



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 09:18 AM UTC

PDB ID : 5M3X / pdb_00005m3x
Title : Crystal structure of human angiotensin I-deleted angiotensinogen
Authors : Yan, Y.; Read, R.J.
Deposited on : 2016-10-17
Resolution : 2.63 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

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

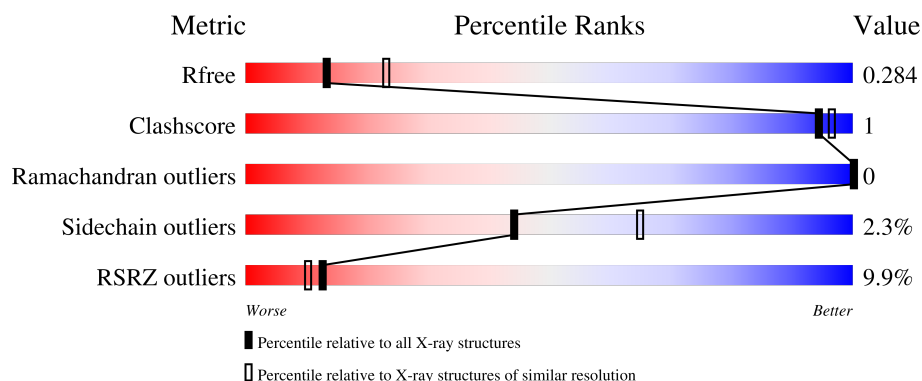
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.63 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}	180053	2053 (2.66-2.62)
Clashscore	190562	2097 (2.66-2.62)
Ramachandran outliers	187476	2066 (2.66-2.62)
Sidechain outliers	187428	2066 (2.66-2.62)
RSRZ outliers	180081	2052 (2.66-2.62)

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 $\leq 5\%$. 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	448	6% 81% • 15%
1	B	448	10% 81% 6% 14%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 11847 atoms, of which 5924 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 Angiotensinogen.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	383	Total	C	H	N	O	S	0	0	0
			5853	1894	2923	478	550	8			
1	B	387	Total	C	H	N	O	S	0	0	0
			5987	1928	3001	493	556	9			

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	137	GLN	ASN	engineered mutation	UNP P01019
A	232	SER	CYS	engineered mutation	UNP P01019
A	271	GLN	ASN	engineered mutation	UNP P01019
A	295	GLN	ASN	engineered mutation	UNP P01019
A	308	SER	CYS	engineered mutation	UNP P01019
A	453	HIS	-	expression tag	UNP P01019
A	454	HIS	-	expression tag	UNP P01019
A	455	HIS	-	expression tag	UNP P01019
A	456	HIS	-	expression tag	UNP P01019
A	457	HIS	-	expression tag	UNP P01019
A	458	HIS	-	expression tag	UNP P01019
B	137	GLN	ASN	engineered mutation	UNP P01019
B	232	SER	CYS	engineered mutation	UNP P01019
B	271	GLN	ASN	engineered mutation	UNP P01019
B	295	GLN	ASN	engineered mutation	UNP P01019
B	308	SER	CYS	engineered mutation	UNP P01019
B	453	HIS	-	expression tag	UNP P01019
B	454	HIS	-	expression tag	UNP P01019
B	455	HIS	-	expression tag	UNP P01019
B	456	HIS	-	expression tag	UNP P01019
B	457	HIS	-	expression tag	UNP P01019
B	458	HIS	-	expression tag	UNP P01019

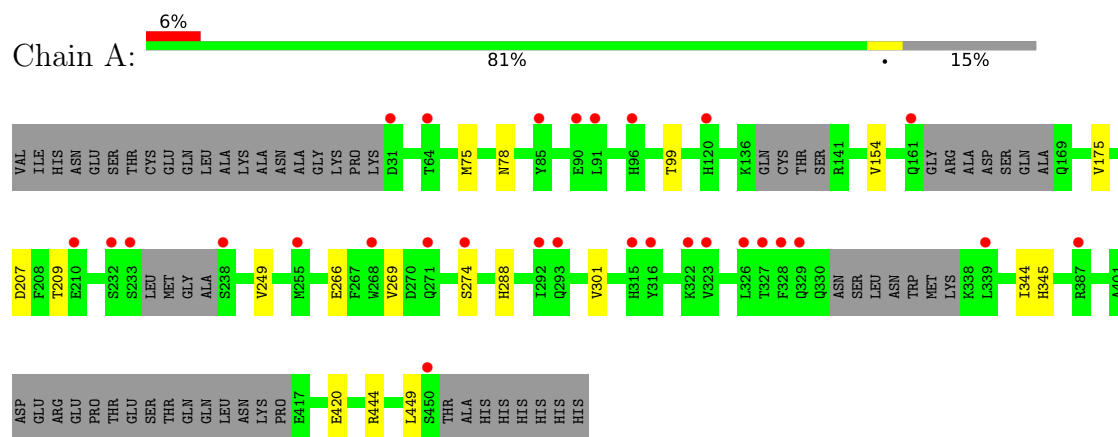
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total 3	O 3	0	0
2	B	4	Total 4	O 4	0	0

