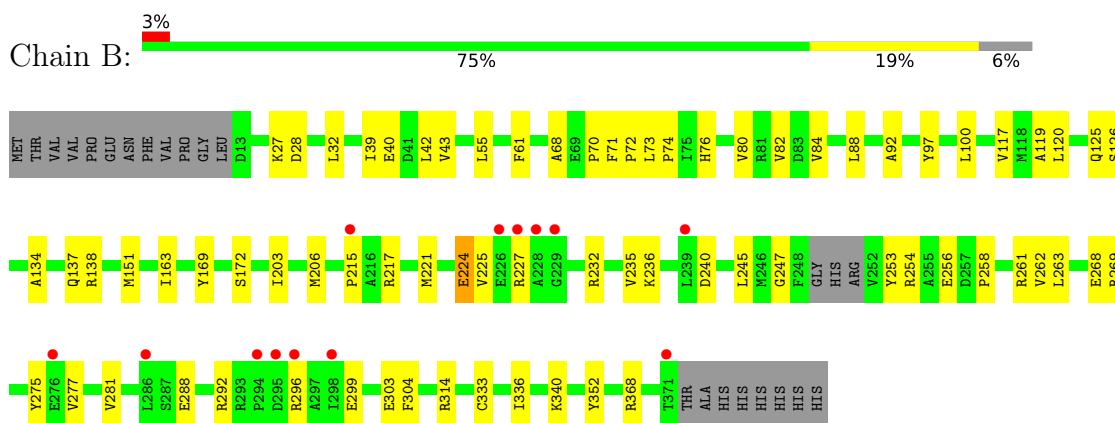
### 3 Residue-property plots [i](#)

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.

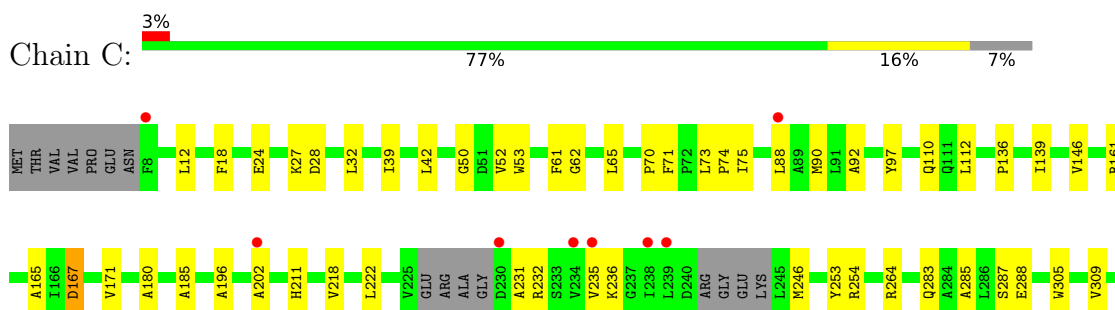
- Molecule 1: citrate synthase



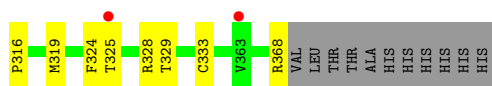
- Molecule 1: citrate synthase



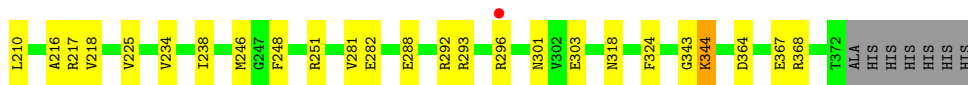
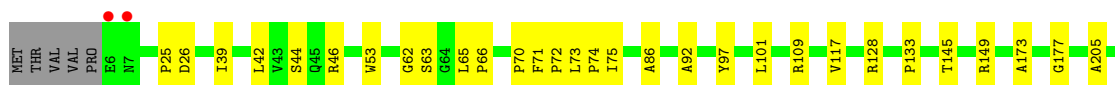
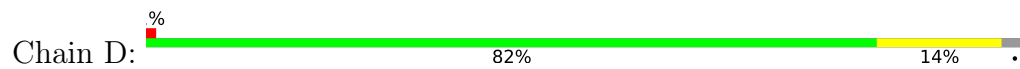
- Molecule 1: citrate synthase







