



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 7, 2023 – 07:59 PM EDT

PDB ID : 1NZK
Title : Crystal Structure of a Multiple Mutant (L44F, L73V, V109L, L111I, C117V)
of Human Acidic Fibroblast Growth Factor
Authors : Brych, S.R.; Kim, J.; Logan, T.M.; Blaber, M.
Deposited on : 2003-02-18
Resolution : 1.95 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35
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

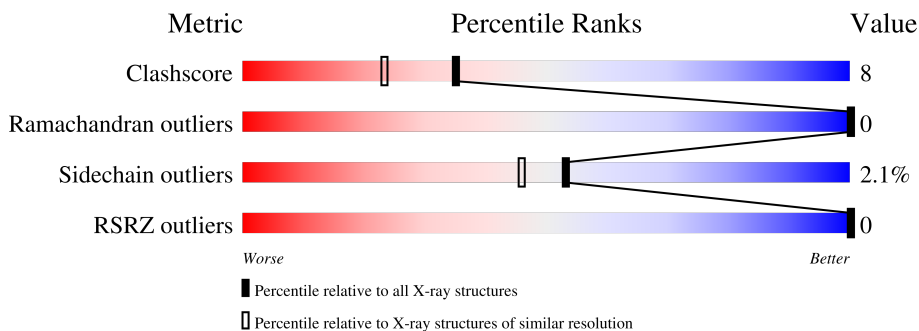
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

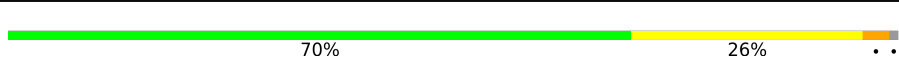


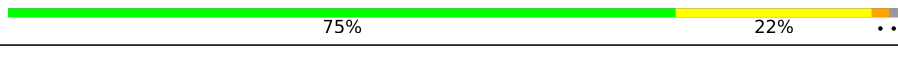
The reported resolution of this entry is 1.95 Å.

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	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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	143	 70% 26% ..
1	B	143	 74% 21% ..
1	C	143	 74% 21% ..
1	D	143	 75% 22% ..

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4999 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 Acidic Fibroblast Growth Factor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	141	1123	717	198	205	3	0	1	0
1	B	141	1129	719	198	209	3	0	1	0
1	C	141	1127	718	198	208	3	0	1	0
1	D	141	1139	725	202	209	3	0	1	0

There are 44 discrepancies between the modelled and reference sequences:

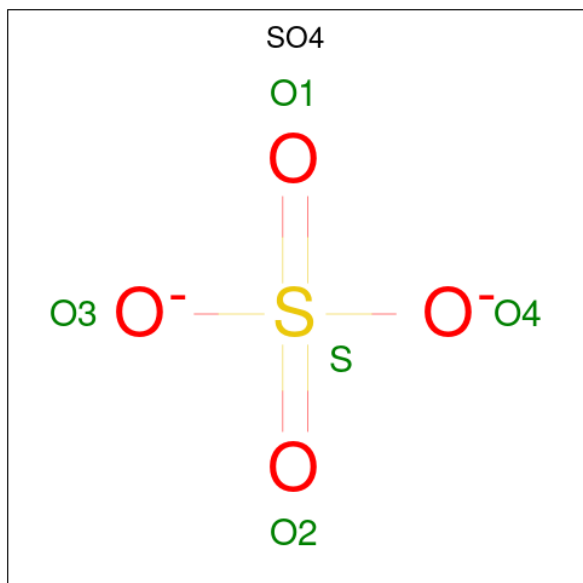
Chain	Residue	Modelled	Actual	Comment	Reference
A	1C	HIS	-	expression tag	UNP P05230
A	1C	HIS	-	expression tag	UNP P05230
A	1C	HIS	-	expression tag	UNP P05230
A	1D	HIS	-	expression tag	UNP P05230
A	1E	HIS	-	expression tag	UNP P05230
A	1F	HIS	-	expression tag	UNP P05230
A	44	PHE	LEU	engineered mutation	UNP P05230
A	73	VAL	LEU	engineered mutation	UNP P05230
A	109	LEU	VAL	engineered mutation	UNP P05230
A	111	ILE	LEU	engineered mutation	UNP P05230
A	117	VAL	CYS	engineered mutation	UNP P05230
B	1C	HIS	-	expression tag	UNP P05230
B	1C	HIS	-	expression tag	UNP P05230
B	1C	HIS	-	expression tag	UNP P05230
B	1D	HIS	-	expression tag	UNP P05230
B	1E	HIS	-	expression tag	UNP P05230
B	1F	HIS	-	expression tag	UNP P05230
B	44	PHE	LEU	engineered mutation	UNP P05230
B	73	VAL	LEU	engineered mutation	UNP P05230
B	109	LEU	VAL	engineered mutation	UNP P05230
B	111	ILE	LEU	engineered mutation	UNP P05230