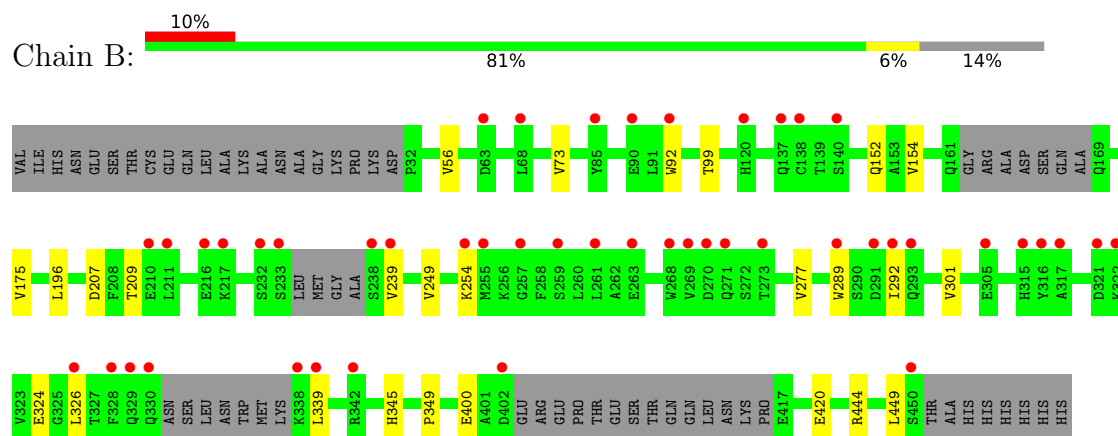
3 Residue-property plots [i](#)

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: Angiotensinogen



• Molecule 1: Angiotensinogen



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	86.30Å 41.04Å 129.95Å 90.00° 107.82° 90.00°	Depositor
Resolution (Å)	43.44 – 2.63 43.44 – 2.63	Depositor EDS
% Data completeness (in resolution range)	99.2 (43.44-2.63) 99.2 (43.44-2.63)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.43 (at 2.61Å)	Xtriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, R_{free}	0.242 , 0.282 0.247 , 0.284	Depositor DCC
R_{free} test set	1262 reflections (4.81%)	wwPDB-VP
Wilson B-factor (Å ²)	41.6	Xtriage
Anisotropy	0.616	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 39.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.006 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	11847	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.99% 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](#)

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	0.10	0/2990	0.29	0/4074
1	B	0.10	0/3049	0.31	0/4150
All	All	0.10	0/6039	0.30	0/8224

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	2930	2923	2921	6	0
1	B	2986	3001	3000	9	0
2	A	3	0	0	0	0
2	B	4	0	0	0	0
All	All	5923	5924	5921	15	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.

All (15) 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:B:254:LYS:NZ	1:B:400:GLU:OE2	2.20	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:152:GLN:NE2	1:B:196:LEU:O	2.40	0.55
1:B:92:TRP:NE1	1:B:324:GLU:OE1	2.38	0.54
1:B:99:THR:OG1	1:B:444:ARG:O	2.25	0.53
1:B:277:VAL:HG11	1:B:349:PRO:HB3	1.93	0.51
1:A:99:THR:OG1	1:A:444:ARG:O	2.33	0.47
1:B:207:ASP:OD1	1:B:209:THR:OG1	2.32	0.45
1:B:209:THR:HA	1:B:239:VAL:HG13	1.99	0.45
1:A:75:MET:HE3	1:A:78:ASN:HD22	1.83	0.43
1:A:288:HIS:HB2	1:A:344:ILE:HD11	2.00	0.42
1:A:345:HIS:ND1	1:A:420:GLU:OE2	2.51	0.42
1:B:345:HIS:ND1	1:B:420:GLU:OE1	2.39	0.41
1:A:207:ASP:OD1	1:A:209:THR:OG1	2.36	0.41
1:A:266:GLU:HG3	1:A:274:SER:HB2	2.03	0.41
1:B:289:TRP:HB3	1:B:339:LEU:HD23	2.03	0.40

