wwPDB X-ray Structure Validation Summary Report (i)

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PDB ID : 6SS4

Title : Structure of arginase-2 in complex with the inhibitory human antigen-binding fragment Fab C0021181

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Deposited on : 2019-09-06
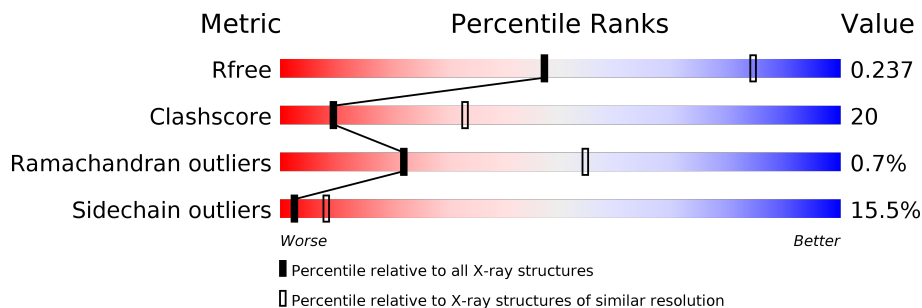
Resolution : 2.90 Å(reported)

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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 2.90 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		20
Ramachandran outliers		0.7%
Sidechain outliers		15.5%

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	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)

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%

Mol	Chain	Length	Quality of chain
1	AAA	339	60% 27% 6% 7%
2	HHH	233	58% 29% 5% 7%
3	LLL	220	60% 29% 8% .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	PO4	AAA	403	-	-	X	-

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 11180 atoms, of which 5548 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 Arginase-2, mitochondrial.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	AAA	316	4830	1527	2413	420	460	10	119	0	0

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AAA	22	MET	-	initiating methionine	UNP P78540
AAA	355	HIS	-	expression tag	UNP P78540
AAA	356	HIS	-	expression tag	UNP P78540
AAA	357	HIS	-	expression tag	UNP P78540
AAA	358	HIS	-	expression tag	UNP P78540
AAA	359	HIS	-	expression tag	UNP P78540
AAA	360	HIS	-	expression tag	UNP P78540

- Molecule 2 is a protein called Fab C0021181 heavy chain (IgG1).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
2	HHH	216	3238	1027	1607	281	316	7	89	1	0

- Molecule 3 is a protein called Fab C0021181 light chain (IgG1).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
3	LLL	213	3105	985	1528	262	325	5	100	0	0

- Molecule 4 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mn		
4	AAA	2	2	2	0	0

• Molecule 5 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).
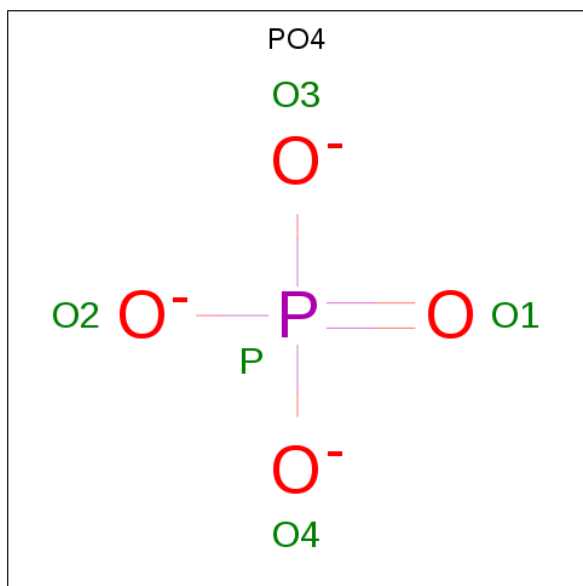
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	AAA	1	Total O P			0	0
			5	4	1		

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. 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. 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: Arginase-2, mitochondrial

- Molecule 2: Fab C0021181 heavy chain (IgG1)

- Molecule 3: Fab C0021181 light chain (IgG1)

