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P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

Jan 30, 2021 – 03:51 PM EST

PDB ID : 3G17

Title : Structure of putative 2-dehydropantoate 2-reductase from staphylococcus aureus

Authors : Ramagopal, U.A.; Toro, R.; Burley, S.K.; Almo, S.C.; New York SGX Research Center for Structural Genomics (NYSGXRC)

Deposited on : 2009-01-29

Resolution : 2.30 Å(reported)

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

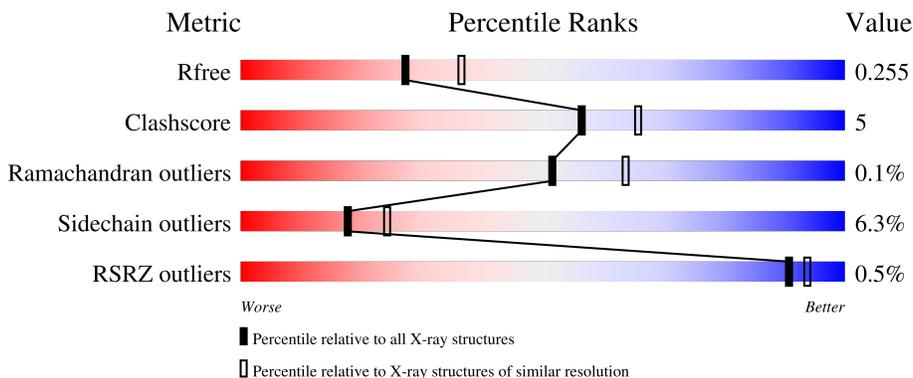|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.16
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.16

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 2.30 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	Percentile Ranks	Value
Rfree		0.255
Clashscore		5
Ramachandran outliers		0.1%
Sidechain outliers		6.3%
RSRZ outliers		0.5%

Worse ... *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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 <=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	294	85% ... 10% · ·
1	B	294	83% ... 13% · ·
1	C	294	80% ... 15% · ·
1	D	294	82% ... 14% · ·
1	E	294	86% ... 11% · ·

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Mol	Chain	Length	Quality of chain
1	F	294	73% 21%
1	G	294	89% 9%
1	H	294	86% 11%

2 Entry composition ⓘ

There are 2 unique types of molecules in this entry. The entry contains 18687 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 Similar to 2-dehydropantoate 2-reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	286	Total 2268	C 1449	N 389	O 423	S 7	0	0	0
1	B	286	Total 2278	C 1453	N 390	O 428	S 7	0	0	0
1	C	285	Total 2273	C 1452	N 388	O 426	S 7	0	1	0
1	D	287	Total 2291	C 1460	N 395	O 429	S 7	0	0	0
1	E	288	Total 2303	C 1467	N 399	O 430	S 7	0	1	0
1	F	282	Total 2245	C 1430	N 390	O 418	S 7	0	0	0
1	G	290	Total 2318	C 1477	N 403	O 431	S 7	0	0	0
1	H	290	Total 2315	C 1476	N 402	O 430	S 7	0	0	0

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	expression tag	UNP Q99R37
A	2	SER	-	expression tag	UNP Q99R37
A	287	GLU	-	expression tag	UNP Q99R37
A	288	GLY	-	expression tag	UNP Q99R37
A	289	HIS	-	expression tag	UNP Q99R37
A	290	HIS	-	expression tag	UNP Q99R37
A	291	HIS	-	expression tag	UNP Q99R37
A	292	HIS	-	expression tag	UNP Q99R37
A	293	HIS	-	expression tag	UNP Q99R37
A	294	HIS	-	expression tag	UNP Q99R37
B	1	MET	-	expression tag	UNP Q99R37
B	2	SER	-	expression tag	UNP Q99R37
B	287	GLU	-	expression tag	UNP Q99R37

