



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 27, 2024 – 08:36 PM EST

PDB ID : 1DHP  
Title : DIHYDRODIPICOLINATE SYNTHASE  
Authors : Mirwaldt, C.; Korndorfer, I.; Huber, R.  
Deposited on : 1995-02-09  
Resolution : 2.30 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  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
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) : 2.36

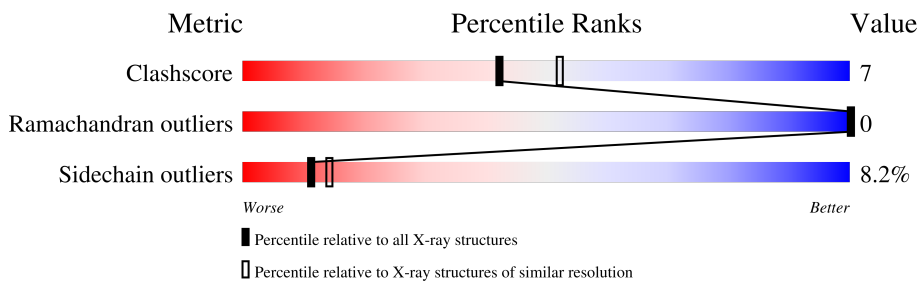
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)

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  $\leq 5\%$ .

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	292	
1	B	292	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4726 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 DIHYDRODIPICOLINATE SYNTHASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	292	2190	1373	384	419	14	0	0	0
1	B	292	2190	1373	384	419	14	0	0	0

- Molecule 2 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total 1	K 1	0	0
2	B	1	Total 1	K 1	0	0

- Molecule 3 is water.

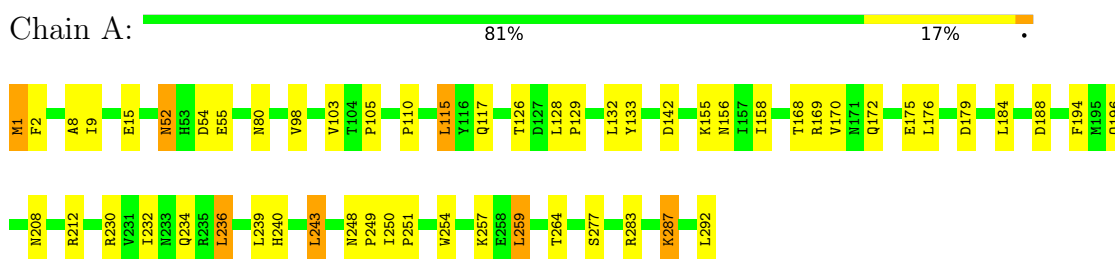
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	153	Total 153	O 153	0	0
3	B	191	Total 191	O 191	0	0

### 3 Residue-property plots

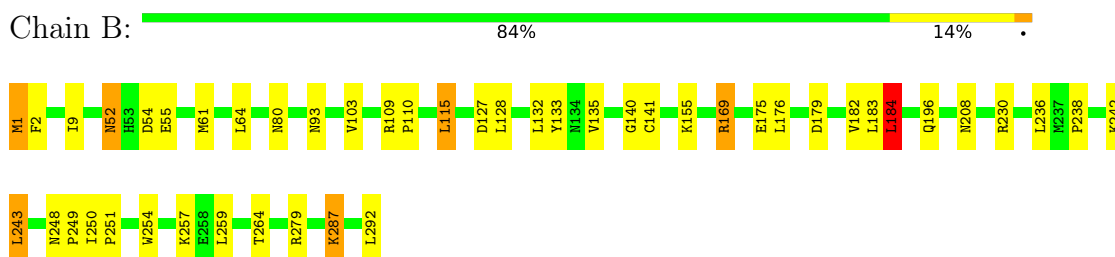
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: DIHYDRODIPICOLINATE SYNTHASE



- Molecule 1: DIHYDRODIPICOLINATE SYNTHASE



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	122.41Å 122.41Å 111.22Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	8.00 – 2.30	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-2.30)	Depositor
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, $R_{free}$	0.197 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	4726	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