● Molecule 1: citrate synthase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	75.33Å 121.03Å 99.58Å 90.00° 94.73° 90.00°	Depositor
Resolution (Å)	43.06 – 2.40 43.06 – 2.20	Depositor EDS
% Data completeness (in resolution range)	94.3 (43.06-2.40) 80.5 (43.06-2.20)	Depositor EDS
$R_{merge}$	0.17	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.44 (at 2.20Å)	Xtrriage
Refinement program	PHENIX 1.19.2_4158:000	Depositor
R, $R_{free}$	0.220 , 0.275 0.220 , 0.274	Depositor DCC
$R_{free}$ test set	1998 reflections (2.31%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	36.1	Xtrriage
Anisotropy	0.805	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 37.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	11239	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	59.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.68% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: EDO, PEG, AKR

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	0.24	0/2829	0.49	0/3853
1	B	0.24	0/2756	0.49	0/3752
1	C	0.24	0/2736	0.49	0/3726
1	D	0.24	0/2857	0.50	0/3890
All	All	0.24	0/11178	0.49	0/15221

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 [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	2766	0	2742	39	0
1	B	2697	0	2672	45	0
1	C	2675	0	2644	33	0
1	D	2794	0	2766	37	0
2	A	16	0	24	6	0
2	B	8	0	12	2	0
2	C	12	0	18	4	0
2	D	12	0	18	1	0
3	A	7	0	10	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	14	0	20	1	0
4	A	5	0	3	0	0
4	B	5	0	3	1	0
4	C	5	0	3	0	0
4	D	5	0	3	0	0
5	A	70	0	0	1	0
5	B	27	0	0	0	0
5	C	58	0	0	0	0
5	D	63	0	0	1	0
All	All	11239	0	10938	140	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