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Chain	Residue	Modelled	Actual	Comment	Reference
B	288	GLY	-	expression tag	UNP Q99R37
B	289	HIS	-	expression tag	UNP Q99R37
B	290	HIS	-	expression tag	UNP Q99R37
B	291	HIS	-	expression tag	UNP Q99R37
B	292	HIS	-	expression tag	UNP Q99R37
B	293	HIS	-	expression tag	UNP Q99R37
B	294	HIS	-	expression tag	UNP Q99R37
C	1	MET	-	expression tag	UNP Q99R37
C	2	SER	-	expression tag	UNP Q99R37
C	287	GLU	-	expression tag	UNP Q99R37
C	288	GLY	-	expression tag	UNP Q99R37
C	289	HIS	-	expression tag	UNP Q99R37
C	290	HIS	-	expression tag	UNP Q99R37
C	291	HIS	-	expression tag	UNP Q99R37
C	292	HIS	-	expression tag	UNP Q99R37
C	293	HIS	-	expression tag	UNP Q99R37
C	294	HIS	-	expression tag	UNP Q99R37
D	1	MET	-	expression tag	UNP Q99R37
D	2	SER	-	expression tag	UNP Q99R37
D	287	GLU	-	expression tag	UNP Q99R37
D	288	GLY	-	expression tag	UNP Q99R37
D	289	HIS	-	expression tag	UNP Q99R37
D	290	HIS	-	expression tag	UNP Q99R37
D	291	HIS	-	expression tag	UNP Q99R37
D	292	HIS	-	expression tag	UNP Q99R37
D	293	HIS	-	expression tag	UNP Q99R37
D	294	HIS	-	expression tag	UNP Q99R37
E	1	MET	-	expression tag	UNP Q99R37
E	2	SER	-	expression tag	UNP Q99R37
E	287	GLU	-	expression tag	UNP Q99R37
E	288	GLY	-	expression tag	UNP Q99R37
E	289	HIS	-	expression tag	UNP Q99R37
E	290	HIS	-	expression tag	UNP Q99R37
E	291	HIS	-	expression tag	UNP Q99R37
E	292	HIS	-	expression tag	UNP Q99R37
E	293	HIS	-	expression tag	UNP Q99R37
E	294	HIS	-	expression tag	UNP Q99R37
F	1	MET	-	expression tag	UNP Q99R37
F	2	SER	-	expression tag	UNP Q99R37
F	287	GLU	-	expression tag	UNP Q99R37
F	288	GLY	-	expression tag	UNP Q99R37
F	289	HIS	-	expression tag	UNP Q99R37

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Chain	Residue	Modelled	Actual	Comment	Reference
F	290	HIS	-	expression tag	UNP Q99R37
F	291	HIS	-	expression tag	UNP Q99R37
F	292	HIS	-	expression tag	UNP Q99R37
F	293	HIS	-	expression tag	UNP Q99R37
F	294	HIS	-	expression tag	UNP Q99R37
G	1	MET	-	expression tag	UNP Q99R37
G	2	SER	-	expression tag	UNP Q99R37
G	287	GLU	-	expression tag	UNP Q99R37
G	288	GLY	-	expression tag	UNP Q99R37
G	289	HIS	-	expression tag	UNP Q99R37
G	290	HIS	-	expression tag	UNP Q99R37
G	291	HIS	-	expression tag	UNP Q99R37
G	292	HIS	-	expression tag	UNP Q99R37
G	293	HIS	-	expression tag	UNP Q99R37
G	294	HIS	-	expression tag	UNP Q99R37
H	1	MET	-	expression tag	UNP Q99R37
H	2	SER	-	expression tag	UNP Q99R37
H	287	GLU	-	expression tag	UNP Q99R37
H	288	GLY	-	expression tag	UNP Q99R37
H	289	HIS	-	expression tag	UNP Q99R37
H	290	HIS	-	expression tag	UNP Q99R37
H	291	HIS	-	expression tag	UNP Q99R37
H	292	HIS	-	expression tag	UNP Q99R37
H	293	HIS	-	expression tag	UNP Q99R37
H	294	HIS	-	expression tag	UNP Q99R37

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	74	Total 74	O 74	0	0
2	B	60	Total 60	O 60	0	0
2	C	51	Total 51	O 51	0	0
2	D	38	Total 38	O 38	0	0
2	E	31	Total 31	O 31	0	0
2	F	29	Total 29	O 29	0	0
2	G	60	Total 60	O 60	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	H	53	Total 53	O 53	0	0

3 Residue-property plots ⓘ

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: Similar to 2-dehydropantoate 2-reductase

