



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 3, 2023 – 10:46 am GMT

PDB ID : 2JEQ
Title : Family 5 xyloglucanase from *Paenibacillus pabuli* in complex with ligand
Authors : Gloster, T.M.; Ibatullin, F.M.; Macauley, K.; Eklof, J.M.; Roberts, S.; Turkenburg, J.P.; Bjornvad, M.E.; Jorgensen, P.L.; Danielsen, S.; Johansen, K.; Borchert, T.V.; Wilson, K.S.; Brumer, H.; Davies, G.J.
Deposited on : 2007-01-18
Resolution : 1.94 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 : 4.02b-467
Mogul : **NOT EXECUTED**
Xtriage (Phenix) : 1.13
EDS : 2.36
buster-report : **NOT EXECUTED**
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

PERCENTILES INFOmissingINFO

1 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3241 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 XYLOGLUCANASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	359	2920	1856	496	561	7	0	17	0

- Molecule 2 is an oligosaccharide called beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-[beta-D-galactopyranose-(1-2)-alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-beta-D-glucopyranose.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
2	B	7	74	40	34	0	0	0

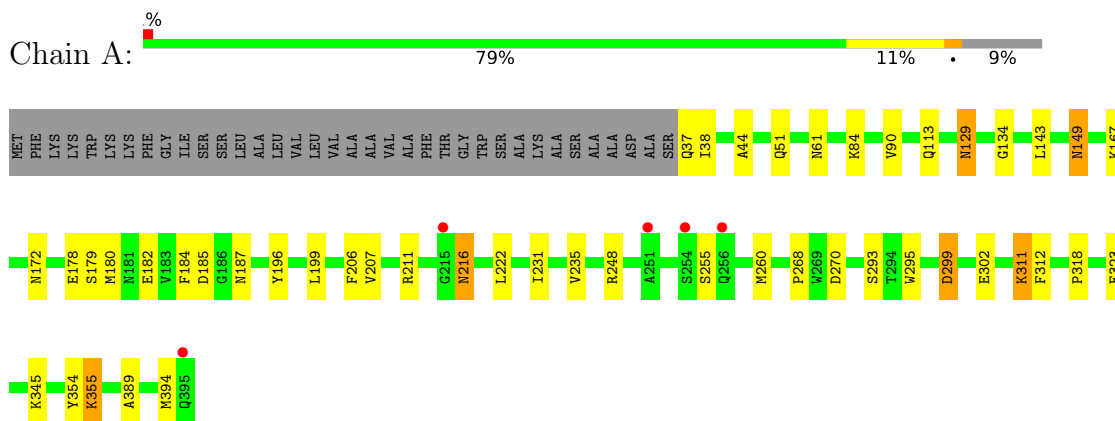
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	247	247	247	0	0

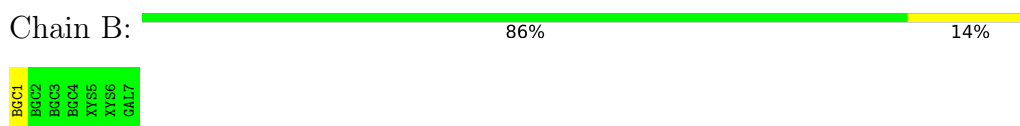
2 Residue-property plots [i](#)

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: XYLOGLUCANASE



- Molecule 2: beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-[beta-D-galactopyranose-(1-2)-alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-beta-D-glucopyranose



3 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	85.07Å 89.16Å 38.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	61.55 – 1.94 39.49 – 1.94	Depositor EDS
% Data completeness (in resolution range)	97.9 (61.55-1.94) 97.9 (39.49-1.94)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.64 (at 1.95Å)	Xtrriage
Refinement program	REFMAC 5.3.0011	Depositor
R, R_{free}	0.182 , 0.260 (Not available) , (Not available)	Depositor DCC
R_{free} test set	1117 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å ²)	20.9	Xtrriage
Anisotropy	0.599	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 49.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.015 for k,h,-l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3241	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.70% 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.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: BGC, GAL, XYS

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	0.69	0/3046	0.69	0/4146

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

4.2 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	2920	0	2813	38	0
2	B	74	0	62	3	0
3	A	247	0	0	8	0
All	All	3241	0	2875	38	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 (38) 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:299[A]:ASP:OD1	3:A:2175:HOH:O	1.60	1.15

