



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:29 PM UTC

PDB ID : 1H6F / pdb_00001h6f
Title : Human TBX3, a transcription factor responsible for ulnar-mammary syndrome, bound to a palindromic DNA site
Authors : Coll, M.; Muller, C.W.
Deposited on : 2001-06-13
Resolution : 1.70 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) : **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

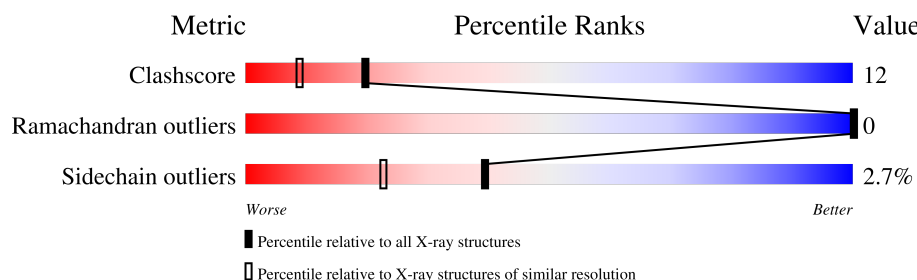
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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))
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	193	75% 19% • 5%
1	B	193	76% 19% • •
2	C	24	63% 29% 8%
2	D	24	67% 21% 12%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4655 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 T-BOX TRANSCRIPTION FACTOR TBX3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	184	Total	C	N	O	S	48	0	0
			1524	982	269	263	10			
1	B	186	Total	C	N	O	S	86	0	0
			1541	992	272	267	10			

- Molecule 2 is a DNA chain called 5'-D(*TP*AP*AP*TP*TP*TP*CP*AP*CP*AP*CP*CP*TP* AP*GP*GP*TP*GP*TP*GP*AP*AP*AP*T)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	24	Total	C	N	O	P	11	0	0
			489	236	88	142	23			
2	D	24	Total	C	N	O	P	15	0	0
			489	236	88	142	23			

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	214	Total	O	0	0
			214	214		
4	B	188	Total	O	0	0
			188	188		
4	C	94	Total	O	0	0
			94	94		
4	D	115	Total	O	0	0
			115	115		

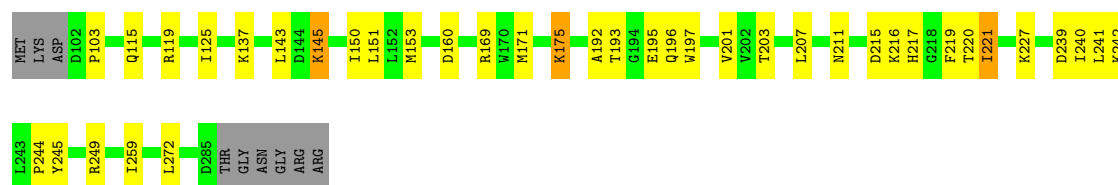
3 Residue-property plots [i](#)

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.

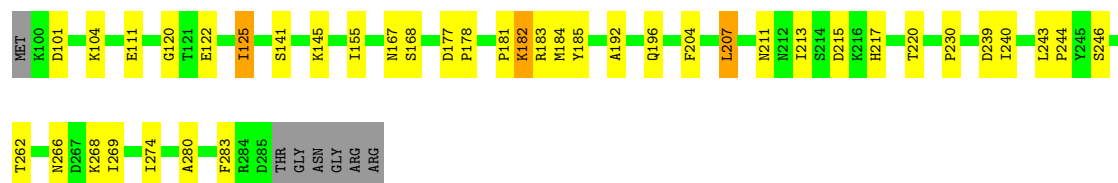
• Molecule 1: T-BOX TRANSCRIPTION FACTOR TBX3

Chain A: 



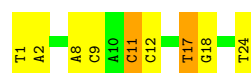
• Molecule 1: T-BOX TRANSCRIPTION FACTOR TBX3

Chain B: 



• Molecule 2: 5'-D(*TP*AP*AP*TP*TP*TP*CP*AP*CP*AP*CP*CP*TP* AP*GP*GP*TP*GP*TP*GP*AP*AP*AP*T)-3'

Chain C: 



