



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 09:12 AM GMT

PDB ID : 3HL1  
Title : CRYSTAL STRUCTURE OF A FERRITIN LIKE PROTEIN (CC\_0557)  
FROM CAULOBACTER VIBRIOIDES AT 1.95 Å RESOLUTION  
Authors : Joint Center for Structural Genomics (JCSG)  
Deposited on : 2009-05-26  
Resolution : 1.95 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  
<http://wwpdb.org/validation/2016/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 : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

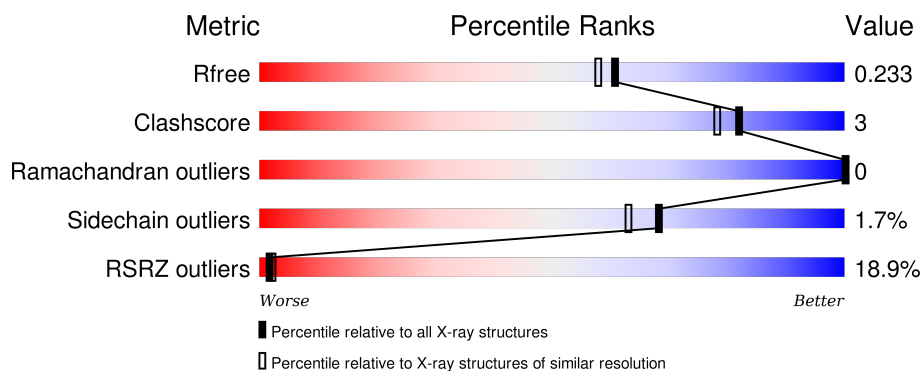
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.95 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))
$R_{free}$	91344	1833 (1.96-1.96)
Clashscore	102246	1953 (1.96-1.96)
Ramachandran outliers	100387	1936 (1.96-1.96)
Sidechain outliers	100360	1936 (1.96-1.96)
RSRZ outliers	91569	1835 (1.96-1.96)

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. 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	317	<div> <div>9%</div> <div>84%</div> <div>7%</div> <div>9%</div> </div>
1	B	317	<div> <div>24%</div> <div>81%</div> <div>8%</div> <div>11%</div> </div>

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	UNL	B	317	-	-	-	X

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4736 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 Ferritin like protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	289	Total	C	N	O	S	Se	0	8	0
			2289	1474	377	428	2	8			
1	B	282	Total	C	N	O	S	Se	0	2	0
			2186	1413	353	409	2	9			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	GLY	-	leader sequence	UNP Q9AAP0
B	0	GLY	-	leader sequence	UNP Q9AAP0

- Molecule 2 is UNKNOWN LIGAND (three-letter code: UNL) (formula: ).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	O	0	0
			1	1		
2	A	1	Total	O	0	0
			5	5		

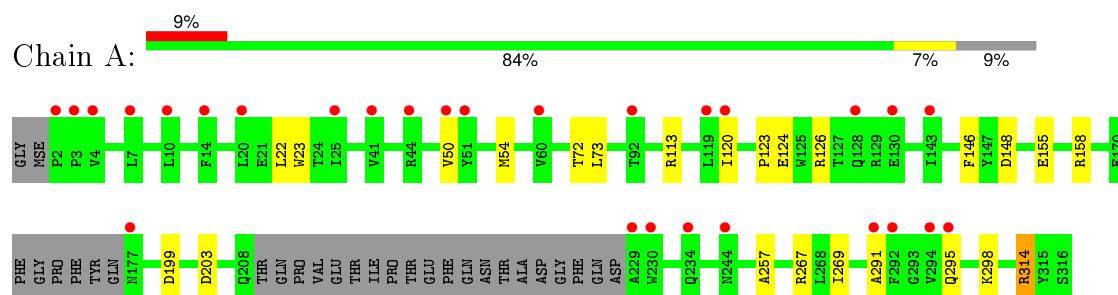
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	207	Total	O	0	1
			208	208		
3	B	47	Total	O	0	0
			47	47		

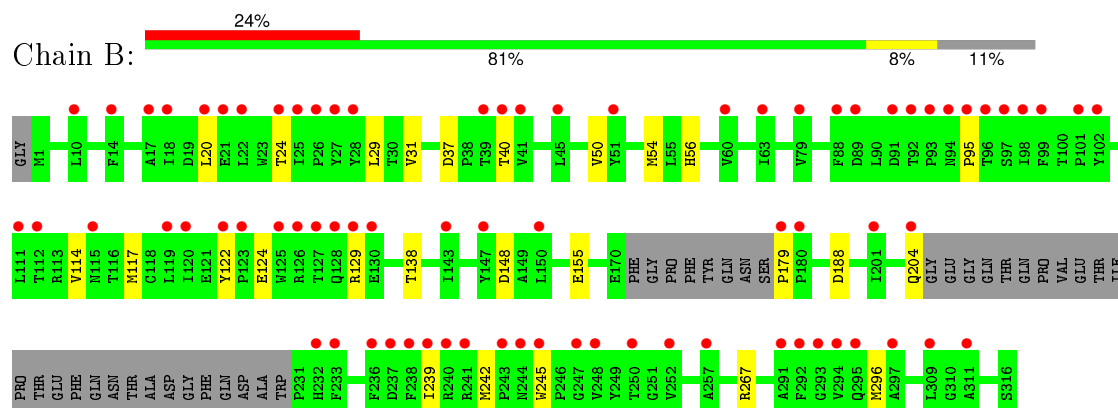
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of 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 ( $\text{RSRZ} > 2$ ). 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: Ferritin like protein



