

Full wwPDB X-ray Structure Validation Report (i)

May 15, 2020 - 04:40 pm BST

PDB ID 1PRP : CRYSTAL STRUCTURE OF D(CGCGAATTCGCG) COMPLEXED WITH Title : PROPAMIDINE, A SHORT-CHAIN HOMOLOGUE OF THE DRUG PEN-TAMIDIN Authors Nunn, C.M.; Jenkins, T.C.; Neidle, S. : Deposited on 1993-07-23 2.10 Å(reported) Resolution :

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 (i) symbol.

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

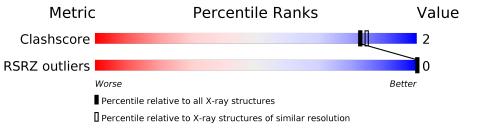
Xtriage (Phenix) : EDS : buster-report : Percentile statistics : Refmac : CCP4 : Ideal geometry (proteins) : Ideal geometry (DNA, RNA) :	 1.8.5 (274361), CSD as541be (2020) 1.13 2.11 1.1.7 (2018) 20191225.v01 (using entries in the PDB archive December 25th 2019) 5.8.0158 7.0.044 (Gargrove) Engh & Huber (2001) Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) :	2.11

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 2.10 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.



${f Metric} egin{array}{c} {f Whole archive} \ (\#{ m Entries}) \end{array}$		${f Similar\ resolution}\ (\#{ m Entries,\ resolution\ range}({ m \AA}))$			
Clashscore	141614	5710(2.10-2.10)			
RSRZ outliers	127900	5083 (2.10-2.10)			

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	А	12	8% 75%	17%			
1	В	12	8% 67%	25%			



2 Entry composition (i)

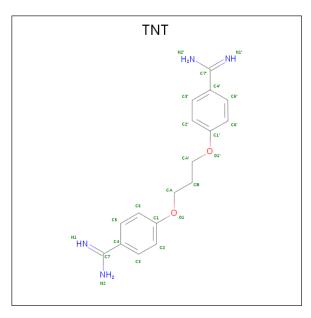
There are 3 unique types of molecules in this entry. The entry contains 578 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 DNA chain called DNA (5'-D(*CP*GP*CP*GP*AP*AP*TP*TP*CP*GP* CP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	1 A	12	Total	С	Ν	Ο	Р	0	0	0
1			243	116	46	70	11	0		
1	1 B	B 12	Total	С	Ν	Ο	Р	0	0	0
		12	243	116	46	70	11	0		

• Molecule 2 is 1,3-BIS (AMIDINOPHENOXY)PROPANE (three-letter code: TNT) (formula: $\rm C_{17}H_{20}N_4O_2).$



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	А	1	Total 23	С 17	N 4	O 2	0	0

• Molecule 3 is water.



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	А	40	Total O 40 40	0	0
3	В	29	Total O 29 29	0	0



3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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: DNA (5'-D(*CP*GP*CP*GP*AP*AP*TP*TP*CP*GP*CP*G)-3')

Chain A: 8%	75%	17%
C1 C2 C3 C3 C3 C3 C3 C3 C3 C3 C3 C3 C3 C3 C3		
• Molecule 1: DNA (5'-I	D(*CP*GP*CP*GP*AP*AP*	*TP*TP*CP*GP*CP*G
Chain B: 8%	67%	25%
C13 C14 C15 C15 C15 C15 A17 A17 C21 C21 C21 C22 C22 C22 C23 C22 C23		



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants	25.00Å 40.88 Å 67.28 Å	Depositor
a, b, c, α , β , γ	90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 - 2.10	Depositor
Resolution (A)	34.94 - 2.25	EDS
% Data completeness	(Not available) $(8.00-2.10)$	Depositor
(in resolution range)	78.1(34.94-2.25)	EDS
R _{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) > 1$	$1.09 (at 2.24 \text{\AA})$	Xtriage
Refinement program	X-PLOR	Depositor
D D.	0.174 , (Not available)	Depositor
R, R_{free}	0.179 , (Not available)	DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor $(Å^2)$	43.0	Xtriage
Anisotropy	0.333	Xtriage
Bulk solvent $k_{sol}(e/Å^3), B_{sol}(Å^2)$	0.26, 96.2	EDS
L-test for twinning ²	$ \langle L \rangle = 0.49, \langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	578	wwPDB-VP
Average B, all atoms $(Å^2)$	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: The largest off-origin peak in the Patterson function is 12.77% of the height of the origin peak. No significant pseudotranslation is detected.

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.



¹Intensities estimated from amplitudes.

