



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 02:19 AM UTC

PDB ID : 6EJ9 / pdb_00006ej9
Title : Human Xylosyltransferase 1 in complex with peptide QEPEGSGGGQGG
Authors : Briggs, D.C.; Hohenester, E.
Deposited on : 2017-09-20
Resolution : 2.02 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
Mogul : 2022.3.0, CSD as543be (2022)
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

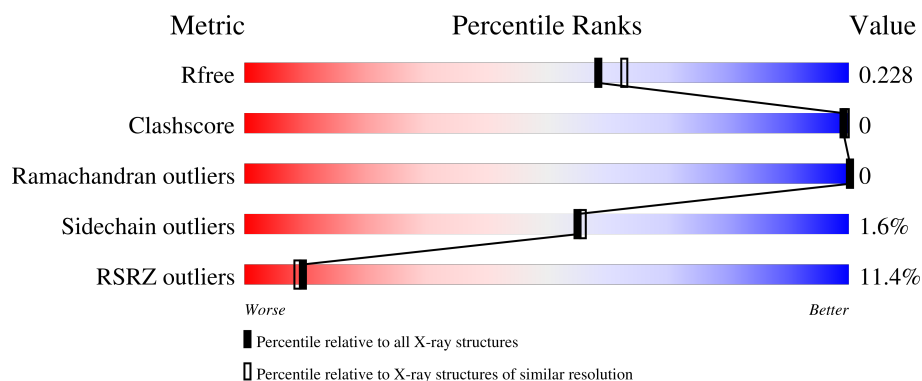
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.02 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	13299 (2.04-2.00)
Clashscore	190562	1022 (2.02-2.02)
Ramachandran outliers	187476	1014 (2.02-2.02)
Sidechain outliers	187428	1014 (2.02-2.02)
RSRZ outliers	180081	13314 (2.04-2.00)

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	751	10% 92% 7%
2	B	11	27% 91% 9%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 11077 atoms, of which 5277 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 Xylosyltransferase 1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	701	Total	C	H	N	O	S	0	1	0
			10782	3560	5245	958	987	32			

There are 23 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	209	ALA	-	expression tag	UNP Q86Y38
A	210	PRO	-	expression tag	UNP Q86Y38
A	211	LEU	-	expression tag	UNP Q86Y38
A	212	VAL	-	expression tag	UNP Q86Y38
A	213	HIS	-	expression tag	UNP Q86Y38
A	214	HIS	-	expression tag	UNP Q86Y38
A	215	HIS	-	expression tag	UNP Q86Y38
A	216	HIS	-	expression tag	UNP Q86Y38
A	217	HIS	-	expression tag	UNP Q86Y38
A	218	HIS	-	expression tag	UNP Q86Y38
A	219	ALA	-	expression tag	UNP Q86Y38
A	220	LEU	-	expression tag	UNP Q86Y38
A	221	ASP	-	expression tag	UNP Q86Y38
A	222	GLU	-	expression tag	UNP Q86Y38
A	223	ASN	-	expression tag	UNP Q86Y38
A	224	LEU	-	expression tag	UNP Q86Y38
A	225	TYR	-	expression tag	UNP Q86Y38
A	226	PHE	-	expression tag	UNP Q86Y38
A	227	GLN	-	expression tag	UNP Q86Y38
A	228	GLY	-	expression tag	UNP Q86Y38
A	229	ALA	-	expression tag	UNP Q86Y38
A	230	LEU	-	expression tag	UNP Q86Y38
A	231	ALA	-	expression tag	UNP Q86Y38

