



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 11, 2021 – 08:08 AM EDT

PDB ID : 2QYA
Title : Crystal structure of an uncharacterized conserved protein from *Methanopyrus kandleri*
Authors : Bonanno, J.B.; Zhang, A.; Bain, K.T.; Adams, J.; Ozyurt, S.; Smith, D.; Wasserman, S.; Sauder, J.M.; Burley, S.K.; Almo, S.C.; New York SGX Research Center for Structural Genomics (NYSGXRC)
Deposited on : 2007-08-14
Resolution : 2.17 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.23.2
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) : 2.23.2

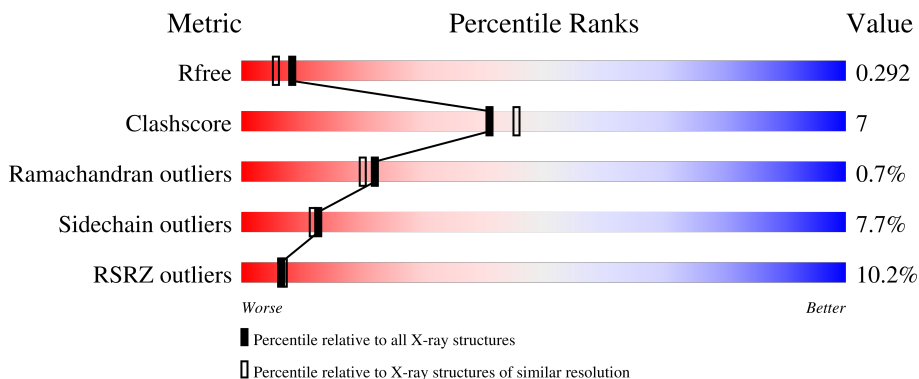
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.17 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	6864 (2.20-2.16)
Clashscore	141614	7689 (2.20-2.16)
Ramachandran outliers	138981	7564 (2.20-2.16)
Sidechain outliers	138945	7564 (2.20-2.16)
RSRZ outliers	127900	6738 (2.20-2.16)

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	124	 7% (poor fit), 77% (0-1 outliers), 15% (2 outliers), 7% (3+ outliers), 0% (not modelled)
1	B	124	 11% (poor fit), 77% (0-1 outliers), 14% (2 outliers), 7% (3+ outliers), 0% (not modelled)
1	C	124	 14% (poor fit), 68% (0-1 outliers), 22% (2 outliers), 7% (3+ outliers), 0% (not modelled)
1	D	124	 6% (poor fit), 77% (0-1 outliers), 14% (2 outliers), 7% (3+ outliers), 0% (not modelled)

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 3630 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 Uncharacterized conserved protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	115	882	556	149	173	4	0	0	0
1	B	115	882	556	149	173	4	0	0	0
1	C	115	887	559	149	175	4	0	1	0
1	D	115	888	560	149	175	4	0	1	0

There are 52 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	MET	-	expression tag	UNP Q8TWR4
A	0	SER	-	expression tag	UNP Q8TWR4
A	1	LEU	-	expression tag	UNP Q8TWR4
A	48	MET	LEU	engineered mutation	UNP Q8TWR4
A	105	MET	ILE	engineered mutation	UNP Q8TWR4
A	115	GLU	-	expression tag	UNP Q8TWR4
A	116	GLY	-	expression tag	UNP Q8TWR4
A	117	HIS	-	expression tag	UNP Q8TWR4
A	118	HIS	-	expression tag	UNP Q8TWR4
A	119	HIS	-	expression tag	UNP Q8TWR4
A	120	HIS	-	expression tag	UNP Q8TWR4
A	121	HIS	-	expression tag	UNP Q8TWR4
A	122	HIS	-	expression tag	UNP Q8TWR4
B	-1	MET	-	expression tag	UNP Q8TWR4
B	0	SER	-	expression tag	UNP Q8TWR4
B	1	LEU	-	expression tag	UNP Q8TWR4
B	48	MET	LEU	engineered mutation	UNP Q8TWR4
B	105	MET	ILE	engineered mutation	UNP Q8TWR4
B	115	GLU	-	expression tag	UNP Q8TWR4
B	116	GLY	-	expression tag	UNP Q8TWR4
B	117	HIS	-	expression tag	UNP Q8TWR4

