



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2014 – 01:26 AM GMT

PDB ID : 1D35  
Title : FACILE FORMATION OF A CROSSLINKED ADDUCT BETWEEN  
DNA AND THE DAUNORUBICIN DERIVATIVE MAR70 MEDIATED  
BY FORMALDEHYDE: MOLECULAR STRUCTURE OF THE MAR70-  
D(CGTNACG) COVALENT ADDUC  
Authors : Gao, Y.-G.; Liaw, Y.-C.; Li, Y.-K.; Van Der Marel, G.A.; Van Boom, J.H.;  
Wang, A.H.-J.  
Deposited on : 1991-04-23  
Resolution : 1.30 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.  
We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)  
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

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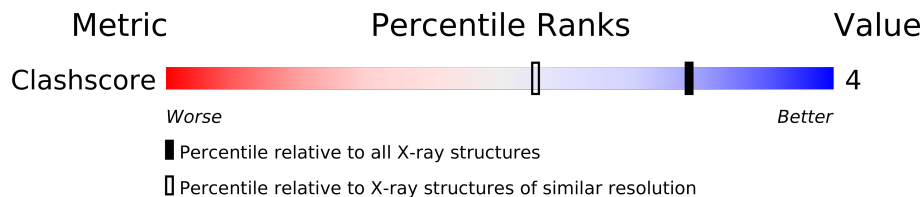
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 21963  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 1.30 Å.

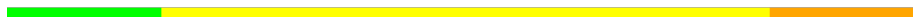
Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	79885	1140 (1.34-1.26)

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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	6	

## 2 Entry composition i

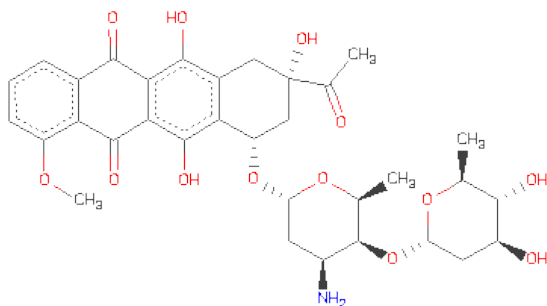
There are 4 unique types of molecules in this entry. The entry contains 238 atoms, of which 0 are hydrogen and 0 are deuterium.

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\*TP\*(A40)P\*CP\*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	6	Total	C	N	O	P	0	0	0
			122	59	24	34	5			

- Molecule 2 is 4'-EPI-4'-(2-DEOXYFUCOSE)DAUNOMYCIN (three-letter code: MAR) (formula: C<sub>33</sub>H<sub>39</sub>NO<sub>13</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			47	33	1	13		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	68	Total 68	O 68	0	0

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

- Molecule 1: DNA (5'-D(\*CP\*GP\*TP\*(A40)P\*CP\*G)-3')

Chain A: 

C1	C2	T3	A4	C5	G6
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## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	28.12Å 28.12Å 52.98Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 1.30	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-1.30)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	NUCLSQ	Depositor
R, $R_{free}$	0.174 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	238	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	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, MAR, A40

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	1.72	2/109 (1.8%)	2.70	12/164 (7.3%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	6	DG	C6-N1	-5.50	1.35	1.39
1	A	5	DC	N3-C4	5.17	1.37	1.33

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	5	DC	O4'-C1'-N1	12.54	116.78	108.00
1	A	6	DG	C5-C6-O6	-7.54	124.07	128.60
1	A	2	DG	C5-C6-N1	7.44	115.22	111.50
1	A	1	DC	P-O3'-C3'	7.37	128.54	119.70
1	A	3	DT	C2-N3-C4	-7.03	122.98	127.20
1	A	2	DG	O4'-C1'-N9	6.79	112.75	108.00
1	A	6	DG	C5-C6-N1	5.89	114.44	111.50
1	A	2	DG	C6-N1-C2	-5.66	121.70	125.10
1	A	1	DC	C2-N3-C4	5.56	122.68	119.90
1	A	3	DT	N1-C2-N3	5.54	117.93	114.60
1	A	5	DC	N3-C4-C5	-5.50	119.70	121.90
1	A	3	DT	N3-C4-C5	5.21	118.33	115.20

There are no chirality outliers.

There are no planarity outliers.

## 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	122	0	70	1	0
2	A	47	0	37	0	0
3	A	1	0	0	0	0
4	A	68	0	0	1	1
All	All	238	0	107	1	1

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 4.

All (1) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:5:DC:OP2	4:A:63:HOH:O	2.00	0.80

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
4:A:73:HOH:O	4:A:76:HOH:O[5_555]	2.00	0.20

## 5.3 Torsion angles

### 5.3.1 Protein backbone ⓘ

There are no protein chains in this entry.