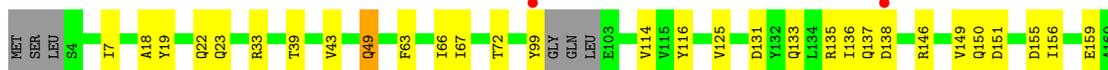Chain A:

- Molecule 1: Similar to 2-dehydropantoate 2-reductase

Chain B:

- Molecule 1: Similar to 2-dehydropantoate 2-reductase

Chain C:

- Molecule 1: Similar to 2-dehydropantoate 2-reductase

Chain D:

E213 Q220 T224 V245 F258 R262 A263 R264 E265 H266 N267 P271 D274 T275 S278 F279 L280 H290 HIS HIS HIS

• Molecule 1: Similar to 2-dehydropantoate 2-reductase

Chain E:	86%	11%	••

MET SER LEU S4 P10 L21 I38 V43 P44 H45 A46 T72 Y99 L102 E103 Q112 A113 V114 R135 I136 Q137 D138 N139 T142 F145 R146 D147 L148 V149 Q150 L158 E159 L174 L182 V187 L198 C199 R200 Q201 L202 D223 T227

E235 E251 R262 E265 P271 T275 H291 HIS HIS HIS

• Molecule 1: Similar to 2-dehydropantoate 2-reductase

Chain F:	73%	21%	•	••

MET SER LEU S4 I7 A18 Y19 Q22 Q23 R33 T39 V43 Q49 F63 I66 I67 T72 Y99 GLY GLN LEU E103 V114 V115 Y116 V125 D131 Y132 Q133 L134 R135 I136 Q137 D138 R146 V149 Q150 D151 D155 I156 E159 A160

N161 I162 Q163 Y168 K169 L170 L171 V172 I179 L182 Q185 A188 I189 P193 I197 L204 D205 G206 Q211 A212 E213 G214 LEU ASN PHE S218 T221 V222 D223 T224 I225 I228 E235 I244 V252 E253 A254 I255 Q256 R264 E265 H266 N267 L268 D269

T270 P271 D274 T275 L280 Y283 Q284 H291 HIS HIS HIS

• Molecule 1: Similar to 2-dehydropantoate 2-reductase

Chain G:	89%	9%	••

MET SER L3 P10 E20 L21 I38 V43 N61 Y99 G100 Q101 L102 E103 H104 V110 C111 F129 Q133 V149 Q153 I154 D155 E159 L171 E194 R195 R196 I197 L198 I225 M226 M236 R262 E265 Y283 H292 HIS HIS

• Molecule 1: Similar to 2-dehydropantoate 2-reductase

Chain H:	86%	11%	••

MET SER L3 S4 L25 T39 V43 K71 Y99 H104 V115 Y116 Q120 K121 K122 V125 F129 R130 D131 Q137 D138 N139 T142 V149 E159 Q163 K169 N173 N177 S178 I179 I189 M190 I195 R196 I197 L198 Q220

T224 Q230 R262 A263 R264 P271 T275 H292 HIS HIS

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	75.24Å 99.64Å 100.26Å 103.66° 105.23° 102.26°	Depositor
Resolution (Å)	50.00 – 2.30 37.55 – 2.30	Depositor EDS
% Data completeness (in resolution range)	98.2 (50.00-2.30) 98.2 (37.55-2.30)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.34 (at 2.29Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.200 , 0.260 0.198 , 0.255	Depositor DCC
R_{free} test set	5744 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å^2)	36.0	Xtriage
Anisotropy	0.047	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 36.2	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.007 for -h,-l,-k	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	18687	wwPDB-VP
Average B, all atoms (Å^2)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.21% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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	0.61	0/2314	0.68	0/3155
1	B	0.63	0/2324	0.67	0/3168
1	C	0.56	0/2322	0.65	0/3166
1	D	0.63	0/2339	0.69	0/3188
1	E	0.62	0/2355	0.66	0/3210
1	F	0.54	0/2291	0.65	0/3121
1	G	0.63	1/2368 (0.0%)	0.70	1/3228 (0.0%)
1	H	0.58	0/2365	0.66	0/3224
All	All	0.60	1/18678 (0.0%)	0.67	1/25460 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	G	111	CYS	CB-SG	-5.72	1.72	1.81

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	226	MET	CA-CB-CG	-5.34	104.22	113.30

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.