W186 S193 H198 V203 E204 K205 T206 P209 T210 E211 C212 SER

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 3 2 1	Depositor
Cell constants a, b, c, α, β, γ	150.38Å 150.38Å 110.74Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	44.98 – 2.90 44.98 – 2.90	Depositor EDS
% Data completeness (in resolution range)	100.0 (44.98-2.90) 90.2 (44.98-2.90)	Depositor EDS
R_{merge}	0.35	Depositor
R_{sym}	(Not available)	Depositor
$<I/\sigma(I)>$ [1]	0.45 (at 2.91Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.266 , 0.318 0.192 , 0.237	Depositor DCC
R_{free} test set	1602 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å^2)	64.4	Xtriage
Anisotropy	0.355	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 19.9	EDS
L-test for twinning [2]	$<|L|> = 0.39, <L^2> = 0.21$	Xtriage
Estimated twinning fraction	0.468 for -h,-k,l	Xtriage
Reported twinning fraction	0.505 for H, K, L 0.495 for -h,-k,l	Depositor
Outliers	1 of 32382 reflections (0.003%)	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	11180	wwPDB-VP
Average B, all atoms (Å^2)	85.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.80% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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)

Bond lengths and bond angles in the following residue types are not validated in this section: PO4, MN

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	AAA	0.93	3/2469 (0.1%)	1.13	2/3358 (0.1%)
2	HHH	0.84	0/1668	1.12	1/2268 (0.0%)
3	LLL	0.84	0/1615	0.99	0/2208
All	All	0.88	3/5752 (0.1%)	1.09	3/7834 (0.0%)

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	AAA	0	2
3	LLL	0	1
All	All	0	3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	AAA	98	GLU	CD-OE2	8.80	1.35	1.25
1	AAA	51	GLU	CD-OE2	5.34	1.31	1.25
1	AAA	34	SER	CA-CB	-5.16	1.45	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	HHH	61	ASP	CB-CG-OD1	-7.58	111.48	118.30
1	AAA	105	ARG	NE-CZ-NH1	6.94	123.77	120.30
1	AAA	311	THR	CA-CB-OG1	-6.91	94.49	109.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	AAA	117	GLY	Peptide
1	AAA	334	TYR	Peptide
3	LLL	211	GLU	Peptide

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	AAA	2417	2413	2398	91	2
2	HHH	1631	1607	1601	72	2
3	LLL	1577	1528	1524	72	0
4	AAA	2	0	0	0	0
5	AAA	5	0	0	2	0
All	All	5632	5548	5523	219	2

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 20.

The worst 5 of 219 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:AAA:38:LYS:HE2	2:HHH:98:ASP:HA	1.36	1.02
3:LLL:167:LYS:HD3	3:LLL:171:ASN:HA	1.36	1.01
2:HHH:48:VAL:HG13	2:HHH:63:VAL:HG11	1.44	0.97
3:LLL:83:GLU:HB3	3:LLL:106:VAL:HG12	1.48	0.95
3:LLL:171:ASN:O	3:LLL:171:ASN:ND2	2.01	0.94

All (2) 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)
1:AAA:97:GLN:NE2	2:HHH:64:LYS:O[5_556]	1.88	0.32
1:AAA:97:GLN:HE22	2:HHH:64:LYS:O[5_556]	1.48	0.12

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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	AAA	314/339 (93%)	288 (92%)	24 (8%)	2 (1%)	25	58
2	HHH	213/233 (91%)	199 (93%)	12 (6%)	2 (1%)	17	48
3	LLL	211/220 (96%)	199 (94%)	11 (5%)	1 (0%)	29	61
All	All	738/792 (93%)	686 (93%)	47 (6%)	5 (1%)	22	54

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	AAA	162	GLN
1	AAA	120	HIS
2	HHH	98	ASP
2	HHH	212	GLU
3	LLL	68	GLY

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	AAA	266/288 (92%)	231 (87%)	35 (13%)	4	12
2	HHH	181/193 (94%)	153 (84%)	28 (16%)	2	8
3	LLL	178/184 (97%)	144 (81%)	34 (19%)	1	4
All	All	625/665 (94%)	528 (84%)	97 (16%)	2	8

5 of 97 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	HHH	105	ARG
2	HHH	191	THR
3	LLL	169	SER
2	HHH	117	LYS
2	HHH	153	SER

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 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	$\#|Z| > 2$
5	PO4	AAA	403	4	4,4,4	1.11	0	6,6,6	0.48	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.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	AAA	403	PO4	2	0

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)

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates (i)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands (i)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.5 Other polymers (i)

Unable to reproduce the depositors R factor - this section is therefore empty.