• Molecule 2: 5'-D(*TP*AP*AP*TP*TP*TP*CP*AP*CP*AP*CP*CP*TP* AP*GP*GP*TP*GP*TP*GP*AP*AP*AP*T)-3'

Chain D: 



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	39.04Å 104.91Å 125.31Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.70	Depositor
% Data completeness (in resolution range)	96.6 (20.00-1.70)	Depositor
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.201 , 0.239	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4655	wwPDB-VP
Average B, all atoms (Å ²)	24.0	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: MG

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	0.78	0/1567	1.06	3/2111 (0.1%)
1	B	0.81	0/1584	1.05	5/2133 (0.2%)
2	C	0.47	0/548	1.02	2/844 (0.2%)
2	D	0.48	0/548	0.95	2/844 (0.2%)
All	All	0.73	0/4247	1.04	12/5932 (0.2%)

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	C	0	1
2	D	0	2
All	All	0	3

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	24	DT	C4'-C3'-O3'	6.11	119.16	110.00
2	D	23	DA	C5'-C4'-O4'	-5.98	100.43	109.40
1	B	181	PRO	N-CA-C	-5.73	102.46	111.34
2	D	24	DT	C5'-C4'-O4'	-5.71	100.83	109.40
1	A	201	VAL	N-CA-C	-5.62	101.48	108.89
1	A	145	LYS	N-CA-C	5.56	118.06	111.33
1	B	145	LYS	N-CA-C	5.36	117.12	111.28
1	B	184	MET	N-CA-C	-5.36	100.44	108.96
1	A	249	ARG	N-CA-C	-5.31	100.08	108.73
2	C	11	DC	C5'-C4'-C3'	-5.29	106.97	114.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	101	ASP	N-CA-C	5.05	117.86	109.94
1	B	207	LEU	N-CA-C	-5.01	103.72	110.24

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	C	17	DT	Sidechain
2	D	17	DT	Sidechain
2	D	19	DT	Sidechain

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	1524	0	1529	33	0
1	B	1541	0	1546	34	0
2	C	489	0	274	11	0
2	D	489	0	274	8	0
3	A	1	0	0	0	0
4	A	214	0	0	3	0
4	B	188	0	0	4	0
4	C	94	0	0	1	0
4	D	115	0	0	1	0
All	All	4655	0	3623	84	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 12.

All (84) 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:274:ILE:HD11	2:C:18:DG:H4'	1.36	1.07
1:B:120:GLY:O	1:B:269:ILE:HD11	1.65	0.96
1:B:274:ILE:HD12	1:B:283:PHE:HB2	1.53	0.90

