



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 5, 2022 – 01:06 pm BST

PDB ID : 7QVR
Title : Structure of E.coli Class 2 L-asparaginase EcAIII, mutant RDM1-37 (G206S, R207T, D210S)
Authors : Loch, J.I.; Kadziolka, K.; Jaskolski, M.
Deposited on : 2022-01-23
Resolution : 1.90 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 : 4.02b-467
Xtrriage (Phenix) : 1.13
EDS : 2.29
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.29

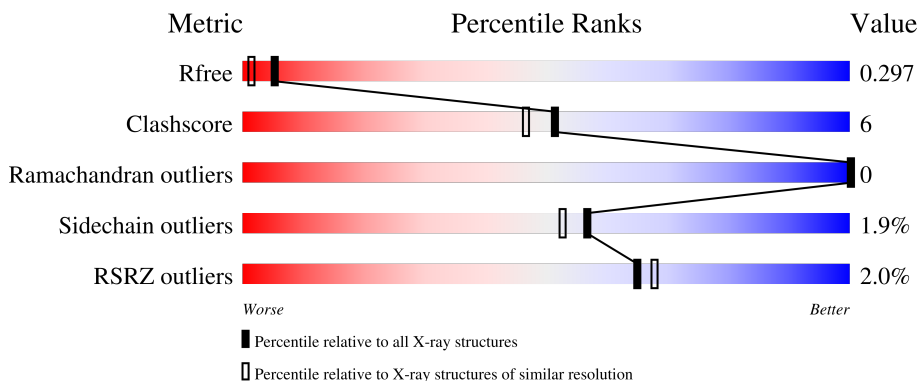
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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}	130704	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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	AAA	178	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 81%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 10%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 7%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">81% 10% 10%</p>
1	CCC	178	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 80%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 7%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 13%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">80% 7% 13%</p>
2	BBB	143	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 80%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 14%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 6%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">80% 14% 6%</p>
2	DDD	143	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 78%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 15%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 6%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">78% 15% 6%</p>

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 4833 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 Isoaspartyl peptidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	AAA	161	1206	752	213	230	11	0	2	0
1	CCC	155	1168	729	206	223	10	0	2	0

- Molecule 2 is a protein called Beta-aspartyl-peptidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	BBB	135	960	601	158	194	7	0	3	0
2	DDD	135	952	595	158	192	7	0	1	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
BBB	206	SER	GLY	engineered mutation	UNP A0A0A1A394
BBB	207	THR	ARG	engineered mutation	UNP A0A0A1A394
BBB	210	SER	ASP	engineered mutation	UNP A0A0A1A394
DDD	206	SER	GLY	engineered mutation	UNP A0A0A1A394
DDD	207	THR	ARG	engineered mutation	UNP A0A0A1A394
DDD	210	SER	ASP	engineered mutation	UNP A0A0A1A394

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	AAA	1	Total	Na	0	0
			1	1		
3	CCC	1	Total	Na	0	0
			1	1		

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	BBB	1	Total Cl 1 1	0	0
4	DDD	1	Total Cl 1 1	0	0

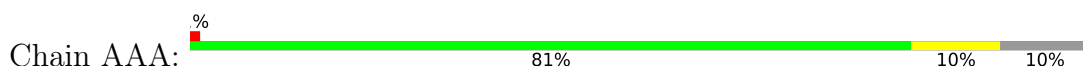
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	AAA	172	Total O 176 176	0	4
5	BBB	112	Total O 116 116	0	4
5	CCC	156	Total O 160 160	0	4
5	DDD	86	Total O 91 91	0	5

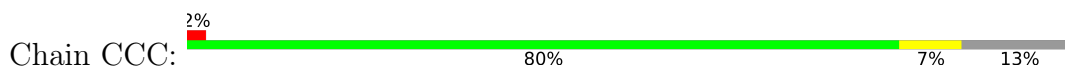
3 Residue-property plots [i](#)

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.

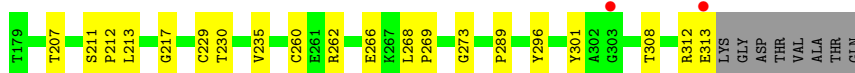
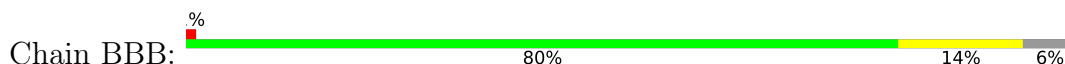
- Molecule 1: Isoaspartyl peptidase



