



Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 08:11 pm BST

PDB ID : 2TCT
Title : THE COMPLEX FORMED BETWEEN TET REPRESSOR AND
TETRACYCLINE-MG2+ REVEALS MECHANISM OF ANTIBIOTIC RE-
SISTANCE
Authors : Hinrichs, W.; Kisker, C.; Saenger, W.
Deposited on : 1995-03-02
Resolution : 2.10 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
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

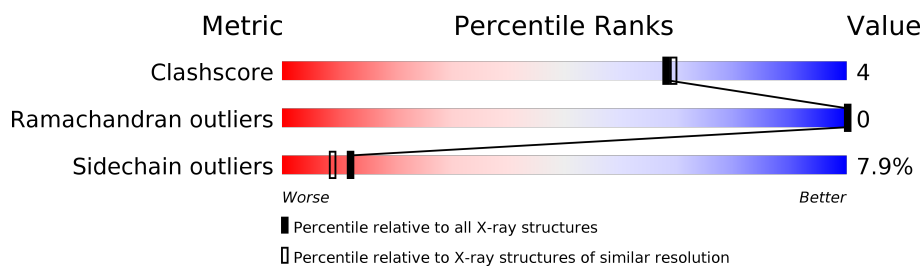
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	207	 77% 16% . .

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 1742 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.

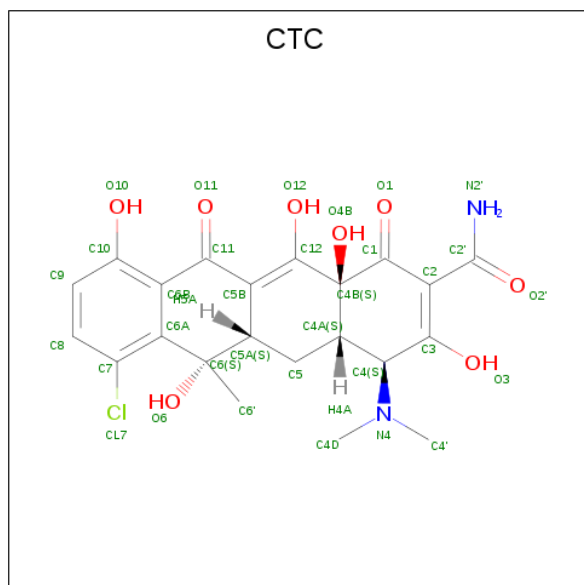
- Molecule 1 is a protein called TETRACYCLINE REPRESSOR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	198	Total	C	N	O	S	0	0	0
			1573	992	283	295	3			

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		

- Molecule 3 is 7-CHLOROTETRACYCLINE (three-letter code: CTC) (formula: $C_{22}H_{23}ClN_2O_8$).




Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	135	Total 135	O 135	0	0

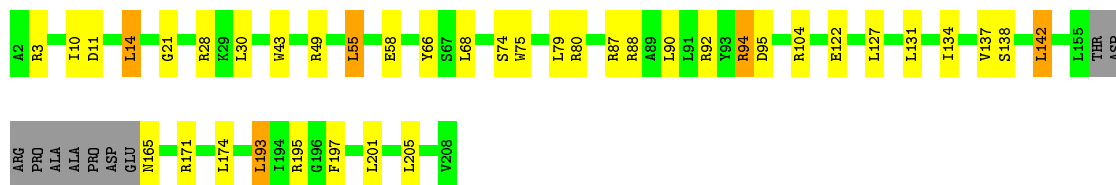
3 Residue-property plots [i](#)

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. 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. 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.

Note EDS was not executed.

- Molecule 1: TETRACYCLINE REPRESSOR

Chain A:  77% 16% . .



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	I 41 2 2	Depositor
Cell constants a, b, c, α , β , γ	68.78 Å 68.78 Å 181.45 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.10	Depositor
% Data completeness (in resolution range)	93.8 (10.00-2.10)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.180 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1742	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.92	0/1599	1.55	27/2161 (1.2%)

There are no bond length outliers.

