



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 10:34 PM UTC

PDB ID : 6XZ6 / pdb_00006xz6
Title : Structure of the trypanosome brucei factor H receptor bound to domain D5 of bovine factor H
Authors : Macleod, O.J.S.; Carrington, M.; Higgins, M.K.
Deposited on : 2020-02-02
Resolution : 2.70 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

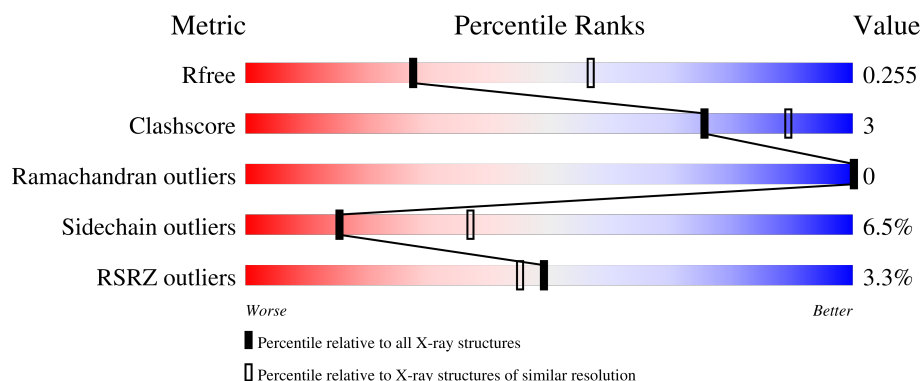
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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 $\leq 5\%$. 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	229	4% 81% 11% 7%
1	C	229	% 81% 11% 7%
2	B	61	5% 74% 23% .
2	D	61	7% 75% 20% ..

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4371 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 GARP domain-containing protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	213	Total	C	N	O	S	0	0	0
			1615	986	289	336	4			
1	C	213	Total	C	N	O	S	0	0	0
			1615	986	289	336	4			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	23	GLY	-	expression tag	UNP Q57Z47
A	24	PRO	-	expression tag	UNP Q57Z47
C	23	GLY	-	expression tag	UNP Q57Z47
C	24	PRO	-	expression tag	UNP Q57Z47

- Molecule 2 is a protein called Complement factor H.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	59	Total	C	N	O	S	0	0	0
			478	303	85	86	4			
2	D	59	Total	C	N	O	S	0	0	0
			478	303	85	86	4			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	263	GLY	-	expression tag	UNP Q28085
D	263	GLY	-	expression tag	UNP Q28085

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	89	Total	O	0	0
			89	89		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	20	Total 20	O 20	0	0
3	C	62	Total 62	O 62	0	0
3	D	14	Total 14	O 14	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	160.50Å 66.06Å 71.02Å 90.00° 94.44° 90.00°	Depositor
Resolution (Å)	27.77 – 2.70 27.77 – 2.70	Depositor EDS
% Data completeness (in resolution range)	98.9 (27.77-2.70) 98.7 (27.77-2.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.97 (at 2.72Å)	Xtriage
Refinement program	BUSTER 2.10.3	Depositor
R, R_{free}	0.192 , 0.249 0.195 , 0.255	Depositor DCC
R_{free} test set	1049 reflections (5.16%)	wwPDB-VP
Wilson B-factor (Å ²)	34.5	Xtriage
Anisotropy	0.367	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 63.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	4371	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.18% 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

5.1 Standard geometry

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	0.87	0/1629	1.56	8/2189 (0.4%)
1	C	0.89	0/1629	1.61	13/2189 (0.6%)
2	B	0.86	0/493	1.15	2/670 (0.3%)
2	D	0.84	0/493	1.10	2/670 (0.3%)
All	All	0.87	0/4244	1.49	25/5718 (0.4%)

There are no bond length outliers.

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	26	ASP	N-CA-C	-10.63	99.71	112.89
1	A	25	ASN	CA-CB-CG	9.76	122.36	112.60
1	C	173	LEU	CA-C-N	6.56	128.97	120.44
1	C	173	LEU	C-N-CA	6.56	128.97	120.44
2	D	321	ALA	CA-C-N	6.32	133.08	121.70
2	D	321	ALA	C-N-CA	6.32	133.08	121.70
1	C	26	ASP	CA-C-N	6.04	130.90	120.58
1	C	26	ASP	C-N-CA	6.04	130.90	120.58
1	A	38	LEU	CA-C-N	5.51	127.66	120.28
1	A	38	LEU	C-N-CA	5.51	127.66	120.28
1	C	207	GLN	CB-CG-CD	5.39	121.77	112.60
1	C	50	LEU	CA-C-N	5.39	127.45	120.44
1	C	50	LEU	C-N-CA	5.39	127.45	120.44
1	C	150	ASN	CA-CB-CG	5.37	117.97	112.60
1	C	68	LYS	CA-C-N	5.30	127.64	120.38
1	C	68	LYS	C-N-CA	5.30	127.64	120.38
1	A	50	LEU	CA-C-N	5.22	127.22	120.44
1	A	50	LEU	C-N-CA	5.22	127.22	120.44
1	C	222	ASP	CA-CB-CG	5.21	117.81	112.60
1	A	29	GLU	CA-C-N	5.11	127.08	120.44
1	A	29	GLU	C-N-CA	5.11	127.08	120.44
1	C	71	LYS	CA-C-N	5.04	127.45	120.29
1	C	71	LYS	C-N-CA	5.04	127.45	120.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	301	GLU	CA-C-N	5.03	127.65	122.27
2	B	301	GLU	C-N-CA	5.03	127.65	122.27

There are no chirality outliers.