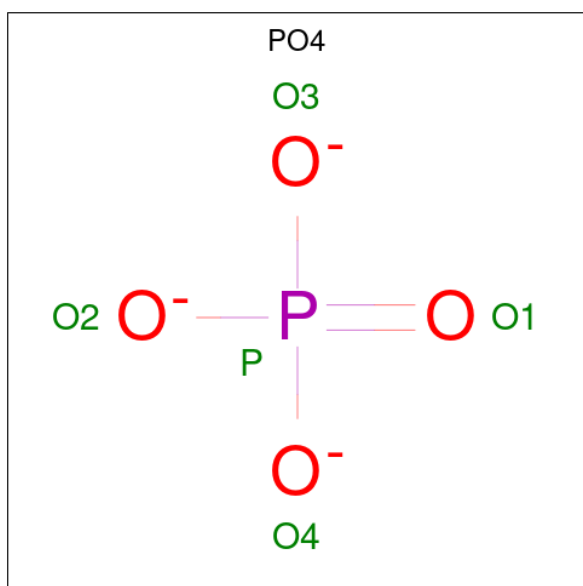
- Molecule 2 is a protein called Protein AMBP.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	11	Total	C	H	N	O	0	0	0
			97	36	32	12	17			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	212	PRO	GLU	engineered mutation	UNP P02760
B	220	GLY	LEU	engineered mutation	UNP P02760

- Molecule 3 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	P	0	0
			5	4	1		
3	A	1	Total	O	P	0	0
			5	4	1		

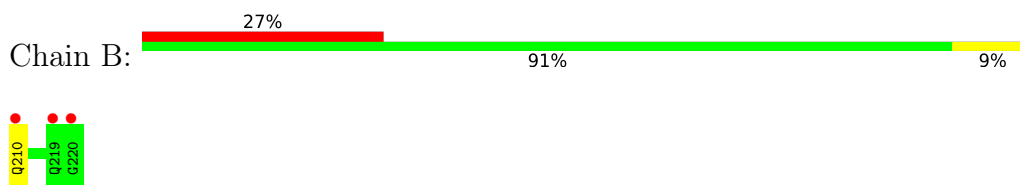
- Molecule 4 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Na	0	0
			1	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	184	Total 184	O 184	0	0
5	B	3	Total 3	O 3	0	0

- Molecule 1: Xylosyltransferase 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	67.38Å 86.82Å 153.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	75.53 – 2.02 75.53 – 2.02	Depositor EDS
% Data completeness (in resolution range)	99.0 (75.53-2.02) 98.9 (75.53-2.02)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.63 (at 2.02Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.204 , 0.225 0.205 , 0.228	Depositor DCC
R_{free} test set	2840 reflections (4.75%)	wwPDB-VP
Wilson B-factor (Å ²)	32.7	Xtriage
Anisotropy	0.730	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 45.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11077	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.96% 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: NA, PO4

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	0.16	0/5701	0.32	0/7767
2	B	0.08	0/65	0.26	0/85
All	All	0.16	0/5766	0.32	0/7852

There are no bond length outliers.

There are no bond angle outliers.

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	5537	5245	5270	2	0
2	B	65	32	48	1	0
3	A	10	0	0	0	0
4	A	1	0	0	0	0
5	A	184	0	0	1	0
5	B	3	0	0	1	0
All	All	5800	5277	5318	3	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 0.

All (3) 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)
2:B:210:GLN:N	5:B:301:HOH:O	2.35	0.58
1:A:466:ARG:NH1	5:A:1105:HOH:O	2.45	0.49
1:A:253:GLN:HG3	1:A:254:PRO:HD2	2.02	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	696/751 (93%)	680 (98%)	16 (2%)	0	100	100
2	B	9/11 (82%)	9 (100%)	0	0	100	100
All	All	705/762 (92%)	689 (98%)	16 (2%)	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	574/656 (88%)	565 (98%)	9 (2%)	55	56
2	B	5/6 (83%)	5 (100%)	0	100	100
All	All	579/662 (88%)	570 (98%)	9 (2%)	55	56

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

Mol	Chain	Res	Type
1	A	291	LEU
1	A	317	SER
1	A	318	VAL
1	A	362	LYS
1	A	412	THR
1	A	712	LEU
1	A	786	ASP
1	A	880	SER
1	A	930	MET

