



# Full wwPDB X-ray Structure Validation Report

Feb 27, 2014 – 03:51 PM GMT

PDB ID : 1HSR  
Title : BINDING MODE OF BENZHYDROXAMIC ACID TO ARTHROMYCES  
RAMOSUS PEROXIDASE  
Authors : Fukuyama, K.; Itakura, H.  
Deposited on : 1997-07-01  
Resolution : 1.60 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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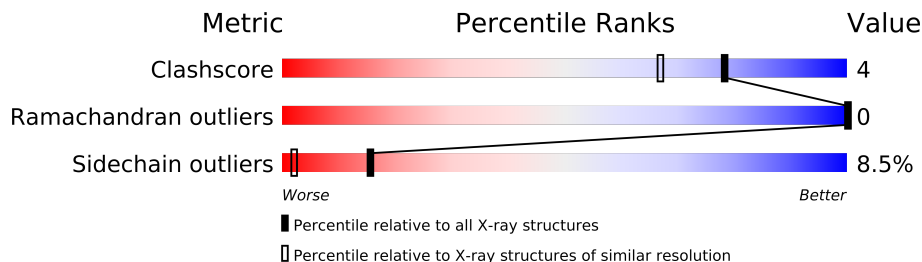
The following versions of software and data (see [references](#)) were used in the production of this report:

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 1.60 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	2199 (1.60-1.60)
Ramachandran outliers	78287	2126 (1.60-1.60)
Sidechain outliers	78261	2125 (1.60-1.60)

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	344	

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 2789 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 protein called PEROXIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	336	Total	C	N	O	S	0	0	0
			2465	1537	421	492	15			

- Molecule 2 is a polymer of unknown type called SUGAR (2-MER).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

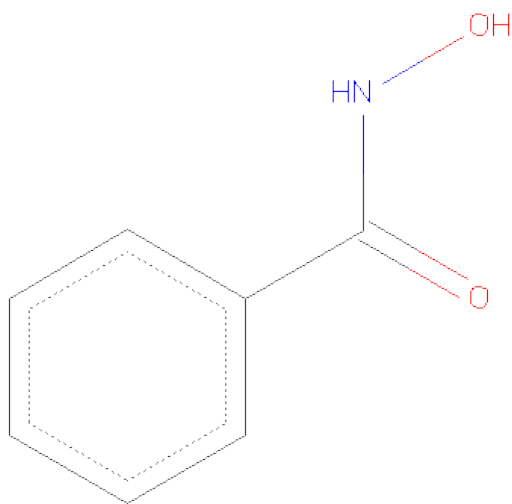
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	2	Total	Ca	0	0
			2	2		

- Molecule 4 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: C<sub>34</sub>H<sub>32</sub>FeN<sub>4</sub>O<sub>4</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 5 is BENZHYDROXAMIC ACID (three-letter code: BHO) (formula:  $C_7H_7NO_2$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			10	7	1	2		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	241	Total 241	O 241	0	0

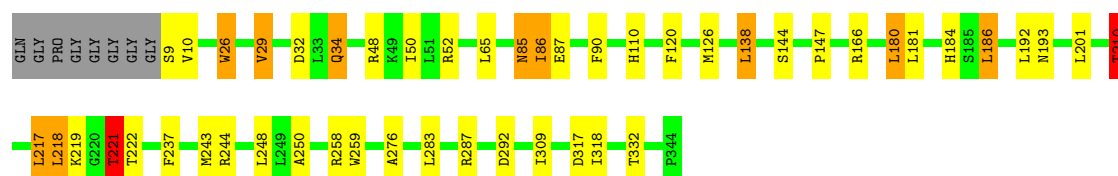
### 3 Residue-property plots

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: PEROXIDASE

Chain A: 



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 42 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.50Å 74.50Å 118.01Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	7.00 – 1.60	Depositor
% Data completeness (in resolution range)	(Not available) (7.00-1.60)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, $R_{free}$	0.187 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2789	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	16.0	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: HEM, CA, NAG, BHO

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	0.72	0/2521	1.29	23/3436 (0.7%)

There are no bond length outliers.