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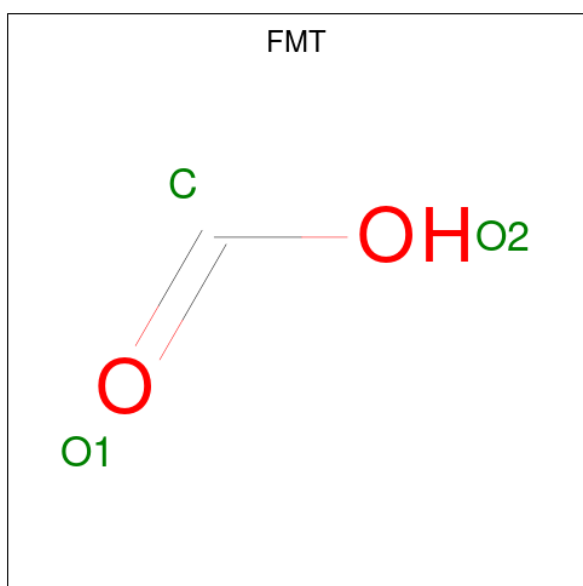
Chain	Residue	Modelled	Actual	Comment	Reference
B	117	VAL	CYS	engineered mutation	UNP P05230
C	1C	HIS	-	expression tag	UNP P05230
C	1C	HIS	-	expression tag	UNP P05230
C	1C	HIS	-	expression tag	UNP P05230
C	1D	HIS	-	expression tag	UNP P05230
C	1E	HIS	-	expression tag	UNP P05230
C	1F	HIS	-	expression tag	UNP P05230
C	44	PHE	LEU	engineered mutation	UNP P05230
C	73	VAL	LEU	engineered mutation	UNP P05230
C	109	LEU	VAL	engineered mutation	UNP P05230
C	111	ILE	LEU	engineered mutation	UNP P05230
C	117	VAL	CYS	engineered mutation	UNP P05230
D	1C	HIS	-	expression tag	UNP P05230
D	1C	HIS	-	expression tag	UNP P05230
D	1C	HIS	-	expression tag	UNP P05230
D	1D	HIS	-	expression tag	UNP P05230
D	1E	HIS	-	expression tag	UNP P05230
D	1F	HIS	-	expression tag	UNP P05230
D	44	PHE	LEU	engineered mutation	UNP P05230
D	73	VAL	LEU	engineered mutation	UNP P05230
D	109	LEU	VAL	engineered mutation	UNP P05230
D	111	ILE	LEU	engineered mutation	UNP P05230
D	117	VAL	CYS	engineered mutation	UNP P05230

- Molecule 2 is SULFATE ION (three-letter code: SO₄) (formula: O₄S).



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

- Molecule 3 is FORMIC ACID (three-letter code: FMT) (formula: CH₂O₂).



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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	111	Total 111	O 111	0	0
4	B	102	Total 102	O 102	0	0
4	C	112	Total 112	O 112	0	0
4	D	112	Total 112	O 112	0	0

4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	96.75Å 74.03Å 109.08Å 90.00° 89.98° 90.00°	Depositor
Resolution (Å)	29.60 – 1.95 29.57 – 1.95	Depositor EDS
% Data completeness (in resolution range)	97.0 (29.60-1.95) 98.4 (29.57-1.95)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.48 (at 1.95Å)	Xtrriage
Refinement program	TNT	Depositor
R, R_{free}	0.194 , 0.253 0.192 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	16.7	Xtrriage
Anisotropy	0.464	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 51.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.488 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4999	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.44% 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 [i](#)

5.1 Standard geometry [i](#)

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

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	0.79	7/1158 (0.6%)	1.04	13/1568 (0.8%)
1	B	0.83	6/1165 (0.5%)	1.04	12/1579 (0.8%)
1	C	0.81	8/1162 (0.7%)	1.05	12/1574 (0.8%)
1	D	0.82	4/1175 (0.3%)	1.03	13/1590 (0.8%)
All	All	0.81	25/4660 (0.5%)	1.04	50/6311 (0.8%)

The worst 5 of 25 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	49	GLU	CD-OE2	5.93	1.32	1.25
1	C	49	GLU	CD-OE2	5.88	1.32	1.25
1	D	104	GLU	CD-OE2	5.60	1.31	1.25
1	C	81	GLU	CD-OE2	5.48	1.31	1.25
1	B	87	GLU	CD-OE2	5.47	1.31	1.25

The worst 5 of 50 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	36	ASP	CB-CG-OD2	-7.13	111.89	118.30
1	C	36	ASP	CB-CG-OD2	-6.98	112.02	118.30
1	D	36	ASP	CB-CG-OD1	6.79	124.41	118.30
1	D	68	ASP	CB-CG-OD2	-6.70	112.27	118.30
1	B	36	ASP	CB-CG-OD2	-6.56	112.39	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	1123	0	1086	21	0
1	B	1129	0	1083	20	0
1	C	1127	0	1085	13	0
1	D	1139	0	1105	19	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
2	C	5	0	0	0	0
2	D	5	0	0	0	0
3	A	6	0	2	0	0
3	B	6	0	2	0	0
3	C	6	0	2	0	0
3	D	6	0	2	1	0
4	A	111	0	0	2	0
4	B	102	0	0	4	0
4	C	112	0	0	2	0
4	D	112	0	0	1	0
All	All	4999	0	4367	73	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 8.