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	28	ARG	NE-CZ-NH1	9.92	125.26	120.30
1	A	87	ARG	NE-CZ-NH1	7.54	124.07	120.30
1	A	75	TRP	CD1-CG-CD2	7.11	111.99	106.30
1	A	43	TRP	CE2-CD2-CG	-7.08	101.63	107.30
1	A	171	ARG	NE-CZ-NH1	7.02	123.81	120.30
1	A	195	ARG	NE-CZ-NH1	7.00	123.80	120.30
1	A	3	ARG	NE-CZ-NH1	6.89	123.74	120.30
1	A	75	TRP	CE2-CD2-CG	-6.77	101.89	107.30
1	A	92	ARG	NE-CZ-NH2	-6.64	116.98	120.30
1	A	171	ARG	NE-CZ-NH2	-6.60	117.00	120.30
1	A	49	ARG	NE-CZ-NH2	-6.56	117.02	120.30
1	A	43	TRP	CD1-CG-CD2	6.55	111.54	106.30
1	A	92	ARG	NE-CZ-NH1	6.36	123.48	120.30
1	A	94	ARG	NE-CZ-NH1	6.31	123.45	120.30
1	A	104	ARG	NE-CZ-NH1	6.23	123.42	120.30
1	A	88	ARG	NE-CZ-NH1	6.21	123.40	120.30
1	A	3	ARG	NE-CZ-NH2	-6.17	117.21	120.30
1	A	90	LEU	CB-CG-CD1	-6.09	100.65	111.00
1	A	94	ARG	CA-CB-CG	-5.89	100.44	113.40
1	A	195	ARG	NE-CZ-NH2	-5.84	117.38	120.30
1	A	137	VAL	CG1-CB-CG2	-5.50	102.10	110.90
1	A	193	LEU	CB-CG-CD1	-5.40	101.83	111.00
1	A	80	ARG	NE-CZ-NH2	-5.26	117.67	120.30
1	A	122	GLU	CA-CB-CG	-5.25	101.86	113.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	66	TYR	CB-CG-CD2	-5.20	117.88	121.00
1	A	43	TRP	CG-CD2-CE3	5.11	138.50	133.90
1	A	142	LEU	CA-CB-CG	5.09	127.02	115.30

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	1573	0	1574	11	0
2	A	1	0	0	0	0
3	A	33	0	22	4	0
4	A	135	0	0	2	0
All	All	1742	0	1596	12	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 4.

All (12) 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:10:ILE:HG21	1:A:58:GLU:HG3	1.78	0.65
1:A:14:LEU:HD13	1:A:55:LEU:HG	1.88	0.55
3:A:222:CTC:CL7	3:A:222:CTC:H6'1	2.48	0.51
1:A:14:LEU:CD1	1:A:55:LEU:HG	2.41	0.50
1:A:138:SER:OG	3:A:222:CTC:H4A3	2.14	0.47
1:A:134:ILE:HG21	3:A:222:CTC:H6'3	1.96	0.47
1:A:21:GLY:HA2	1:A:94:ARG:HD2	1.96	0.47
1:A:134:ILE:HG23	3:A:222:CTC:H4A2	1.98	0.46
1:A:193:LEU:HD22	1:A:197:PHE:CZ	2.53	0.43
1:A:74:SER:HA	4:A:254:HOH:O	2.19	0.41
1:A:94:ARG:HD3	4:A:297:HOH:O	2.21	0.40
1:A:94:ARG:HG2	1:A:95:ASP:N	2.36	0.40

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	194/207 (94%)	190 (98%)	4 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	165/172 (96%)	152 (92%)	13 (8%)	12	9

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	11	ASP
1	A	14	LEU
1	A	30	LEU
1	A	55	LEU
1	A	68	LEU
1	A	79	LEU
1	A	127	LEU
1	A	131	LEU
1	A	142	LEU
1	A	165	ASN

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Mol	Chain	Res	Type
1	A	174	LEU
1	A	201	LEU
1	A	205	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	175	GLN
1	A	200	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 for Mogul analysis.

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	CTC	A	222	2	34,36,36	2.03	14 (41%)	42,60,60	1.98	14 (33%)

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
3	CTC	A	222	2	-	0/8/74/74	0/4/4/4

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	222	CTC	C4B-C4A	4.35	1.57	1.53
3	A	222	CTC	C4-N4	3.85	1.55	1.47
3	A	222	CTC	C5B-C12	3.34	1.40	1.36
3	A	222	CTC	C5B-C11	-3.25	1.39	1.47
3	A	222	CTC	O12-C12	3.07	1.43	1.32
3	A	222	CTC	C6-C6A	2.65	1.55	1.53
3	A	222	CTC	C2-C2'	-2.63	1.42	1.47
3	A	222	CTC	O1-C1	2.44	1.26	1.22
3	A	222	CTC	C4'-N4	2.43	1.55	1.46
3	A	222	CTC	C4D-N4	2.29	1.54	1.46
3	A	222	CTC	O10-C10	2.23	1.40	1.36
3	A	222	CTC	O3-C3	2.19	1.40	1.33
3	A	222	CTC	C4B-C12	-2.13	1.50	1.52
3	A	222	CTC	C5-C4A	-2.06	1.50	1.53