All (140) 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:256:GLU:HB3	1:B:261:ARG:HD3	1.61	0.81
1:A:100:LEU:HD22	1:A:340:LYS:HD2	1.69	0.74
1:B:215:PRO:HA	1:B:303:GLU:HB3	1.70	0.73
1:B:368:ARG:HG3	1:C:62:GLY:HA2	1.69	0.73
1:D:39:ILE:HA	1:D:42:LEU:HD12	1.70	0.72
1:C:232:ARG:HH12	1:C:287:SER:HB2	1.55	0.71
1:B:55:LEU:HB2	1:B:61:PHE:HE1	1.56	0.71
1:A:128:ARG:HH22	2:A:401:EDO:H22	1.56	0.70
1:B:39:ILE:HA	1:B:42:LEU:HD12	1.77	0.67
1:A:368:ARG:HD2	1:D:62:GLY:HA2	1.77	0.66
1:B:70:PRO:HB2	1:D:70:PRO:HB2	1.76	0.66
1:D:367:GLU:HG2	1:D:368:ARG:HD3	1.78	0.64
1:A:101:LEU:HD13	1:D:210:LEU:HD21	1.80	0.63
1:D:92:ALA:HA	1:D:97:TYR:HB2	1.80	0.62
1:D:218:VAL:HG12	1:D:246:MET:HB3	1.81	0.62
1:A:12:LEU:HD22	1:A:15:VAL:HG21	1.81	0.61
1:D:128[B]:ARG:NH1	1:D:133:PRO:O	2.34	0.60
1:A:92:ALA:HA	1:A:97:TYR:HB2	1.84	0.60
1:A:301:ASN:HA	2:A:403:EDO:H21	1.84	0.59
1:B:92:ALA:HA	1:B:97:TYR:HB2	1.84	0.59
1:A:70:PRO:HB2	1:C:70:PRO:HB2	1.85	0.58
1:B:333:CYS:HA	1:B:336:ILE:HD12	1.85	0.58
1:B:138:ARG:HG2	1:B:138:ARG:HH11	1.68	0.57
1:A:340:LYS:NZ	5:A:502:HOH:O	2.38	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:73:LEU:HD12	1:D:74:PRO:HD2	1.88	0.56
1:C:231:ALA:O	1:C:235:VAL:HG12	2.06	0.55
1:C:73:LEU:HD12	1:C:74:PRO:HD2	1.87	0.55
1:C:328:ARG:HH12	2:C:401:EDO:H12	1.72	0.55
1:B:72:PRO:HD2	1:D:72:PRO:HD2	1.89	0.55
1:B:240:ASP:OD1	1:B:292:ARG:NH2	2.39	0.54
1:B:88:LEU:HD21	1:B:119:ALA:HB2	1.88	0.54
1:D:234:VAL:O	1:D:238:ILE:HG13	2.08	0.54
1:C:146:VAL:HB	2:C:402:EDO:H22	1.89	0.53
1:A:128:ARG:HD3	3:A:404:PEG:H21	1.91	0.53
1:D:293:ARG:HB3	1:D:296:ARG:HG2	1.90	0.53
1:D:301:ASN:HB3	1:D:303:GLU:OE1	2.08	0.53
1:D:343:GLY:HA2	2:D:402:EDO:H12	1.91	0.52
1:B:40:GLU:OE2	1:B:261:ARG:NH2	2.40	0.52
1:A:293:ARG:HD3	1:A:296:ARG:HG3	1.91	0.52
1:C:50:GLY:HA3	2:C:402:EDO:H21	1.91	0.51
1:A:134:ALA:HB1	3:A:404:PEG:H11	1.93	0.51
1:C:92:ALA:HA	1:C:97:TYR:HB2	1.92	0.51
1:A:28:ASP:HA	1:A:254:ARG:HB2	1.93	0.50
1:D:288:GLU:HG3	1:D:292:ARG:HE	1.77	0.50
1:B:235:VAL:HG13	1:B:245:LEU:HD21	1.92	0.49
1:B:76:HIS:ND1	2:B:401:EDO:O1	2.44	0.49
1:B:55:LEU:HB2	1:B:61:PHE:CE1	2.43	0.49
1:C:165:ALA:HB1	1:C:309:VAL:HG13	1.94	0.49
