WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Oct 9, 2023 – 02:29 AM EDT

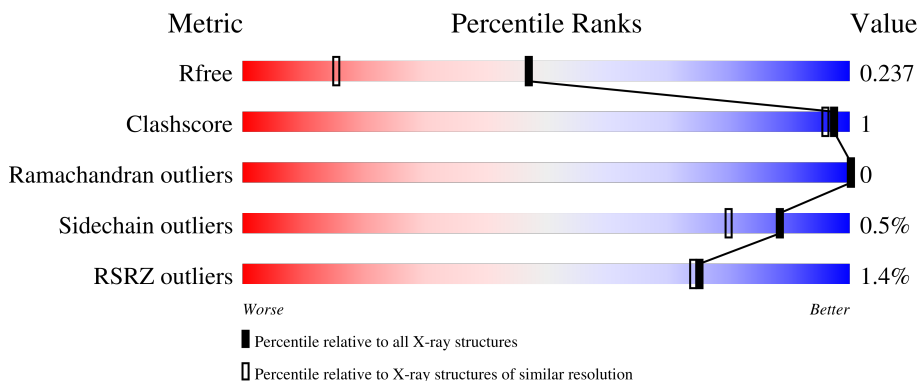|		
PDB ID	:	6WGK
Title	:	Fab portion of dupilumab with Crystal Kappa design and intrachain disulfide
Authors	:	Druzina, Z.; Atwell, S.; Pustilnik, A.; Antonysamy, S.; Ho, C.; Lieu, R.; Hendle, J.; Benach, J.; Wang, J.
Deposited on	:	2020-04-05
Resolution	:	1.62 Å(reported)

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 1.62 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.
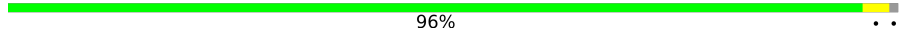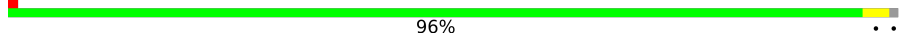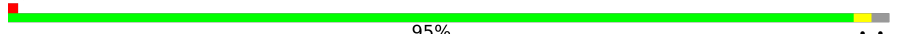
Metric	Percentile Ranks	Value
Rfree		0.237
Clashscore		1
Ramachandran outliers		0
Sidechain outliers		0.5%
RSRZ outliers		1.4%

Worse   *Better*

▮ Percentile relative to all X-ray structures

⬜ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	4693 (1.64-1.60)
Clashscore	141614	5002 (1.64-1.60)
Ramachandran outliers	138981	4888 (1.64-1.60)
Sidechain outliers	138945	4887 (1.64-1.60)
RSRZ outliers	127900	4609 (1.64-1.60)

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 <=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	235	2% / 89% · 7%
1	C	235	3% / 91% · 8%
1	E	235	3% / 91% · 7%
1	G	235	89% · 9%
2	B	217	96% ··

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	D	217	96%
2	F	217	% 96%
2	H	217	% 95%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 13743 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 Dupilumab Fab heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	218	Total 1636	C 1027	N 275	O 327	S 7	0	4	0
1	C	217	Total 1624	C 1019	N 274	O 324	S 7	0	3	0
1	E	219	Total 1629	C 1022	N 275	O 324	S 8	0	1	0
1	G	214	Total 1535	C 968	N 257	O 303	S 7	0	2	0

- Molecule 2 is a protein called Dupilumab Fab light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	215	Total 1681	C 1058	N 274	O 342	S 7	0	10	0
2	D	214	Total 1648	C 1039	N 266	O 336	S 7	0	6	0
2	F	214	Total 1636	C 1030	N 266	O 333	S 7	0	11	0
2	H	212	Total 1563	C 986	N 257	O 313	S 7	0	2	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	140	Total 140	O 140	0	0
3	B	113	Total 113	O 113	0	0
3	C	114	Total 114	O 114	0	0
3	D	72	Total 72	O 72	0	0

Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	E	89	Total 89	O 89	0	0
3	F	94	Total 94	O 94	0	0
3	G	77	Total 77	O 77	0	0
3	H	92	Total 92	O 92	0	0

