



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 5, 2023 – 05:03 am GMT

PDB ID : 1US3  
Title : Native xylanase10C from *Cellvibrio japonicus*  
Authors : Pell, G.; Szabo, L.; Charnock, S.J.; Xie, H.; Gloster, T.M.; Davies, G.J.; Gilbert, H.J.  
Deposited on : 2003-11-17  
Resolution : 1.85 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

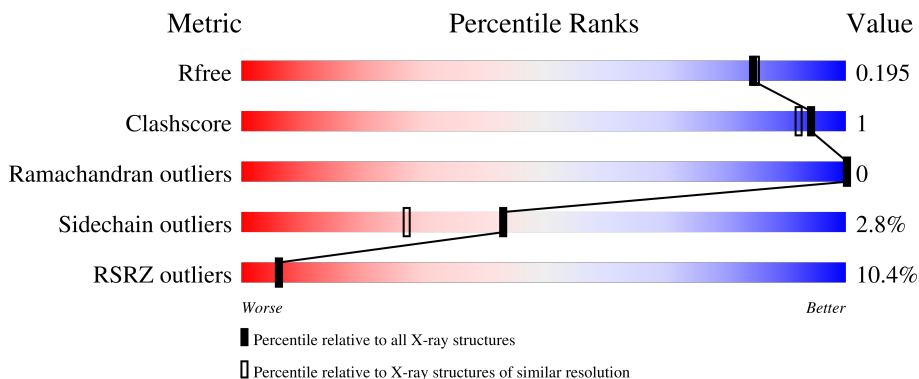
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.85 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))
$R_{free}$	130704	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	530	

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4435 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 ENDO-BETA-1,4-XYLANASE PRECURSOR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	482	3738	2348	632	740	18	48	9	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	85	MET	-	expression tag	UNP Q59675
A	186	ALA	GLY	SEE REMARK 999	UNP Q59675
A	536	ALA	GLY	SEE REMARK 999	UNP Q59675
A	594	ALA	GLY	SEE REMARK 999	UNP Q59675
A	607	GLU	-	expression tag	UNP Q59675
A	608	LEU	-	expression tag	UNP Q59675
A	609	HIS	-	expression tag	UNP Q59675
A	610	HIS	-	expression tag	UNP Q59675
A	611	HIS	-	expression tag	UNP Q59675
A	612	HIS	-	expression tag	UNP Q59675
A	613	HIS	-	expression tag	UNP Q59675
A	614	HIS	-	expression tag	UNP Q59675

- Molecule 2 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			6	3	3		

- Molecule 3 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: TRS) (formula:  $C_4H_{12}NO_3$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			8	4	1	3		

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total 2	Na 2	0	0

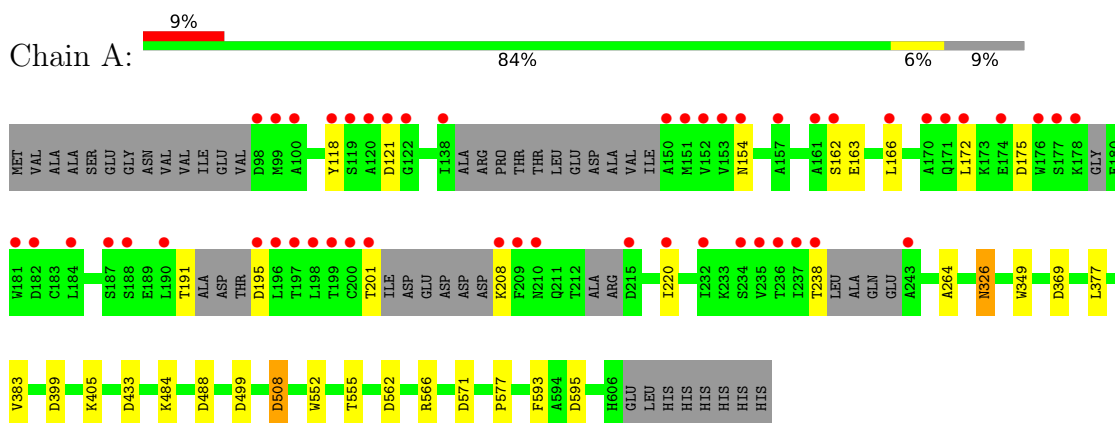
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	681	Total 681	O 681	0	0

### 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: ENDO-BETA-1,4-XYLANASE PRECURSOR



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	44.17Å 78.79Å 172.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.85 19.94 – 1.85	Depositor EDS
% Data completeness (in resolution range)	99.1 (20.00-1.85) 99.1 (19.94-1.85)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.65 (at 1.85Å)	Xtrriage
Refinement program	REFMAC 5.1.24	Depositor
R, $R_{free}$	0.160 , 0.195 0.161 , 0.195	Depositor DCC
$R_{free}$ test set	2636 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	18.4	Xtrriage
Anisotropy	0.129	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 60.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	4435	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	17.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.08% of the height of the origin peak. No significant pseudotranslation is detected.*

<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, 0.333 respectively for untwinned datasets, and 0.375, 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: NA, GOL, TRS

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	0.74	3/3850 (0.1%)	0.83	9/5236 (0.2%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	201	THR	C-O	9.93	1.42	1.23
1	A	383	VAL	CB-CG2	5.51	1.64	1.52
1	A	118	TYR	CG-CD1	5.31	1.46	1.39

