



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 05:08 AM UTC

PDB ID : 8R4P / pdb_00008r4p
Title : Structure of BabA from Helicobacter pylori strain 17875
Authors : Persson, K.; Boren, T.; Bugaytsova, J.
Deposited on : 2023-11-14
Resolution : 2.00 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

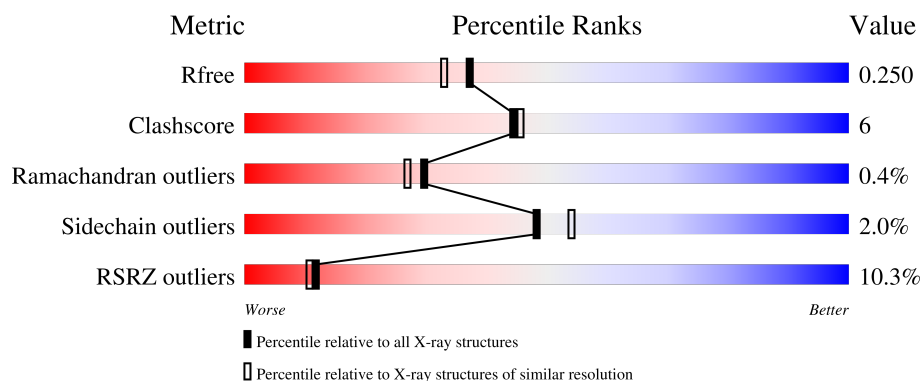
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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	571	9% 70% 12% • 16%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3843 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 Adhesin binding fucosylated histo-blood group antigen.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	477	3618	2232	623	751	12	0	2	0

There are 47 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-21	MET	-	initiating methionine	UNP O52269
A	-20	LYS	-	expression tag	UNP O52269
A	-19	TYR	-	expression tag	UNP O52269
A	-18	LEU	-	expression tag	UNP O52269
A	-17	LEU	-	expression tag	UNP O52269
A	-16	PRO	-	expression tag	UNP O52269
A	-15	THR	-	expression tag	UNP O52269
A	-14	ALA	-	expression tag	UNP O52269
A	-13	ALA	-	expression tag	UNP O52269
A	-12	ALA	-	expression tag	UNP O52269
A	-11	GLY	-	expression tag	UNP O52269
A	-10	LEU	-	expression tag	UNP O52269
A	-9	LEU	-	expression tag	UNP O52269
A	-8	LEU	-	expression tag	UNP O52269
A	-7	LEU	-	expression tag	UNP O52269
A	-6	ALA	-	expression tag	UNP O52269
A	-5	ALA	-	expression tag	UNP O52269
A	-4	GLN	-	expression tag	UNP O52269
A	-3	PRO	-	expression tag	UNP O52269
A	-2	ALA	-	expression tag	UNP O52269
A	-1	MET	-	expression tag	UNP O52269
A	0	ALA	-	expression tag	UNP O52269
A	525	LYS	-	expression tag	UNP O52269
A	526	LYS	-	expression tag	UNP O52269
A	527	LYS	-	expression tag	UNP O52269
A	528	LYS	-	expression tag	UNP O52269
A	529	LYS	-	expression tag	UNP O52269

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Chain	Residue	Modelled	Actual	Comment	Reference
A	530	LYS	-	expression tag	UNP O52269
A	531	GLY	-	expression tag	UNP O52269
A	532	SER	-	expression tag	UNP O52269
A	533	GLU	-	expression tag	UNP O52269
A	534	GLN	-	expression tag	UNP O52269
A	535	LYS	-	expression tag	UNP O52269
A	536	LEU	-	expression tag	UNP O52269
A	537	ILE	-	expression tag	UNP O52269
A	538	SER	-	expression tag	UNP O52269
A	539	GLU	-	expression tag	UNP O52269
A	540	GLU	-	expression tag	UNP O52269
A	541	ASP	-	expression tag	UNP O52269
A	542	LEU	-	expression tag	UNP O52269
A	543	SER	-	expression tag	UNP O52269
A	544	HIS	-	expression tag	UNP O52269
A	545	HIS	-	expression tag	UNP O52269
A	546	HIS	-	expression tag	UNP O52269
A	547	HIS	-	expression tag	UNP O52269
A	548	HIS	-	expression tag	UNP O52269
A	549	HIS	-	expression tag	UNP O52269

- Molecule 2 is CADMIUM ION (CCD ID: CD) (formula: Cd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	10	Total	Cd	0	0
			10	10		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	205	Total	O	0	10
			215	215		

