



# Full wwPDB X-ray Structure Validation Report ⓘ

May 13, 2020 – 08:45 pm BST

PDB ID : 1VNC  
Title : CHLOROPEROXIDASE FROM THE FUNGUS CURVULARIA INAEQUALIS  
Authors : Messerschmidt, A.; Wever, R.  
Deposited on : 1995-09-01  
Resolution : 2.10 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.

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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)	:	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)	:	2.11

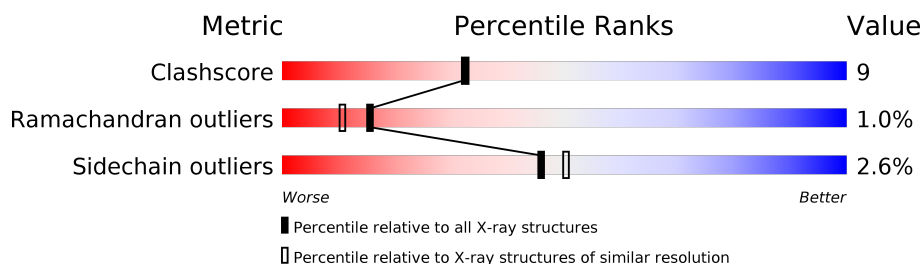
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)

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  $\leq 5\%$ .

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	609	76% 18% • 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	VO4	A	610	-	-	X	-

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 4920 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.

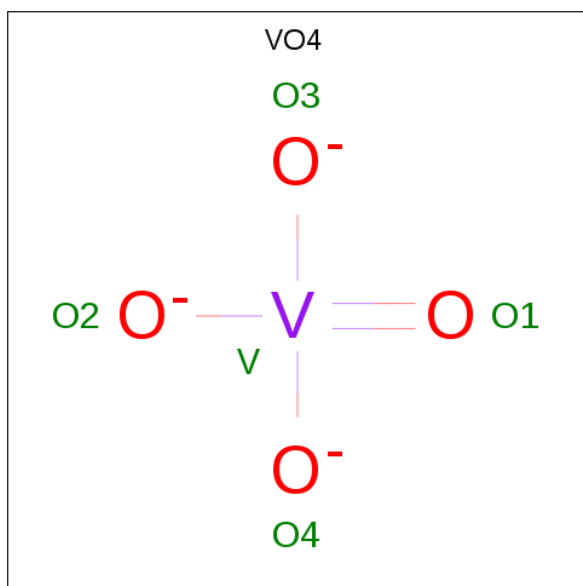
- Molecule 1 is a protein called VANADIUM-CONTAINING CHLOROPEROXIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	576	4484	2854	771	847	12	51	0	0

There is a discrepancy between the modelled and reference sequences:

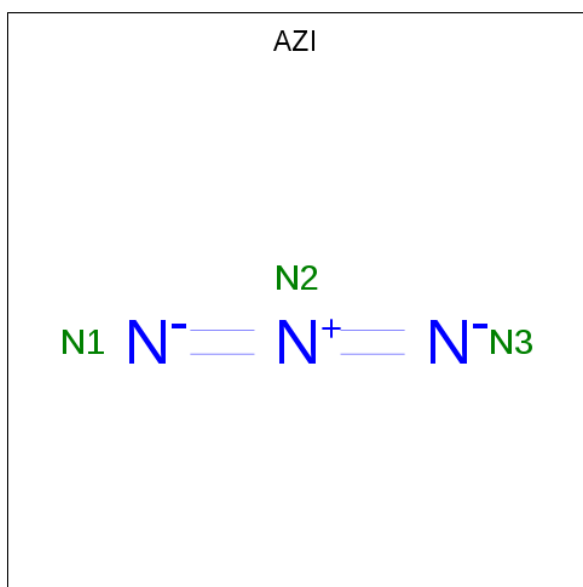
Chain	Residue	Modelled	Actual	Comment	Reference
A	544	GLU	PRO	CONFLICT	UNP P49053

- Molecule 2 is VANADATE ION (three-letter code: VO4) (formula: O<sub>4</sub>V).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	V		
2	A	1	4	3	1	0	0

- Molecule 3 is AZIDE ION (three-letter code: AZI) (formula: N<sub>3</sub>).



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

- Molecule 4 is water.