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

Mol	Chain	Res	Type
1	A	585	HIS

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 3 ligands modelled in this entry, 1 is 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	$\# Z > 2$
3	PO4	A	1001	-	4,4,4	0.98	0	6,6,6	0.43	0
3	PO4	A	1002	-	4,4,4	0.97	0	6,6,6	0.41	0

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	701/751 (93%)	0.57	78 (11%) 10 9	23, 43, 98, 185	1 (0%)
2	B	11/11 (100%)	1.42	3 (27%) 1 1	37, 47, 79, 93	0
All	All	712/762 (93%)	0.58	81 (11%) 10 9	23, 43, 98, 185	1 (0%)

All (81) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	311	VAL	9.2
1	A	313	TRP	8.5
1	A	252	ASP	7.3
1	A	255	PRO	7.2
1	A	865	ASN	7.0
1	A	314	ASP	7.0
1	A	306	LYS	6.7
1	A	318	VAL	6.7
1	A	829	TRP	6.5
1	A	254	PRO	5.6
1	A	307	ALA	5.3
1	A	856	LEU	5.2
1	A	734	PHE	5.1
1	A	727	ILE	5.0
1	A	316	ASP	4.9
1	A	308	ASN	4.9
1	A	309	LYS	4.9
1	A	310	ASN	4.8
1	A	304	GLU	4.6
2	B	220	GLY	4.5
1	A	591	ALA	4.3
1	A	863	LEU	4.2
1	A	590	THR	4.2
1	A	864	ARG	4.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	315	GLU	4.2
1	A	888	VAL	4.2
1	A	887	GLN	4.1
1	A	883	ILE	4.1
1	A	592	ARG	4.0
1	A	412	THR	3.8
1	A	565	TYR	3.7
1	A	319	GLU	3.7
1	A	253	GLN	3.7
1	A	868	MET	3.6
1	A	878	VAL	3.6
1	A	305	GLY	3.4
1	A	889	GLU	3.4
1	A	668	HIS	3.3
1	A	317	SER	3.1
1	A	851	LYS	3.1
1	A	561	CYS	3.1
1	A	563	CYS	3.1
1	A	588	GLN	3.1
1	A	873	GLN	3.1
1	A	885	PRO	3.0
1	A	778	VAL	3.0
1	A	303	LEU	3.0
1	A	886	ALA	3.0
1	A	274	LYS	2.9
1	A	562	LYS	2.9
1	A	875	LEU	2.9
1	A	872	PHE	2.8
1	A	879	LEU	2.8
1	A	830	VAL	2.7
2	B	210	GLN	2.7
1	A	257	CYS	2.6
1	A	273	SER	2.6
1	A	460	ARG	2.6
1	A	589	GLN	2.6
1	A	662	ARG	2.6
1	A	869	GLU	2.5
1	A	935	GLN	2.5
2	B	219	GLN	2.5
1	A	453	ARG	2.5
1	A	853	GLU	2.4
1	A	866	ALA	2.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	871	SER	2.4
1	A	877	PRO	2.3
1	A	775	GLY	2.3
1	A	794	THR	2.3
1	A	376	ARG	2.2
1	A	900	THR	2.2
1	A	846	ASN	2.2
1	A	870	GLN	2.2
1	A	275	HIS	2.1
1	A	282	GLU	2.1
1	A	777	ASN	2.1
1	A	669	THR	2.1
1	A	628	ARG	2.0
1	A	256	LYS	2.0
1	A	854	GLU	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($\text{\AA}^2$)	Q<0.9
3	PO4	A	1001	5/5	0.72	0.24	105,106,106,107	0
3	PO4	A	1002	5/5	0.83	0.18	88,88,89,90	0
4	NA	A	1003	1/1	0.98	0.04	34,34,34,34	0

6.5 Other polymers [i](#)

There are no such residues in this entry.