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	244	ARG	NE-CZ-NH2	-8.92	115.84	120.30
1	A	210	THR	N-CA-CB	-8.54	94.08	110.30
1	A	10	VAL	N-CA-C	-7.13	91.75	111.00
1	A	259	TRP	CD1-CG-CD2	6.93	111.84	106.30
1	A	26	TRP	CD1-CG-CD2	6.64	111.61	106.30
1	A	258	ARG	NE-CZ-NH1	6.44	123.52	120.30
1	A	221	THR	N-CA-CB	-6.38	98.18	110.30
1	A	166	ARG	NE-CZ-NH1	6.31	123.45	120.30
1	A	52	ARG	NE-CZ-NH2	-6.25	117.18	120.30
1	A	244	ARG	NE-CZ-NH1	6.20	123.40	120.30
1	A	210	THR	OG1-CB-CG2	6.04	123.89	110.00
1	A	26	TRP	CE2-CD2-CG	-6.02	102.48	107.30
1	A	259	TRP	CE2-CD2-CG	-5.98	102.51	107.30
1	A	287	ARG	NE-CZ-NH2	-5.98	117.31	120.30
1	A	287	ARG	NE-CZ-NH1	5.94	123.27	120.30
1	A	218	LEU	CA-CB-CG	5.68	128.38	115.30
1	A	186	LEU	CA-CB-CG	5.47	127.87	115.30
1	A	166	ARG	NE-CZ-NH2	-5.43	117.59	120.30
1	A	90	PHE	CB-CG-CD2	-5.26	117.12	120.80
1	A	48	ARG	NE-CZ-NH2	-5.25	117.67	120.30
1	A	52	ARG	NE-CZ-NH1	5.24	122.92	120.30
1	A	309	ILE	N-CA-C	-5.22	96.92	111.00
1	A	126	MET	CA-CB-CG	-5.08	104.66	113.30



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	2465	0	2373	18	0
2	A	28	0	25	0	0
3	A	2	0	0	0	0
4	A	43	0	30	0	0
5	A	10	0	7	0	0
6	A	241	0	0	4	0
All	All	2789	0	2435	18	0

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

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:184:HIS:HE1	1:A:243:MET:HE2	1.34	0.90
1:A:243:MET:SD	6:A:843:HOH:O	2.40	0.79
1:A:184:HIS:CE1	1:A:243:MET:HE2	2.18	0.77
1:A:86:ILE:HG12	1:A:147:PRO:HB3	1.81	0.62
1:A:34:GLN:HE21	1:A:34:GLN:HA	1.66	0.60
1:A:32:ASP:OD2	1:A:110:HIS:HE1	1.87	0.58
1:A:217:LEU:HD13	1:A:250:ALA:HB1	1.87	0.57
1:A:210:THR:HG22	6:A:530:HOH:O	2.07	0.55
1:A:138:LEU:HD12	1:A:292:ASP:HA	1.91	0.53
1:A:180:LEU:HD13	1:A:276:ALA:HB1	1.93	0.51
1:A:221:THR:HG22	1:A:222:THR:OG1	2.14	0.48
1:A:26:TRP:HA	1:A:29:VAL:HG13	1.96	0.48
1:A:201:LEU:HD21	6:A:843:HOH:O	2.15	0.46
1:A:86:ILE:HG13	1:A:87:GLU:N	2.32	0.45
1:A:85:ASN:H	1:A:85:ASN:HD22	1.67	0.42
1:A:29:VAL:HG22	1:A:120:PHE:CE2	2.54	0.42
1:A:221:THR:HG21	6:A:538:HOH:O	2.19	0.42

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:219:LYS:HG3	1:A:317:ASP:O	2.21	0.41