1:D:217:ARG:NH1	5:D:509:HOH:O	2.44	0.49
1:C:185:ALA:HB2	1:C:202:ALA:HB2	1.94	0.49
1:B:68:ALA:HB2	1:B:117:VAL:HG22	1.95	0.48
1:A:52:VAL:HG11	1:A:171:VAL:HG23	1.96	0.48
1:A:239:LEU:HD21	1:A:245:LEU:HB2	1.96	0.48
1:B:73:LEU:HD12	1:B:74:PRO:HD2	1.96	0.48
1:A:62:GLY:HA2	1:D:368:ARG:HB2	1.95	0.48
2:A:405:EDO:H11	1:D:25:PRO:HG2	1.94	0.48
1:D:173:ALA:HB1	1:D:324:PHE:CE1	2.49	0.48
1:B:134:ALA:HB1	3:B:403:PEG:H11	1.94	0.48
1:B:169:TYR:HA	1:B:263:LEU:HD21	1.96	0.48
1:A:248:PHE:CZ	1:A:282:GLU:HA	2.49	0.48
1:C:235:VAL:HG21	1:C:285:ALA:HA	1.95	0.48
1:A:63:SER:O	1:A:109:ARG:NH2	2.37	0.47
1:A:68:ALA:HB2	1:A:117:VAL:HG22	1.96	0.47
1:C:28:ASP:OD1	1:C:254:ARG:NH1	2.47	0.47
1:C:136:PRO:HD2	1:C:139:ILE:HD12	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:73:LEU:HD12	1:A:74:PRO:HD2	1.96	0.47
1:B:80:VAL:HG13	1:B:126:SER:HB3	1.96	0.46
1:B:27:LYS:HA	1:B:253:TYR:CD1	2.50	0.46
1:A:185:ALA:HB2	1:A:202:ALA:HB2	1.98	0.46
1:B:84:VAL:HG13	1:B:203:ILE:HD13	1.97	0.46
1:D:216:ALA:HB1	1:D:246:MET:HG3	1.97	0.46
1:A:210:LEU:HG	1:D:101:LEU:HD11	1.98	0.46
1:B:247:GLY:HA3	1:B:304:PHE:HB2	1.97	0.46
1:C:112:LEU:HD12	1:C:333:CYS:SG	2.56	0.46
1:A:53:TRP:CD2	1:A:65:LEU:HD13	2.51	0.46
1:B:32:LEU:HD23	1:B:39:ILE:HD13	1.98	0.46
1:A:156:GLY:HA3	2:A:401:EDO:H21	1.97	0.46
1:C:167:ASP:O	1:C:171:VAL:HG12	2.16	0.46
1:D:66:PRO:O	1:D:117:VAL:HG11	2.16	0.45
1:B:277:VAL:O	1:B:281:VAL:HG13	2.15	0.45
1:D:65:LEU:HG	1:D:117:VAL:HG12	1.97	0.45
1:A:90:MET:SD	1:D:75:ILE:HD12	2.56	0.45
1:A:88:LEU:HD11	1:A:119:ALA:HB2	1.96	0.45
1:A:128:ARG:HD3	3:A:404:PEG:H31	1.98	0.45
1:A:234:VAL:O	1:A:238:ILE:HG13	2.16	0.45
1:C:264:ARG:HG3	1:C:305:TRP:CZ2	2.52	0.45
1:C:88:LEU:O	1:C:196:ALA:HB1	2.17	0.45
1:C:218:VAL:HG12	1:C:246:MET:HB2	1.99	0.45
1:A:161:ARG:NH1	1:A:270:LEU:O	2.44	0.45
1:A:251:ARG:HA	2:A:403:EDO:H11	1.98	0.45
1:B:352:TYR:CG	1:C:24:GLU:HB2	2.52	0.45
1:A:188:ILE:HG12	1:D:205:ALA:HB2	1.99	0.44
1:B:256:GLU:HA	1:B:299:GLU:OE1	2.18	0.44
1:B:100:LEU:HD22	1:B:340:LYS:HG3	2.00	0.44
1:B:224:GLU:HA	1:B:227:ARG:HG2	1.98	0.44
1:B:258:PRO:O	1:B:262:VAL:HG12	2.17	0.44
1:D:63:SER:HB2	1:D:109:ARG:NH2	2.32	0.44
