



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 7, 2026 – 05:12 AM UTC

PDB ID : 1VDP / pdb_00001vdp
Title : The crystal structure of the monoclinic form of hen egg white lysozyme at 1.7 angstroms resolution in space
Authors : Aibara, S.; Suzuki, A.; Kidera, A.; Shibata, K.; Yamane, T.; DeLucas, L.J.; Hirose, M.
Deposited on : 2004-03-24
Resolution : 1.70 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

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>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

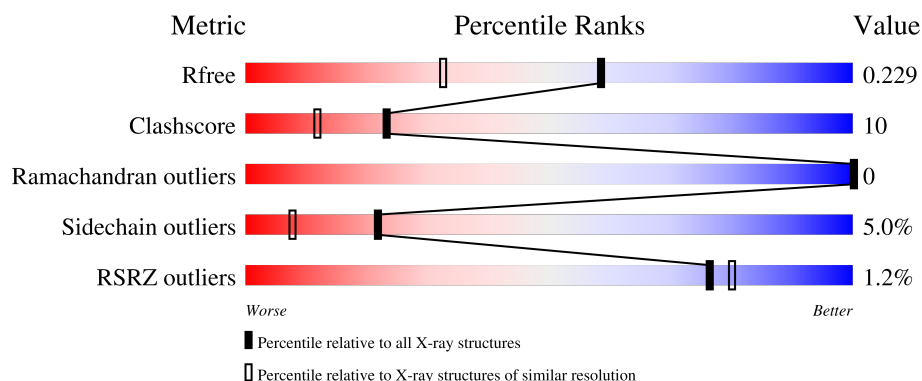
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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}	180053	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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 ≥ 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	129	2% 72% 22% 5%
1	B	129	% 76% 21% .

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2673 atoms, of which 491 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 Lysozyme C.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	129	Total	C	H	N	O	S	0	0	0
			1211	599	241	177	184	10			
1	B	129	Total	C	H	N	O	S	0	0	0
			1232	605	250	183	184	10			

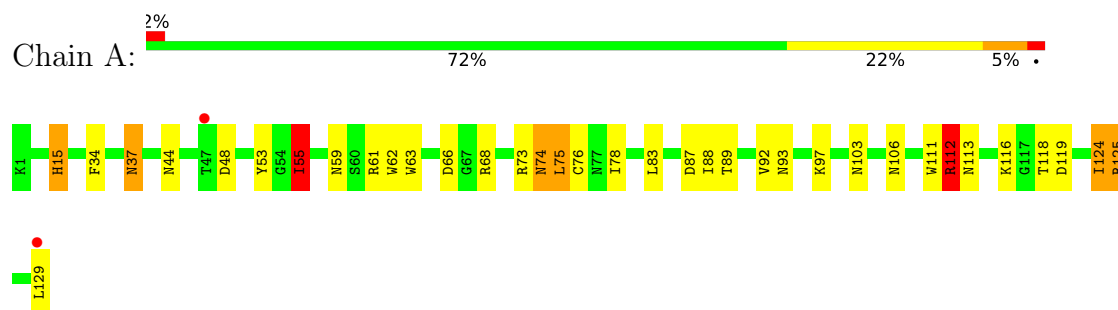
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	108	Total	O	0	0
			108	108		
2	B	122	Total	O	0	0
			122	122		

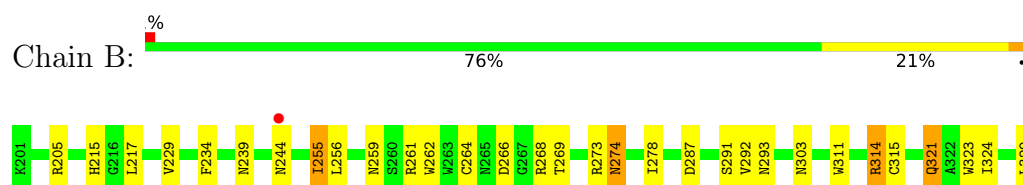
3 Residue-property plots [i](#)

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 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.