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2268	0	2254	23	0
1	B	2278	0	2264	20	0
1	C	2273	0	2259	33	0
1	D	2291	0	2269	22	0
1	E	2303	0	2281	20	0
1	F	2245	0	2218	40	0
1	G	2318	0	2294	14	0
1	H	2315	0	2290	25	0
2	A	74	0	0	2	0
2	B	60	0	0	0	0
2	C	51	0	0	0	0
2	D	38	0	0	0	0
2	E	31	0	0	0	0
2	F	29	0	0	1	0
2	G	60	0	0	0	0
2	H	53	0	0	0	0
All	All	18687	0	18129	182	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 5.

The worst 5 of 182 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:262:ARG:HH11	1:B:262:ARG:HG3	1.19	1.01
1:H:137:GLN:O	1:H:142:THR:HG21	1.68	0.91
1:F:137:GLN:HE21	1:F:138:ASP:H	1.16	0.89
1:B:262:ARG:NH1	1:B:262:ARG:HG3	1.85	0.88
1:F:171:LEU:HD11	1:F:206:GLY:HA3	1.56	0.86

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	284/294 (97%)	273 (96%)	11 (4%)	0	100	100
1	B	284/294 (97%)	269 (95%)	15 (5%)	0	100	100
1	C	284/294 (97%)	270 (95%)	14 (5%)	0	100	100
1	D	285/294 (97%)	275 (96%)	10 (4%)	0	100	100
1	E	287/294 (98%)	276 (96%)	11 (4%)	0	100	100
1	F	276/294 (94%)	255 (92%)	19 (7%)	2 (1%)	22	26
1	G	288/294 (98%)	278 (96%)	10 (4%)	0	100	100
1	H	288/294 (98%)	276 (96%)	12 (4%)	0	100	100
All	All	2276/2352 (97%)	2172 (95%)	102 (4%)	2 (0%)	51	64

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	F	188	ALA
1	F	255	ILE

5.3.2 Protein sidechains ⓘ

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	244/256 (95%)	230 (94%)	14 (6%)	20	28
1	B	247/256 (96%)	227 (92%)	20 (8%)	11	15
1	C	246/256 (96%)	227 (92%)	19 (8%)	13	16
1	D	248/256 (97%)	230 (93%)	18 (7%)	14	18
1	E	250/256 (98%)	239 (96%)	11 (4%)	28	39
1	F	242/256 (94%)	220 (91%)	22 (9%)	9	11
1	G	251/256 (98%)	243 (97%)	8 (3%)	39	54
1	H	250/256 (98%)	237 (95%)	13 (5%)	23	32
All	All	1978/2048 (97%)	1853 (94%)	125 (6%)	18	24

5 of 125 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	71	LYS
1	D	275	THR
1	H	71	LYS
1	D	89	ASP
1	D	179	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	164	GLN
1	F	137	GLN
1	H	177	ASN
1	F	96	GLN
1	F	144	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no monosaccharides 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 ⓘ

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	286/294 (97%)	-0.36	2 (0%)	87	91	22, 32, 47, 53	0
1	B	286/294 (97%)	-0.21	2 (0%)	87	91	22, 36, 59, 64	0
1	C	285/294 (96%)	-0.22	1 (0%)	92	95	25, 39, 54, 61	0
1	D	287/294 (97%)	-0.30	0	100	100	20, 33, 51, 60	0
1	E	288/294 (97%)	-0.41	0	100	100	20, 33, 48, 62	0
1	F	282/294 (95%)	-0.04	4 (1%)	75	80	27, 44, 63, 66	0
1	G	290/294 (98%)	-0.39	1 (0%)	94	96	20, 31, 45, 59	0
1	H	290/294 (98%)	-0.40	1 (0%)	94	96	23, 35, 48, 57	0
All	All	2294/2352 (97%)	-0.29	11 (0%)	91	94	20, 35, 56, 66	0

The worst 5 of 11 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	288	GLY	2.9
1	F	218	SER	2.9
1	B	216	ASN	2.7
1	G	292	HIS	2.6
1	A	84	TYR	2.5

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

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6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.