### 5.3.2 Protein sidechains ⓘ

There are no protein chains in this entry.

### 5.3.3 RNA ⓘ

There are no RNA chains in this entry.



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

1 non-standard protein/DNA/RNA residue 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		
					Counts	RMSZ	# $ Z  > 2$	Counts	RMSZ	# $ Z  > 2$
1	A40	A	4	1,2	23,25,26	1.04	2 (8%)	33,36,39	2.23	6 (18%)

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
1	A40	A	4	1,2	-	0/8/23/24	0/1/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	4	A40	P-O1P	2.61	1.49	1.46
1	A	4	A40	O4'-C4'	-2.05	1.40	1.45

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	4	A40	CH2-N2-C2	-10.35	111.31	123.04
1	A	4	A40	C2-N3-C4	-3.92	110.24	115.15
1	A	4	A40	P-O5'-C5'	-2.72	112.56	123.19
1	A	4	A40	C4-C5-N7	2.57	111.72	109.52
1	A	4	A40	C2-N1-C6	2.44	122.48	113.91
1	A	4	A40	C5-C6-N6	2.04	125.34	120.72

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

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	$\# Z  > 2$
2	MAR	A	7	1,3	52,52,52	2.03	21 (40%)	81,81,81	1.89	21 (25%)

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	MAR	A	7	1,3	-	0/16/78/78	0/2/6/6

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	7	MAR	C2'-C3'	5.17	1.56	1.52
2	A	7	MAR	C18-C7	3.77	1.49	1.41
2	A	7	MAR	C3-C4	3.65	1.47	1.39
2	A	7	MAR	C9-C10	3.29	1.57	1.51
2	A	7	MAR	O5'-C5'	3.24	1.52	1.44
2	A	7	MAR	O4-C4	-3.20	1.32	1.37
2	A	7	MAR	O4-C21	3.01	1.52	1.42
2	A	7	MAR	C15-C16	-3.00	1.46	1.51
2	A	7	MAR	OB3-CB3	2.92	1.50	1.43
2	A	7	MAR	C20-C5	-2.90	1.36	1.41
2	A	7	MAR	O10-C10	2.80	1.49	1.44
2	A	7	MAR	O12-C12	2.55	1.48	1.43
2	A	7	MAR	C2-C3	2.53	1.44	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	7	MAR	O5'-C1'	2.52	1.49	1.42
2	A	7	MAR	OB5-CB5	2.49	1.50	1.44
2	A	7	MAR	O8-C8	-2.34	1.31	1.37
2	A	7	MAR	OB5-CB1	2.29	1.48	1.42
2	A	7	MAR	C15-C12	2.25	1.57	1.53
2	A	7	MAR	OB4-CB4	2.22	1.48	1.43
2	A	7	MAR	CB2-CB3	2.15	1.56	1.52
2	A	7	MAR	C11-C10	-2.03	1.48	1.52

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	7	MAR	C20-C5-C4	5.32	124.58	118.06
2	A	7	MAR	C5-C20-C19	4.58	127.45	120.77
2	A	7	MAR	C1-C20-C19	-4.57	111.83	119.23
2	A	7	MAR	O10-C10-C9	-3.85	98.59	107.73
2	A	7	MAR	O4'-C4'-C5'	3.74	116.44	106.75
2	A	7	MAR	C4-C5-C6	-3.74	117.10	122.40
2	A	7	MAR	C1'-O10-C10	3.67	120.99	115.84
2	A	7	MAR	OB3-CB3-CB2	-3.34	101.94	110.09
2	A	7	MAR	O4-C4-C5	3.22	120.86	115.82
2	A	7	MAR	C3-C4-C5	-2.75	115.19	120.34
2	A	7	MAR	C15-C16-C9	2.64	128.45	121.79
2	A	7	MAR	C8-C9-C16	2.58	125.20	119.69
2	A	7	MAR	C14-C13-C12	2.52	122.56	118.62
2	A	7	MAR	O10-C1'-C2'	2.46	112.89	108.44
2	A	7	MAR	O6-C6-C7	-2.45	117.06	121.50
2	A	7	MAR	O6-C6-C5	2.41	125.86	121.50
2	A	7	MAR	O12-C12-C13	-2.27	103.28	108.19
2	A	7	MAR	C17-C18-C19	2.18	124.55	120.58
2	A	7	MAR	C12-C11-C10	2.17	117.32	111.25
2	A	7	MAR	C17-C16-C9	-2.12	115.37	119.08
2	A	7	MAR	OB4-CB4-CB3	-2.10	106.24	110.03

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 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 ⓘ

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.