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone ⓘ

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	334/344 (97%)	326 (98%)	8 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains ⓘ

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	271/273 (99%)	248 (92%)	23 (8%)	15	2

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	SER
1	A	29	VAL
1	A	34	GLN
1	A	50	ILE
1	A	65	LEU
1	A	85	ASN
1	A	86	ILE
1	A	138	LEU
1	A	144	SER

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Mol	Chain	Res	Type
1	A	180	LEU
1	A	181	LEU
1	A	186	LEU
1	A	192	LEU
1	A	193	ASN
1	A	210	THR
1	A	217	LEU
1	A	218	LEU
1	A	221	THR
1	A	237	PHE
1	A	248	LEU
1	A	283	LEU
1	A	318	ILE
1	A	332	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	34	GLN
1	A	39	GLN
1	A	85	ASN
1	A	110	HIS
1	A	128	ASN
1	A	193	ASN

### 5.3.3 RNA ⓘ

There are no RNA chains 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 ⓘ

2 carbohydrates are 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	$\# Z  > 2$
2	NAG	A	348	1,2	12,14,15	0.44	0	15,19,21	1.39	3 (20%)
2	NAG	A	349	2	12,14,15	0.51	0	15,19,21	1.72	3 (20%)

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	NAG	A	348	1,2	-	0/6/23/26	0/1/1/1
2	NAG	A	349	2	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	349	NAG	O5-C5-C4	-3.90	105.71	110.65
2	A	349	NAG	O5-C5-C6	3.12	110.25	106.98
2	A	348	NAG	C3-C2-N2	-2.64	107.74	111.76
2	A	348	NAG	C6-C5-C4	-2.42	107.14	113.00
2	A	349	NAG	C6-C5-C4	2.24	118.42	113.00
2	A	348	NAG	C3-C4-C5	2.10	113.95	110.20

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 5.6 Ligand geometry ⓘ

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	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
4	HEM	A	345	1,6	49,50,50	2.23	12 (24%)	46,82,82	1.18	5 (10%)
5	BHO	A	800	-	10,10,10	1.77	2 (20%)	12,12,12	0.93	1 (8%)

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	HEM	A	345	1,6	-	0/14/114/114	0/0/8/8
5	BHO	A	800	-	-	0/6/6/6	0/1/1/1

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	345	HEM	C2D-C1D	8.63	1.46	1.44
4	A	345	HEM	C2B-C1B	6.23	1.46	1.44
4	A	345	HEM	C3D-C2D	-4.76	1.35	1.43
4	A	345	HEM	C3C-C2C	-4.21	1.36	1.43
5	A	800	BHO	C1-C	-4.19	1.41	1.50
4	A	345	HEM	C3B-C2B	-3.70	1.37	1.43
4	A	345	HEM	C4A-C3A	3.07	1.44	1.40
4	A	345	HEM	CBC-CAC	2.97	1.46	1.28
4	A	345	HEM	C3D-C4D	-2.89	1.43	1.44
4	A	345	HEM	CBB-CAB	2.54	1.43	1.28
4	A	345	HEM	CHB-C1B	2.28	1.39	1.35
4	A	345	HEM	CHA-C4D	2.19	1.39	1.35
5	A	800	BHO	C-N	2.07	1.35	1.32
4	A	345	HEM	CMC-C2C	2.07	1.53	1.47

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	345	HEM	C3B-C4B-NB	-3.43	111.55	114.00
4	A	345	HEM	C3A-C4A-NA	2.57	111.35	109.41
5	A	800	BHO	O2-N-C	-2.48	112.84	119.64
4	A	345	HEM	CMA-C3A-C4A	-2.13	125.34	128.62
4	A	345	HEM	C1A-CHA-C4D	-2.10	124.71	127.47
4	A	345	HEM	C4A-CHB-C1B	-2.00	124.84	127.47

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.