



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:06 PM UTC

PDB ID : 5F42 / pdb_00005f42
Title : Activity and Crystal Structure of Francisella novicida UDP-N-Acetylglucosamine Acyltransferase
Authors : Joo, S.H.; Raetz, C.R.H.
Deposited on : 2015-12-03
Resolution : 2.06 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

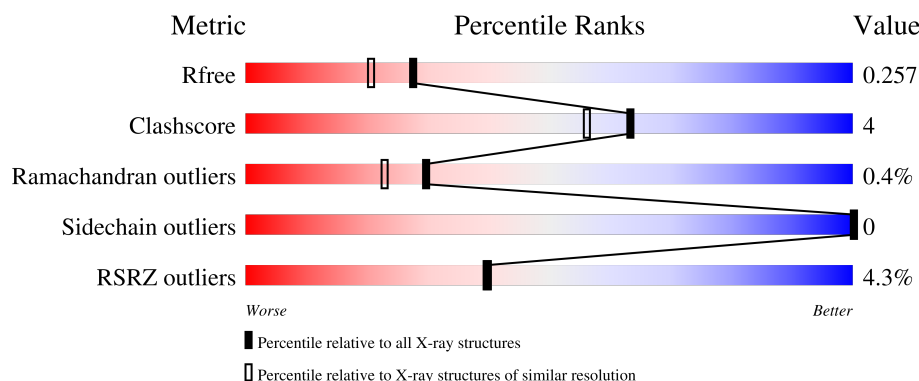
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.06 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	3774 (2.08-2.04)
Clashscore	190562	3883 (2.08-2.04)
Ramachandran outliers	187476	3860 (2.08-2.04)
Sidechain outliers	187428	3860 (2.08-2.04)
RSRZ outliers	180081	3775 (2.08-2.04)

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	280	
1	B	280	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4579 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 Acyl-[acyl-carrier-protein]--UDP-N-acetylglucosamine O-acyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	276	Total	C	N	O	S	0	0	0
			2100	1328	369	390	13			
1	B	276	Total	C	N	O	S	0	0	0
			2100	1328	369	390	13			

There are 42 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	260	ASP	-	expression tag	UNP A0Q7Y0
A	261	PRO	-	expression tag	UNP A0Q7Y0
A	262	ASN	-	expression tag	UNP A0Q7Y0
A	263	SER	-	expression tag	UNP A0Q7Y0
A	264	SER	-	expression tag	UNP A0Q7Y0
A	265	SER	-	expression tag	UNP A0Q7Y0
A	266	VAL	-	expression tag	UNP A0Q7Y0
A	267	ASP	-	expression tag	UNP A0Q7Y0
A	268	LYS	-	expression tag	UNP A0Q7Y0
A	269	LEU	-	expression tag	UNP A0Q7Y0
A	270	ALA	-	expression tag	UNP A0Q7Y0
A	271	ALA	-	expression tag	UNP A0Q7Y0
A	272	ALA	-	expression tag	UNP A0Q7Y0
A	273	LEU	-	expression tag	UNP A0Q7Y0
A	274	GLU	-	expression tag	UNP A0Q7Y0
A	275	HIS	-	expression tag	UNP A0Q7Y0
A	276	HIS	-	expression tag	UNP A0Q7Y0
A	277	HIS	-	expression tag	UNP A0Q7Y0
A	278	HIS	-	expression tag	UNP A0Q7Y0
A	279	HIS	-	expression tag	UNP A0Q7Y0
A	280	HIS	-	expression tag	UNP A0Q7Y0
B	260	ASP	-	expression tag	UNP A0Q7Y0
B	261	PRO	-	expression tag	UNP A0Q7Y0
B	262	ASN	-	expression tag	UNP A0Q7Y0

