

Full wwPDB X-ray Structure Validation Report (i)

Oct 18, 2023 – 06:17 PM EDT

PDB ID : 2EI1

Title: Anaerobic Crystal Structure Analysis of the 1,2-dihydroxynaphthalene

dioxygeanse of Pseudomonas sp. strain C18 complexes to 1,2-dihydroxynapht

halene

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Deposited on : 2007-03-10

Resolution : 1.52 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 (i) symbol.

The types of validation reports are described at http://www.wwpdb.org/validation/2017/FAQs#types.

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

Mol Probity : 4.02b-467

Mogul: 1.8.5 (274361), CSD as541be (2020)

Xtriage (Phenix) : 1.13 EDS : 2.36

Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)

 $Refmac \quad : \quad 5.8.0158$

CCP4 : 7.0.044 (Gargrove)

Ideal geometry (proteins) : Engh & Huber (2001) Ideal geometry (DNA, RNA) : Parkinson et al. (1996)

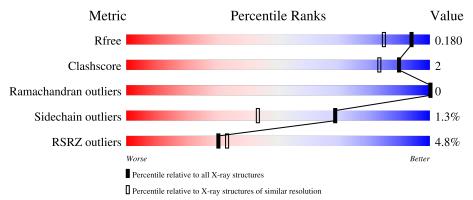
Validation Pipeline (wwPDB-VP) : 2.36

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 1.52 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 $(\# \mathrm{Entries})$	$\begin{array}{c} {\rm Similar\ resolution} \\ (\#{\rm Entries},{\rm resolution\ range}({\rm \AA})) \end{array}$
R_{free}	130704	4009 (1.54-1.50)
Clashscore	141614	4249 (1.54-1.50)
Ramachandran outliers	138981	4148 (1.54-1.50)
Sidechain outliers	138945	4146 (1.54-1.50)
RSRZ outliers	127900	3943 (1.54-1.50)

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 >=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		
			5%		
1	A	302	92%	5% •	



2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 2632 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 1,2-dihydroxynaphthalene dioxygenase.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace		
1	Λ	293	Total	С	N	О	S	16	2	0
1	Α	290	2332	1487	401	429	15	10	3	

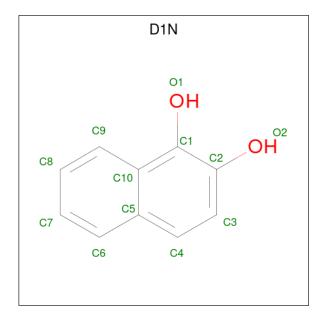
• Molecule 2 is FE (II) ION (three-letter code: FE2) (formula: Fe).

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

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

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

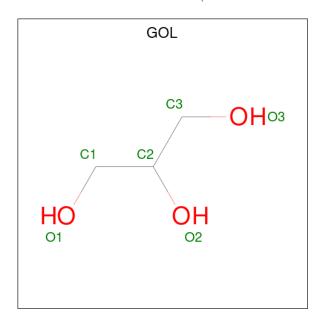
• Molecule 4 is NAPHTHALENE-1,2-DIOL (three-letter code: D1N) (formula: C₁₀H₈O₂).





Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total 12	C 10	O 2	0	0

 \bullet Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $\mathrm{C_3H_8O_3}).$



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	Δ	1	Total	С	О	0	0
	11	1	6	3	3	U	

• Molecule 6 is water.

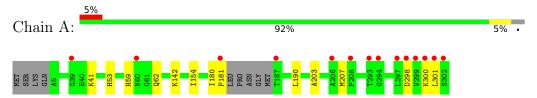
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	280	Total O 280 280	0	0



3 Residue-property plots (i)

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: 1,2-dihydroxynaphthalene dioxygenase





4 Data and refinement statistics (i)

Property	Value	Source	
Space group	I 4 2 2	Depositor	
Cell constants	117.85Å 117.85Å 120.97Å	Depositor	
a, b, c, α , β , γ	90.00° 90.00° 90.00°	Depositor	
Resolution (Å)	50.00 - 1.52	Depositor	
Resolution (A)	48.95 - 1.52	EDS	
% Data completeness	98.9 (50.00-1.52)	Depositor	
(in resolution range)	98.9 (48.95-1.52)	EDS	
R_{merge}	(Not available)	Depositor	
R_{sym}	0.06	Depositor	
$< I/\sigma(I) > 1$	1.62 (at 1.52Å)	Xtriage	
Refinement program	REFMAC 5.2.0019	Depositor	
R, R_{free}	0.171 , 0.180	Depositor	
it, it free	0.171 , 0.180	DCC	
R_{free} test set	3252 reflections $(5.07%)$	wwPDB-VP	
Wilson B-factor (\mathring{A}^2)	19.4	Xtriage	
Anisotropy	0.029	Xtriage	
Bulk solvent $k_{sol}(e/Å^3)$, $B_{sol}(Å^2)$	0.37 , 48.7	EDS	
L-test for twinning ²	$< L > = 0.52, < L^2> = 0.36$	Xtriage	
Estimated twinning fraction	0.000 for -l,-k,-h	Vtriego	
Estimated twinning fraction	0.004 for -h,l,k	Xtriage	
F_o, F_c correlation	0.97	EDS	
Total number of atoms	2632	wwPDB-VP	
Average B, all atoms (Å ²)	18.0	wwPDB-VP	

Xtriage's analysis on translational NCS is as follows: The largest off-origin peak in the Patterson function is 4.13% of the height of the origin peak. No significant pseudotranslation is detected.

