



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 22, 2020 – 08:32 pm BST

PDB ID : 1JR2  
Title : Structure of Uroporphyrinogen III Synthase  
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Deposited on : 2001-08-10  
Resolution : 1.84 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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.

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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
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	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)	:	2.11

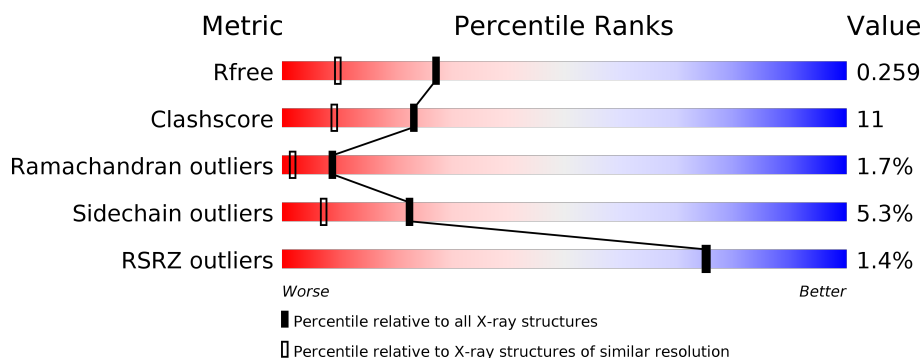
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.84 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))
$R_{free}$	130704	4003 (1.86-1.82)
Clashscore	141614	4233 (1.86-1.82)
Ramachandran outliers	138981	4185 (1.86-1.82)
Sidechain outliers	138945	4186 (1.86-1.82)
RSRZ outliers	127900	3957 (1.86-1.82)

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 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	286	<div> <div></div> <div> <div></div> <div>67%</div> <div>21%</div> <div>9%</div> </div> </div>
1	B	286	<div> <div></div> <div> <div></div> <div>74%</div> <div>15%</div> <div>9%</div> </div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4537 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 UROPORPHYRINOGEN-III SYNTHASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	260	Total	C	N	O	S	44	6	0
			1989	1263	329	389	8			
1	B	260	Total	C	N	O	S	36	2	0
			1979	1256	327	388	8			

There are 42 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-20	MET	-	EXPRESSION TAG	UNP P10746
A	-19	GLY	-	EXPRESSION TAG	UNP P10746
A	-18	HIS	-	EXPRESSION TAG	UNP P10746
A	-17	HIS	-	EXPRESSION TAG	UNP P10746
A	-16	HIS	-	EXPRESSION TAG	UNP P10746
A	-15	HIS	-	EXPRESSION TAG	UNP P10746
A	-14	HIS	-	EXPRESSION TAG	UNP P10746
A	-13	HIS	-	EXPRESSION TAG	UNP P10746
A	-12	HIS	-	EXPRESSION TAG	UNP P10746
A	-11	HIS	-	EXPRESSION TAG	UNP P10746
A	-10	HIS	-	EXPRESSION TAG	UNP P10746
A	-9	HIS	-	EXPRESSION TAG	UNP P10746
A	-8	SER	-	EXPRESSION TAG	UNP P10746
A	-7	SER	-	EXPRESSION TAG	UNP P10746
A	-6	GLY	-	EXPRESSION TAG	UNP P10746
A	-5	HIS	-	EXPRESSION TAG	UNP P10746
A	-4	ILE	-	EXPRESSION TAG	UNP P10746
A	-3	GLU	-	EXPRESSION TAG	UNP P10746
A	-2	GLY	-	EXPRESSION TAG	UNP P10746
A	-1	ARG	-	EXPRESSION TAG	UNP P10746
A	0	HIS	-	EXPRESSION TAG	UNP P10746
B	-20	MET	-	EXPRESSION TAG	UNP P10746
B	-19	GLY	-	EXPRESSION TAG	UNP P10746
B	-18	HIS	-	EXPRESSION TAG	UNP P10746
B	-17	HIS	-	EXPRESSION TAG	UNP P10746

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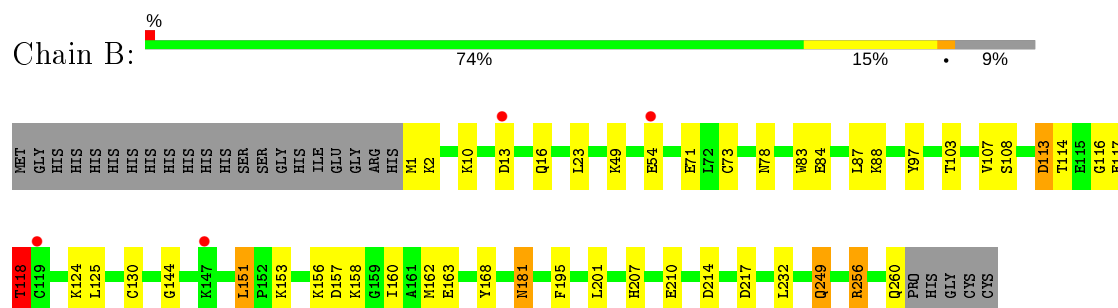
Chain	Residue	Modelled	Actual	Comment	Reference
B	-16	HIS	-	EXPRESSION TAG	UNP P10746
B	-15	HIS	-	EXPRESSION TAG	UNP P10746
B	-14	HIS	-	EXPRESSION TAG	UNP P10746
B	-13	HIS	-	EXPRESSION TAG	UNP P10746
B	-12	HIS	-	EXPRESSION TAG	UNP P10746
B	-11	HIS	-	EXPRESSION TAG	UNP P10746
B	-10	HIS	-	EXPRESSION TAG	UNP P10746
B	-9	HIS	-	EXPRESSION TAG	UNP P10746
B	-8	SER	-	EXPRESSION TAG	UNP P10746
B	-7	SER	-	EXPRESSION TAG	UNP P10746
B	-6	GLY	-	EXPRESSION TAG	UNP P10746
B	-5	HIS	-	EXPRESSION TAG	UNP P10746
B	-4	ILE	-	EXPRESSION TAG	UNP P10746
B	-3	GLU	-	EXPRESSION TAG	UNP P10746
B	-2	GLY	-	EXPRESSION TAG	UNP P10746
B	-1	ARG	-	EXPRESSION TAG	UNP P10746
B	0	HIS	-	EXPRESSION TAG	UNP P10746

