



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 06:50 PM UTC

PDB ID : 1IHS / pdb_00001ihs
Title : CRYSTAL STRUCTURE OF THE COMPLEX OF HUMAN ALPHA-THROMBIN AND NON-HYDROLYZABLE BIFUNCTIONAL INHIBITORS, HIRUTONIN-2 AND HIRUTONIN-6
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Deposited on : 1993-08-04
Resolution : 2.00 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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

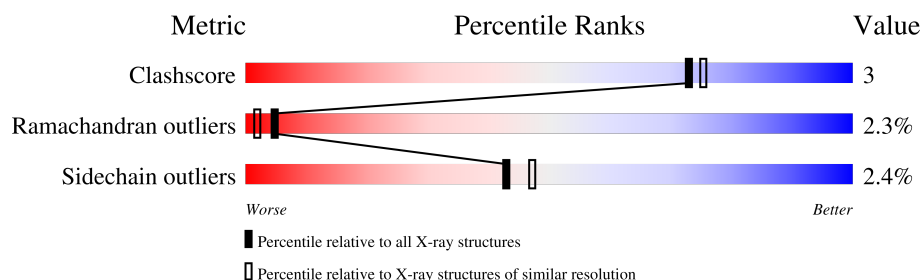
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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))
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (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 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	L	36	
2	H	259	
3	I	21	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 2561 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 ALPHA-THROMBIN (SMALL SUBUNIT).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	30	Total	C	N	O	S	0	0	1
			228	141	39	47	1			

- Molecule 2 is a protein called ALPHA-THROMBIN (LARGE SUBUNIT).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	259	Total	C	N	O	S	0	0	1
			2035	1295	364	362	14			

- Molecule 3 is a protein called HIRUTONIN.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	I	21	Total	C	N	O	0	0	1
			152	99	24	29			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	0	ACE	-	insertion	UNP P28504
I	1	DPN	-	insertion	UNP P28504
I	2	PRO	-	insertion	UNP P28504
I	3	OPR	-	insertion	UNP P28504

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	L	13	Total	O	0	0
			13	13		
4	H	130	Total	O	0	0
			130	130		
4	I	3	Total	O	0	0
			3	3		

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. 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.

Note EDS was not executed.

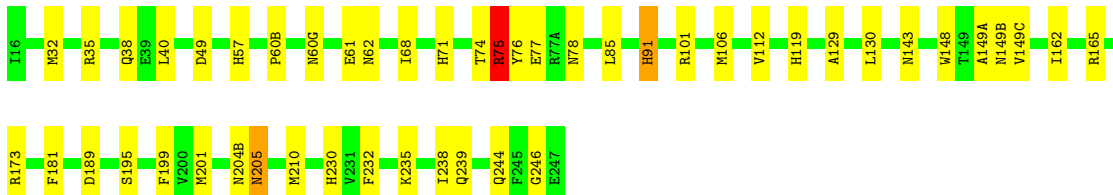
- Molecule 1: ALPHA-THROMBIN (SMALL SUBUNIT)

Chain L: 



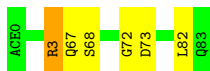
- Molecule 2: ALPHA-THROMBIN (LARGE SUBUNIT)

Chain H: 



- Molecule 3: HIRUTONIN

Chain I: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	71.00Å 72.10Å 73.10Å 90.00° 100.90° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.00	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.169 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2561	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: OPR, ACE, DPN

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	L	0.93	0/230	1.41	3/306 (1.0%)
2	H	0.95	6/2088 (0.3%)	1.56	25/2824 (0.9%)
3	I	1.01	1/125 (0.8%)	1.63	1/169 (0.6%)
All	All	0.95	7/2443 (0.3%)	1.55	29/3299 (0.9%)

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
2	H	0	1
3	I	0	2
All	All	0	3

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	I	82	LEU	C-N	-7.53	1.22	1.33
2	H	57	HIS	CD2-NE2	-7.22	1.29	1.37
2	H	91	HIS	CD2-NE2	-6.99	1.30	1.37
2	H	246	GLY	C-N	-6.86	1.23	1.33
2	H	230	HIS	CD2-NE2	-6.64	1.30	1.37
2	H	71	HIS	CD2-NE2	-6.22	1.31	1.37
2	H	119	HIS	CD2-NE2	-5.39	1.31	1.37