²Theoretical 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.



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: GOL, MG, FE2, D1N

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	Bo	nd lengths	Bo	ond angles
IVIOI	Chain	RMSZ	# Z > 5	RMSZ	# Z > 5
1	A	0.52	1/2410 (0.0%)	0.67	1/3258 (0.0%)

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 maintain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (1) bond length outliers are listed below:

Mol			V -			Observed(A)	Ideal(A)
1	A	41	LYS	CB-CG	9.19	1.77	1.52

All (1) bond angle outliers are listed below:

\mathbf{Mol}	Chain	Res	Type	Atoms	\mathbf{Z}	$\mathbf{Observed}(^{o})$	$\operatorname{Ideal}(^{o})$
1	A	41	LYS	CA-CB-CG	-7.20	97.56	113.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	59	HIS	Peptide



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	2332	0	2235	8	0
2	A	1	0	0	0	0
3	A	1	0	0	0	0
4	A	12	0	6	0	0
5	A	6	0	8	1	0
6	A	280	0	0	2	0
All	All	2632	0	2249	8	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 (8) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	$\begin{array}{c} {\rm Interatomic} \\ {\rm distance} \ ({\rm \AA}) \end{array}$	$egin{aligned} ext{Clash} \ ext{overlap } (ext{Å}) \end{aligned}$
1:A:298:ASP:OD2	6:A:1769:HOH:O	1.77	1.00
1:A:190:LEU:HD21	1:A:207:MET:HE2	1.74	0.69
1:A:190:LEU:HD21	1:A:207:MET:CE	2.31	0.59
1:A:53:HIS:CE1	5:A:901:GOL:H31	2.54	0.43
1:A:142:LYS:HE3	6:A:1836:HOH:O	2.19	0.43
1:A:207:MET:SD	1:A:207:MET:N	2.90	0.42
1:A:154:ILE:HG12	1:A:203:ALA:HB3	2.03	0.41
1:A:180:ILE:HA	1:A:181:PRO:HD3	1.95	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	Favoured Allowed		Percentiles	
1	A	$292/302 \ (97\%)$	283 (97%)	9 (3%)	0	100 100	

There are no Ramachandran outliers to report.

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	rsed Rotameric		Percentiles	
1	A	240/245 (98%)	237 (99%)	3 (1%)	69 43	

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	62	GLN
1	A	300	LYS
1	A	301	LEU

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 monosaccharides in this entry.



5.6 Ligand geometry (i)

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	Dag	Timle	Во	ond leng	ths	В	ond ang	les
MIOI	Туре	Chain	Res	Link	Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	D1N	A	1637	2	11,13,13	2.14	3 (27%)	11,18,18	1.07	0
5	GOL	A	901	-	5,5,5	0.51	0	5,5,5	0.40	0

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
4	D1N	A	1637	2	-	-	0/2/2/2
5	GOL	A	901	-	-	0/4/4/4	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	\mathbf{Z}	$\operatorname{Observed}(\operatorname{\AA})$	$\operatorname{Ideal}(\text{\AA})$
4	A	1637	D1N	C3-C2	4.72	1.41	1.36
4	A	1637	D1N	O2-C2	3.54	1.43	1.34
4	A	1637	D1N	O1-C1	2.71	1.42	1.33

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

\mathbf{Mol}	Chain	Res	Type	Clashes	Symm-Clashes
5	A	901	GOL	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 (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>	$\#\mathrm{RSRZ}{>}2$		$OWAB(Å^2)$	Q < 0.9
1	A	293/302 (97%)	-0.13	14 (4%) 30	33	12, 16, 23, 26	30 (10%)

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	299	VAL	14.3
1	A	300	LYS	7.2
1	A	298	ASP	6.5
1	A	294	GLY	6.2
1	A	187	THR	6.0
1	A	208	PRO	5.6
1	A	297	LEU	4.6
1	A	301	LEU	4.3
1	A	302	SER	4.0
1	A	181	PRO	3.8
1	A	293	THR	3.2
1	A	60	ASN	2.7
1	A	206	ALA	2.3
1	A	39	GLY	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^{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	${f B-factors}({f \AA}^2)$	Q < 0.9
4	D1N	A	1637	12/12	0.96	0.06	16,17,17,17	0
5	GOL	A	901	6/6	0.96	0.11	17,20,22,22	0
3	MG	A	398	1/1	0.98	0.05	15,15,15,15	0
2	FE2	A	399	1/1	0.99	0.04	14,14,14,14	0

6.5 Other polymers (i)

There are no such residues in this entry.