## 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: K

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	0.50	0/2225	0.76	1/3022 (0.0%)
1	B	0.51	0/2225	0.80	1/3022 (0.0%)
All	All	0.51	0/4450	0.78	2/6044 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	184	LEU	CA-CB-CG	5.36	127.63	115.30
1	A	8	ALA	N-CA-C	-5.03	97.43	111.00

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	2190	0	2225	33	0
1	B	2190	0	2225	28	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	153	0	0	0	0
3	B	191	0	0	2	0
All	All	4726	0	4450	61	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 7.

All (61) 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:1:MET:SD	1:A:2:PHE:N	2.50	0.84
1:B:196:GLN:NE2	1:B:230:ARG:HH21	1.78	0.81
1:A:196:GLN:NE2	1:A:230:ARG:HH21	1.79	0.80
1:B:110:PRO:HG2	1:B:115:LEU:HD13	1.72	0.70
1:B:1:MET:SD	1:B:2:PHE:N	2.65	0.69
1:A:196:GLN:HE22	1:A:230:ARG:HH21	1.47	0.62
1:B:287:LYS:HZ2	1:B:292:LEU:HB2	1.64	0.62
1:A:110:PRO:HG2	1:A:115:LEU:HD13	1.82	0.61
1:A:172:GLN:O	1:A:176:LEU:HD13	2.01	0.61
1:B:254:TRP:NE1	1:B:257:LYS:NZ	2.48	0.61
1:A:168:THR:O	1:A:172:GLN:HG3	2.02	0.60
1:B:196:GLN:HE22	1:B:230:ARG:HH21	1.52	0.58
1:A:15:GLU:H	1:A:15:GLU:CD	2.08	0.57
1:A:52:ASN:ND2	1:A:55:GLU:H	2.03	0.57
1:B:254:TRP:HE1	1:B:257:LYS:HZ3	1.49	0.56
1:A:129:PRO:HB3	1:A:158:ILE:HG12	1.85	0.56
1:B:103:VAL:HA	1:B:133:TYR:HB3	1.87	0.56
1:B:250:ILE:HB	1:B:251:PRO:HD3	1.88	0.56
1:A:9:ILE:HA	1:A:208:ASN:HD21	1.71	0.55
1:B:238:PRO:O	1:B:242:LYS:HG2	2.07	0.55
1:A:254:TRP:HE1	1:A:257:LYS:HZ3	1.50	0.54
1:A:52:ASN:HD22	1:A:52:ASN:C	2.11	0.54
1:B:175:GLU:HG3	3:B:459:HOH:O	2.09	0.53
1:A:248:ASN:ND2	1:A:249:PRO:HA	2.24	0.51
1:A:98:VAL:O	1:A:129:PRO:HD2	2.11	0.51
1:A:250:ILE:HB	1:A:251:PRO:HD3	1.92	0.51
1:B:254:TRP:HE1	1:B:257:LYS:NZ	2.07	0.50
1:B:248:ASN:ND2	1:B:249:PRO:HA	2.27	0.50
1:A:230:ARG:O	1:A:234:GLN:HG3	2.12	0.49
1:B:287:LYS:HZ2	1:B:292:LEU:CB	2.26	0.48
1:A:287:LYS:HD2	1:A:292:LEU:HB3	1.95	0.47
1:A:254:TRP:NE1	1:A:257:LYS:NZ	2.54	0.46
1:A:1:MET:SD	1:A:2:PHE:CD2	3.09	0.46
1:B:52:ASN:ND2	1:B:55:GLU:H	2.14	0.46
1:B:287:LYS:HZ1	1:B:292:LEU:HB3	1.81	0.46
1:B:287:LYS:NZ	1:B:292:LEU:HB3	2.30	0.46
1:B:287:LYS:NZ	1:B:292:LEU:CB	2.79	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:169:ARG:HD2	3:B:449:HOH:O	2.17	0.45
1:B:155:LYS:HB3	1:B:155:LYS:HE2	1.71	0.44
1:B:254:TRP:CE2	1:B:279:ARG:HG2	2.53	0.43
1:A:239:LEU:O	1:A:243:LEU:HB2	2.18	0.43
1:B:93:ASN:HA	1:B:128:LEU:HD21	2.00	0.43
1:A:257:LYS:HE2	1:A:257:LYS:HB3	1.89	0.43
1:A:142:ASP:OD1	1:A:169:ARG:NH2	2.52	0.42
1:A:52:ASN:HD21	1:A:54:ASP:HB2	1.84	0.42
1:B:9:ILE:HA	1:B:208:ASN:HD21	1.84	0.42
1:A:232:ILE:HG22	1:A:236:LEU:HD22	2.01	0.42
1:B:135:VAL:O	1:B:135:VAL:HG13	2.20	0.42
1:A:283:ARG:HG3	1:A:292:LEU:CD1	2.50	0.42
1:B:243:LEU:HD12	1:B:243:LEU:HA	1.79	0.42
1:A:196:GLN:HE21	1:A:196:GLN:HB2	1.66	0.42
1:A:52:ASN:HD22	1:A:54:ASP:N	2.18	0.41
1:A:188:ASP:HB3	1:A:240:HIS:ND1	2.35	0.41
1:A:170:VAL:HG22	1:A:194:PHE:CE2	2.55	0.41
1:B:254:TRP:CZ2	1:B:279:ARG:HG2	2.55	0.41
1:A:126:THR:HG23	1:A:156:ASN:HD21	1.86	0.41
1:B:182:VAL:HG12	1:B:184:LEU:HD22	2.02	0.41
1:A:259:LEU:HD12	1:A:259:LEU:HA	1.90	0.41
1:B:109:ARG:NH1	1:B:140:GLY:O	2.54	0.41
1:A:103:VAL:HA	1:A:133:TYR:HB3	2.04	0.40
1:A:239:LEU:HD12	1:A:239:LEU:HA	1.89	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	290/292 (99%)	282 (97%)	8 (3%)	0	<a href="#">100</a> <a href="#">100</a>