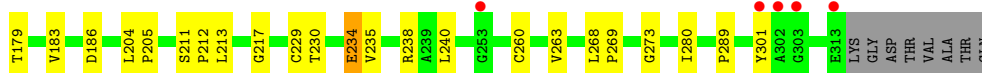
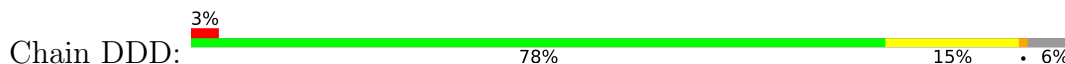
- Molecule 1: Isoaspartyl peptidase



- Molecule 2: Beta-aspartyl-peptidase



- Molecule 2: Beta-aspartyl-peptidase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	51.22Å 74.11Å 147.77Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.28 – 1.90 20.28 – 1.90	Depositor EDS
% Data completeness (in resolution range)	95.0 (20.28-1.90) 95.1 (20.28-1.90)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.04 (at 1.90Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.223 , 0.288 0.229 , 0.297	Depositor DCC
R_{free} test set	1055 reflections (2.46%)	wwPDB-VP
Wilson B-factor (Å ²)	12.6	Xtriage
Anisotropy	0.321	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.41$, $\langle L^2 \rangle = 0.24$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	4833	wwPDB-VP
Average B, all atoms (Å ²)	16.0	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 21.46 % 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 6.9840e-03.*

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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CL, NA

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	AAA	0.88	0/1226	0.91	0/1651
1	CCC	0.84	0/1188	0.90	0/1602
2	BBB	0.81	0/984	0.87	0/1342
2	DDD	0.82	0/970	0.90	0/1322
All	All	0.84	0/4368	0.90	0/5917

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	AAA	1206	0	1216	16	0
1	CCC	1168	0	1180	12	0
2	BBB	960	0	947	15	0
2	DDD	952	0	933	14	0
3	AAA	1	0	0	0	0
3	CCC	1	0	0	0	0
4	BBB	1	0	0	0	0
4	DDD	1	0	0	0	0
5	AAA	176	0	0	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	BBB	116	0	0	3	0
5	CCC	160	0	0	2	0
5	DDD	91	0	0	2	0
All	All	4833	0	4276	48	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 (48) 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:AAA:29:ILE:HG23	2:BBB:308[B]:THR:HG21	1.57	0.85
1:CCC:76:ARG:NH2	1:CCC:77:ASP:OD1	2.16	0.78
1:CCC:76:ARG:HE	2:DDD:204:LEU:HD12	1.49	0.78
1:AAA:3:LYS:HG3	5:AAA:445:HOH:O	1.90	0.72
1:AAA:3:LYS:HD2	2:BBB:301:TYR:HB3	1.70	0.71
2:BBB:262:ARG:NH1	5:BBB:501:HOH:O	2.22	0.71
1:AAA:3:LYS:NZ	5:AAA:301:HOH:O	2.26	0.68
1:CCC:76:ARG:HG2	2:DDD:205:PRO:HD3	1.83	0.61
2:BBB:207:THR:HG21	1:CCC:119:HIS:CD2	2.36	0.60
2:DDD:260:CYS:HB3	2:DDD:289:PRO:HG3	1.85	0.58
2:DDD:217:GLY:HA2	2:DDD:229:CYS:HB2	1.88	0.56
2:DDD:268:LEU:HB2	2:DDD:269:PRO:HD3	1.87	0.55
1:AAA:114:MET:CE	1:AAA:115:GLU:OE2	2.55	0.55
2:BBB:268:LEU:HB2	2:BBB:269:PRO:HD3	1.92	0.52
2:BBB:213:LEU:HD22	2:DDD:213:LEU:HD22	1.90	0.52
2:BBB:217:GLY:HA2	2:BBB:229:CYS:HB2	1.92	0.51
1:AAA:35:ILE:HG12	1:AAA:59:LEU:HB3	1.92	0.51
1:CCC:108:LEU:HB2	1:CCC:136:MET:CE	2.41	0.50
2:BBB:260:CYS:HB3	2:BBB:289:PRO:HG3	1.95	0.49
2:BBB:235:VAL:HG11	2:BBB:273:GLY:HA3	1.95	0.48
1:AAA:85:CYS:HB2	2:BBB:212:PRO:HA	1.95	0.48
2:DDD:183:VAL:HG23	2:DDD:280:ILE:HD12	1.96	0.48
2:DDD:235:VAL:HG11	2:DDD:273:GLY:HA3	1.96	0.46
1:AAA:116:GLN:HG3	5:AAA:418:HOH:O	2.16	0.46
1:CCC:27:ARG:NH2	5:CCC:309[A]:HOH:O	2.43	0.46
2:BBB:211:SER:N	2:BBB:212:PRO:CD	2.79	0.45
1:AAA:114:MET:HE3	1:AAA:115:GLU:OE2	2.16	0.45
1:AAA:118:PRO:HG2	1:AAA:119:HIS:NE2	2.32	0.45
1:AAA:116:GLN:OE1	1:AAA:116:GLN:HA	2.17	0.44
1:AAA:134:ARG:NE	5:AAA:310:HOH:O	2.43	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:CCC:141:PRO:HB2	5:CCC:413:HOH:O	2.17	0.44
1:AAA:108:LEU:CB	1:AAA:136:MET:HE1	2.47	0.44
2:BBB:313:GLU:HB3	5:BBB:554:HOH:O	2.18	0.43
2:DDD:179:THR:N	5:DDD:508[A]:HOH:O	2.51	0.43
1:CCC:5:VAL:HB	2:DDD:301:TYR:CD1	2.54	0.43
1:AAA:9:HIS:HA	2:BBB:296:TYR:O	2.19	0.42
2:BBB:312:ARG:HG3	5:BBB:524:HOH:O	2.19	0.42
2:BBB:262:ARG:O	2:BBB:266:GLU:HB2	2.20	0.42
1:AAA:3:LYS:HD3	5:AAA:399:HOH:O	2.18	0.42
1:AAA:16:SER:HB3	1:AAA:19:GLN:OE1	2.20	0.42
1:CCC:108:LEU:HB2	1:CCC:136:MET:HE1	2.02	0.42
2:DDD:186:ASP:O	5:DDD:501:HOH:O	2.22	0.42
2:DDD:263:VAL:O	2:DDD:268:LEU:HG	2.19	0.42
1:CCC:92:LEU:HD23	1:CCC:92:LEU:HA	1.91	0.41
2:DDD:211:SER:N	2:DDD:212:PRO:CD	2.84	0.41
2:DDD:234:GLU:O	2:DDD:238:ARG:HG3	2.20	0.40
1:CCC:108:LEU:CB	1:CCC:136:MET:CE	2.98	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	AAA	161/178 (90%)	159 (99%)	2 (1%)	0	100	100
1	CCC	155/178 (87%)	152 (98%)	3 (2%)	0	100	100
2	BBB	136/143 (95%)	129 (95%)	7 (5%)	0	100	100
2	DDD	134/143 (94%)	127 (95%)	7 (5%)	0	100	100
All	All	586/642 (91%)	567 (97%)	19 (3%)	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	AAA	123/136 (90%)	122 (99%)	1 (1%)	81	82
1	CCC	121/136 (89%)	118 (98%)	3 (2%)	47	41
2	BBB	97/100 (97%)	96 (99%)	1 (1%)	76	76
2	DDD	95/100 (95%)	92 (97%)	3 (3%)	39	30
All	All	436/472 (92%)	428 (98%)	8 (2%)	57	55