#### • Molecule 1: Ferritin like protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	54.63Å 44.02Å 119.38Å 90.00° 96.17° 90.00°	Depositor
Resolution (Å)	29.42 – 1.95 29.42 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.2 (29.42-1.95) 99.2 (29.42-1.95)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.12 (at 1.95Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.185 , 0.232 0.190 , 0.233	Depositor DCC
$R_{free}$ test set	2079 reflections (5.30%)	DCC
Wilson B-factor (Å <sup>2</sup> )	32.5	Xtriage
Anisotropy	0.258	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 56.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 41296 reflections	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	4736	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 40.76 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 2.6100e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

## 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: UNL

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	0.83	0/2364	0.83	2/3219 (0.1%)
1	B	0.61	0/2250	0.68	0/3067
All	All	0.73	0/4614	0.76	2/6286 (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	A	158	ARG	NE-CZ-NH1	5.24	122.92	120.30
1	A	267	ARG	NE-CZ-NH2	-5.16	117.72	120.30

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	2289	0	2213	12	0
1	B	2186	0	2099	17	0
2	A	5	0	0	1	0
2	B	1	0	0	0	0
3	A	208	0	0	2	0
3	B	47	0	0	0	0
All	All	4736	0	4312	28	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 3.

All (28) 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:B:54[A]:MSE:HE1	1:B:296:MSE:SE	2.10	0.99
1:B:54[A]:MSE:CE	1:B:296:MSE:SE	2.65	0.95
1:A:72:THR:HG23	3:A:408:HOH:O	1.72	0.90
1:B:114:VAL:HA	1:B:117:MSE:HE3	1.64	0.79
2:A:317:UNL:O3	2:A:317:UNL:O4	2.09	0.70
1:A:257[B]:ALA:O	3:A:401:HOH:O	2.11	0.69
1:B:95:PRO:HB3	1:B:122:TYR:CZ	2.37	0.59
1:A:123:PRO:HD2	1:A:126:ARG:HD3	1.85	0.57
1:B:29:LEU:HD21	1:B:50:VAL:HG11	1.88	0.56
1:A:22:LEU:HD22	1:A:73:LEU:HD22	1.88	0.56
1:A:50[A]:VAL:CG1	1:A:54[A]:MSE:HE3	2.38	0.54
1:B:54[A]:MSE:HE2	1:B:296:MSE:SE	2.58	0.54
1:A:199:ASP:OD2	1:B:155:GLU:OE2	2.26	0.53
1:A:203:ASP:OD2	1:B:188:ASP:OD2	2.27	0.51
1:B:20:LEU:O	1:B:24:THR:HG23	2.12	0.50
1:A:269:ILE:HD11	1:A:314[A]:ARG:HE	1.75	0.49
1:B:56:HIS:NE2	1:B:204:GLN:OE1	2.44	0.48
1:B:114:VAL:HG21	1:B:245:TRP:CH2	2.48	0.48
1:A:298:LYS:NZ	1:A:298:LYS:HB3	2.31	0.46
1:B:31:VAL:HG11	1:B:117:MSE:HE1	1.98	0.46
1:A:291:ALA:O	1:A:295:GLN:CB	2.66	0.43
1:B:239:ILE:HG23	1:B:242:MSE:CE	2.48	0.43
1:A:23:TRP:HZ3	1:A:120:ILE:HD11	1.84	0.43
1:B:37:ASP:HB3	1:B:40:THR:HG23	2.00	0.43
1:B:239:ILE:O	1:B:242:MSE:HE2	2.19	0.43
1:B:124:GLU:OE2	1:B:148:ASP:OD2	2.37	0.42
1:B:242:MSE:HE3	1:B:245:TRP:CD1	2.56	0.41
1:A:124:GLU:OE2	1:A:148:ASP:OD2	2.40	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	291/317 (92%)	285 (98%)	6 (2%)	0	100	100
1	B	278/317 (88%)	273 (98%)	5 (2%)	0	100	100
All	All	569/634 (90%)	558 (98%)	11 (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	242/255 (95%)	237 (98%)	5 (2%)	61	53
1	B	229/255 (90%)	225 (98%)	4 (2%)	68	63
All	All	471/510 (92%)	462 (98%)	9 (2%)	68	58

