W O R L D W I D E
wwPDB
PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Sep 17, 2020 – 07:16 PM BST

PDB ID	:	6Z1Y
Title	:	Crystal structure of type-I ribosome-inactivating protein trichobakin (TBK)
Authors	:	Boyko, K.M.; Nikolaeva, A.Y.; Britikov, V.V.; Bocharov, E.V.; Britikova, E.V.; Le, T.B.T.; Phan, C.V.; Popov, V.O.; Usanov, S.A.
Deposited on	:	2020-05-14
Resolution	:	2.00 Å(reported)

The following versions of software and data (see references (1)) were used in the production of this report:

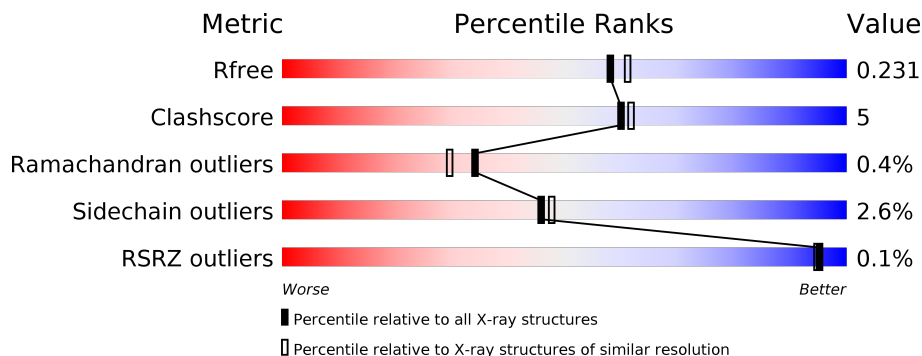|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.14.5
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.14.5

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 2.00 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		0.231
Clashscore		5
Ramachandran outliers		0.4%
Sidechain outliers		2.6%
RSRZ outliers		0.1%

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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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 on 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	248	87%　　　　　　　10%　••
1	B	248	85%　　　　　　　12%　••
1	C	248	88%　　　　　　　10%　•
1	D	248	88%　　　　　　　10%　••

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 8335 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 Trichobakin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	244	Total	C	N	O	S	0	6	0
			1916	1220	323	370	3			
1	B	243	Total	C	N	O	S	0	3	0
			1882	1202	315	363	2			
1	C	248	Total	C	N	O	S	0	6	0
			1948	1242	328	374	4			
1	D	246	Total	C	N	O	S	0	4	0
			1909	1213	324	369	3			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	initiating methionine	UNP Q9LRE3
B	0	MET	-	initiating methionine	UNP Q9LRE3
C	0	MET	-	initiating methionine	UNP Q9LRE3
D	0	MET	-	initiating methionine	UNP Q9LRE3

- Molecule 2 is SODIUM ION (three-letter code: NA) (formula: Na).

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

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	171	Total	O	0	0
			171	171		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	168	Total 168	O 168	0	0
3	C	154	Total 154	O 154	0	0
3	D	181	Total 181	O 181	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.
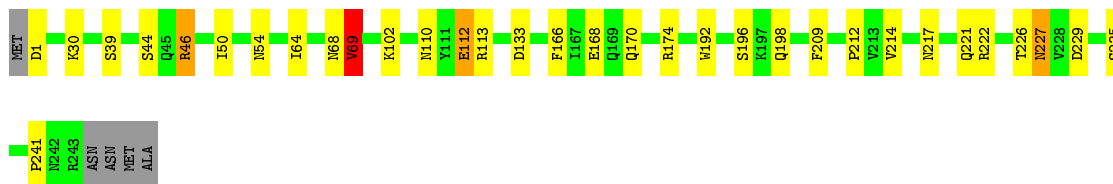
- Molecule 1: Trichobakin

Chain A:

- Molecule 1: Trichobakin

Chain B:

- Molecule 1: Trichobakin

Chain C:

- Molecule 1: Trichobakin

Chain D:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	71.72Å 73.73Å 88.07Å 90.00° 96.85° 90.00°	Depositor
Resolution (Å)	39.41 – 2.00 39.41 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.8 (39.41-2.00) 99.8 (39.41-2.00)	Depositor EDS
R_{merge}	0.20	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.35 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.172 , 0.227 0.182 , 0.231	Depositor DCC
R_{free} test set	2986 reflections (4.85%)	wwPDB-VP
Wilson B-factor (Å²)	12.0	Xtriage
Anisotropy	0.641	Xtriage
Bulk solvent k_{sol}(e/Å³), B_{sol}(Å²)	0.36 , 58.8	EDS
L-test for twinning[2]	$< |L| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	8335	wwPDB-VP
Average B, all atoms (Å²)	14.0	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 73.44 % 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 1.8366e-06. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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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 (i)

