WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 10, 2023 – 07:47 PM EDT

PDB ID	:	4K0V
Title	:	Structural basis for angiopoietin-1 mediated signaling initiation
Authors	:	Yu, X.; Seegar, T.C.M.; Dalton, A.C.; Tzvetkova-Robev, D.; Goldgur, Y.; Nikolov, D.B.; Barton, W.A.
Deposited on	:	2013-04-04
Resolution	:	4.51 Å(reported)

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

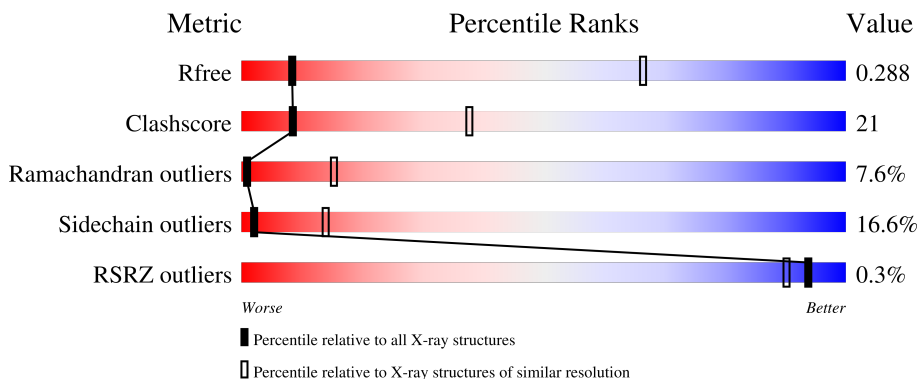|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 4.51 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		0.288
Clashscore		21
Ramachandran outliers		7.6%
Sidechain outliers		16.6%
RSRZ outliers		0.3%

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	1056 (5.22-3.80)
Clashscore	141614	1124 (5.22-3.80)
Ramachandran outliers	138981	1070 (5.22-3.80)
Sidechain outliers	138945	1051 (5.22-3.80)
RSRZ outliers	127900	1101 (5.30-3.70)

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	529	44% 40% 13% · ·
2	B	230	52% 35% 7% 6%

2 Entry composition ⓘ

There are 2 unique types of molecules in this entry. The entry contains 5775 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 TEK tyrosine kinase variant.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	514	Total	C	N	O	S	0	0	0
			4021	2532	713	736	40			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	543	GLY	-	expression tag	UNP Q59HG2
A	544	SER	-	expression tag	UNP Q59HG2
A	545	ALA	-	expression tag	UNP Q59HG2
A	546	SER	-	expression tag	UNP Q59HG2
A	547	GLY	-	expression tag	UNP Q59HG2
A	548	LEU	-	expression tag	UNP Q59HG2
A	549	VAL	-	expression tag	UNP Q59HG2
A	550	PRO	-	expression tag	UNP Q59HG2
A	551	ARG	-	expression tag	UNP Q59HG2

- Molecule 2 is a protein called Angiopoietin-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	217	Total	C	N	O	S	0	0	0
			1754	1115	304	319	16			

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	ALA	-	expression tag	UNP Q15389
B	-3	GLU	-	expression tag	UNP Q15389
B	-2	LEU	-	expression tag	UNP Q15389
B	-1	ALA	-	expression tag	UNP Q15389
B	0	SER	-	expression tag	UNP Q15389
B	220	GLY	-	expression tag	UNP Q15389
B	221	SER	-	expression tag	UNP Q15389

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| Chain	Residue	Modelled	Actual	Comment	Reference
B	222	LEU	-	expression tag	UNP Q15389
B	223	VAL	-	expression tag	UNP Q15389
B	224	PRO	-	expression tag	UNP Q15389
B	225	ARG	-	expression tag	UNP Q15389