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Chain	Residue	Modelled	Actual	Comment	Reference
B	118	HIS	-	expression tag	UNP Q8TWR4
B	119	HIS	-	expression tag	UNP Q8TWR4
B	120	HIS	-	expression tag	UNP Q8TWR4
B	121	HIS	-	expression tag	UNP Q8TWR4
B	122	HIS	-	expression tag	UNP Q8TWR4
C	-1	MET	-	expression tag	UNP Q8TWR4
C	0	SER	-	expression tag	UNP Q8TWR4
C	1	LEU	-	expression tag	UNP Q8TWR4
C	48	MET	LEU	engineered mutation	UNP Q8TWR4
C	105	MET	ILE	engineered mutation	UNP Q8TWR4
C	115	GLU	-	expression tag	UNP Q8TWR4
C	116	GLY	-	expression tag	UNP Q8TWR4
C	117	HIS	-	expression tag	UNP Q8TWR4
C	118	HIS	-	expression tag	UNP Q8TWR4
C	119	HIS	-	expression tag	UNP Q8TWR4
C	120	HIS	-	expression tag	UNP Q8TWR4
C	121	HIS	-	expression tag	UNP Q8TWR4
C	122	HIS	-	expression tag	UNP Q8TWR4
D	-1	MET	-	expression tag	UNP Q8TWR4
D	0	SER	-	expression tag	UNP Q8TWR4
D	1	LEU	-	expression tag	UNP Q8TWR4
D	48	MET	LEU	engineered mutation	UNP Q8TWR4
D	105	MET	ILE	engineered mutation	UNP Q8TWR4
D	115	GLU	-	expression tag	UNP Q8TWR4
D	116	GLY	-	expression tag	UNP Q8TWR4
D	117	HIS	-	expression tag	UNP Q8TWR4
D	118	HIS	-	expression tag	UNP Q8TWR4
D	119	HIS	-	expression tag	UNP Q8TWR4
D	120	HIS	-	expression tag	UNP Q8TWR4
D	121	HIS	-	expression tag	UNP Q8TWR4
D	122	HIS	-	expression tag	UNP Q8TWR4

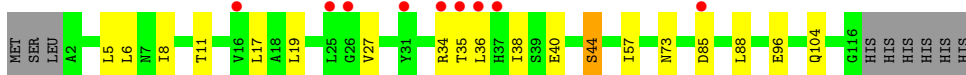
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	26	Total O 26 26	0	0
2	B	25	Total O 25 25	0	0
2	C	13	Total O 13 13	0	0
2	D	27	Total O 27 27	0	0

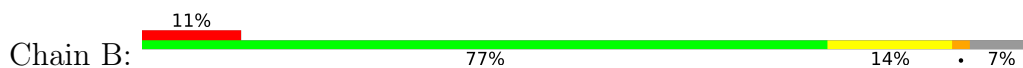
3 Residue-property plots [i](#)

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.

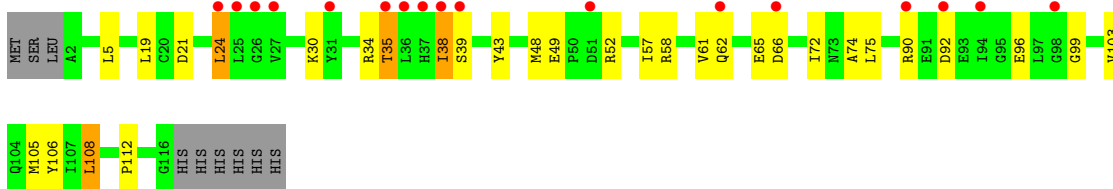
- Molecule 1: Uncharacterized conserved protein



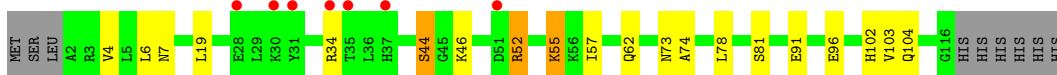
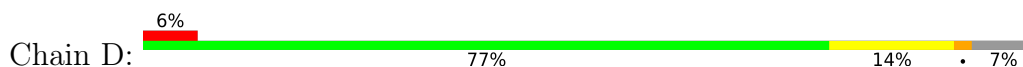
- Molecule 1: Uncharacterized conserved protein



- Molecule 1: Uncharacterized conserved protein



- Molecule 1: Uncharacterized conserved protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	55.25Å 49.39Å 104.21Å 90.00° 102.75° 90.00°	Depositor
Resolution (Å)	20.00 – 2.17 32.05 – 2.17	Depositor EDS
% Data completeness (in resolution range)	98.6 (20.00-2.17) 98.6 (32.05-2.17)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.82 (at 2.18Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.234 , 0.291 0.236 , 0.292	Depositor DCC
R_{free} test set	1476 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	31.5	Xtrriage
Anisotropy	0.368	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 47.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.024 for h,-k,-h-l	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	3630	wwPDB-VP
Average B, all atoms (Å ²)	51.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.80% 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](#)