There are no planarity outliers.

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	A	1615	0	1577	11	0
1	C	1615	0	1577	8	0
2	B	478	0	460	5	0
2	D	478	0	460	5	0
3	A	89	0	0	0	0
3	B	20	0	0	0	0
3	C	62	0	0	0	0
3	D	14	0	0	0	0
All	All	4371	0	4074	25	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 (25) 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:C:150:ASN:HB2	1:C:153:ILE:HD12	1.87	0.55
1:A:31:GLU:HG3	2:B:279:PRO:HB3	1.88	0.54
1:C:209:ALA:O	1:C:213:THR:HG23	2.08	0.53
1:A:150:ASN:HB2	1:A:153:ILE:HD12	1.93	0.51
1:A:132:GLU:HA	2:B:296:LYS:HD2	1.90	0.51
1:C:115:ALA:HB3	1:C:213:THR:HG22	1.94	0.49
1:A:64:GLU:HG3	1:C:64:GLU:OE1	2.13	0.49
2:B:292:TYR:O	2:B:305:THR:HB	2.11	0.49
1:A:25:ASN:HB2	1:A:27:ASN:H	1.79	0.48
1:C:31:GLU:HG3	2:D:279:PRO:HB3	1.96	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:81:GLU:OE2	1:A:99:ARG:HD2	2.16	0.46
2:B:272:ILE:HG12	2:B:318:PRO:HB2	1.98	0.45
1:C:115:ALA:CB	1:C:213:THR:HG22	2.47	0.45
2:D:272:ILE:HG12	2:D:318:PRO:HB2	1.98	0.45
2:D:301:GLU:HG3	2:D:319:ARG:HD3	1.99	0.44
1:A:25:ASN:HD22	1:A:25:ASN:N	2.16	0.44
2:D:321:ALA:O	2:D:322:TRP:HB2	2.18	0.43
1:C:133:TYR:OH	1:C:195:GLU:HG3	2.19	0.42
1:A:99:ARG:O	1:A:103:THR:HG23	2.19	0.42
1:A:80:ALA:HA	1:A:234:PHE:CD2	2.56	0.41
2:B:265:ILE:HD11	2:B:311:ARG:CZ	2.50	0.41
2:D:265:ILE:HD11	2:D:311:ARG:CZ	2.51	0.41
1:A:133:TYR:OH	1:A:195:GLU:HG3	2.21	0.41
1:C:80:ALA:HA	1:C:234:PHE:CD2	2.56	0.41
1:A:226:GLU:O	1:A:230:GLU:HG2	2.22	0.40

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	211/229 (92%)	209 (99%)	2 (1%)	0	100	100
1	C	211/229 (92%)	210 (100%)	1 (0%)	0	100	100
2	B	57/61 (93%)	57 (100%)	0	0	100	100
2	D	57/61 (93%)	56 (98%)	1 (2%)	0	100	100
All	All	536/580 (92%)	532 (99%)	4 (1%)	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	155/169 (92%)	147 (95%)	8 (5%)	21	47
1	C	155/169 (92%)	145 (94%)	10 (6%)	15	37
2	B	52/53 (98%)	47 (90%)	5 (10%)	8	20
2	D	52/53 (98%)	48 (92%)	4 (8%)	12	30
All	All	414/444 (93%)	387 (94%)	27 (6%)	15	37

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	ASN
1	A	65	GLU
1	A	75	LYS
1	A	109	SER
1	A	198	GLU
1	A	213	THR
1	A	229	GLU
1	A	237	ILE
2	B	264	GLU
2	B	276	VAL
2	B	278	ARG
2	B	283	LYS
2	B	295	LYS
1	C	26	ASP
1	C	32	LEU
1	C	72	GLU
1	C	109	SER
1	C	117	MET
1	C	151	GLU
1	C	174	THR
1	C	181	ARG
1	C	198	GLU
1	C	202	LYS
2	D	266	THR

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Mol	Chain	Res	Type
2	D	278	ARG
2	D	283	LYS
2	D	302	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	147	HIS
1	C	92	GLN
1	C	179	ASN

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 oligosaccharides 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(Å ²)	Q<0.9
1	A	213/229 (93%)	0.02	9 (4%) 40 37	17, 32, 95, 130	0
1	C	213/229 (93%)	-0.11	2 (0%) 81 80	15, 37, 66, 86	0
2	B	59/61 (96%)	0.41	3 (5%) 33 29	18, 48, 89, 109	0
2	D	59/61 (96%)	0.49	4 (6%) 23 20	18, 53, 102, 118	0
All	All	544/580 (93%)	0.06	18 (3%) 49 45	15, 38, 85, 130	0

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	25	ASN	4.7
1	A	237	ILE	4.6
2	D	322	TRP	4.0
2	D	302	ILE	3.5
2	B	302	ILE	3.5
2	B	322	TRP	3.3
1	C	237	ILE	3.2
1	A	232	ALA	3.1
2	B	304	GLY	2.9
2	D	311	ARG	2.7
1	C	150	ASN	2.7
2	D	265	ILE	2.7
1	A	83	GLY	2.7
1	A	90	GLU	2.5
1	A	235	PRO	2.5
1	A	88	THR	2.2
1	A	86	GLY	2.1
1	A	84	ALA	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.