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	371/448 (83%)	362 (98%)	9 (2%)	0	100	100
1	B	377/448 (84%)	366 (97%)	11 (3%)	0	100	100
All	All	748/896 (84%)	728 (97%)	20 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	318/381 (84%)	312 (98%)	6 (2%)	50	70
1	B	327/381 (86%)	318 (97%)	9 (3%)	38	58
All	All	645/762 (85%)	630 (98%)	15 (2%)	44	65

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	154	VAL
1	A	175	VAL
1	A	249	VAL
1	A	269	VAL
1	A	301	VAL
1	A	449	LEU
1	B	56	VAL
1	B	73	VAL
1	B	154	VAL
1	B	175	VAL
1	B	249	VAL
1	B	292	ILE
1	B	301	VAL
1	B	326	LEU
1	B	449	LEU

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

Mol	Chain	Res	Type
1	A	120	HIS
1	A	313	GLN
1	A	354	GLN
1	B	354	GLN

5.3.3 RNA ⓘ

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 oligosaccharides 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	383/448 (85%)	0.61	29 (7%) 20 16	24, 42, 79, 118	0
1	B	387/448 (86%)	0.81	47 (12%) 8 7	26, 45, 82, 113	0
All	All	770/896 (85%)	0.71	76 (9%) 13 10	24, 44, 81, 118	0

All (76) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	238	SER	4.6
1	A	233	SER	4.5
1	B	316	TYR	4.4
1	A	271	GLN	4.0
1	A	238	SER	3.9
1	A	327	THR	3.8
1	B	90	GLU	3.8
1	B	321	ASP	3.8
1	A	315	HIS	3.6
1	B	330	GLN	3.6
1	B	233	SER	3.5
1	B	268	TRP	3.3
1	B	138	CYS	3.3
1	A	316	TYR	3.3
1	A	293	GLN	3.2
1	B	63	ASP	3.2
1	B	326	LEU	3.2
1	A	31	ASP	3.1
1	B	137	GLN	3.1
1	B	293	GLN	3.0
1	B	120	HIS	3.0
1	B	263	GLU	2.9
1	A	328	PHE	2.8
1	A	90	GLU	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	271	GLN	2.8
1	B	254	LYS	2.8
1	B	289	TRP	2.7
1	A	232	SER	2.7
1	A	450	SER	2.7
1	B	315	HIS	2.7
1	B	273	THR	2.7
1	A	96	HIS	2.6
1	B	322	LYS	2.6
1	B	140	SER	2.6
1	B	291	ASP	2.6
1	B	269	VAL	2.6
1	A	161	GLN	2.6
1	A	326	LEU	2.5
1	A	210	GLU	2.5
1	B	210	GLU	2.5
1	B	257	GLY	2.5
1	A	339	LEU	2.5
1	B	402	ASP	2.5
1	A	292	ILE	2.4
1	A	91	LEU	2.4
1	B	339	LEU	2.4
1	B	329	GLN	2.4
1	B	92	TRP	2.4
1	B	450	SER	2.3
1	A	268	TRP	2.3
1	B	317	ALA	2.3
1	B	328	PHE	2.3
1	B	270	ASP	2.3
1	B	292	ILE	2.3
1	B	217	LYS	2.3
1	B	255	MET	2.3
1	B	305	GLU	2.3
1	B	338	LYS	2.3
1	A	323	VAL	2.3
1	B	68	LEU	2.3
1	B	261	LEU	2.3
1	A	329	GLN	2.2
1	A	274	SER	2.2
1	A	322	LYS	2.2
1	B	239	VAL	2.2
1	B	85	TYR	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	255	MET	2.2
1	B	259	SER	2.1
1	A	387	ARG	2.1
1	A	120	HIS	2.1
1	B	342	ARG	2.0
1	B	232	SER	2.0
1	B	211	LEU	2.0
1	B	216	GLU	2.0
1	A	64	THR	2.0
1	A	85	TYR	2.0

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 oligosaccharides 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.