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	0.66	0/895	0.78	0/1210
1	B	0.65	0/895	0.77	0/1210
1	C	0.66	0/903	0.77	0/1221
1	D	0.63	0/904	0.74	0/1223
All	All	0.65	0/3597	0.77	0/4864

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	882	0	883	8	0
1	B	882	0	883	15	0
1	C	887	0	887	18	0
1	D	888	0	889	11	0
2	A	26	0	0	0	0
2	B	25	0	0	1	0
2	C	13	0	0	1	0
2	D	27	0	0	0	0
All	All	3630	0	3542	50	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 7.

All (50) 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:55:LYS:HE3	1:B:58:ARG:HH22	1.13	1.13
1:B:48:MET:HE2	1:B:52:ARG:HG2	1.46	0.95
1:C:90:ARG:NH1	1:C:92:ASP:OD2	2.00	0.94
1:B:55:LYS:HE3	1:B:58:ARG:NH2	1.84	0.93
1:B:48:MET:CE	1:B:52:ARG:HG2	1.97	0.92
1:B:55:LYS:CE	1:B:58:ARG:HH22	1.87	0.87
1:C:58:ARG:O	1:C:62:GLN:HG2	1.75	0.85
1:D:55:LYS:HB2	1:D:55:LYS:NZ	1.99	0.77
1:A:34:ARG:HH21	1:B:67:GLU:HG2	1.55	0.71
1:C:112:PRO:HB3	1:D:34:ARG:HD2	1.72	0.71
1:A:40:GLU:O	1:A:44:SER:HB3	1.91	0.71
1:B:48:MET:HE1	1:B:56:LYS:HD2	1.76	0.67
1:B:74:ALA:HB3	1:B:103:VAL:HG12	1.76	0.66
1:C:21:ASP:HB2	1:C:24:LEU:HD22	1.81	0.63
1:D:102:HIS:CE1	1:D:104:GLN:HG3	2.36	0.60
1:D:102:HIS:HE1	1:D:104:GLN:HG3	1.68	0.58
1:D:55:LYS:HB2	1:D:55:LYS:HZ3	1.69	0.57
1:B:48:MET:CE	1:B:56:LYS:HD2	2.36	0.55
1:D:46:LYS:NZ	1:D:52:ARG:HH12	2.06	0.54
1:D:74:ALA:HB3	1:D:103:VAL:HG12	1.92	0.52
1:A:36:LEU:HG	1:A:38:ILE:HD13	1.92	0.51
1:D:4:VAL:HG13	1:D:78:LEU:HD23	1.93	0.50
1:C:74:ALA:HB3	1:C:103:VAL:HB	1.92	0.49
1:C:72:ILE:HB	1:C:105:MET:HG3	1.94	0.49
1:B:37:HIS:CD2	2:B:134:HOH:O	2.64	0.49
1:C:48:MET:CE	1:C:52:ARG:HG2	2.42	0.49
1:A:6:LEU:HD13	1:A:57:ILE:HD11	1.95	0.48
1:B:90:ARG:NH2	1:B:92:ASP:OD1	2.46	0.48
1:B:30:LYS:HA	1:B:34:ARG:O	2.15	0.47
1:C:48:MET:HE2	1:C:52:ARG:HG2	1.95	0.47
1:C:5:LEU:O	1:C:19:LEU:HA	2.15	0.46
1:D:6:LEU:HD13	1:D:57:ILE:HD11	1.96	0.46
1:D:7:ASN:HB2	1:D:44:SER:O	2.16	0.46
1:C:61:VAL:O	1:C:65:GLU:HB2	2.17	0.45
1:B:51:ASP:O	1:B:55:LYS:HD2	2.18	0.44
1:A:5:LEU:O	1:A:19:LEU:HA	2.18	0.43
1:A:8:ILE:HG12	1:A:17:LEU:HD22	2.01	0.43
1:C:38:ILE:N	2:C:127:HOH:O	2.51	0.43
1:C:39:SER:O	1:C:43:TYR:HD2	2.02	0.43
1:C:30:LYS:HG2	1:C:35:THR:HG23	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:6:LEU:CD1	1:A:57:ILE:HD11	2.49	0.42
1:C:49:GLU:H	1:C:52:ARG:NH2	2.17	0.42
1:D:46:LYS:HZ2	1:D:52:ARG:HH12	1.66	0.41
1:B:48:MET:HE2	1:B:52:ARG:CG	2.34	0.41
1:A:44:SER:O	1:A:44:SER:OG	2.28	0.41
1:B:48:MET:HG3	1:B:53:ALA:HB2	2.02	0.41
1:C:57:ILE:HD13	1:C:57:ILE:HA	1.90	0.41
1:C:96:GLU:OE2	1:C:99:GLY:N	2.35	0.40
1:C:38:ILE:CD1	1:C:75:LEU:HD21	2.52	0.40
1:C:106:TYR:HB3	1:C:108:LEU:HD13	2.02	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	113/124 (91%)	110 (97%)	2 (2%)	1 (1%)	17	15
1	B	113/124 (91%)	108 (96%)	5 (4%)	0	100	100
1	C	114/124 (92%)	110 (96%)	3 (3%)	1 (1%)	17	15
1	D	114/124 (92%)	111 (97%)	2 (2%)	1 (1%)	17	15
All	All	454/496 (92%)	439 (97%)	12 (3%)	3 (1%)	22	20