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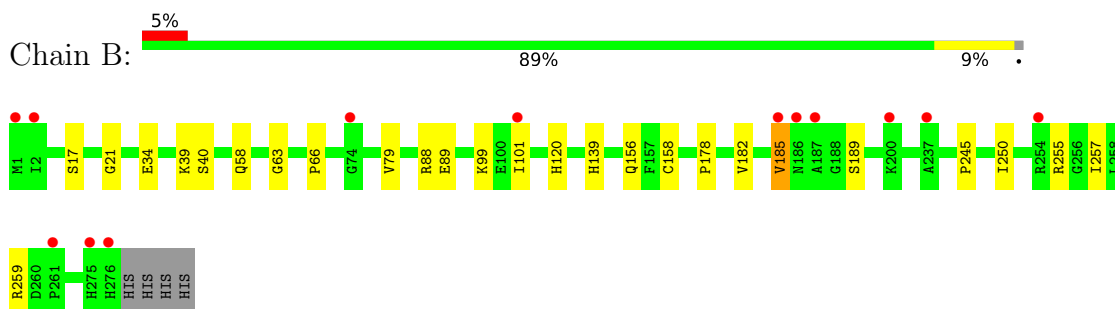
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Chain	Residue	Modelled	Actual	Comment	Reference
B	263	SER	-	expression tag	UNP A0Q7Y0
B	264	SER	-	expression tag	UNP A0Q7Y0
B	265	SER	-	expression tag	UNP A0Q7Y0
B	266	VAL	-	expression tag	UNP A0Q7Y0
B	267	ASP	-	expression tag	UNP A0Q7Y0
B	268	LYS	-	expression tag	UNP A0Q7Y0
B	269	LEU	-	expression tag	UNP A0Q7Y0
B	270	ALA	-	expression tag	UNP A0Q7Y0
B	271	ALA	-	expression tag	UNP A0Q7Y0
B	272	ALA	-	expression tag	UNP A0Q7Y0
B	273	LEU	-	expression tag	UNP A0Q7Y0
B	274	GLU	-	expression tag	UNP A0Q7Y0
B	275	HIS	-	expression tag	UNP A0Q7Y0
B	276	HIS	-	expression tag	UNP A0Q7Y0
B	277	HIS	-	expression tag	UNP A0Q7Y0
B	278	HIS	-	expression tag	UNP A0Q7Y0
B	279	HIS	-	expression tag	UNP A0Q7Y0
B	280	HIS	-	expression tag	UNP A0Q7Y0

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	208	Total O 208 208	0	0
2	B	171	Total O 171 171	0	0

- Molecule 1: Acyl-[acyl-carrier-protein]--UDP-N-acetylglucosamine O-acyltransferase



4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α , β , γ	105.38Å 105.38Å 285.79Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	18.95 – 2.06 18.95 – 2.06	Depositor EDS
% Data completeness (in resolution range)	100.0 (18.95-2.06) 99.2 (18.95-2.06)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.41 (at 2.06Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.210 , 0.260 0.209 , 0.257	Depositor DCC
R_{free} test set	1894 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	25.5	Xtriage
Anisotropy	0.079	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 40.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4579	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 14.02% 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 [i](#)

5.1 Standard geometry [i](#)

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	0.55	0/2137	0.80	0/2886
1	B	0.50	0/2137	0.78	0/2886
All	All	0.52	0/4274	0.79	0/5772

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 [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	2100	0	2129	18	0
1	B	2100	0	2129	16	0
2	A	208	0	0	0	0
2	B	171	0	0	1	0
All	All	4579	0	4258	34	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 4.