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	113	ARG
1	A	146	PHE
1	A	155	GLU
1	A	314[A]	ARG
1	A	314[B]	ARG
1	B	129	ARG
1	B	138	THR
1	B	179	PRO
1	B	267	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	52	GLN

### 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 carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 2 are unknown - 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

### 6.1 Protein, DNA and RNA chains

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	282/317 (88%)	0.60	28 (9%) <b>9</b> <b>15</b>	25, 34, 56, 77	0
1	B	274/317 (86%)	1.57	77 (28%) <b>1</b> <b>0</b>	29, 41, 54, 74	0
All	All	556/634 (87%)	1.08	105 (18%) <b>2</b> <b>2</b>	25, 38, 56, 77	0

All (105) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	97	SER	11.9
1	B	127	THR	7.6
1	A	294	VAL	7.3
1	B	98	ILE	6.5
1	B	93	PRO	6.1
1	B	101	PRO	6.1
1	B	128	GLN	6.0
1	B	20	LEU	5.9
1	B	257	ALA	5.9
1	B	241	ARG	5.8
1	B	233	PHE	5.6
1	A	230	TRP	5.5
1	B	125	TRP	5.5
1	B	92	THR	5.4
1	B	122	TYR	5.2
1	A	2	PRO	5.1
1	B	247	GLY	5.1
1	B	60	VAL	4.9
1	B	96	THR	4.9
1	A	229	ALA	4.8
1	B	243	PRO	4.7
1	B	295	GLN	4.7
1	B	294	VAL	4.7
1	B	238	PHE	4.6

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Mol	Chain	Res	Type	RSRZ
1	B	130	GLU	4.6
1	B	115	ASN	4.4
1	B	180	PRO	4.4
1	B	240	ARG	4.3
1	B	179	PRO	4.1
1	B	102	TYR	4.1
1	B	79	VAL	4.1
1	B	239	ILE	4.1
1	A	177	ASN	4.1
1	B	244	ASN	4.0
1	B	150	LEU	4.0
1	B	18	ILE	3.9
1	B	204	GLN	3.9
1	B	17	ALA	3.8
1	B	25	ILE	3.8
1	A	41	VAL	3.7
1	B	291	ALA	3.7
1	A	128	GLN	3.7
1	B	129	ARG	3.7
1	B	99	PHE	3.7
1	B	22	LEU	3.6
1	B	245	TRP	3.6
1	B	297	ALA	3.5
1	A	20	LEU	3.5
1	B	126	ARG	3.5
1	A	120	ILE	3.5
1	B	14	PHE	3.5
1	B	292	PHE	3.4
1	A	291	ALA	3.4
1	B	237	ASP	3.4
1	B	112	THR	3.3
1	B	45	LEU	3.2
1	B	147	TYR	3.2
1	B	27	TYR	3.1
1	B	94	ASN	3.1
1	A	295	GLN	3.1
1	B	309	LEU	3.0
1	B	24	THR	3.0
1	B	250	THR	3.0
1	A	14	PHE	2.9
1	B	91	ASP	2.9
1	B	51	TYR	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	244	ASN	2.8
1	B	28	TYR	2.8
1	B	89	ASP	2.8
1	B	88	PHE	2.8
1	A	60	VAL	2.8
1	B	26	PRO	2.8
1	A	4	VAL	2.8
1	B	41	VAL	2.8
1	B	311	ALA	2.7
1	B	119	LEU	2.7
1	B	10	LEU	2.5
1	A	130	GLU	2.5
1	B	39	THR	2.4
1	A	25	ILE	2.4
1	B	95	PRO	2.4
1	A	10	LEU	2.4
1	B	120	ILE	2.4
1	B	248	VAL	2.4
1	B	21	GLU	2.4
1	B	232	HIS	2.3
1	B	40	THR	2.3
1	A	51	TYR	2.3
1	A	7	LEU	2.2
1	A	3	PRO	2.2
1	A	44[A]	ARG	2.2
1	A	292	PHE	2.2
1	A	92	THR	2.2
1	B	236	PHE	2.2
1	B	111	LEU	2.2
1	A	50[A]	VAL	2.2
1	B	252	VAL	2.1
1	B	201	ILE	2.1
1	A	119	LEU	2.1
1	B	123	PRO	2.1
1	A	234	GLN	2.1
1	B	143	ILE	2.0
1	A	143	ILE	2.0
1	B	293	GLY	2.0
1	B	63	ILE	2.0

## 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](#)

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
2	UNL	B	317	1/-	0.90	0.72	9.91	54,54,54,54	0
2	UNL	A	317	5/-	0.88	0.18	0.60	36,43,45,49	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.