



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 30, 2024 – 04:12 PM JST

PDB ID : 9JPL  
Title : Crystal structure of DhdR inducer binding domain in complex with inducer  
Authors : Sun, P.; Wang, B.  
Deposited on : 2024-09-26  
Resolution : 2.01 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](mailto: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 types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.003 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39

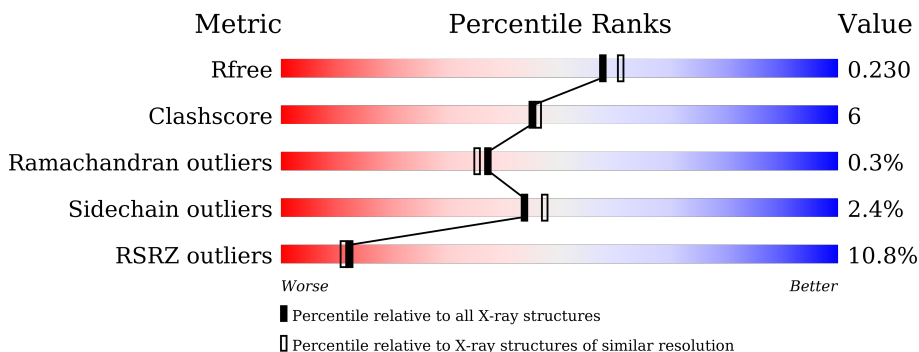
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.01 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))
$R_{free}$	164625	9409 (2.00-2.00)
Clashscore	180529	10737 (2.00-2.00)
Ramachandran outliers	177936	10628 (2.00-2.00)
Sidechain outliers	177891	10627 (2.00-2.00)
RSRZ outliers	164620	9409 (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 of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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  $\leq 5\%$ . 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	238	
1	B	238	

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 2377 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 Pyruvate dehydrogenase complex repressor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	148	1116	687	220	207	2	0	0	0
1	B	147	1108	681	217	208	2	0	0	0

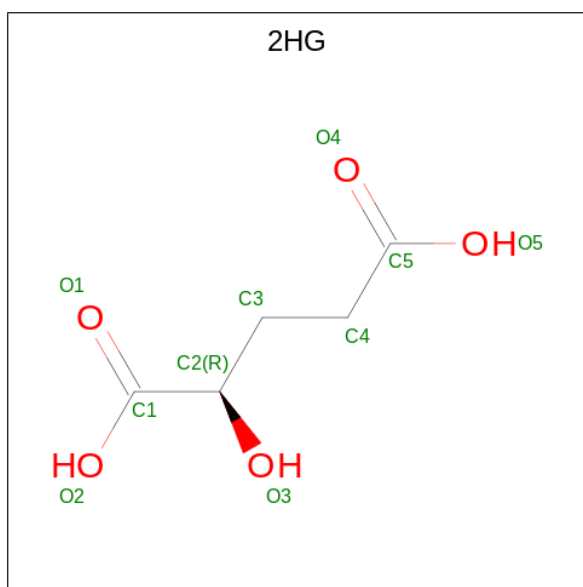
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	120	ALA	VAL	conflict	UNP A0A6N0JVZ6
A	134	ASP	GLU	conflict	UNP A0A6N0JVZ6
B	120	ALA	VAL	conflict	UNP A0A6N0JVZ6
B	134	ASP	GLU	conflict	UNP A0A6N0JVZ6

- Molecule 2 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 3 is (2R)-2-hydroxypentanedioic acid (three-letter code: 2HG) (formula: C<sub>5</sub>H<sub>8</sub>O<sub>5</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 10 5 5	0	0
3	A	1	Total C O 10 5 5	0	0
3	B	1	Total C O 10 5 5	0	0

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Zn 1 1	0	0
4	B	1	Total Zn 1 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	67	Total O 67 67	0	0
5	B	53	Total O 53 53	0	0



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	128.00Å 128.00Å 42.95Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.72 – 2.01 40.72 – 2.01	Depositor EDS
% Data completeness (in resolution range)	100.0 (40.72-2.01) 100.0 (40.72-2.01)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.96 (at 2.01Å)	Xtrriage
Refinement program	PHENIX 1.14_3260	Depositor
R, $R_{free}$	0.200 , 0.230 0.200 , 0.230	Depositor DCC
$R_{free}$ test set	1196 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	35.8	Xtrriage
Anisotropy	0.283	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 40.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	2377	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.86% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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.

## 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: CL, 2HG, ZN

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	0.42	0/1130	0.54	0/1535
1	B	0.37	0/1121	0.54	0/1522
All	All	0.39	0/2251	0.54	0/3057

There are no bond length outliers.

There are no bond angle outliers.

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	1116	0	1096	13	0
1	B	1108	0	1086	18	0
2	A	1	0	0	0	0
3	A	20	0	11	0	0
3	B	10	0	5	1	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	67	0	0	2	0
5	B	53	0	0	5	0
All	All	2377	0	2198	26	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 6.