The worst 5 of 73 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:D:119:ARG:HH22	1:D:122:ARG:HH11	1.20	0.89
1:D:119:ARG:HH22	1:D:122:ARG:NH1	1.70	0.89
1:D:119:ARG:NH2	1:D:122:ARG:HH11	1.74	0.86
1:C:32:ASP:HA	1:C:117[B]:VAL:HG23	1.61	0.83
1:A:32:ASP:HA	1:A:117[B]:VAL:HG23	1.74	0.69

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	140/143 (98%)	135 (96%)	5 (4%)	0	100	100
1	B	140/143 (98%)	132 (94%)	8 (6%)	0	100	100
1	C	140/143 (98%)	134 (96%)	6 (4%)	0	100	100
1	D	140/143 (98%)	133 (95%)	7 (5%)	0	100	100
All	All	560/572 (98%)	534 (95%)	26 (5%)	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	120/126 (95%)	119 (99%)	1 (1%)	81	80
1	B	122/126 (97%)	119 (98%)	3 (2%)	47	38
1	C	121/126 (96%)	118 (98%)	3 (2%)	47	38
1	D	124/126 (98%)	121 (98%)	3 (2%)	49	40
All	All	487/504 (97%)	477 (98%)	10 (2%)	53	46

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	12	LYS
1	D	106	ASN
1	D	137	VAL

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Mol	Chain	Res	Type
1	B	137	VAL
1	C	1(D)	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	1(D)	HIS
1	C	77	GLN
1	D	106	ASN
1	C	106	ASN
1	B	106	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](#)

12 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	$\# Z > 2$
3	FMT	B	2161	-	2,2,2	0.44	0	1,1,1	0.32	0
3	FMT	C	3161	-	2,2,2	0.37	0	1,1,1	0.29	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	SO4	B	2160	-	4,4,4	0.28	0	6,6,6	0.07	0
2	SO4	D	4160	-	4,4,4	0.32	0	6,6,6	0.07	0
2	SO4	C	3160	-	4,4,4	0.21	0	6,6,6	0.06	0
3	FMT	A	1162	-	2,2,2	0.38	0	1,1,1	0.24	0
3	FMT	C	3162	-	2,2,2	0.34	0	1,1,1	0.30	0
2	SO4	A	1160	-	4,4,4	0.24	0	6,6,6	0.05	0
3	FMT	D	4161	-	2,2,2	0.33	0	1,1,1	0.29	0
3	FMT	D	4162	-	2,2,2	0.32	0	1,1,1	0.29	0
3	FMT	B	2162	-	2,2,2	0.36	0	1,1,1	0.28	0
3	FMT	A	1161	-	2,2,2	0.35	0	1,1,1	0.28	0

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	4161	FMT	1	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 [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	141/143 (98%)	-0.43	0 100 100	12, 18, 32, 42	0
1	B	141/143 (98%)	-0.49	0 100 100	12, 18, 32, 49	0
1	C	141/143 (98%)	-0.46	0 100 100	11, 19, 32, 50	0
1	D	141/143 (98%)	-0.47	0 100 100	12, 17, 31, 60	0
All	All	564/572 (98%)	-0.46	0 100 100	11, 18, 32, 60	0

There are no RSRZ outliers to report.

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
3	FMT	B	2161	3/3	0.95	0.09	19,19,21,35	0
2	SO4	B	2160	5/5	0.96	0.17	40,47,65,69	0
3	FMT	D	4161	3/3	0.96	0.12	20,20,24,31	0
2	SO4	D	4160	5/5	0.97	0.14	37,44,55,73	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	FMT	D	4162	3/3	0.97	0.14	21,21,28,93	0
2	SO4	A	1160	5/5	0.98	0.08	25,28,37,37	0
3	FMT	B	2162	3/3	0.98	0.18	21,21,43,49	0
3	FMT	C	3161	3/3	0.98	0.12	24,24,25,30	0
3	FMT	A	1161	3/3	0.98	0.09	22,22,25,29	0
3	FMT	A	1162	3/3	0.98	0.12	20,20,25,64	0
2	SO4	C	3160	5/5	0.99	0.10	27,28,36,38	0
3	FMT	C	3162	3/3	0.99	0.14	16,16,47,65	0

6.5 Other polymers [i](#)

There are no such residues in this entry.