



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 24, 2017 – 07:45 PM EDT

PDB ID : 5N8B
Title : CRYSTAL STRUCTURE OF STREPTAVIDIN WITH PEPTIDE AFPDY-LAEYHGG
Authors : Lyamichev, V.; Goodrich, L.; Sullivan, E.; Bannen, R.; Benz, J.; Albert, T.; Patel, J.
Deposited on : unknown
Resolution : 1.03 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20029824
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20029824

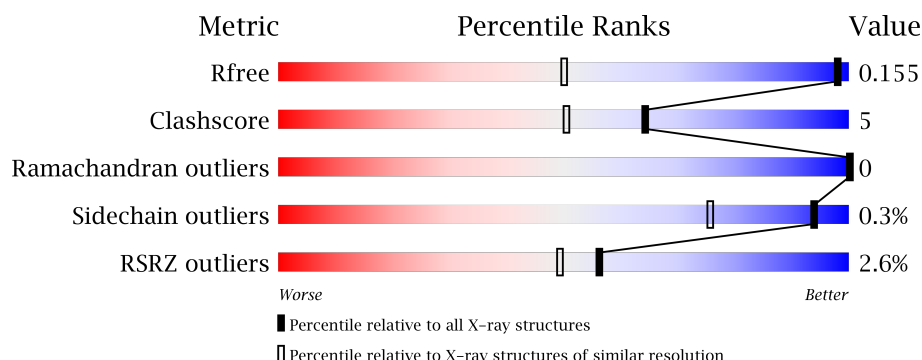
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.03 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}	100719	1186 (1.10-0.98)
Clashscore	112137	1267 (1.10-0.98)
Ramachandran outliers	110173	1192 (1.10-0.98)
Sidechain outliers	110143	1190 (1.10-0.98)
RSRZ outliers	101464	1191 (1.10-0.98)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	183	<div> <div>0.1%</div> <div>60%</div> <div>6%</div> <div>34%</div> </div>
1	B	183	<div> <div>3%</div> <div>64%</div> <div>•</div> <div>34%</div> </div>
1	D	183	<div> <div>3%</div> <div>66%</div> <div>•</div> <div>32%</div> </div>
1	G	183	<div> <div>2%</div> <div>65%</div> <div>•</div> <div>34%</div> </div>
2	C	13	<div> <div>100%</div> </div>

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	E	13	 92%8%
2	F	13	 100%
2	H	13	 92%8%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 5153 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 Streptavidin.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
1	A	121	Total	C	N	O	0	10	0
			948	601	159	188			
1	B	120	Total	C	N	O	0	10	0
			941	596	157	188			
1	D	125	Total	C	N	O	0	10	0
			973	612	166	195			
1	G	121	Total	C	N	O	0	8	0
			937	592	158	187			

- Molecule 2 is a protein called ALA-PHE-PRO-ASP-TYR-LEU-ALA-GLU-TYR-HIS-GLY-GLY-NH2.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	13	Total	C	N	O	0	0	1
			96	63	15	18			
2	C	13	Total	C	N	O	0	0	1
			96	63	15	18			
2	F	13	Total	C	N	O	0	0	1
			96	63	15	18			
2	H	13	Total	C	N	O	0	0	1
			96	63	15	18			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	230	Total	O	0	0
			230	230		
3	E	33	Total	O	0	0
			33	33		
3	B	179	Total	O	0	3
			182	182		
3	C	26	Total	O	0	0
			26	26		

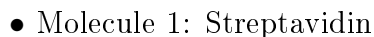
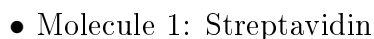
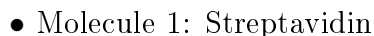
Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	209	Total 211	O 211	0	2
3	F	33	Total 33	O 33	0	0
3	G	230	Total 231	O 231	0	1
3	H	24	Total 24	O 24	0	0

i

- Molecule 1: Streptavidin



GLY
VAL
ASN
ASN
GLY
ASN
PRO
LEU
ASP
ALA
VAL
GLN
GLN

- Molecule 2: ALA-PHE-PRO-ASP-TYR-LEU-ALA-GLU-TYR-HIS-GLY-GLY-NH2

Chain E:  92% 8%

41
612
713

- Molecule 2: ALA-PHE-PRO-ASP-TYR-LEU-ALA-GLU-TYR-HIS-GLY-GLY-NH2

Chain C:  100%

There are no outlier residues recorded for this chain.