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	55.61Å 96.95Å 97.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	36.64 – 2.00 36.64 – 2.00	Depositor EDS
% Data completeness (in resolution range)	98.5 (36.64-2.00) 91.8 (36.64-2.00)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.39 (at 2.00Å)	Xtriage
Refinement program	PHENIX (1.17.1_3660: ???)	Depositor
R, R_{free}	0.211 , 0.247 0.213 , 0.250	Depositor DCC
R_{free} test set	1783 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	30.8	Xtriage
Anisotropy	0.151	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 45.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.008 for -h,l,k	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3843	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.19% of the height of the origin peak. No significant pseudotranslation is detected.*

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

Bond lengths and bond angles in the following residue types are not validated in this section: CD

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	0.58	5/3671 (0.1%)	0.70	14/4992 (0.3%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	410	PRO	C-O	-6.47	1.19	1.25
1	A	76	ASP	C-N	-6.15	1.26	1.33
1	A	425	TYR	C-O	-5.56	1.16	1.23
1	A	451	GLU	C-O	-5.35	1.18	1.24
1	A	448	GLN	C-O	-5.09	1.18	1.24

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	337	ASN	CB-CA-C	7.72	124.10	110.35
1	A	483	ASN	N-CA-C	-7.08	102.63	110.91
1	A	397	ASN	CB-CA-C	7.07	123.53	110.10
1	A	410	PRO	CB-CA-C	-6.82	104.98	111.39
1	A	197	CYS	N-CA-C	-5.92	105.88	112.57
1	A	337	ASN	CA-C-N	5.56	131.91	122.12
1	A	337	ASN	C-N-CA	5.56	131.91	122.12
1	A	485	GLN	CB-CA-C	5.40	120.70	112.00
1	A	484	ALA	CA-C-N	-5.20	114.22	122.23
1	A	484	ALA	C-N-CA	-5.20	114.22	122.23
1	A	482	PRO	CB-CA-C	-5.10	104.70	111.23
1	A	333	PRO	CA-C-N	-5.06	115.50	122.69
1	A	333	PRO	C-N-CA	-5.06	115.50	122.69
1	A	31	ASP	CB-CA-C	5.03	120.33	110.67

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	3618	0	3519	43	0
2	A	10	0	0	0	0
3	A	215	0	0	1	0
All	All	3843	0	3519	43	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 6.

All (43) 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:239:ASN:OD1	1:A:241:THR:HG22	1.77	0.84
1:A:338:ASN:OD1	1:A:338:ASN:N	2.11	0.76
1:A:239:ASN:OD1	1:A:241:THR:CG2	2.33	0.75
1:A:60:ASN:OD1	1:A:63[B]:ARG:NH1	2.25	0.70
1:A:199:LYS:O	1:A:203:GLY:N	2.25	0.69
1:A:63[B]:ARG:NH2	1:A:332:THR:O	2.28	0.67
1:A:340:LYS:HB3	1:A:341:PRO:HD2	1.77	0.66
1:A:341:PRO:HG3	1:A:500:PRO:HG2	1.80	0.63
1:A:243:VAL:O	1:A:243:VAL:HG12	2.01	0.59
1:A:186:THR:HG22	1:A:249:THR:HG22	1.86	0.58
1:A:29:LEU:HD11	1:A:482:PRO:HG3	1.86	0.58
1:A:278:PRO:HD2	1:A:298:LEU:HB2	1.86	0.58
1:A:82:ALA:HB1	1:A:318:LEU:HD21	1.87	0.55
1:A:234:SER:HB3	1:A:244:SER:H	1.73	0.53
1:A:29:LEU:HD11	1:A:482:PRO:CD	2.40	0.52
1:A:189:CYS:SG	1:A:197:CYS:N	2.83	0.52
1:A:142:PRO:HA	1:A:147:PRO:HG2	1.92	0.51
1:A:277:CYS:SG	1:A:297:LYS:HB2	2.50	0.51
1:A:63[A]:ARG:NH1	1:A:330:GLN:OE1	2.45	0.50
1:A:212:LYS:HD2	1:A:213:THR:N	2.28	0.49
1:A:44:SER:HB2	1:A:509:LEU:HD22	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:29:LEU:CD1	1:A:482:PRO:CD	2.92	0.48
1:A:29:LEU:HD11	1:A:482:PRO:CG	2.46	0.46
1:A:308:ILE:HA	1:A:311:MET:HE3	1.97	0.46
1:A:121:ILE:HG12	1:A:134:THR:HG23	1.97	0.45
1:A:216:GLN:O	1:A:223:VAL:HB	2.16	0.45
1:A:216:GLN:OE1	1:A:225:THR:OG1	2.34	0.44
1:A:53:SER:HB3	1:A:457:LEU:HG	2.00	0.43
1:A:171:LEU:HD12	1:A:172:PRO:HD2	2.01	0.43
1:A:388:VAL:HA	1:A:392:LEU:HB3	2.01	0.43
1:A:515:ASN:O	1:A:519:THR:HG23	2.19	0.43
1:A:155:LYS:NZ	3:A:711:HOH:O	2.52	0.43
1:A:148:MET:HE3	1:A:278:PRO:HG3	2.01	0.42
1:A:335:GLY:HA3	1:A:336:GLY:HA3	1.48	0.42
1:A:298:LEU:HD23	1:A:298:LEU:HA	1.90	0.42
1:A:46:LEU:HD12	1:A:46:LEU:HA	1.86	0.41
1:A:239:ASN:OD1	1:A:241:THR:HG23	2.15	0.41
1:A:150:ILE:HG13	1:A:196:ASN:ND2	2.35	0.41
1:A:49:LEU:HD23	1:A:49:LEU:HA	1.95	0.41
1:A:245:TYR:CD1	1:A:245:TYR:C	2.98	0.41
1:A:329:GLU:OE1	1:A:331:SER:OG	2.28	0.41
1:A:336:GLY:N	1:A:338:ASN:OD1	2.53	0.41
1:A:228:SER:HB2	1:A:249:THR:OG1	2.22	0.40