5.1   Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: 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	A	1.07	6/1975 (0.3%)	1.03	4/2685 (0.1%)
1	B	0.98	2/1929 (0.1%)	0.98	2/2626 (0.1%)
1	C	0.97	2/2004 (0.1%)	1.00	6/2724 (0.2%)
1	D	1.00	5/1959 (0.3%)	0.96	3/2666 (0.1%)
All	All	1.00	15/7867 (0.2%)	0.99	15/10701 (0.1%)

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	123[A]	GLU	CD-OE1	9.62	1.36	1.25
1	A	123[B]	GLU	CD-OE1	9.62	1.36	1.25
1	A	112	GLU	CD-OE1	8.67	1.35	1.25
1	A	210	GLU	CD-OE1	7.45	1.33	1.25
1	D	28	GLU	CD-OE1	6.62	1.32	1.25

The worst 5 of 15 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	113	ARG	NE-CZ-NH1	7.92	124.26	120.30
1	A	174	ARG	NE-CZ-NH2	-7.57	116.51	120.30
1	D	5	ARG	CG-CD-NE	-7.43	96.20	111.80
1	A	101	ARG	NE-CZ-NH2	-7.08	116.76	120.30
1	D	5	ARG	NE-CZ-NH2	-6.69	116.96	120.30

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	1916	0	1928	16	0
1	B	1882	0	1886	23	0
1	C	1948	0	1962	19	0
1	D	1909	0	1904	17	0
2	A	1	0	0	0	0
2	B	2	0	0	0	0
2	C	3	0	0	0	0
3	A	171	0	0	1	0
3	B	168	0	0	3	0
3	C	154	0	0	1	0
3	D	181	0	0	3	0
All	All	8335	0	7680	71	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 71 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:C:108:SER:OG	1:C:113[A]:ARG:HD3	1.69	0.92
1:B:217:ASN:HD21	1:B:221:GLN:NE2	1.87	0.72
1:B:227:ASN:HD22	1:B:229:ASP:H	1.37	0.71
1:B:50:ILE:HD12	1:B:64:ILE:CD1	2.24	0.67
1:B:50:ILE:HD12	1:B:64:ILE:HD11	1.78	0.65

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	248/248 (100%)	241 (97%)	6 (2%)	1 (0%)	34	30
1	B	244/248 (98%)	236 (97%)	7 (3%)	1 (0%)	34	30
1	C	252/248 (102%)	242 (96%)	9 (4%)	1 (0%)	34	30
1	D	248/248 (100%)	241 (97%)	6 (2%)	1 (0%)	34	30
All	All	992/992 (100%)	960 (97%)	28 (3%)	4 (0%)	34	30

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	69	VAL
1	C	69	VAL
1	D	69	VAL
1	B	69	VAL

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	211/209 (101%)	207 (98%)	4 (2%)	57	61
1	B	203/209 (97%)	198 (98%)	5 (2%)	47	49
1	C	212/209 (101%)	205 (97%)	7 (3%)	38	37
1	D	207/209 (99%)	201 (97%)	6 (3%)	42	43
All	All	833/836 (100%)	811 (97%)	22 (3%)	46	48

5 of 22 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	39	SER
1	C	177	LYS
1	D	107	TYR
1	C	69	VAL

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Mol	Chain	Res	Type
1	C	120	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 27 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	156	GLN
1	B	227	ASN
1	D	170	GLN
1	B	170	GLN
1	A	156	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)

Of 6 ligands modelled in this entry, 6 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	A	244/248 (98%)	-0.60	1 (0%)	92	92	7, 13, 25, 48	0
1	B	243/248 (97%)	-0.61	0	100	100	7, 13, 26, 36	0
1	C	248/248 (100%)	-0.64	0	100	100	7, 12, 24, 36	0
1	D	246/248 (99%)	-0.68	0	100	100	5, 12, 23, 40	0
All	All	981/992 (98%)	-0.63	1 (0%)	95	95	5, 12, 25, 48	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	0	MET	2.1

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
2	NA	C	301	1/1	0.99	0.11	10,10,10,10	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	NA	A	301	1/1	0.99	0.08	0,0,0,0	0
2	NA	C	302	1/1	0.99	0.07	4,4,4,4	0
2	NA	C	303	1/1	0.99	0.14	5,5,5,5	0
2	NA	B	301	1/1	1.00	0.07	4,4,4,4	0
2	NA	B	302	1/1	1.00	0.11	4,4,4,4	0

6.5　Other polymers ⓘ

There are no such residues in this entry.