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	222	CTC	C1-C4B-C12	5.58	116.42	109.88
3	A	222	CTC	O4B-C4B-C4A	-3.97	105.21	110.09
3	A	222	CTC	C11-C5B-C12	3.71	121.73	118.80
3	A	222	CTC	C4B-C4A-C4	-3.15	107.33	111.64
3	A	222	CTC	O4B-C4B-C12	-3.03	105.29	110.14
3	A	222	CTC	C4B-C12-C5B	-2.97	120.05	123.06
3	A	222	CTC	C5A-C5B-C12	-2.80	118.05	122.01
3	A	222	CTC	O12-C12-C4B	2.80	117.42	113.37
3	A	222	CTC	O2'-C2'-N2'	-2.72	116.52	122.88
3	A	222	CTC	C4'-N4-C4	-2.61	107.97	114.09
3	A	222	CTC	O6-C6-C6'	2.39	114.06	108.02
3	A	222	CTC	C5-C5A-C5B	2.34	114.97	109.53
3	A	222	CTC	C6B-C6A-C7	2.10	119.80	116.40
3	A	222	CTC	O11-C11-C5B	-2.01	117.70	120.78

There are no chirality outliers.

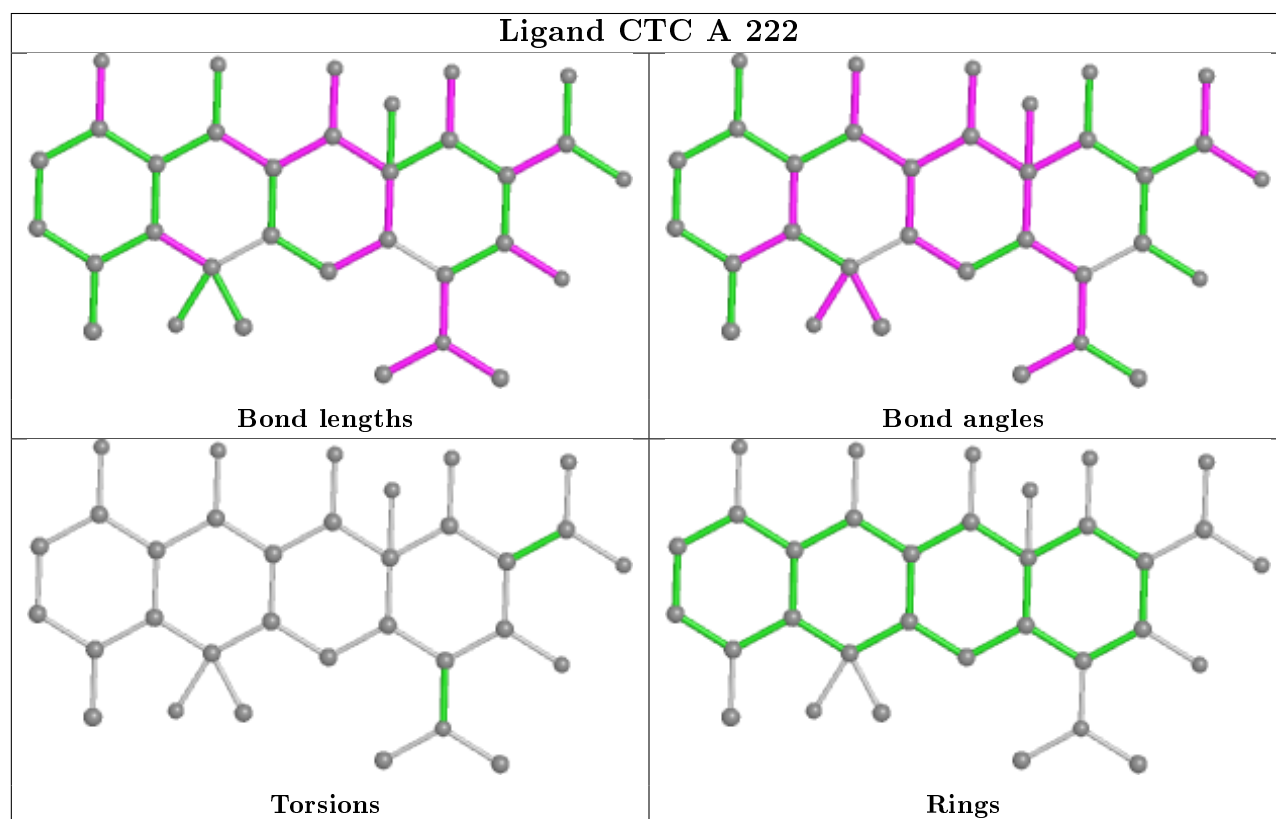
There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	222	CTC	4	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 than 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 any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. 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

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.