• Molecule 1: Lysozyme C



• Molecule 1: Lysozyme C



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	28.05Å 62.88Å 60.65Å 90.00° 90.90° 90.00°	Depositor
Resolution (Å)	9.98 – 1.70 9.98 – 1.70	Depositor EDS
% Data completeness (in resolution range)	79.7 (9.98-1.70) 89.4 (9.98-1.70)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.62 (at 1.70Å)	Xtriage
Refinement program	CNS 1.0, X-PLOR 3.1	Depositor
R, R_{free}	0.175 , 0.221 0.189 , 0.229	Depositor DCC
R_{free} test set	1003 reflections (4.83%)	wwPDB-VP
Wilson B-factor (Å ²)	16.2	Xtriage
Anisotropy	0.413	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 58.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.013 for -h,-l,-k 0.000 for -h,l,k 0.042 for h,-k,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	2673	wwPDB-VP
Average B, all atoms (Å ²)	17.0	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 34.30 % 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 6.9764e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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	1.07	1/990 (0.1%)	1.93	23/1341 (1.7%)
1	B	1.09	2/1002 (0.2%)	1.82	15/1356 (1.1%)
All	All	1.08	3/1992 (0.2%)	1.88	38/2697 (1.4%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	255	ILE	CA-CB	6.66	1.64	1.54
1	A	15	HIS	CD2-NE2	-5.96	1.31	1.37
1	B	229	VAL	CA-CB	5.65	1.61	1.54

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	266	ASP	CA-CB-CG	10.57	123.17	112.60
1	A	112	ARG	CB-CG-CD	8.96	131.90	111.30
1	A	37	ASN	OD1-CG-ND2	-8.89	113.71	122.60
1	A	124	ILE	N-CA-CB	-8.36	101.16	112.28
1	A	74	ASN	OD1-CG-ND2	-8.26	114.34	122.60
1	A	66	ASP	CA-CB-CG	8.01	120.61	112.60
1	A	55	ILE	CB-CA-C	-7.99	99.78	112.16
1	B	239	ASN	OD1-CG-ND2	-7.96	114.64	122.60
1	B	303	ASN	OD1-CG-ND2	-7.47	115.13	122.60
1	A	119	ASP	CA-CB-CG	7.33	119.92	112.60
1	A	48	ASP	CA-CB-CG	7.30	119.90	112.60
1	B	287	ASP	CA-CB-CG	7.23	119.83	112.60
1	A	75	LEU	N-CA-C	7.22	119.15	111.28
1	A	53	TYR	N-CA-C	7.08	120.44	108.90
1	A	89	THR	CA-C-O	-7.00	113.08	120.92
1	A	44	ASN	OD1-CG-ND2	-6.92	115.68	122.60
1	B	324	ILE	N-CA-CB	-6.69	103.63	112.26
1	A	93	ASN	OD1-CG-ND2	-6.55	116.05	122.60
1	B	274	ASN	OD1-CG-ND2	-6.51	116.09	122.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	113	ASN	N-CA-C	6.49	120.40	112.23
1	A	73	ARG	CA-C-N	-6.25	114.58	123.20
1	A	73	ARG	C-N-CA	-6.25	114.58	123.20
1	A	87	ASP	CA-CB-CG	6.18	118.78	112.60
1	B	205	ARG	N-CA-C	6.15	118.49	111.11
1	B	239	ASN	CB-CG-ND2	6.10	125.55	116.40
1	B	323	TRP	CE2-CD2-CG	-6.10	99.88	107.20
1	B	293	ASN	OD1-CG-ND2	-6.08	116.52	122.60
1	B	234	PHE	CA-CB-CG	-5.99	107.81	113.80
1	B	321	GLN	CA-CB-CG	-5.88	102.34	114.10
1	B	259	ASN	N-CA-C	5.71	119.22	110.20
1	A	44	ASN	CB-CG-ND2	5.55	124.73	116.40
1	A	55	ILE	N-CA-CB	5.54	120.13	110.65
1	A	111	TRP	CE2-CD2-CG	-5.49	100.61	107.20
1	A	74	ASN	CB-CG-ND2	5.47	124.61	116.40
1	A	34	PHE	CA-CB-CG	-5.42	108.38	113.80
1	A	111	TRP	CG-CD2-CE3	5.20	139.10	133.90
1	B	256	LEU	N-CA-CB	-5.16	102.67	110.92
1	B	291	SER	CA-C-O	-5.15	115.09	120.55

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-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 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	970	241	905	25	0
1	B	982	250	923	14	0
2	A	108	0	0	12	1
2	B	122	0	0	8	1
All	All	2182	491	1828	39	1

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 10.