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: TNT

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	Bon	d lengths	Bond angles		
		RMSZ	# Z > 5	RMSZ	# Z > 5	
1	А	1.91	2/272~(0.7%)	2.68	28/418~(6.7%)	
1	В	1.97	6/272~(2.2%)	2.56	27/418~(6.5%)	
All	All	1.94	8/544~(1.5%)	2.62	55/836~(6.6%)	

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	А	0	1
1	В	0	1
All	All	0	2

Mol	Chain	\mathbf{Res}	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	В	19	DT	C5-C7	7.96	1.54	1.50
1	В	15	DC	N1-C6	-6.93	1.32	1.37
1	В	13	DC	C5'-C4'	6.21	1.58	1.51
1	А	6	DA	P-O5'	5.75	1.65	1.59
1	В	18	DA	C5'-C4'	5.54	1.57	1.51
1	В	17	DA	N3-C4	5.14	1.38	1.34
1	В	22	DG	P-O5'	5.10	1.64	1.59
1	А	7	DT	C4-C5	-5.07	1.40	1.45

All (8) bond length outliers are listed below:

All (55) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
1	В	19	DT	C6-C5-C7	-10.51	116.59	122.90

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Mol	nuea fron Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
1	А	4	DG	O4'-C1'-N9	10.00	115.00	108.00
1	А	8	DT	O4'-C1'-C2'	-9.88	98.00	105.90
1	В	20	DT	O4'-C1'-C2'	-9.75	98.10	105.90
1	А	8	DT	C6-C5-C7	-9.26	117.35	122.90
1	А	9	DC	O4'-C1'-C2'	-9.00	98.70	105.90
1	В	23	DC	O4'-C1'-N1	8.79	114.15	108.00
1	А	9	DC	N1-C2-O2	8.74	124.14	118.90
1	А	8	DT	P-O3'-C3'	8.31	129.68	119.70
1	А	10	DG	O4'-C1'-N9	7.97	113.58	108.00
1	А	8	DT	N3-C2-O2	-7.93	117.54	122.30
1	А	1	DC	N1-C2-O2	7.86	123.61	118.90
1	В	16	DG	O4'-C1'-C2'	-7.60	99.82	105.90
1	В	13	DC	N1-C2-O2	7.53	123.42	118.90
1	В	19	DT	C4-C5-C7	7.51	123.51	119.00
1	В	19	DT	C1'-O4'-C4'	-7.51	102.59	110.10
1	В	15	DC	O4'-C4'-C3'	-7.36	101.56	104.50
1	В	22	DG	O4'-C1'-N9	7.28	113.10	108.00
1	А	5	DA	O4'-C1'-C2'	-7.26	100.09	105.90
1	В	17	DA	O4'-C4'-C3'	-7.20	101.62	104.50
1	В	21	DC	P-O3'-C3'	7.19	128.33	119.70
1	В	18	DA	O4'-C1'-C2'	-7.05	100.26	105.90
1	А	12	DG	O4'-C4'-C3'	-6.98	101.71	104.50
1	А	7	DT	O4'-C1'-C2'	-6.94	100.35	105.90
1	В	16	DG	C8-N9-C4	-6.87	103.65	106.40
1	В	15	DC	P-O3'-C3'	6.83	127.90	119.70
1	В	22	DG	O4'-C1'-C2'	-6.64	100.59	105.90
1	А	7	DT	C1'-O4'-C4'	-6.63	103.47	110.10
1	А	7	DT	C4-C5-C6	6.45	121.87	118.00
1	В	19	DT	N3-C2-O2	-6.38	118.47	122.30
1	А	2	DG	C2-N3-C4	6.33	115.06	111.90
1	В	24	DG	C5-C6-N1	6.30	114.65	111.50
1	В	20	DT	C4-C5-C6	6.21	121.73	118.00
1	А	1	DC	O4'-C1'-C2'	-6.12	101.01	105.90
1	В	16	DG	P-O3'-C3'	6.05	126.97	119.70
1	А	8	DT	C4-C5-C6	6.03	121.62	118.00
1	В	24	DG	C5-C6-O6	-6.00	125.00	128.60
1	В	21	DC	C1'-O4'-C4'	-5.92	104.18	110.10
1	А	4	DG	N1-C6-O6	-5.88	116.37	119.90
1	А	10	DG	O4'-C1'-C2'	-5.88	101.20	105.90
1	A	9	DC	O4'-C1'-N1	-5.86	103.89	108.00
1	A	2	DG	P-O3'-C3'	5.78	126.63	119.70
1	В	13	DC	O4'-C1'-N1	-5.74	103.98	108.00

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Mol	Chain	\mathbf{Res}	Type	Atoms	Z	$\mathbf{Observed}(^{o})$	$Ideal(^{o})$
1	В	16	DG	N7-C8-N9	5.57	115.88	113.10
1	А	6	DA	N9-C4-C5	5.41	107.96	105.80
1	В	13	DC	C2-N3-C4	5.31	122.55	119.90
1	А	6	DA	O4'-C1'-C2'	-5.27	101.68	105.90
1	В	19	DT	P-O3'-C3'	5.25	126.00	119.70
1	А	7	DT	N3-C4-O4	5.24	123.04	119.90
1	А	5	DA	P-O3'-C3'	5.12	125.84	119.70
1	А	12	DG	O4'-C1'-N9	-5.08	104.45	108.00
1	А	3	DC	N1-C2-O2	5.05	121.93	118.90
1	В	17	DA	P-O3'-C3'	5.01	125.71	119.70
1	В	23	DC	C3'-C2'-C1'	5.01	108.51	102.50
1	А	10	DG	O3'-P-O5'	-5.00	94.50	104.00

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There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	А	3	DC	Sidechain
1	В	18	DA	Sidechain

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	А	243	0	136	1	0
1	В	243	0	136	1	0
2	А	23	0	18	1	0
3	А	40	0	0	0	0
3	В	29	0	0	0	0
All	All	578	0	290	2	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 2.