3 Residue-property plots ⓘ

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: Dupilumab Fab heavy chain
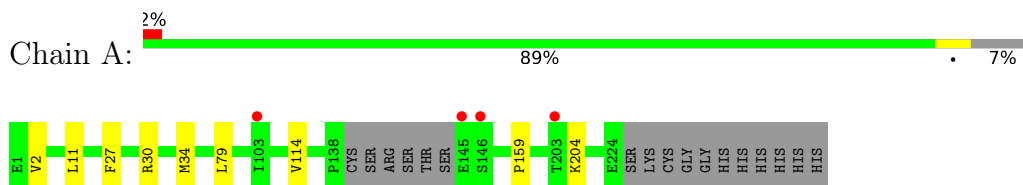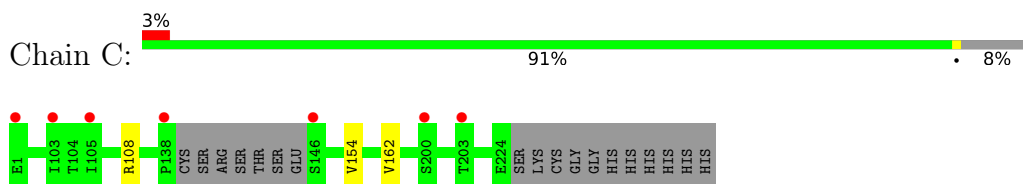
Chain A:

- Molecule 1: Dupilumab Fab heavy chain

Chain C:

- Molecule 1: Dupilumab Fab heavy chain

Chain E:

- Molecule 1: Dupilumab Fab heavy chain

Chain G:

- Molecule 2: Dupilumab Fab light chain

Chain B:

- Molecule 2: Dupilumab Fab light chain

Chain D:

96%

D1 L11 R59 V88 E110 R147 Q171 R214 GLY GLU PRO

• Molecule 2: Dupilumab Fab light chain

%

Chain F:

96%

D1 I33 L42 Q43 K44 L52 L130 K174 Y191 Y197 R214 GLY GLU PRO

• Molecule 2: Dupilumab Fab light chain

%

Chain H:

95%

D1 L11 P12 R82 K112 S132 Y191 Y197 F212 ASN ARG GLY GLU PRO
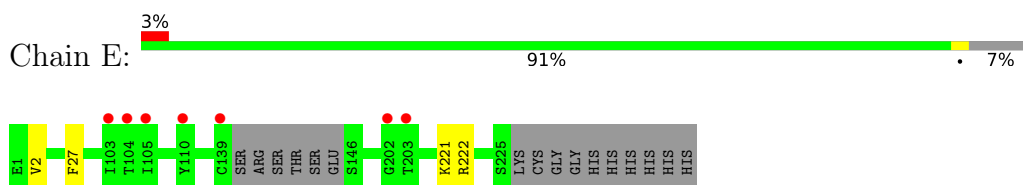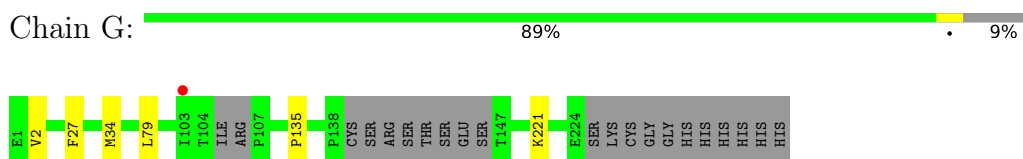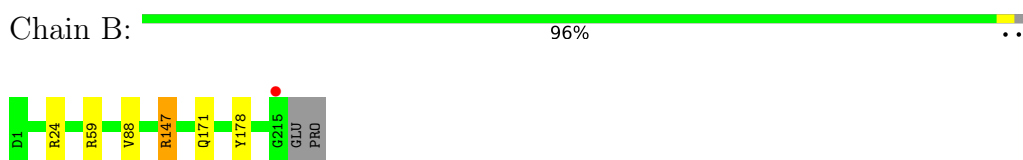
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	109.16Å 79.27Å 109.56Å 90.00° 91.87° 90.00°	Depositor
Resolution (Å)	30.00 – 1.62 109.50 – 1.62	Depositor EDS
% Data completeness (in resolution range)	95.2 (30.00-1.62) 95.2 (109.50-1.62)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.42 (at 1.62Å)	Xtriage
Refinement program	REFMAC 5.8.0103	Depositor
R, R_{free}	0.210 , 0.236 0.210 , 0.237	Depositor DCC
R_{free} test set	11284 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	24.8	Xtriage
Anisotropy	0.017	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 39.1	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.000 for l,k,-h 0.012 for h,-k,-l 0.007 for l,-k,h	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	13743	wwPDB-VP
Average B, all atoms (Å^2)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 34.17 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 7.1219e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