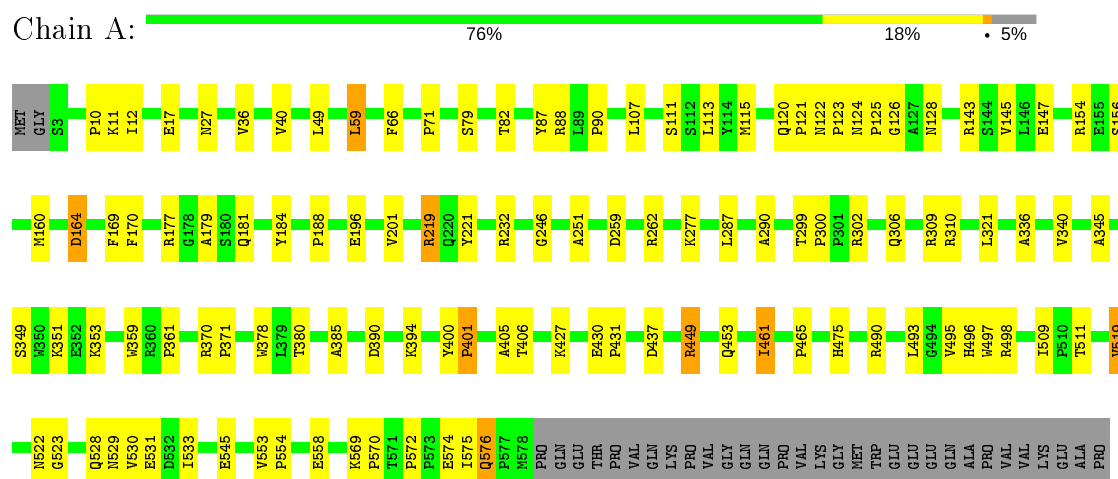
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	429	Total O 429 429	0	0

### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: VANADIUM-CONTAINING CHLOROPEROXIDASE



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	131.69 Å   131.69 Å   112.97 Å 90.00°   90.00°   120.00°	Depositor
Resolution (Å)	8.00 – 2.10	Depositor
% Data completeness (in resolution range)	98.5 (8.00-2.10)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, $R_{free}$	0.200 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4920	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	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: VO4, AZI

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	0.56	0/4617	0.76	5/6313 (0.1%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	449	ARG	NE-CZ-NH2	-6.82	116.89	120.30
1	A	449	ARG	NE-CZ-NH1	6.65	123.62	120.30
1	A	121	PRO	N-CA-CB	5.47	109.86	103.30
1	A	123	PRO	N-CA-CB	5.43	109.82	103.30
1	A	125	PRO	N-CA-CB	5.42	109.81	103.30

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	4484	0	4256	74	0
2	A	4	0	0	2	0
3	A	3	0	0	1	0
4	A	429	0	0	12	0
All	All	4920	0	4256	76	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 9.