1:D:145:THR:O	1:D:149:ARG:HG3	2.17	0.44
1:C:32:LEU:HB3	1:C:39:ILE:HD13	2.00	0.44
1:C:180:ALA:HB3	1:C:211:HIS:CD2	2.53	0.44
2:A:405:EDO:H12	1:D:177:GLY:HA3	1.99	0.44
1:B:236:LYS:HZ2	1:B:292:ARG:HE	1.65	0.44
1:C:39:ILE:HA	1:C:42:LEU:HD12	2.00	0.43
1:A:259:ARG:HB2	1:A:302:VAL:HG21	2.01	0.43
1:A:180:ALA:HB3	1:A:211:HIS:CD2	2.53	0.43
1:D:248:PHE:CZ	1:D:282:GLU:HA	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:82:VAL:HG11	1:C:90:MET:HA	2.01	0.43
1:C:232:ARG:NH2	1:C:288:GLU:OE1	2.51	0.43
1:B:43:VAL:HG21	1:B:262:VAL:HG21	1.99	0.43
1:B:70:PRO:HG3	1:B:137:GLN:HG3	2.00	0.43
1:B:268:GLU:HB3	1:B:275:TYR:CZ	2.53	0.43
1:D:65:LEU:HG	1:D:117:VAL:CG1	2.48	0.43
1:B:236:LYS:HA	1:B:236:LYS:HD2	1.60	0.43
1:B:120:LEU:HB3	4:B:404:AKR:HB3	2.01	0.43
1:D:225:VAL:HG21	1:D:281:VAL:HG22	2.01	0.42
1:C:75:ILE:HD11	1:C:90:MET:SD	2.59	0.42
1:A:165:ALA:HB1	1:A:309:VAL:HG13	2.02	0.42
1:B:236:LYS:HD3	1:B:288:GLU:CD	2.40	0.42
1:D:53:TRP:CD2	1:D:65:LEU:HD13	2.54	0.42
1:A:199:LEU:O	1:A:203:ILE:HG12	2.19	0.42
1:C:53:TRP:CD2	1:C:65:LEU:HD13	2.54	0.42
1:A:80:VAL:O	1:A:84:VAL:HG12	2.20	0.42
1:A:136:PRO:HD2	1:A:139:ILE:HD12	2.02	0.42
1:C:52:VAL:HG11	1:C:171:VAL:HG23	2.02	0.42
1:B:125:GLN:O	2:B:401:EDO:H11	2.20	0.42
1:C:27:LYS:HA	1:C:253:TYR:CD2	2.55	0.42
1:B:268:GLU:HG2	1:B:269:ARG:N	2.34	0.41
1:B:314:ARG:HA	1:B:314:ARG:HD3	1.81	0.41
1:B:151:MET:HG3	1:B:163:ILE:HG12	2.02	0.41
1:D:318:ASN:H	1:D:318:ASN:ND2	2.18	0.41
1:C:316:PRO:HD2	1:C:319:MET:SD	2.60	0.41
1:C:324:PHE:HZ	2:C:401:EDO:H21	1.85	0.41
1:D:344:LYS:HA	1:D:344:LYS:HD2	1.87	0.41
1:C:325:THR:O	1:C:329:THR:HG23	2.21	0.41
1:D:248:PHE:HZ	1:D:282:GLU:HA	1.86	0.40
1:C:222:LEU:HD23	1:C:222:LEU:HA	1.94	0.40
1:A:372:THR:HB	1:D:46:ARG:NH2	2.36	0.40
1:B:221:MET:O	1:B:225:VAL:HG22	2.21	0.40
1:B:232:ARG:NE	1:B:288:GLU:OE2	2.54	0.40
1:A:86:ALA:HB1	1:D:86:ALA:HB1	2.03	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	363/379 (96%)	354 (98%)	9 (2%)	0	100	100
1	B	352/379 (93%)	339 (96%)	13 (4%)	0	100	100
1	C	347/379 (92%)	337 (97%)	9 (3%)	1 (0%)	41	55
1	D	366/379 (97%)	359 (98%)	6 (2%)	1 (0%)	41	55
All	All	1428/1516 (94%)	1389 (97%)	37 (3%)	2 (0%)	51	68