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	290/292 (99%)	283 (98%)	7 (2%)	0	100	100
All	All	580/584 (99%)	565 (97%)	15 (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	Rotameric	Outliers	Percentiles	
1	A	238/238 (100%)	219 (92%)	19 (8%)	12	15
1	B	238/238 (100%)	218 (92%)	20 (8%)	11	13
All	All	476/476 (100%)	437 (92%)	39 (8%)	11	14

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	52	ASN
1	A	80	ASN
1	A	105	PRO
1	A	115	LEU
1	A	117	GLN
1	A	128	LEU
1	A	132	LEU
1	A	155	LYS
1	A	175	GLU
1	A	179	ASP
1	A	184	LEU
1	A	212	ARG
1	A	236	LEU
1	A	243	LEU
1	A	259	LEU
1	A	264	THR
1	A	277	SER

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Mol	Chain	Res	Type
1	A	287	LYS
1	B	1	MET
1	B	52	ASN
1	B	54	ASP
1	B	61	MET
1	B	64	LEU
1	B	80	ASN
1	B	115	LEU
1	B	127	ASP
1	B	132	LEU
1	B	141	CYS
1	B	169	ARG
1	B	176	LEU
1	B	179	ASP
1	B	183	LEU
1	B	184	LEU
1	B	236	LEU
1	B	243	LEU
1	B	259	LEU
1	B	264	THR
1	B	287	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	18	ASN
1	A	52	ASN
1	A	53	HIS
1	A	80	ASN
1	A	90	GLN
1	A	172	GLN
1	A	196	GLN
1	A	208	ASN
1	A	225	HIS
1	A	233	ASN
1	B	52	ASN
1	B	80	ASN
1	B	90	GLN
1	B	172	GLN
1	B	196	GLN
1	B	208	ASN
1	B	233	ASN

### 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 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

### 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](#)

EDS was not executed - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

### 6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.