- Molecule 2: ALA-PHE-PRO-ASP-TYR-LEU-ALA-GLU-TYR-HIS-GLY-GLY-NH2

Chain F:  100%

There are no outlier residues recorded for this chain.

- Molecule 2: ALA-PHE-PRO-ASP-TYR-LEU-ALA-GLU-TYR-HIS-GLY-GLY-NH2

Chain H:  92% 8%

41
612
713

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	51.32Å 65.76Å 78.13Å 90.00° 103.72° 90.00°	Depositor
Resolution (Å)	75.90 – 1.03 49.85 – 1.03	Depositor EDS
% Data completeness (in resolution range)	99.7 (75.90-1.03) 99.7 (49.85-1.03)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.46 (at 1.03Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.138 , 0.155 0.139 , 0.155	Depositor DCC
R_{free} test set	12218 reflections (5.19%)	DCC
Wilson B-factor (Å ²)	10.7	Xtriage
Anisotropy	0.293	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 35.3	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	0.98	EDS
Total number of atoms	5153	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.80% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NH2

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	0.41	0/999	0.71	0/1368
1	B	0.39	0/992	0.71	0/1360
1	D	0.41	0/1024	0.68	0/1402
1	G	0.38	0/982	0.69	0/1346
2	C	0.43	0/99	0.67	0/134
2	E	0.37	0/99	0.72	0/134
2	F	0.41	0/99	0.68	0/134
2	H	0.40	0/99	0.70	0/134
All	All	0.40	0/4393	0.70	0/6012

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	948	0	921	15	0
1	B	941	0	910	14	0
1	D	973	0	938	12	0
1	G	937	0	899	8	0
2	C	96	0	80	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	96	0	80	1	0
2	F	96	0	80	0	0
2	H	96	0	80	1	0
3	A	230	0	0	3	0
3	B	182	0	0	6	0
3	C	26	0	0	0	0
3	D	211	0	0	10	1
3	E	33	0	0	0	0
3	F	33	0	0	0	0
3	G	231	0	0	0	0
3	H	24	0	0	0	0
All	All	5153	0	3988	39	1

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 5.

All (39) 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:D:107[A]:GLN:OE1	3:D:201[A]:HOH:O	1.60	1.19
1:B:107[B]:GLN:OE1	3:B:201[B]:HOH:O	1.62	1.17
1:A:103:ARG:HH21	1:A:129[B]:THR:CG2	1.71	1.01
1:A:103:ARG:HH21	1:A:129[B]:THR:HG21	1.23	0.98
1:D:107[A]:GLN:CG	3:D:201[A]:HOH:O	2.16	0.94
1:B:107[B]:GLN:CG	3:B:201[B]:HOH:O	2.18	0.89
1:B:57[A]:THR:HG22	1:G:57[A]:THR:CG2	2.13	0.78
1:A:40[A]:THR:HG22	3:A:211:HOH:O	1.85	0.77
1:B:57[A]:THR:HG22	1:G:57[A]:THR:HG22	1.70	0.73
1:A:103:ARG:NH2	1:A:129[B]:THR:CG2	2.52	0.72
1:B:57[A]:THR:CG2	1:G:57[A]:THR:CG2	2.68	0.72
1:A:103:ARG:NH2	1:A:129[B]:THR:HG21	2.02	0.71
1:A:103:ARG:HH21	1:A:129[B]:THR:HG22	1.59	0.65
1:B:57[A]:THR:CG2	1:G:57[A]:THR:HG22	2.26	0.65
1:D:40[A]:THR:HG22	3:D:227:HOH:O	1.96	0.64
1:B:107[B]:GLN:HB3	3:B:201[B]:HOH:O	1.98	0.64
1:D:107[A]:GLN:HB3	3:D:201[A]:HOH:O	1.98	0.63
1:D:107[A]:GLN:CD	3:D:201[A]:HOH:O	2.09	0.62
1:B:57[A]:THR:HG22	1:G:57[A]:THR:HG21	1.83	0.61
1:B:107[B]:GLN:CB	3:B:201[B]:HOH:O	2.47	0.60
1:B:107[B]:GLN:CD	3:B:201[B]:HOH:O	2.12	0.59
1:D:107[A]:GLN:CB	3:D:201[A]:HOH:O	2.46	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:57[B]:THR:HG23	3:D:227:HOH:O	2.07	0.54
1:A:30[B]:ILE:HG13	3:A:213:HOH:O	2.06	0.54
1:A:103:ARG:NH2	1:A:129[B]:THR:HG22	2.21	0.54
1:A:15:ALA:N	3:A:201:HOH:O	2.41	0.52
1:A:22[B]:TYR:CD1	1:A:28[B]:THR:HG23	2.43	0.52
1:A:57[B]:THR:HG21	3:D:292:HOH:O	2.12	0.50
1:B:57[A]:THR:HG21	1:G:57[A]:THR:CG2	2.42	0.49
1:B:57[A]:THR:CG2	1:G:57[A]:THR:HG21	2.42	0.49
1:A:114:THR:H	1:D:95[B]:GLN:NE2	2.11	0.48
1:D:107[B]:GLN:NE2	3:D:201[B]:HOH:O	2.47	0.47
1:B:107[B]:GLN:HG2	3:B:201[B]:HOH:O	2.01	0.46
1:D:107[A]:GLN:HG2	3:D:201[A]:HOH:O	1.98	0.45
1:A:107[A]:GLN:HE22	1:G:127:HIS:HD2	1.68	0.42
1:A:114:THR:H	1:D:95[B]:GLN:HE22	1.67	0.42
1:D:120:TRP:HB3	2:H:12:GLY:HA3	2.02	0.42
1:A:103:ARG:HD3	1:A:129[B]:THR:HG21	2.01	0.41
2:E:12:GLY:HA3	1:B:120:TRP:HB3	2.02	0.41