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	26	ASP
1	C	61	PHE

### 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	278/291 (96%)	275 (99%)	3 (1%)	73	87
1	B	271/291 (93%)	263 (97%)	8 (3%)	41	61
1	C	269/291 (92%)	260 (97%)	9 (3%)	38	57
1	D	281/291 (97%)	276 (98%)	5 (2%)	59	76
All	All	1099/1164 (94%)	1074 (98%)	25 (2%)	50	70

All (25) residues with a non-rotameric sidechain are listed below:



Mol	Chain	Res	Type
1	A	71	PHE
1	A	226	GLU
1	A	295	ASP
1	B	28	ASP
1	B	71	PHE
1	B	172	SER
1	B	206	MET
1	B	217	ARG
1	B	224	GLU
1	B	254	ARG
1	B	296	ARG
1	C	12	LEU
1	C	18	PHE
1	C	71	PHE
1	C	110	GLN
1	C	161	ARG
1	C	167	ASP
1	C	236	LYS
1	C	283	GLN
1	C	368	ARG
1	D	44	SER
1	D	71	PHE
1	D	251	ARG
1	D	344	LYS
1	D	364	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	301	ASN
1	D	318	ASN

### 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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

19 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	EDO	A	401	-	3,3,3	0.46	0	2,2,2	0.34	0
2	EDO	B	405	-	3,3,3	0.46	0	2,2,2	0.32	0
3	PEG	B	402	-	6,6,6	0.49	0	5,5,5	0.27	0
2	EDO	A	405	-	3,3,3	0.46	0	2,2,2	0.34	0
2	EDO	B	401	-	3,3,3	0.46	0	2,2,2	0.25	0
2	EDO	C	403	-	3,3,3	0.46	0	2,2,2	0.34	0
4	AKR	A	406	-	4,4,4	1.57	1 (25%)	4,4,4	1.35	1 (25%)
4	AKR	C	404	-	4,4,4	1.58	1 (25%)	4,4,4	1.34	1 (25%)
2	EDO	A	403	-	3,3,3	0.44	0	2,2,2	0.30	0
2	EDO	D	403	-	3,3,3	0.46	0	2,2,2	0.34	0
4	AKR	B	404	-	4,4,4	1.56	1 (25%)	4,4,4	1.36	1 (25%)
2	EDO	D	402	-	3,3,3	0.46	0	2,2,2	0.30	0
3	PEG	A	404	-	6,6,6	0.49	0	5,5,5	0.26	0
3	PEG	B	403	-	6,6,6	0.50	0	5,5,5	0.24	0
2	EDO	C	402	-	3,3,3	0.44	0	2,2,2	0.31	0
4	AKR	D	404	-	4,4,4	1.56	1 (25%)	4,4,4	1.37	1 (25%)
2	EDO	C	401	-	3,3,3	0.45	0	2,2,2	0.33	0
2	EDO	D	401	-	3,3,3	0.46	0	2,2,2	0.32	0
2	EDO	A	402	-	3,3,3	0.45	0	2,2,2	0.34	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
2	EDO	A	401	-	-	0/1/1/1	-
2	EDO	B	405	-	-	0/1/1/1	-
3	PEG	B	402	-	-	1/4/4/4	-
2	EDO	A	405	-	-	0/1/1/1	-
2	EDO	B	401	-	-	0/1/1/1	-
2	EDO	C	403	-	-	0/1/1/1	-
4	AKR	A	406	-	-	2/2/2/2	-
4	AKR	C	404	-	-	2/2/2/2	-
2	EDO	A	403	-	-	0/1/1/1	-
2	EDO	D	403	-	-	0/1/1/1	-
4	AKR	B	404	-	-	2/2/2/2	-
2	EDO	D	402	-	-	0/1/1/1	-
3	PEG	A	404	-	-	2/4/4/4	-
3	PEG	B	403	-	-	0/4/4/4	-
2	EDO	C	402	-	-	0/1/1/1	-
4	AKR	D	404	-	-	2/2/2/2	-
2	EDO	C	401	-	-	0/1/1/1	-
2	EDO	D	401	-	-	0/1/1/1	-
2	EDO	A	402	-	-	0/1/1/1	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	404	AKR	CA-C	2.40	1.53	1.46
4	A	406	AKR	CA-C	2.37	1.53	1.46
4	D	404	AKR	CA-C	2.37	1.53	1.46
4	B	404	AKR	CA-C	2.36	1.53	1.46

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	404	AKR	OXT-C-CA	2.13	119.99	114.19
4	B	404	AKR	OXT-C-CA	2.13	119.98	114.19
4	C	404	AKR	OXT-C-CA	2.10	119.92	114.19
4	A	406	AKR	OXT-C-CA	2.10	119.91	114.19

There are no chirality outliers.

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	406	AKR	O-C-CA-CB

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Mol	Chain	Res	Type	Atoms
4	A	406	AKR	OXT-C-CA-CB
4	B	404	AKR	O-C-CA-CB
4	B	404	AKR	OXT-C-CA-CB
4	C	404	AKR	O-C-CA-CB
4	C	404	AKR	OXT-C-CA-CB
4	D	404	AKR	O-C-CA-CB
4	D	404	AKR	OXT-C-CA-CB
3	A	404	PEG	O2-C3-C4-O4
3	B	402	PEG	C1-C2-O2-C3
3	A	404	PEG	C4-C3-O2-C2

There are no ring outliers.