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	44	SER
1	A	44	SER
1	C	38	ILE

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	94/103 (91%)	86 (92%)	8 (8%)	10	9
1	B	94/103 (91%)	86 (92%)	8 (8%)	10	9
1	C	95/103 (92%)	90 (95%)	5 (5%)	22	25
1	D	95/103 (92%)	87 (92%)	8 (8%)	11	9
All	All	378/412 (92%)	349 (92%)	29 (8%)	13	12

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	11	THR
1	A	27	VAL
1	A	35	THR
1	A	73	ASN
1	A	85	ASP
1	A	88	LEU
1	A	96	GLU
1	A	104	GLN
1	B	55	LYS
1	B	66	ASP
1	B	67	GLU
1	B	81	SER
1	B	88	LEU
1	B	100	VAL
1	B	103	VAL
1	B	111	GLU
1	C	24	LEU
1	C	34	ARG
1	C	35	THR
1	C	66	ASP
1	C	108	LEU
1	D	19	LEU
1	D	52	ARG
1	D	55	LYS

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Mol	Chain	Res	Type
1	D	62	GLN
1	D	73	ASN
1	D	81	SER
1	D	91	GLU
1	D	96	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	104	GLN
1	B	104	GLN
1	C	104	GLN
1	D	9	HIS
1	D	37	HIS
1	D	62	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 monosaccharides 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

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, 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	115/124 (92%)	0.62	9 (7%) 13 13	35, 44, 75, 80	0
1	B	115/124 (92%)	0.87	14 (12%) 4 4	35, 51, 77, 80	0
1	C	115/124 (92%)	0.89	17 (14%) 2 2	37, 52, 79, 81	0
1	D	115/124 (92%)	0.61	7 (6%) 21 22	33, 45, 72, 79	0
All	All	460/496 (92%)	0.75	47 (10%) 6 7	33, 48, 77, 81	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	36	LEU	6.0
1	C	37	HIS	5.8
1	C	25	LEU	5.8
1	B	31	TYR	4.9
1	B	37	HIS	4.5
1	C	26	GLY	4.3
1	A	36	LEU	4.3
1	C	66	ASP	4.1
1	B	36	LEU	3.6
1	C	38	ILE	3.5
1	C	92	ASP	3.4
1	C	35	THR	3.3
1	B	35	THR	3.2
1	C	94	ILE	3.1
1	C	31	TYR	3.1
1	D	35	THR	3.0
1	C	39	SER	3.0
1	B	26	GLY	3.0
1	A	35	THR	3.0
1	C	90	ARG	2.9
1	B	66	ASP	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	25	LEU	2.9
1	A	34	ARG	2.9
1	A	26	GLY	2.8
1	D	37	HIS	2.8
1	B	39	SER	2.8
1	D	34	ARG	2.7
1	B	32	LYS	2.5
1	A	37	HIS	2.5
1	B	92	ASP	2.5
1	C	62	GLN	2.4
1	A	25	LEU	2.4
1	D	31	TYR	2.4
1	C	98	GLY	2.4
1	D	51	ASP	2.4
1	D	30	LYS	2.3
1	C	51	ASP	2.3
1	C	27	VAL	2.3
1	B	28	GLU	2.3
1	C	24	LEU	2.2
1	A	31	TYR	2.2
1	B	62	GLN	2.2
1	A	85	ASP	2.1
1	B	52	ARG	2.1
1	D	28	GLU	2.1
1	A	16	VAL	2.0
1	B	38	ILE	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 [\(i\)](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.