All (76) 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:232:ARG:H	1:A:576:GLN:HE22	1.16	0.92
1:A:27:ASN:HD22	1:A:309:ARG:HH11	1.26	0.82
1:A:390:ASP:HB3	4:A:4041:HOH:O	1.83	0.77
1:A:17:GLU:HG2	1:A:321:LEU:HD12	1.67	0.76
1:A:219:ARG:HH11	1:A:219:ARG:HG2	1.51	0.75
1:A:453:GLN:OE1	1:A:465:PRO:HG2	1.88	0.73
1:A:394:LYS:NZ	1:A:495:VAL:HA	2.04	0.72
1:A:351:LYS:HD3	4:A:5009:HOH:O	1.91	0.70
1:A:385:ALA:HB3	4:A:4044:HOH:O	1.93	0.69
1:A:111:SER:O	1:A:115:MET:HB3	1.93	0.68
2:A:610:VO4:V	2:A:610:VO4:O1	1.54	0.63
1:A:394:LYS:HZ2	1:A:495:VAL:HA	1.67	0.59
1:A:576:GLN:HA	1:A:576:GLN:HE21	1.69	0.58
1:A:156:SER:O	1:A:160:MET:HG3	2.05	0.57
1:A:287:LEU:HD23	1:A:493:LEU:HD21	1.86	0.56
1:A:10:PRO:HB3	1:A:461:ILE:HD11	1.87	0.56
1:A:336:ALA:O	1:A:340:VAL:HG23	2.06	0.55
1:A:530:VAL:HA	1:A:533:ILE:HD12	1.88	0.54
1:A:177:ARG:HB2	4:A:4099:HOH:O	2.07	0.53
1:A:90:PRO:HG2	1:A:164:ASP:HB3	1.91	0.53
1:A:349:SER:HB3	1:A:406:THR:HG21	1.91	0.53
1:A:49:LEU:CD1	1:A:179:ALA:HB2	2.39	0.53
1:A:299:THR:HB	1:A:300:PRO:CD	2.39	0.52
1:A:27:ASN:ND2	1:A:309:ARG:HD2	2.23	0.52
1:A:201:VAL:HG13	4:A:4082:HOH:O	2.08	0.52
1:A:219:ARG:HH11	1:A:219:ARG:CG	2.21	0.52
1:A:437:ASP:HA	1:A:475:HIS:HA	1.93	0.50
1:A:511:THR:HB	4:A:2172:HOH:O	2.11	0.49
1:A:59:LEU:HG	1:A:169:PHE:CE1	2.48	0.49
1:A:554:PRO:O	1:A:558:GLU:HG3	2.12	0.49
1:A:531:GLU:CD	1:A:531:GLU:H	2.17	0.49
1:A:82:THR:HG21	1:A:87:TYR:O	2.14	0.48
1:A:519:VAL:CG1	1:A:523:GLY:HA2	2.44	0.48
1:A:519:VAL:HG13	1:A:523:GLY:HA2	1.96	0.48
1:A:107:LEU:HD11	1:A:145:VAL:HG22	1.96	0.48
1:A:143:ARG:O	1:A:147:GLU:HG3	2.14	0.48
1:A:36:VAL:O	1:A:40:VAL:HG22	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:545:GLU:HG2	4:A:2185:HOH:O	2.15	0.47
1:A:66:PHE:HB3	1:A:71:PRO:HD3	1.97	0.47
1:A:188:PRO:HB3	4:A:2081:HOH:O	2.14	0.47
1:A:17:GLU:CG	1:A:321:LEU:HD12	2.41	0.47
1:A:529:ASN:HB3	1:A:531:GLU:OE1	2.16	0.46
1:A:259:ASP:HB3	1:A:498:ARG:HH22	1.81	0.46
1:A:17:GLU:HB2	4:A:2002:HOH:O	2.16	0.45
2:A:610:VO4:O1	3:A:611:AZI:N1	2.51	0.44
1:A:79:SER:O	1:A:82:THR:HG22	2.17	0.44
1:A:277:LYS:HD2	1:A:522:ASN:O	2.18	0.44
1:A:394:LYS:HE3	1:A:394:LYS:HB3	1.80	0.44
1:A:427:LYS:NZ	4:A:5046:HOH:O	2.50	0.44
1:A:394:LYS:HZ1	1:A:495:VAL:HA	1.77	0.44
1:A:113:LEU:HD23	1:A:170:PHE:HE1	1.83	0.44
1:A:553:VAL:HB	1:A:554:PRO:HD3	1.99	0.44
1:A:572:PRO:HG2	1:A:575:ILE:HG12	2.00	0.44
1:A:361:PRO:HA	1:A:497:TRP:CZ2	2.52	0.43
1:A:378:TRP:CH2	1:A:380:THR:HG22	2.52	0.43
1:A:262:ARG:HG2	4:A:4062:HOH:O	2.17	0.43
1:A:509:ILE:HD13	1:A:528:GLN:HG2	2.00	0.43
1:A:17:GLU:HG2	1:A:321:LEU:CD1	2.44	0.43
1:A:287:LEU:HD23	1:A:493:LEU:CD2	2.49	0.43
1:A:370:ARG:HA	1:A:371:PRO:HD3	1.82	0.43
1:A:11:LYS:HE3	1:A:12:ILE:O	2.19	0.43
1:A:184:TYR:HD2	4:A:2079:HOH:O	2.02	0.43
1:A:302:ARG:O	1:A:306:GLN:HG3	2.19	0.42
1:A:490:ARG:HB3	1:A:496:HIS:HD2	1.84	0.42
1:A:145:VAL:HG21	1:A:154:ARG:NH2	2.34	0.42
1:A:232:ARG:H	1:A:576:GLN:NE2	1.98	0.42
1:A:49:LEU:HD11	1:A:179:ALA:HB2	2.02	0.41
1:A:349:SER:O	1:A:353:LYS:HG3	2.20	0.41
1:A:246:GLY:C	1:A:251:ALA:HA	2.41	0.41
1:A:430:GLU:HB3	1:A:431:PRO:HD2	2.02	0.41
1:A:82:THR:CG2	1:A:88:ARG:HA	2.50	0.41
1:A:400:TYR:HA	1:A:401:PRO:HA	1.90	0.41
1:A:405:ALA:HB1	1:A:553:VAL:HG23	2.03	0.41
1:A:569:LYS:HA	1:A:570:PRO:HD3	1.96	0.41
1:A:345:ALA:HB1	1:A:406:THR:HG22	2.01	0.40
1:A:181:GLN:HG3	1:A:221:TYR:HB2	2.02	0.40

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	574/609 (94%)	544 (95%)	24 (4%)	6 (1%)	15	11

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	120	GLN
1	A	124	ASN
1	A	128	ASN
1	A	290	ALA
1	A	122	ASN
1	A	126	GLY

### 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	466/506 (92%)	454 (97%)	12 (3%)	46	50

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	59	LEU
1	A	164	ASP
1	A	196	GLU
1	A	219	ARG
1	A	310	ARG

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Mol	Chain	Res	Type
1	A	359	TRP
1	A	401	PRO
1	A	449	ARG
1	A	461	ILE
1	A	519	VAL
1	A	574	GLU
1	A	576	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	27	ASN
1	A	174	ASN
1	A	220	GLN
1	A	305	ASN
1	A	576	GLN

### 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 ⓘ

2 ligands 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	$\# Z  > 2$
3	AZI	A	611	2	0,2,2	0.00	-	0,1,1	0.00	-
2	VO4	A	610	1,3	0,3,4	0.00	-	-		

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.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	611	AZI	1	0
2	A	610	VO4	2	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 ⓘ

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.