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	433	ASP	CB-CG-OD2	6.49	124.14	118.30
1	A	571	ASP	CB-CG-OD2	5.95	123.65	118.30
1	A	399	ASP	CB-CG-OD2	5.60	123.34	118.30
1	A	562	ASP	CB-CG-OD2	5.36	123.12	118.30
1	A	508[A]	ASP	CB-CG-OD2	5.30	123.07	118.30
1	A	508[B]	ASP	CB-CG-OD2	5.30	123.07	118.30
1	A	595	ASP	CB-CG-OD2	5.28	123.05	118.30
1	A	175	ASP	CB-CG-OD2	5.25	123.03	118.30
1	A	121	ASP	CB-CG-OD2	5.18	122.96	118.30

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	3738	0	3554	9	0
2	A	6	0	8	0	0
3	A	8	0	12	0	0
4	A	2	0	0	0	0
5	A	681	0	0	2	0
All	All	4435	0	3574	9	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 1.

All (9) 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:508[B]:ASP:OD2	5:A:2560:HOH:O	1.95	0.81
1:A:369[B]:ASP:OD2	5:A:2367:HOH:O	2.12	0.67
1:A:166:LEU:HB3	1:A:220:ILE:HD11	1.87	0.57
1:A:484[A]:LYS:NZ	1:A:488:ASP:OD2	2.43	0.50
1:A:349:TRP:HB3	1:A:405:LYS:HD2	1.95	0.49
1:A:264:ALA:HB2	1:A:552:TRP:CE3	2.52	0.44
1:A:162:SER:O	1:A:163:GLU:HB2	2.19	0.42
1:A:499:ASP:HB2	1:A:577:PRO:HB2	2.01	0.42

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	477/530 (90%)	459 (96%)	18 (4%)	0	<b>100</b> <b>100</b>

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	405/439 (92%)	393 (97%)	12 (3%)	41 24

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

Mol	Chain	Res	Type
1	A	154	ASN
1	A	172	LEU
1	A	191	THR
1	A	195	ASP
1	A	208	LYS
1	A	238	THR
1	A	326[A]	ASN
1	A	326[B]	ASN
1	A	377	LEU
1	A	555	THR
1	A	566	ARG
1	A	593	PHE

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

Mol	Chain	Res	Type
1	A	154	ASN
1	A	296	ASN
1	A	418	GLN
1	A	523	GLN
1	A	601	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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

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	$\# Z  > 2$
2	GOL	A	1607	-	5,5,5	0.34	0	5,5,5	0.65	0
3	TRS	A	1608	-	7,7,7	0.58	0	9,9,9	0.77	0

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	GOL	A	1607	-	-	4/4/4/4	-
3	TRS	A	1608	-	-	0/9/9/9	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1607	GOL	O1-C1-C2-C3
2	A	1607	GOL	C1-C2-C3-O3

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Mol	Chain	Res	Type	Atoms
2	A	1607	GOL	O2-C2-C3-O3
2	A	1607	GOL	O1-C1-C2-O2

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	482/530 (90%)	0.05	50 (10%) <b>6</b> <b>6</b>	5, 11, 31, 43	13 (2%)

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	237	ILE	7.3
1	A	100	ALA	6.8
1	A	176	TRP	6.7
1	A	181	TRP	6.5
1	A	120	ALA	5.3
1	A	238	THR	5.2
1	A	157	ALA	4.8
1	A	188	SER	4.8
1	A	236	THR	4.2
1	A	182	ASP	4.1
1	A	209	PHE	4.0
1	A	122	GLY	3.9
1	A	152	VAL	3.8
1	A	177	SER	3.7
1	A	232	ILE	3.6
1	A	235	VAL	3.6
1	A	178	LYS	3.6
1	A	174	GLU	3.6
1	A	121	ASP	3.5
1	A	200	CYS	3.5
1	A	184	LEU	3.4
1	A	150	ALA	3.3
1	A	118	TYR	3.2
1	A	198	LEU	3.1
1	A	215	ASP	3.1
1	A	154	ASN	3.0
1	A	197	THR	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	151	MET	2.9
1	A	195	ASP	2.9
1	A	138	ILE	2.9
1	A	172	LEU	2.8
1	A	119	SER	2.7
1	A	161	ALA	2.7
1	A	153	VAL	2.7
1	A	166	LEU	2.7
1	A	243	ALA	2.6
1	A	187	SER	2.6
1	A	196	LEU	2.4
1	A	99	MET	2.3
1	A	201	THR	2.3
1	A	190	LEU	2.2
1	A	170	ALA	2.2
1	A	199	THR	2.1
1	A	208	LYS	2.1
1	A	98	ASP	2.1
1	A	220	ILE	2.1
1	A	162	SER	2.1
1	A	210	ASN	2.1
1	A	234	SER	2.1
1	A	171	GLN	2.1

## 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 monosaccharides 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, 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.

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	GOL	A	1607	6/6	0.87	0.16	32,39,41,47	0
4	NA	A	1610	1/1	0.92	0.13	49,49,49,49	0
4	NA	A	1609	1/1	0.93	0.09	28,28,28,28	0
3	TRS	A	1608	8/8	0.94	0.09	14,15,17,23	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.