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: TEK tyrosine kinase variant
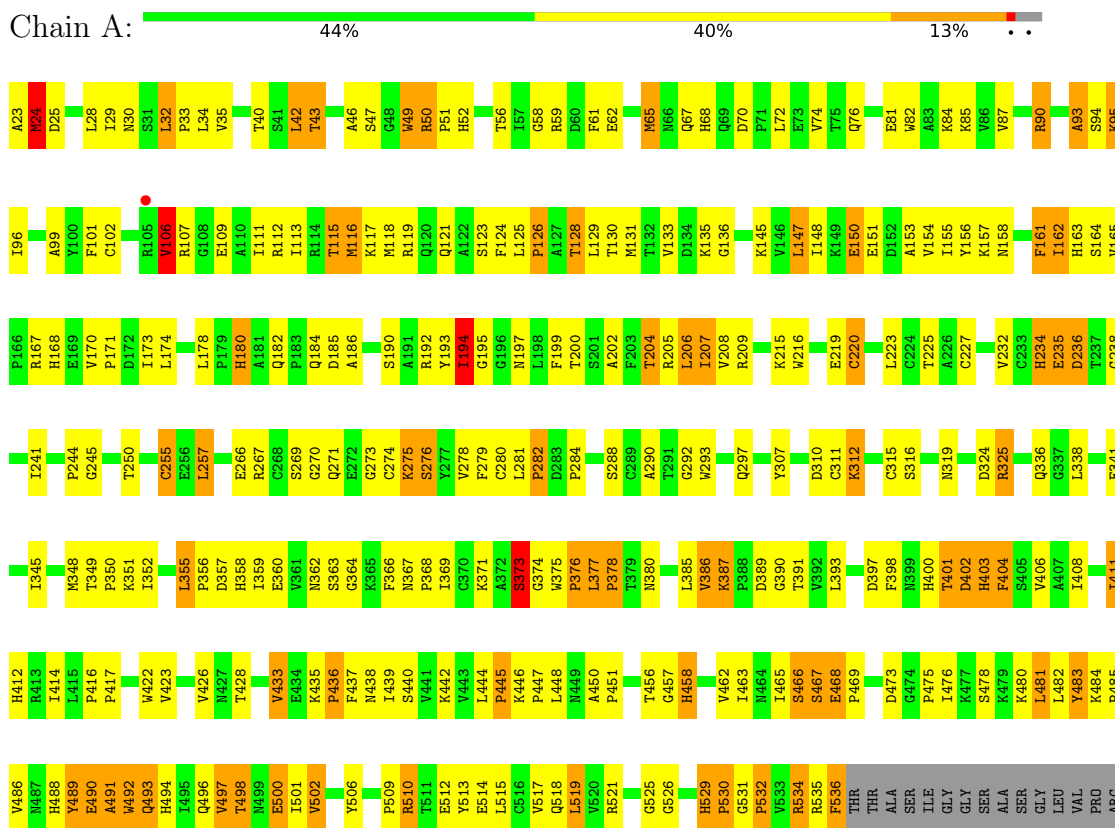
- Molecule 2: Angiopoietin-1
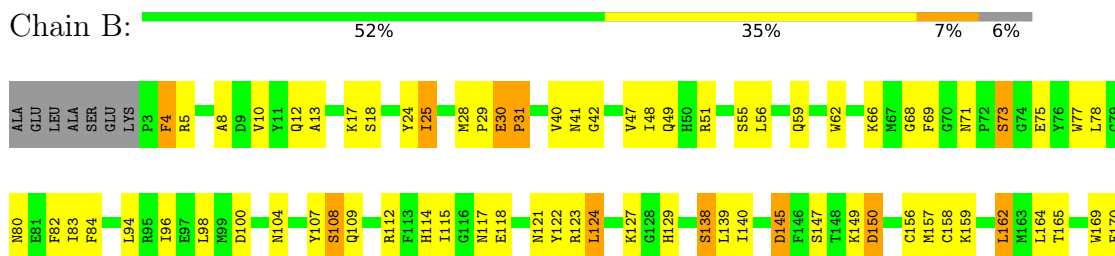
4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 41 2 2	Depositor
Cell constants a, b, c, α, β, γ	189.53Å 189.53Å 334.87Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.01 – 4.51 30.01 – 4.51	Depositor EDS
% Data completeness (in resolution range)	93.1 (30.01-4.51) 91.9 (30.01-4.51)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.14	Depositor
$< I/\sigma(I) >$ [1]	4.48 (at 4.42Å)	Xtriage
Refinement program	PHENIX (phenix.refine)	Depositor
R, R_{free}	0.248 , 0.288 0.248 , 0.288	Depositor DCC
R_{free} test set	542 reflections (3.00%)	wwPDB-VP
Wilson B-factor (Å^2)	141.8	Xtriage
Anisotropy	0.393	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.27 , 178.2	EDS
L-test for twinning[2]	$< |L| > = 0.46, < L^2 > = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.87	EDS
Total number of atoms	5775	wwPDB-VP
Average B, all atoms (Å^2)	229.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.91% 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)

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	0.56	0/4126	0.79	2/5600 (0.0%)
2	B	0.49	0/1806	0.68	0/2433
All	All	0.54	0/5932	0.76	2/8033 (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	A	0	1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	500	GLU	N-CA-C	5.41	125.62	111.00
1	A	178	LEU	CA-CB-CG	5.06	126.94	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	467	SER	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	A	4021	0	3909	182	0
2	B	1754	0	1642	57	0
All	All	5775	0	5551	235	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 21.

The worst 5 of 235 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:A:373:SER:OG	1:A:374:GLY:N	2.04	0.89
1:A:463:ILE:HD11	1:A:481:LEU:HD11	1.58	0.86
2:B:156:CYS:HB2	2:B:172:ALA:HA	1.57	0.86
1:A:450:ALA:HA	1:A:530:PRO:HB3	1.60	0.83
2:B:59:GLN:NE2	2:B:181:MET:SD	2.52	0.83

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	512/529 (97%)	396 (77%)	71 (14%)	45 (9%)	1	12
2	B	215/230 (94%)	179 (83%)	26 (12%)	10 (5%)	2	24
All	All	727/759 (96%)	575 (79%)	97 (13%)	55 (8%)	1	15

5 of 55 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	51	PRO
1	A	106	VAL
1	A	111	ILE

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Mol	Chain	Res	Type
1	A	121	GLN
1	A	194	ILE

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	446/457 (98%)	363 (81%)	83 (19%)	1	10
2	B	182/192 (95%)	161 (88%)	21 (12%)	5	23
All	All	628/649 (97%)	524 (83%)	104 (17%)	2	14

5 of 104 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	363	SER
1	A	481	LEU
2	B	192	LEU
1	A	373	SER
1	A	402	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	109	GLN
2	B	142	HIS
1	A	438	ASN
1	A	449	ASN
2	B	59	GLN

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 ⓘ

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	514/529 (97%)	-0.28	1 (0%)	95	93	184, 225, 272, 309	0
2	B	217/230 (94%)	-0.22	1 (0%)	91	85	194, 228, 268, 281	1 (0%)
All	All	731/759 (96%)	-0.26	2 (0%)	94	90	184, 226, 270, 309	1 (0%)

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	105	ARG	2.3
2	B	219	PHE	2.1

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.