All (26) 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:130:GLU:OE1	5:B:401:HOH:O	1.90	0.88
1:A:178:ARG:NH2	5:A:401:HOH:O	2.16	0.78
1:A:97:GLU:OE2	1:B:113:ARG:NH1	2.18	0.69
1:B:157:ARG:NH1	5:B:406:HOH:O	2.30	0.65
1:B:216:ARG:NH1	5:B:404:HOH:O	2.27	0.64
1:B:101:GLU:OE2	5:B:402:HOH:O	2.15	0.63
1:A:188:THR:HG23	5:A:418:HOH:O	2.02	0.60
1:B:89:ARG:HD2	1:B:227:LEU:HD23	1.90	0.54
1:A:101:GLU:HG3	1:B:159:TYR:OH	2.09	0.53
1:B:185:GLU:HG2	1:B:186:GLY:H	1.73	0.51
1:A:88:ASP:O	1:A:92:LEU:HD23	2.11	0.51
1:A:144:ILE:HD11	1:A:171:ARG:HA	1.93	0.50
1:B:200:ASP:OD2	1:B:209:ARG:NH2	2.45	0.49
1:A:159:TYR:OH	1:B:101:GLU:HG3	2.13	0.49
1:B:130:GLU:HG3	1:B:192:HIS:NE2	2.28	0.49
1:B:131:ALA:HB3	5:B:432:HOH:O	2.17	0.45
1:B:183:ARG:HE	1:B:183:ARG:HB3	1.48	0.45
1:A:162:LEU:HD11	1:B:166:LEU:HD11	2.00	0.44
1:B:143:ASP:OD2	3:B:301:2HG:O3	2.36	0.44
1:A:113:ARG:NH1	1:B:97:GLU:OE2	2.37	0.43
1:B:184:GLN:NE2	1:B:185:GLU:HB2	2.33	0.42
1:A:135:HIS:HA	1:A:136:PRO:HD2	1.89	0.42
1:A:160:GLN:O	1:A:164:GLN:HG3	2.19	0.42
1:A:136:PRO:HB3	1:A:182:ARG:CZ	2.49	0.41
1:A:178:ARG:O	1:A:182:ARG:HG3	2.19	0.41
1:B:184:GLN:CD	1:B:185:GLU:HB2	2.41	0.40

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	146/238 (61%)	146 (100%)	0	0	100	100
1	B	145/238 (61%)	140 (97%)	4 (3%)	1 (1%)	19	14
All	All	291/476 (61%)	286 (98%)	4 (1%)	1 (0%)	37	35

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	85	GLY

### 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	104/179 (58%)	102 (98%)	2 (2%)	52	57
1	B	103/179 (58%)	100 (97%)	3 (3%)	37	39
All	All	207/358 (58%)	202 (98%)	5 (2%)	44	47

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	114	ARG
1	A	159	TYR
1	B	183	ARG
1	B	184	GLN
1	B	228	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 6 ligands modelled in this entry, 3 are monoatomic - leaving 3 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	2HG	B	301	4	9,9,9	1.07	0	10,11,11	2.90	3 (30%)
3	2HG	A	302	-	9,9,9	1.06	0	10,11,11	1.86	3 (30%)
3	2HG	A	303	4	9,9,9	0.96	0	10,11,11	2.67	3 (30%)

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	2HG	B	301	4	-	0/9/9/9	-
3	2HG	A	302	-	-	5/9/9/9	-
3	2HG	A	303	4	-	4/9/9/9	-

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
3	B	301	2HG	C4-C3-C2	-7.56	104.15	114.46
3	A	303	2HG	C4-C3-C2	-6.86	105.10	114.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	301	2HG	O2-C1-C2	3.49	120.40	112.72
3	A	302	2HG	O2-C1-C2	3.33	120.05	112.72
3	A	303	2HG	O2-C1-C2	3.18	119.71	112.72
3	A	302	2HG	C4-C3-C2	-2.38	111.22	114.46
3	A	302	2HG	O5-C5-C4	2.36	121.61	114.03
3	B	301	2HG	O2-C1-O1	-2.25	118.98	124.09
3	A	303	2HG	O5-C5-C4	2.07	120.69	114.03

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	302	2HG	C1-C2-C3-C4
3	A	302	2HG	O3-C2-C3-C4
3	A	302	2HG	C2-C3-C4-C5
3	A	303	2HG	O2-C1-C2-C3
3	A	303	2HG	O1-C1-C2-C3
3	A	302	2HG	O1-C1-C2-O3
3	A	302	2HG	O2-C1-C2-O3
3	A	303	2HG	O1-C1-C2-O3
3	A	303	2HG	O2-C1-C2-O3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	301	2HG	1	0

## 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

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	148/238 (62%)	0.30	16 (10%) 12 11	25, 33, 61, 88	0
1	B	147/238 (61%)	0.73	16 (10%) 12 11	31, 42, 74, 85	0
All	All	295/476 (61%)	0.51	32 (10%) 12 11	25, 37, 73, 88	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	133	LEU	4.8
1	A	82	VAL	4.2
1	B	86	LEU	3.3
1	B	134	ASP	3.2
1	B	135	HIS	3.2
1	A	131	ALA	3.1
1	B	133	LEU	2.9
1	B	193	GLN	2.7
1	A	134	ASP	2.7
1	B	182	ARG	2.7
1	A	136	PRO	2.7
1	A	183	ARG	2.7
1	A	132	ASN	2.7
1	B	85	GLY	2.6
1	B	84	ALA	2.6
1	A	187	LEU	2.6
1	A	138	GLN	2.5
1	A	229	LEU	2.5
1	B	190	VAL	2.5
1	A	208	ASP	2.4
1	A	135	HIS	2.4
1	A	130	GLU	2.4
1	B	90	GLU	2.3
1	B	161	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	228	ASP	2.2
1	A	182	ARG	2.2
1	B	188	THR	2.2
1	A	137	GLU	2.1
1	B	229	LEU	2.1
1	B	83	SER	2.1
1	B	186	GLY	2.1
1	B	130	GLU	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
3	2HG	A	302	10/10	0.68	0.14	53,57,66,69	0
2	CL	A	301	1/1	0.82	0.17	59,59,59,59	0
3	2HG	B	301	10/10	0.91	0.09	35,41,47,50	0
3	2HG	A	303	10/10	0.97	0.06	25,27,32,34	0
4	ZN	B	302	1/1	0.98	0.03	39,39,39,39	0
4	ZN	A	304	1/1	1.00	0.03	29,29,29,29	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.