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	AAA	17	ARG
2	BBB	230	THR
1	CCC	17	ARG
1	CCC	111	ARG
1	CCC	147	SER
2	DDD	230	THR
2	DDD	234	GLU
2	DDD	240	LEU

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

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](#)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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 [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	AAA	161/178 (90%)	0.16	1 (0%) 89 90	5, 12, 24, 31	0
1	CCC	155/178 (87%)	0.24	4 (2%) 56 58	6, 13, 31, 46	0
2	BBB	135/143 (94%)	0.21	2 (1%) 73 76	7, 13, 25, 41	0
2	DDD	135/143 (94%)	0.21	5 (3%) 41 44	6, 13, 26, 44	0
All	All	586/642 (91%)	0.21	12 (2%) 65 68	5, 13, 28, 46	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	CCC	18	ALA	4.5
2	DDD	303	GLY	4.0
2	DDD	313	GLU	3.1
1	CCC	15	ILE	2.6
2	BBB	313	GLU	2.6
1	CCC	16[A]	SER	2.6
2	BBB	303	GLY	2.6
1	AAA	162	THR	2.3
1	CCC	156	ALA	2.3
2	DDD	253	GLY	2.2
2	DDD	302	ALA	2.1
2	DDD	301	TYR	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, 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
4	CL	DDD	401	1/1	0.98	0.03	18,18,18,18	0
3	NA	CCC	201	1/1	0.99	0.05	11,11,11,11	0
4	CL	BBB	401	1/1	0.99	0.05	16,16,16,16	0
3	NA	AAA	201	1/1	0.99	0.06	4,4,4,4	0

6.5 Other polymers [i](#)

There are no such residues in this entry.