wwPDB X-ray Structure Validation Summary Report (i)

May 19, 2020 – 11:03 pm BST

PDB ID	:	5E94
Title	:	Antibody-bound Glucagon-like Peptide-1 receptor extracellular domain
Authors	:	Soroka, V.; Schluckebier, G.; Reedtz-Runge, S.
Deposited on	:	2015-10-14
Resolution	:	2.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

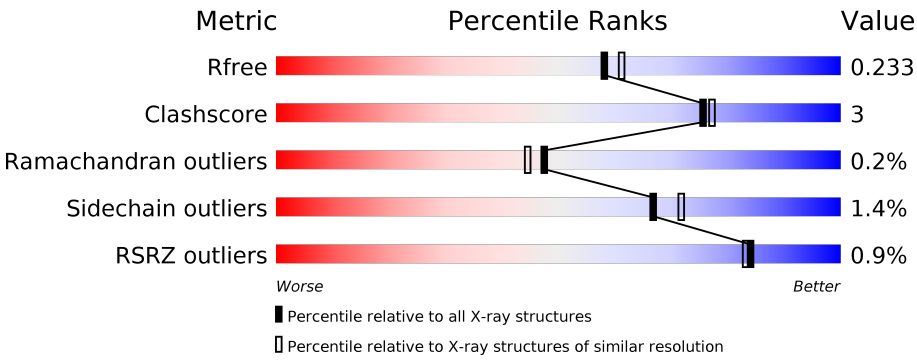
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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 on 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 <=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	214	95% 5%
1	C	214	94% 6%
2	B	224	% 90% 10%
2	D	224	% 89% 11%
3	G	126	2% 79% 8% 13%
3	H	126	% 69% 10% 21%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 8974 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 Antibody Fab fragment light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	214	1652	1027	277	342	6	0	0	0
1	C	214	1665	1034	279	346	6	0	2	0

- Molecule 2 is a protein called Antibody Fab fragment heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	224	1715	1086	278	345	6	0	0	0
2	D	224	1721	1089	281	345	6	0	0	0

- Molecule 3 is a protein called Glucagon-like peptide 1 receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	G	110	924	589	152	177	6	0	1	0
3	H	100	830	527	140	157	6	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	20	GLY	-	expression tag	UNP P43220
G	21	SER	-	expression tag	UNP P43220
G	22	HIS	-	expression tag	UNP P43220
G	23	MET	-	expression tag	UNP P43220
H	20	GLY	-	expression tag	UNP P43220
H	21	SER	-	expression tag	UNP P43220
H	22	HIS	-	expression tag	UNP P43220
H	23	MET	-	expression tag	UNP P43220

- Molecule 4 is water.

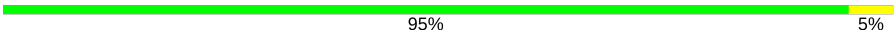
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	124	124	124	0	0
			Total	O		
4	B	94	94	94	0	0
			Total	O		
4	C	77	77	77	0	0
			Total	O		
4	D	61	61	61	0	0
			Total	O		
4	G	66	66	66	0	0
			Total	O		
4	H	45	45	45	0	0

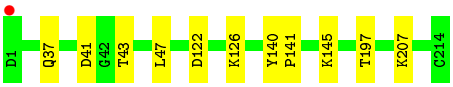
3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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: Antibody Fab fragment light chain

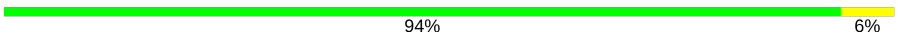
Chain A:

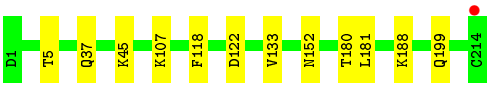




- Molecule 1: Antibody Fab fragment light chain

Chain C:



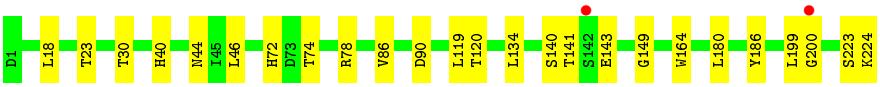


- Molecule 2: Antibody Fab fragment heavy chain

Chain B:

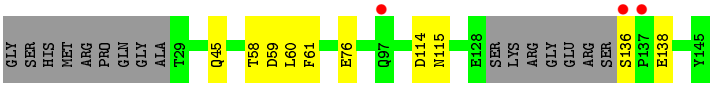
- Molecule 2: Antibody Fab fragment heavy chain

Chain D:



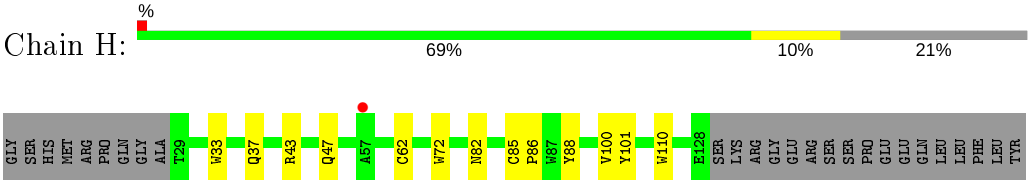
- Molecule 3: Glucagon-like peptide 1 receptor