All (2) 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:A:6:DA:N3	2:A:25:TNT:H3'	2.09	0.68
1:B:15:DC:H2'	1:B:16:DG:C8	2.37	0.59

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

There are no protein molecules in this entry.

5.3.2 Protein sidechains (i)

There are no protein molecules in this entry.

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 carbohydrates in this entry.

5.6 Ligand geometry (i)

1 ligand is 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		
WIOI					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	TNT	А	25	-	24,24,24	1.13	2 (8%)	$23,\!31,\!31$	1.68	<mark>5 (21%)</mark>

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	TNT	А	25	-	-	4/16/16/16	0/2/2/2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$\operatorname{Observed}(\operatorname{\AA})$	Ideal(Å)
2	А	25	TNT	C4-C7	-2.77	1.42	1.47
2	А	25	TNT	C6'-C5'	2.36	1.43	1.38

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$\mathbf{Observed}(^{o})$	$\mathbf{Ideal}(^{o})$
2	А	25	TNT	C4'-C7'-N2'	3.79	123.76	118.05
2	А	25	TNT	C2'-C3'-C4'	2.86	124.10	120.78
2	А	25	TNT	CA'-CB-CA	-2.79	104.42	113.70
2	А	25	TNT	C5-C6-C1	2.38	122.64	119.73
2	А	25	TNT	C4-C7-N2	2.36	121.61	118.05

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	А	25	TNT	C3-C4-C7-N2
2	А	25	TNT	C5-C4-C7-N2
2	А	25	TNT	C3-C4-C7-N1
2	А	25	TNT	C5-C4-C7-N1

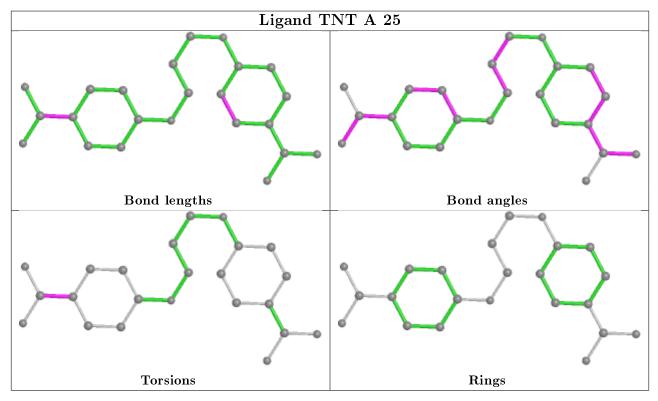
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	А	25	TNT	1	0



The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and sufficient the outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



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, 95^{th} 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 $>$	#	$\#RSRZ{>}2$		$\mathbf{OWAB}(\mathrm{\AA}^2)$	$\mathbf{Q}{<}0.9$
1	А	12/12~(100%)	-0.76	0	100	100	20, 23, 31, 32	0
1	В	12/12~(100%)	-0.78	0	100	100	19, 25, 28, 41	0
All	All	24/24~(100%)	-0.77	0	100	100	19, 24, 31, 41	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 carbohydrates in this entry.

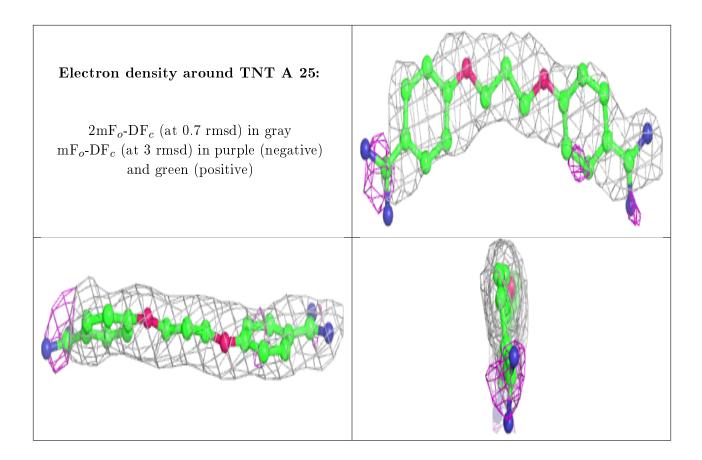
6.4 Ligands (i)

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, 95^{th} 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	${f B} ext{-factors}({ m \AA}^2)$	$Q{<}0.9$
2	TNT	А	25	23/23	0.82	0.27	$33,\!38,\!44,\!46$	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.





6.5 Other polymers (i)

There are no such residues in this entry.