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:149:ASN:H	1:A:149:ASN:HD22	1.06	1.00
1:A:149:ASN:H	1:A:149:ASN:ND2	1.83	0.77
1:A:299[A]:ASP:CG	3:A:2175:HOH:O	2.17	0.71
1:A:149:ASN:HD22	1:A:149:ASN:N	1.84	0.63
1:A:37[B]:GLN:NE2	3:A:2002:HOH:O	2.13	0.62
1:A:182:GLU:OE2	2:B:1:BGC:O1	2.20	0.58
1:A:260:MET:HG2	1:A:318:PRO:HB2	1.87	0.57
1:A:355:LYS:N	1:A:355:LYS:HD2	2.20	0.57
1:A:179:SER:HB3	1:A:206:PHE:CD2	2.41	0.56
1:A:323:GLU:OE1	2:B:1:BGC:H1	2.07	0.55
1:A:295:TRP:HH2	3:A:2149:HOH:O	1.90	0.54
1:A:299[A]:ASP:HB3	3:A:2172:HOH:O	2.07	0.54
1:A:129:ASN:C	1:A:129:ASN:HD22	2.13	0.52
1:A:206:PHE:CE2	1:A:222:LEU:HB3	2.47	0.49
1:A:302:GLU:OE2	1:A:354:TYR:OH	2.24	0.49
1:A:216:ASN:N	1:A:216:ASN:OD1	2.45	0.48
1:A:61:ASN:ND2	3:A:2013:HOH:O	2.45	0.48
1:A:129:ASN:HB3	1:A:178:GLU:HB3	1.95	0.47
1:A:268:PRO:HG3	1:A:295:TRP:O	2.15	0.47
1:A:311:LYS:HG2	1:A:312:PHE:CZ	2.52	0.45
1:A:207:VAL:O	1:A:211:ARG:HG2	2.16	0.44
1:A:113:GLN:OE1	1:A:167:LYS:HE3	2.18	0.44
1:A:231:ILE:O	1:A:235[A]:VAL:HG22	2.18	0.43
1:A:38:ILE:HG12	1:A:260:MET:CE	2.49	0.43
1:A:134:GLY:HA2	1:A:143:LEU:HB3	2.00	0.42
1:A:199:LEU:C	1:A:199:LEU:HD23	2.40	0.42
1:A:323:GLU:OE1	2:B:1:BGC:C1	2.67	0.41
1:A:44:ALA:HB2	1:A:394:MET:HG3	2.01	0.41
1:A:180:MET:CE	1:A:199:LEU:HG	2.51	0.41
1:A:268:PRO:HB2	1:A:270:ASP:OD1	2.21	0.41
1:A:84:LYS:HE3	3:A:2007:HOH:O	2.21	0.40
1:A:90:VAL:H	1:A:129:ASN:ND2	2.19	0.40
1:A:172:ASN:HB2	3:A:2091:HOH:O	2.21	0.40
1:A:129:ASN:C	1:A:129:ASN:ND2	2.74	0.40
1:A:185:ASP:CG	1:A:187[B]:ASN:HD22	2.25	0.40
1:A:345:LYS:HB2	1:A:389:ALA:HB1	2.04	0.40

There are no symmetry-related clashes.

4.3 Torsion angles [i](#)

4.3.1 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	373/395 (94%)	353 (95%)	20 (5%)	0	100 100

There are no Ramachandran outliers to report.

4.3.2 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	315/324 (97%)	302 (96%)	13 (4%)	30 15

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	51	GLN
1	A	129	ASN
1	A	149	ASN
1	A	184	PHE
1	A	196	TYR
1	A	216	ASN
1	A	255	SER
1	A	293[A]	SER
1	A	293[B]	SER
1	A	299[A]	ASP
1	A	299[B]	ASP
1	A	311	LYS
1	A	355	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	57	ASN
1	A	95	ASN
1	A	105	ASN
1	A	129	ASN
1	A	136	ASN
1	A	146	ASN
1	A	149	ASN
1	A	315	GLN

4.3.3 RNA [i](#)

There are no RNA molecules in this entry.

4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

Mogul was not executed - this section is therefore empty.

4.5 Carbohydrates [i](#)

Mogul was not executed - this section is therefore empty.

4.6 Ligand geometry [i](#)

Mogul was not executed - this section is therefore empty.

4.7 Other polymers [i](#)

Mogul was not executed - this section is therefore empty.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

5 Fit of model and data [i](#)

5.1 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	359/395 (90%)	0.00	5 (1%) 75 80	11, 19, 31, 41	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	254	SER	4.6
1	A	215	GLY	3.3
1	A	256[A]	GLN	2.7
1	A	251	ALA	2.4
1	A	395	GLN	2.0

5.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.3 Carbohydrates [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	XYS	B	5	9/10	0.72	0.24	36,38,42,43	0
2	BGC	B	4	11/12	0.78	0.16	37,40,42,45	0
2	BGC	B	1	12/12	0.89	0.15	24,29,33,34	0
2	GAL	B	7	11/12	0.89	0.11	34,35,38,39	0
2	XYS	B	6	9/10	0.92	0.10	29,30,33,33	0
2	BGC	B	3	11/12	0.93	0.10	20,25,31,31	0
2	BGC	B	2	11/12	0.95	0.09	17,19,22,26	0

5.4 Ligands

There are no ligands in this entry.

5.5 Other polymers

There are no such residues in this entry.