10 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	EDO	2	0
2	A	405	EDO	2	0
2	B	401	EDO	2	0
2	A	403	EDO	2	0
4	B	404	AKR	1	0
2	D	402	EDO	1	0
3	A	404	PEG	3	0
3	B	403	PEG	1	0
2	C	402	EDO	2	0
2	C	401	EDO	2	0

## 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

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	365/379 (96%)	-0.07	9 (2%) 57 55	39, 50, 87, 108	0
1	B	356/379 (93%)	0.08	13 (3%) 41 41	45, 64, 90, 98	0
1	C	353/379 (93%)	0.06	10 (2%) 53 51	42, 56, 87, 99	0
1	D	367/379 (96%)	-0.14	3 (0%) 86 84	41, 54, 76, 111	0
All	All	1441/1516 (95%)	-0.02	35 (2%) 59 57	39, 55, 87, 111	0

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	235	VAL	4.6
1	C	239	LEU	4.6
1	B	227	ARG	3.9
1	D	6	GLU	3.6
1	B	226	GLU	3.4
1	B	286	LEU	3.4
1	D	7	ASN	3.3
1	B	298	ILE	3.3
1	C	238	ILE	3.2
1	B	296	ARG	3.0
1	A	244	LYS	2.9
1	A	225	VAL	2.8
1	A	242	GLY	2.7
1	D	296	ARG	2.7
1	C	325	THR	2.7
1	B	294	PRO	2.6
1	B	371	THR	2.6
1	A	239	LEU	2.6
1	C	8	PHE	2.6
1	B	229	GLY	2.6
1	C	234	VAL	2.4

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Mol	Chain	Res	Type	RSRZ
1	B	276	GLU	2.4
1	B	295	ASP	2.4
1	C	202	ALA	2.3
1	A	372	THR	2.3
1	B	239	LEU	2.2
1	B	215	PRO	2.2
1	C	88	LEU	2.2
1	C	230	ASP	2.2
1	A	234	VAL	2.1
1	A	14	GLY	2.1
1	B	228	ALA	2.1
1	C	363	VAL	2.1
1	A	228	ALA	2.0
1	A	325	THR	2.0

## 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 monosaccharides in this entry.

## 6.4 Ligands [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
2	EDO	C	402	4/4	0.74	0.32	52,61,62,68	0
2	EDO	A	403	4/4	0.75	0.54	51,53,56,59	0
2	EDO	D	401	4/4	0.75	0.29	62,66,71,71	0
2	EDO	A	402	4/4	0.77	0.34	53,56,56,61	0
2	EDO	C	403	4/4	0.78	0.46	70,71,73,73	0
2	EDO	B	405	4/4	0.78	0.37	57,57,62,65	0
3	PEG	B	402	7/7	0.81	0.37	79,82,94,99	0
2	EDO	B	401	4/4	0.83	0.79	57,59,61,68	0
2	EDO	A	401	4/4	0.83	0.39	63,69,74,82	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	PEG	B	403	7/7	0.83	0.40	46,51,55,59	0
2	EDO	D	403	4/4	0.89	0.71	58,61,63,66	0
3	PEG	A	404	7/7	0.89	0.39	45,48,52,64	0
4	AKR	D	404	5/5	0.90	0.18	57,59,67,74	0
4	AKR	A	406	5/5	0.91	0.12	50,51,53,59	0
2	EDO	D	402	4/4	0.91	0.29	47,53,59,65	0
2	EDO	A	405	4/4	0.94	0.19	53,54,67,73	0
2	EDO	C	401	4/4	0.94	0.15	54,59,59,61	0
4	AKR	B	404	5/5	0.95	0.36	58,61,62,66	0
4	AKR	C	404	5/5	0.96	0.12	45,53,54,54	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.