All (39) 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:268:ARG:CG	2:B:657:HOH:O	1.69	1.27
1:A:112:ARG:CG	2:A:532:HOH:O	2.20	0.88
1:A:97:LYS:HD2	2:A:591:HOH:O	1.78	0.83
1:B:314:ARG:NH2	2:B:578:HOH:O	2.14	0.80
1:A:112:ARG:HG3	2:A:532:HOH:O	1.80	0.79
1:B:215:HIS:HB3	1:B:292:VAL:HG11	1.72	0.72
1:B:274:ASN:HD21	1:B:278:ILE:H	1.49	0.60
1:A:62:TRP:CD1	2:A:499:HOH:O	2.56	0.58
1:A:112:ARG:HE	1:A:116:LYS:HZ2	1.51	0.58
1:A:15:HIS:HB3	1:A:92:VAL:HG11	1.86	0.57
1:A:118:THR:HG22	2:B:466:HOH:O	2.07	0.55
1:A:59:ASN:ND2	1:A:61:ARG:HB3	2.22	0.55
1:A:112:ARG:CB	2:A:532:HOH:O	2.52	0.55
1:B:255:ILE:CG2	2:B:515:HOH:O	2.55	0.54
1:A:112:ARG:HD2	2:A:503:HOH:O	2.07	0.53
1:B:244:ASN:ND2	2:B:560:HOH:O	2.43	0.52
1:A:59:ASN:HD21	1:A:61:ARG:HB3	1.75	0.52
1:A:125:ARG:NH1	2:A:479:HOH:O	2.42	0.51
1:A:74:ASN:HD21	1:A:78:ILE:H	1.59	0.51
1:A:62:TRP:NE1	2:A:499:HOH:O	2.44	0.51
1:B:321:GLN:CG	2:B:611:HOH:O	2.59	0.49
1:A:125:ARG:CG	1:A:125:ARG:HH11	2.26	0.49
1:A:125:ARG:HH11	1:A:125:ARG:HG2	1.80	0.46
1:A:112:ARG:HH21	1:A:116:LYS:HZ3	1.62	0.46
1:A:55:ILE:H	1:A:55:ILE:HG13	1.63	0.46
1:A:112:ARG:HD2	2:A:532:HOH:O	2.17	0.45
1:B:262:TRP:CZ3	1:B:273:ARG:HG3	2.51	0.45
1:B:215:HIS:CD2	2:B:522:HOH:O	2.69	0.45
1:B:261:ARG:HA	1:B:269:THR:HG21	1.99	0.45
1:A:112:ARG:CD	2:A:532:HOH:O	2.60	0.44
1:A:103:ASN:O	1:A:106:ASN:HB2	2.18	0.44
1:A:78:ILE:CD1	1:A:83:LEU:HD21	2.48	0.43
1:B:311:TRP:CD1	1:B:315:CYS:HB2	2.55	0.42
1:A:88:ILE:HA	2:A:410:HOH:O	2.19	0.41
1:B:264:CYS:HA	1:B:274:ASN:ND2	2.36	0.41
1:A:112:ARG:CD	2:A:503:HOH:O	2.68	0.41
1:B:314:ARG:HD2	2:B:586:HOH:O	2.21	0.41
1:A:63:TRP:O	1:A:76:CYS:HB2	2.21	0.41
1:B:217:LEU:HD12	1:B:217:LEU:HA	1.95	0.40

All (1) 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:579:HOH:O	2:B:484:HOH:O[2_756]	2.15	0.05

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	127/129 (98%)	125 (98%)	2 (2%)	0	100	100
1	B	127/129 (98%)	126 (99%)	1 (1%)	0	100	100
All	All	254/258 (98%)	251 (99%)	3 (1%)	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	99/105 (94%)	91 (92%)	8 (8%)	11	2
1	B	101/105 (96%)	99 (98%)	2 (2%)	48	32
All	All	200/210 (95%)	190 (95%)	10 (5%)	22	8

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	37	ASN
1	A	55	ILE
1	A	68	ARG

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Mol	Chain	Res	Type
1	A	75	LEU
1	A	112	ARG
1	A	124	ILE
1	A	125	ARG
1	A	129	LEU
1	B	314	ARG
1	B	329	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	44	ASN
1	A	59	ASN
1	A	93	ASN
1	A	106	ASN
1	A	113	ASN
1	B	239	ASN
1	B	244	ASN
1	B	246	ASN
1	B	293	ASN
1	B	303	ASN
1	B	306	ASN
1	B	313	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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

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 [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, 95th 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 ²)	Q<0.9
1	A	129/129 (100%)	-0.03	2 (1%) 70 75	8, 14, 26, 43	0
1	B	129/129 (100%)	-0.15	1 (0%) 82 85	7, 13, 26, 36	0
All	All	258/258 (100%)	-0.09	3 (1%) 76 80	7, 14, 27, 43	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	129	LEU	3.0
1	A	47	THR	2.7
1	B	244	ASN	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 oligosaccharides 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.