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:202:HOH:O	3:D:203:HOH:O[2_546]	2.12	0.08

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	128/183 (70%)	128 (100%)	0	0	100	100
1	B	127/183 (69%)	125 (98%)	2 (2%)	0	100	100
1	D	132/183 (72%)	128 (97%)	4 (3%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	G	126/183 (69%)	124 (98%)	2 (2%)	0	100	100
2	C	11/13 (85%)	11 (100%)	0	0	100	100
2	E	11/13 (85%)	11 (100%)	0	0	100	100
2	F	11/13 (85%)	11 (100%)	0	0	100	100
2	H	11/13 (85%)	11 (100%)	0	0	100	100
All	All	557/784 (71%)	549 (99%)	8 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	98/134 (73%)	97 (99%)	1 (1%)	80	48
1	B	98/134 (73%)	98 (100%)	0	100	100
1	D	100/134 (75%)	100 (100%)	0	100	100
1	G	96/134 (72%)	96 (100%)	0	100	100
2	C	8/8 (100%)	8 (100%)	0	100	100
2	E	8/8 (100%)	8 (100%)	0	100	100
2	F	8/8 (100%)	8 (100%)	0	100	100
2	H	8/8 (100%)	8 (100%)	0	100	100
All	All	424/568 (75%)	423 (100%)	1 (0%)	94	76

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	116	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	82	ASN
1	B	82	ASN
1	D	82	ASN
1	G	82	ASN

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 carbohydrates 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	121/183 (66%)	-0.27	1 (0%) 86 81	7, 10, 19, 28	2 (1%)
1	B	120/183 (65%)	-0.20	5 (4%) 37 31	7, 12, 25, 34	2 (1%)
1	D	125/183 (68%)	-0.08	5 (4%) 39 33	7, 12, 24, 32	2 (1%)
1	G	121/183 (66%)	-0.29	3 (2%) 58 51	7, 12, 26, 36	2 (1%)
2	C	12/13 (92%)	-0.46	0 100 100	8, 11, 13, 15	0
2	E	12/13 (92%)	-0.42	0 100 100	8, 10, 13, 15	0
2	F	12/13 (92%)	-0.29	0 100 100	10, 15, 16, 18	0
2	H	12/13 (92%)	-0.47	0 100 100	8, 12, 14, 18	0
All	All	535/784 (68%)	-0.23	14 (2%) 56 49	7, 12, 23, 36	8 (1%)

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	15	ALA	6.9
1	G	15	ALA	6.0
1	D	137	ALA	5.5
1	D	138	ALA	5.1
1	D	15	ALA	3.7
1	G	36	ASP	3.1
1	D	100	ALA	3.0
1	D	139	SER	2.9
1	B	35	ALA	2.9
1	B	134	LYS	2.7
1	B	100	ALA	2.4
1	B	135	PRO	2.4
1	G	101	GLU	2.3
1	B	101	GLU	2.2

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 carbohydrates 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.