There are no symmetry-related clashes.

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	473/571 (83%)	454 (96%)	17 (4%)	2 (0%)	30 27

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	205	SER
1	A	204	VAL

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	404/475 (85%)	396 (98%)	8 (2%)	48 54

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	190	SER
1	A	205	SER
1	A	206	ASP
1	A	242	ARG
1	A	243	VAL
1	A	337	ASN
1	A	338	ASN
1	A	397	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	124	ASN
1	A	157	ASN
1	A	161	GLN
1	A	274	ASN
1	A	361	GLN
1	A	369	HIS
1	A	370	GLN
1	A	379	ASN
1	A	439	HIS
1	A	488	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 10 are monoatomic - 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, 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	477/571 (83%)	0.58	49 (10%)	12 11	18, 38, 86, 108	2 (0%)

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	484	ALA	6.5
1	A	337	ASN	6.0
1	A	243	VAL	5.3
1	A	500	PRO	5.3
1	A	336	GLY	5.1
1	A	338	ASN	5.0
1	A	482	PRO	4.0
1	A	26	ILE	3.9
1	A	217	THR	3.9
1	A	498	TYR	3.8
1	A	216	GLN	3.7
1	A	218	ILE	3.6
1	A	215	THR	3.4
1	A	339	GLY	3.4
1	A	397	ASN	3.4
1	A	206	ASP	3.1
1	A	208	ASN	3.1
1	A	236	ALA	2.9
1	A	140	TYR	2.8
1	A	231	VAL	2.8
1	A	232	VAL	2.8
1	A	486	SER	2.8
1	A	207	GLN	2.7
1	A	234	SER	2.6
1	A	340	LYS	2.6
1	A	222	THR	2.6
1	A	205	SER	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	327	GLU	2.6
1	A	483	ASN	2.6
1	A	200	LYS	2.6
1	A	519	THR	2.6
1	A	497	PRO	2.6
1	A	487	LEU	2.5
1	A	111	ASN	2.5
1	A	204	VAL	2.4
1	A	199	LYS	2.4
1	A	485	GLN	2.3
1	A	220	GLY	2.3
1	A	211	THR	2.2
1	A	334	VAL	2.2
1	A	233	ASP	2.2
1	A	238	GLY	2.2
1	A	209	GLY	2.1
1	A	212	LYS	2.1
1	A	333	PRO	2.1
1	A	219	ASP	2.1
1	A	244	SER	2.1
1	A	241	THR	2.0
1	A	502	GLY	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](#)

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. The B-factors column lists the minimum, median, 95th 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	B-factors(Å ²)	Q<0.9
2	CD	A	610	1/1	0.59	0.16	71,71,71,71	1

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	CD	A	607	1/1	0.85	0.12	103,103,103,103	0
2	CD	A	606	1/1	0.88	0.10	77,77,77,77	1
2	CD	A	605	1/1	0.91	0.10	62,62,62,62	1
2	CD	A	604	1/1	0.94	0.08	50,50,50,50	1
2	CD	A	601	1/1	0.95	0.07	70,70,70,70	1
2	CD	A	609	1/1	0.96	0.06	47,47,47,47	1
2	CD	A	608	1/1	0.98	0.04	42,42,42,42	1
2	CD	A	603	1/1	0.99	0.03	35,35,35,35	0
2	CD	A	602	1/1	0.99	0.03	35,35,35,35	0

6.5 Other polymers [i](#)

There are no such residues in this entry.