Chain G:



- Molecule 3: Glucagon-like peptide 1 receptor

Chain H:


%
69%
10%
21%
GLY SER HIS MET ARG PRO GLN GLY ALA T29 W33 Q37 R43 Q47 A57 C62 W72 N82 C85 P86 H87 Y88 V100 Y101 W110 E128 SER LYS ARG GLY GLU ARG SER SER PRO GLU GLU GLN LEU LEU PHE LEU TYR

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	57.20Å 65.69Å 88.35Å 111.61° 97.47° 91.28°	Depositor
Resolution (Å)	32.09 – 2.00 32.09 – 2.00	Depositor EDS
% Data completeness (in resolution range)	90.5 (32.09-2.00) 83.9 (32.09-2.00)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.58 (at 2.00Å)	Xtriage
Refinement program	PHENIX dev_1938	Depositor
R, R_{free}	0.188 , 0.232 0.188 , 0.233	Depositor DCC
R_{free} test set	3618 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	25.1	Xtriage
Anisotropy	0.242	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 43.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.017 for -h,k,-k-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	8974	wwPDB-VP
Average B, all atoms (Å^2)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.51% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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	0.45	0/1684	0.56	0/2283
1	C	0.38	0/1697	0.54	0/2301
2	B	0.43	0/1763	0.60	0/2410
2	D	0.40	0/1769	0.58	0/2417
3	G	0.45	0/957	0.52	0/1308
3	H	0.45	0/861	0.52	0/1180
All	All	0.42	0/8731	0.56	0/11899

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	1652	0	1597	8	0
1	C	1665	0	1606	8	0
2	B	1715	0	1642	10	0
2	D	1721	0	1652	14	0
3	G	924	0	835	7	0
3	H	830	0	749	8	0
4	A	124	0	0	1	0
4	B	94	0	0	3	0
4	C	77	0	0	1	0
4	D	61	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	G	66	0	0	4	0
4	H	45	0	0	1	0
All	All	8974	0	8081	52	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 3.

The worst 5 of 52 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)
3:H:37:GLN:NE2	4:H:201:HOH:O	2.26	0.68
2:D:140:SER:HB2	2:D:143:GLU:HG2	1.76	0.66
3:G:59:ASP:OD2	4:G:202:HOH:O	2.16	0.62
2:B:40:HIS:NE2	2:B:44:ASN:HA	2.14	0.62
2:D:120:THR:HG21	4:D:339:HOH:O	2.01	0.59

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	212/214 (99%)	208 (98%)	4 (2%)	0	100	100
1	C	214/214 (100%)	206 (96%)	7 (3%)	1 (0%)	29	23
2	B	222/224 (99%)	214 (96%)	7 (3%)	1 (0%)	29	23
2	D	222/224 (99%)	214 (96%)	8 (4%)	0	100	100
3	G	107/126 (85%)	104 (97%)	3 (3%)	0	100	100
3	H	98/126 (78%)	96 (98%)	2 (2%)	0	100	100
All	All	1075/1128 (95%)	1042 (97%)	31 (3%)	2 (0%)	47	44

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	65	LYS
1	C	188	LYS

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	191/191 (100%)	191 (100%)	0	100	100
1	C	193/191 (101%)	191 (99%)	2 (1%)	76	81
2	B	198/199 (100%)	191 (96%)	7 (4%)	36	35
2	D	199/199 (100%)	197 (99%)	2 (1%)	76	81
3	G	103/114 (90%)	100 (97%)	3 (3%)	42	43
3	H	92/114 (81%)	92 (100%)	0	100	100
All	All	976/1008 (97%)	962 (99%)	14 (1%)	67	72

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	223	SER
1	C	5	THR
3	G	114	ASP
2	B	207	ASN
2	D	141	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 (i)

6.1 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	214/214 (100%)	-0.48	1 (0%)	91	90	15, 26, 41, 52	0
1	C	214/214 (100%)	-0.40	1 (0%)	91	90	18, 33, 58, 78	0
2	B	224/224 (100%)	-0.36	2 (0%)	84	83	16, 29, 48, 69	0
2	D	224/224 (100%)	-0.31	2 (0%)	84	83	19, 33, 57, 84	0
3	G	110/126 (87%)	-0.21	3 (2%)	54	53	18, 30, 53, 65	0
3	H	100/126 (79%)	-0.24	1 (1%)	82	81	20, 33, 60, 69	0
All	All	1086/1128 (96%)	-0.35	10 (0%)	84	83	15, 30, 54, 84	0

The worst 5 of 10 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	214	CYS	5.2
2	D	142	SER	4.7
3	G	136	SER	3.2
3	G	97	GLN	3.1
3	G	137	PRO	2.8

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.