All (34) 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:66:PRO:HB3	1:B:120:HIS:HB3	1.76	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:17:SER:OG	1:B:34:GLU:HG3	1.96	0.65
1:B:250:ILE:HA	1:B:257:ILE:HD11	1.80	0.64
1:A:143:ASP:HB3	1:A:162:LYS:HG2	1.85	0.58
1:A:19:ILE:HB	1:A:37:GLU:HG3	1.85	0.57
1:A:138:GLY:O	1:A:156:GLN:HG3	2.05	0.57
1:A:250:ILE:HA	1:A:257:ILE:HD11	1.86	0.57
1:A:184:ALA:C	1:A:186:ASN:H	2.16	0.54
1:A:40:SER:O	1:A:58:GLN:HA	2.07	0.53
1:A:99:LYS:HE3	1:A:139:HIS:NE2	2.24	0.52
1:B:178:PRO:HG3	1:B:245:PRO:HB2	1.91	0.52
1:A:37:GLU:OE1	1:A:55:ARG:NH1	2.43	0.52
1:A:192:CYS:SG	1:A:192:CYS:O	2.68	0.51
1:A:66:PRO:HB3	1:A:120:HIS:HB3	1.92	0.50
1:B:63:GLY:HA2	1:B:79:VAL:HG23	1.94	0.50
1:A:185:VAL:O	1:A:185:VAL:HG13	2.11	0.50
1:B:40:SER:O	1:B:58:GLN:HA	2.13	0.49
1:B:63:GLY:HA2	1:B:79:VAL:CG2	2.43	0.48
1:B:99:LYS:HE3	1:B:139:HIS:CE1	2.48	0.47
1:B:182:VAL:CG1	1:B:189:SER:HB2	2.45	0.47
1:A:226:MET:O	1:A:226:MET:HE3	2.14	0.47
1:B:158:CYS:SG	1:B:255:ARG:HD3	2.55	0.46
1:B:21:GLY:HA3	1:B:39:LYS:O	2.17	0.44
1:B:101:ILE:HG13	1:B:101:ILE:O	2.18	0.44
1:A:194:ILE:HD11	1:A:216:TYR:HB2	1.97	0.44
1:A:182:VAL:CG1	1:A:189:SER:HB2	2.47	0.43
1:B:259:ARG:NH1	2:B:303:HOH:O	2.52	0.43
1:B:185:VAL:HG13	1:B:185:VAL:O	2.19	0.43
1:A:9:HIS:CE1	1:A:28:LYS:HG2	2.54	0.42
1:B:156:GLN:O	1:B:255:ARG:HD2	2.20	0.42
1:B:88:ARG:HD2	1:B:89:GLU:OE1	2.19	0.42
1:A:178:PRO:HG3	1:A:245:PRO:HB2	2.03	0.41
1:A:79:VAL:HG22	1:A:104:THR:HB	2.03	0.41
1:A:156:GLN:O	1:A:255:ARG:HD2	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	274/280 (98%)	264 (96%)	9 (3%)	1 (0%)	30	23
1	B	274/280 (98%)	262 (96%)	11 (4%)	1 (0%)	30	23
All	All	548/560 (98%)	526 (96%)	20 (4%)	2 (0%)	30	23

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	185	VAL
1	B	185	VAL

5.3.2 Protein sidechains

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	228/232 (98%)	228 (100%)	0	100	100
1	B	228/232 (98%)	228 (100%)	0	100	100
All	All	456/464 (98%)	456 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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	262	ASN
1	A	275	HIS

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Mol	Chain	Res	Type
1	B	109	ASN
1	B	129	ASN
1	B	139	HIS
1	B	156	GLN
1	B	262	ASN
1	B	275	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](#)

There are no ligands in this entry.

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	276/280 (98%)	0.03	11 (3%) 42 43	15, 25, 43, 51	0
1	B	276/280 (98%)	0.20	13 (4%) 36 36	16, 31, 46, 54	0
All	All	552/560 (98%)	0.11	24 (4%) 40 40	15, 28, 45, 54	0

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	186	ASN	6.9
1	A	186	ASN	4.9
1	B	187	ALA	4.8
1	B	185	VAL	4.5
1	A	187	ALA	4.0
1	A	185	VAL	3.8
1	B	74	GLY	3.4
1	A	74	GLY	3.4
1	B	1	MET	3.2
1	B	101	ILE	2.9
1	A	276	HIS	2.7
1	A	261	PRO	2.6
1	B	261	PRO	2.6
1	B	275	HIS	2.6
1	B	276	HIS	2.5
1	A	1	MET	2.5
1	A	188	GLY	2.3
1	B	237	ALA	2.2
1	A	254	ARG	2.2
1	A	192	CYS	2.2
1	B	2	ILE	2.1
1	B	254	ARG	2.1
1	A	10	GLU	2.0
1	B	200	LYS	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.