---

[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	0.30	0/1684	0.63	0/2293
1	C	0.29	0/1669	0.62	0/2273
1	E	0.29	0/1668	0.61	0/2273
1	G	0.30	0/1575	0.62	0/2152
2	B	0.29	0/1743	0.62	0/2370
2	D	0.28	0/1701	0.61	0/2316
2	F	0.29	0/1698	0.61	0/2316
2	H	0.28	0/1604	0.61	0/2190
All	All	0.29	0/13342	0.62	0/18183

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	C	0	1
2	B	0	3
2	D	0	2
All	All	0	7

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	30	ARG	Sidechain
2	B	147[A]	ARG	Sidechain
2	B	24	ARG	Sidechain
2	B	59	ARG	Sidechain

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Group
1	C	108	ARG	Sidechain

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	1636	0	1589	4	0
1	C	1624	0	1570	1	0
1	E	1629	0	1576	1	0
1	G	1535	0	1435	3	0
2	B	1681	0	1635	5	0
2	D	1648	0	1593	1	0
2	F	1636	0	1545	3	0
2	H	1563	0	1447	2	0
3	A	140	0	0	0	0
3	B	113	0	0	0	0
3	C	114	0	0	0	0
3	D	72	0	0	0	0
3	E	89	0	0	0	0
3	F	94	0	0	0	0
3	G	77	0	0	0	0
3	H	92	0	0	0	0
All	All	13743	0	12390	20	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 1.

The worst 5 of 20 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:147[B]:ARG:HD2	2:B:147[B]:ARG:O	1.66	0.93
2:B:147[B]:ARG:HD2	2:B:147[B]:ARG:C	2.02	0.75
2:D:88:VAL:HG21	2:D:171:GLN:HB3	1.89	0.54
2:H:12:PRO:HB2	2:H:112:LYS:HE3	1.91	0.53
1:G:135:PRO:HD3	1:G:221:LYS:HE2	1.93	0.49

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	218/235 (93%)	215 (99%)	3 (1%)	0	100	100
1	C	216/235 (92%)	209 (97%)	7 (3%)	0	100	100
1	E	216/235 (92%)	213 (99%)	3 (1%)	0	100	100
1	G	210/235 (89%)	206 (98%)	4 (2%)	0	100	100
2	B	223/217 (103%)	218 (98%)	5 (2%)	0	100	100
2	D	218/217 (100%)	214 (98%)	4 (2%)	0	100	100
2	F	223/217 (103%)	217 (97%)	6 (3%)	0	100	100
2	H	212/217 (98%)	208 (98%)	4 (2%)	0	100	100
All	All	1736/1808 (96%)	1700 (98%)	36 (2%)	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	183/198 (92%)	182 (100%)	1 (0%)	88	80
1	C	180/198 (91%)	180 (100%)	0	100	100
1	E	181/198 (91%)	179 (99%)	2 (1%)	73	56
1	G	160/198 (81%)	160 (100%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	194/191 (102%)	194 (100%)	0	100	100
2	D	189/191 (99%)	187 (99%)	2 (1%)	73	56
2	F	182/191 (95%)	181 (100%)	1 (0%)	88	80
2	H	165/191 (86%)	164 (99%)	1 (1%)	86	76
All	All	1434/1556 (92%)	1427 (100%)	7 (0%)	88	80

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	221	LYS
1	E	222	ARG
2	H	11	LEU
2	F	174	LYS
2	D	110	GLU

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

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

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(Å²)	Q<0.9
1	A	218/235 (92%)	-0.08	4 (1%)	68	67	15, 21, 44, 65	0
1	C	217/235 (92%)	-0.05	7 (3%)	47	44	16, 26, 47, 66	0
1	E	219/235 (93%)	0.01	7 (3%)	47	44	19, 29, 44, 65	0
1	G	214/235 (91%)	-0.05	1 (0%)	91	90	20, 29, 47, 66	0
2	B	215/217 (99%)	-0.15	1 (0%)	91	90	16, 24, 40, 57	0
2	D	214/217 (98%)	-0.13	0	100	100	19, 30, 45, 58	0
2	F	214/217 (98%)	-0.02	2 (0%)	84	84	16, 26, 56, 70	0
2	H	212/217 (97%)	-0.13	2 (0%)	84	84	18, 27, 53, 69	0
All	All	1723/1808 (95%)	-0.07	24 (1%)	75	74	15, 27, 48, 70	0

The worst 5 of 24 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	215	GLY	5.4
1	A	145	GLU	3.8
1	A	103	ILE	3.7
1	C	138	PRO	3.2
1	E	104	THR	3.1

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.