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	205	ASN	CA-CB-CG	-8.14	104.46	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	49	ASP	CA-CB-CG	7.85	120.45	112.60
3	I	73	ASP	CA-CB-CG	7.59	120.19	112.60
2	H	230	HIS	CB-CG-CD2	-7.43	121.53	131.20
2	H	205	ASN	N-CA-C	7.27	121.73	112.86
2	H	143	ASN	OD1-CG-ND2	-6.99	115.61	122.60
2	H	195	SER	CB-CA-C	-6.65	97.87	109.64
1	L	4	ARG	CA-C-N	6.26	125.75	119.24
1	L	4	ARG	C-N-CA	6.26	125.75	119.24
1	L	14(A)	LYS	CA-CB-CG	-5.99	102.12	114.10
2	H	181	PHE	CA-CB-CG	5.87	119.67	113.80
2	H	143	ASN	CB-CG-ND2	5.78	125.06	116.40
2	H	91	HIS	CB-CG-CD2	-5.74	123.74	131.20
2	H	244	GLN	OE1-CD-NE2	-5.74	116.86	122.60
2	H	74	THR	N-CA-C	5.70	120.51	113.50
2	H	78	ASN	OD1-CG-ND2	-5.65	116.95	122.60
2	H	165	ARG	CA-C-N	5.60	125.06	119.24
2	H	165	ARG	C-N-CA	5.60	125.06	119.24
2	H	204(B)	ASN	OD1-CG-ND2	-5.54	117.06	122.60
2	H	199	PHE	N-CA-C	-5.53	99.51	108.52
2	H	61	GLU	CA-CB-CG	5.50	125.09	114.10
2	H	60(B)	PRO	N-CA-C	5.42	117.31	110.70
2	H	75	ARG	NE-CZ-NH2	5.34	124.01	119.20
2	H	239	GLN	OE1-CD-NE2	-5.24	117.36	122.60
2	H	173	ARG	N-CA-C	-5.21	106.97	113.38
2	H	60(G)	ASN	OD1-CG-ND2	-5.16	117.44	122.60
2	H	62	ASN	OD1-CG-ND2	-5.15	117.45	122.60
2	H	232	PHE	CA-CB-CG	-5.12	108.68	113.80
2	H	189	ASP	CA-CB-CG	5.05	117.65	112.60

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	H	75	ARG	Sidechain
3	I	3	OPR	Peptide,Mainchain

5.2 Too-close contacts

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	L	228	0	220	0	0
2	H	2035	0	1976	15	0
3	I	152	0	120	0	0
4	H	130	0	0	0	0
4	I	3	0	0	0	0
4	L	13	0	0	0	0
All	All	2561	0	2316	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 3.

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)
2:H:75:ARG:HH11	2:H:77:GLU:HG2	1.40	0.87
2:H:32:MET:HG3	2:H:40:LEU:HD13	1.63	0.80
2:H:75:ARG:HD2	2:H:77:GLU:HG2	1.63	0.79
2:H:75:ARG:HD2	2:H:77:GLU:CG	2.25	0.66
2:H:130:LEU:HD23	2:H:162:ILE:HD13	1.80	0.62
2:H:75:ARG:HG2	2:H:76:TYR:N	2.23	0.53
2:H:35:ARG:O	2:H:38:GLN:HA	2.11	0.49
2:H:91:HIS:CE1	2:H:101:ARG:HD3	2.51	0.45
2:H:129:ALA:HA	2:H:210:MET:HE1	2.00	0.44
2:H:201:MET:SD	2:H:210:MET:HG3	2.58	0.43
2:H:85:LEU:HD13	2:H:106:MET:HE2	2.01	0.42
2:H:235:LYS:HA	2:H:238:ILE:HD12	2.01	0.41
2:H:68:ILE:HD12	2:H:112:VAL:HG11	2.03	0.41
2:H:85:LEU:CD1	2:H:106:MET:HE2	2.51	0.40
2:H:75:ARG:HG2	2:H:76:TYR:C	2.45	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	L	28/36 (78%)	26 (93%)	1 (4%)	1 (4%)	2	1
2	H	257/259 (99%)	245 (95%)	8 (3%)	4 (2%)	7	3
3	I	17/21 (81%)	10 (59%)	5 (29%)	2 (12%)	0	0
All	All	302/316 (96%)	281 (93%)	14 (5%)	7 (2%)	5	2

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	L	1(C)	GLU
2	H	148	TRP
2	H	149(B)	ASN
3	I	68	SER
2	H	149(C)	VAL
2	H	149(A)	ALA
3	I	72	GLY

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	
2	H	73/225 (32%)	72 (99%)	1 (1%)	59	66
3	I	10/17 (59%)	9 (90%)	1 (10%)	7	4
All	All	83/242 (34%)	81 (98%)	2 (2%)	43	47

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	H	205	ASN
3	I	67	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	H	204(B)	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

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	$\# Z > 2$
3	OPR	I	3	3	12,14,15	1.12	2 (16%)	11,16,18	1.55	2 (18%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	OPR	I	3	3	-	1/14/15/16	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	I	3	OPR	O1-C3	2.79	1.26	1.21
3	I	3	OPR	C2-C3	2.26	1.54	1.51

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	I	3	OPR	CG-CD-NE	-2.81	104.32	112.20
3	I	3	OPR	O1-C3-C2	-2.46	117.52	121.68

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	I	3	OPR	C3-CA-CB-CG

There are no ring outliers.

No monomer is involved in short contacts.

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.