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	282	Total O 282 282	0	0
2	B	287	Total O 287 287	0	0



● Molecule 1: UROPORPHYRINOGEN-III SYNTHASE



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	39.85Å 59.25Å 61.94Å 80.47° 73.32° 88.33°	Depositor
Resolution (Å)	58.72 – 1.84 58.53 – 1.84	Depositor EDS
% Data completeness (in resolution range)	93.3 (58.72-1.84) 93.3 (58.53-1.84)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.04	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.33 (at 1.84Å)	Xtriage
Refinement program	REFMAC 5.0	Depositor
R, $R_{free}$	0.200 , 0.251 0.206 , 0.259	Depositor DCC
$R_{free}$ test set	2214 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	22.7	Xtriage
Anisotropy	0.107	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 59.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.020 for h,-k,h-l	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	4537	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.31% 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

### 5.1 Standard geometry

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	0.74	2/2064 (0.1%)	1.11	11/2798 (0.4%)
1	B	0.65	2/2030 (0.1%)	0.97	12/2753 (0.4%)
All	All	0.70	4/4094 (0.1%)	1.04	23/5551 (0.4%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	3
1	B	0	4
All	All	0	7

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	118	THR	C-N	18.31	1.76	1.34
1	A	112	LEU	C-N	-11.32	1.08	1.34
1	B	113	ASP	C-N	-9.87	1.11	1.34
1	B	118	THR	C-N	8.75	1.54	1.34

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	112	LEU	O-C-N	-19.84	90.96	122.70
1	A	118	THR	CA-C-N	-13.64	87.18	117.20
1	A	113	ASP	O-C-N	-12.92	102.03	122.70
1	A	118	THR	CA-C-O	12.69	146.75	120.10
1	B	118	THR	CA-C-N	-11.37	92.19	117.20

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	112	LEU	Mainchain
1	A	113	ASP	Mainchain,Peptide
1	B	113	ASP	Mainchain,Peptide
1	B	118	THR	Mainchain,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	1989	0	1999	59	0
1	B	1979	0	1989	31	0
2	A	282	0	0	9	2
2	B	287	0	0	12	4
All	All	4537	0	3988	89	4

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 11.

The worst 5 of 89 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:158:LYS:NZ	2:A:446:HOH:O	1.84	1.11
1:A:78:ASN:O	1:A:78:ASN:OD1	1.85	0.94
1:A:45:SER:O	1:A:48:GLU:HG2	1.73	0.88
1:B:256:ARG:HH21	1:B:260:GLN:HE22	1.23	0.83
1:B:153:LYS:HG3	2:B:335:HOH:O	1.77	0.82

All (4) 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	Interatomic distance (Å)	Clash overlap (Å)
2:A:359:HOH:O	2:B:411:HOH:O[1_645]	1.85	0.35
2:B:371:HOH:O	2:B:453:HOH:O[1_556]	2.10	0.10
2:A:440:HOH:O	2:B:411:HOH:O[1_645]	2.18	0.02

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:436:HOH:O	2:B:502:HOH:O[1_655]	2.19	0.01

## 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	264/286 (92%)	256 (97%)	4 (2%)	4 (2%)	10	2
1	B	260/286 (91%)	254 (98%)	1 (0%)	5 (2%)	8	1
All	All	524/572 (92%)	510 (97%)	5 (1%)	9 (2%)	9	2

5 of 9 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	114	THR
1	A	118	THR
1	B	114	THR
1	B	117	GLU
1	B	118	THR

### 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	222/238 (93%)	211 (95%)	11 (5%)	24	8
1	B	218/238 (92%)	205 (94%)	13 (6%)	19	5

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	440/476 (92%)	416 (94%)	24 (6%)	22 7

5 of 24 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	241	CYS
1	B	73	CYS
1	B	249	GLN
1	B	10	LYS
1	B	23	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	169	GLN
1	B	260	GLN
1	B	207	HIS
1	A	249	GLN
1	B	181	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

There are no ligands in this entry.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	2
1	B	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	118:THR	C	119:CYS	N	1.76
1	B	113:ASP	C	114:THR	N	1.11
1	A	112:LEU	C	113:ASP	N	1.08

## 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<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	254/286 (88%)	-0.11	3 (1%) 79 79	15, 30, 61, 70	0
1	B	255/286 (89%)	-0.30	4 (1%) 72 71	14, 27, 46, 61	0
All	All	509/572 (88%)	-0.21	7 (1%) 75 75	14, 29, 55, 70	0

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	84	GLU	3.9
1	A	81	GLU	2.8
1	B	147	LYS	2.6
1	B	13	ASP	2.3
1	A	119	CYS	2.2

### 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 carbohydrates in this entry.

### 6.4 Ligands [i](#)

There are no ligands in this entry.

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

There are no such residues in this entry.