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:125:ILE:HD12	1:B:125:ILE:O	1.73	0.89
1:B:125:ILE:HD13	1:B:211:ASN:HB3	1.55	0.89
1:A:259:ILE:HD13	4:A:2027:HOH:O	1.80	0.82
1:A:169:ARG:HE	1:A:171:MET:HE2	1.45	0.81
1:B:155:ILE:HD13	1:B:230:PRO:HA	1.64	0.79
1:B:125:ILE:HD12	1:B:125:ILE:C	2.12	0.74
1:B:215:ASP:OD1	1:B:217:HIS:HD2	1.71	0.73
1:B:125:ILE:CD1	1:B:211:ASN:HB3	2.19	0.72
1:A:221:ILE:HD12	1:A:221:ILE:N	2.03	0.72
2:D:2:DA:H2''	2:D:3:DA:OP2	1.90	0.72
1:A:239:ASP:HB3	1:A:242:LYS:HG3	1.71	0.71
1:A:216:LYS:HD3	4:A:2155:HOH:O	1.93	0.67
1:B:274:ILE:HD13	1:B:280:ALA:HB1	1.75	0.67
1:B:125:ILE:HD13	1:B:211:ASN:CB	2.25	0.65
1:B:120:GLY:O	1:B:269:ILE:CD1	2.43	0.64
1:A:119:ARG:HD2	1:A:272:LEU:HD11	1.79	0.64
1:A:160:ASP:O	1:A:175:LYS:HD2	1.99	0.63
1:B:155:ILE:O	1:B:182:LYS:HG2	1.99	0.62
2:D:23:DA:H2''	2:D:24:DT:H5'	1.80	0.62
1:A:115:GLN:NE2	4:A:2020:HOH:O	2.33	0.61
1:B:192:ALA:HB1	1:B:196:GLN:HE21	1.67	0.59
2:C:1:DT:H2''	2:C:2:DA:O4'	2.03	0.58
1:B:269:ILE:CD1	4:B:2023:HOH:O	2.51	0.58
2:C:8:DA:H1'	2:C:9:DC:H5''	1.85	0.57
1:B:269:ILE:HD11	4:B:2023:HOH:O	2.04	0.57
1:A:219:PHE:O	1:A:221:ILE:CD1	2.53	0.56
1:A:215:ASP:OD1	1:A:217:HIS:HD2	1.89	0.56
2:C:17:DT:H2'	2:C:18:DG:C8	2.42	0.55
1:A:145:LYS:HB3	1:A:195:GLU:CG	2.36	0.55
1:A:145:LYS:HB3	1:A:195:GLU:HG3	1.87	0.55
1:B:182:LYS:HG3	1:B:220:THR:HG23	1.89	0.55
2:D:22:DA:H2''	2:D:23:DA:H5'	1.90	0.54
2:C:9:DC:H1'	4:C:2017:HOH:O	2.07	0.54
1:A:219:PHE:O	1:A:221:ILE:HD12	2.08	0.54
1:B:125:ILE:C	1:B:125:ILE:CD1	2.81	0.54
2:D:23:DA:H2''	2:D:24:DT:C5'	2.38	0.54
1:A:221:ILE:N	1:A:221:ILE:CD1	2.69	0.53
1:B:182:LYS:O	1:B:183:ARG:C	2.52	0.53
1:B:204:PHE:HA	4:B:2118:HOH:O	2.09	0.53
1:A:239:ASP:HB3	1:A:242:LYS:CG	2.36	0.52
1:B:111:GLU:H	1:B:111:GLU:CD	2.19	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:207:LEU:C	1:A:207:LEU:HD23	2.35	0.51
2:D:22:DA:N7	4:D:2083:HOH:O	2.35	0.51
2:D:24:DT:H5'	2:D:24:DT:C6	2.45	0.51
1:A:119:ARG:HD2	1:A:272:LEU:CD1	2.41	0.51
1:A:240:ILE:HG12	4:B:2144:HOH:O	2.12	0.50
1:B:274:ILE:HD11	2:C:18:DG:C4'	2.26	0.50
1:A:227:LYS:CE	1:A:259:ILE:HD11	2.42	0.49
1:B:104:LYS:HB3	1:B:141:SER:OG	2.12	0.49
1:A:151:LEU:HD22	1:A:197:TRP:CD2	2.47	0.49
2:D:17:DT:H2'	2:D:18:DG:C8	2.47	0.49
1:B:122:GLU:HG3	1:B:269:ILE:HD13	1.95	0.49
1:B:185:TYR:CD1	1:B:207:LEU:HD12	2.48	0.48
1:A:169:ARG:HE	1:A:171:MET:CE	2.23	0.47
1:B:177:ASP:HB3	1:B:178:PRO:HD2	1.97	0.46
1:A:192:ALA:HB1	1:A:196:GLN:HE21	1.81	0.46
1:A:227:LYS:HE3	1:A:259:ILE:HD11	1.99	0.45
2:D:24:DT:H5'	2:D:24:DT:H6	1.80	0.45
1:A:151:LEU:HD22	1:A:197:TRP:CE3	2.51	0.45
1:A:103:PRO:HB3	1:A:143:LEU:HD23	1.97	0.45
1:A:125:ILE:CD1	1:A:211:ASN:HB3	2.46	0.45
1:B:243:LEU:N	1:B:244:PRO:HD2	2.31	0.45
1:B:167:ASN:O	1:B:168:SER:HB3	2.18	0.44
1:B:207:LEU:C	1:B:207:LEU:HD23	2.43	0.44
2:C:11:DC:H2''	2:C:12:DC:C6	2.53	0.44
1:A:137:LYS:HG2	1:A:203:THR:HB	1.99	0.43
1:A:220:THR:C	1:A:221:ILE:HD12	2.44	0.43
1:A:150:ILE:HD13	1:A:240:ILE:HD13	2.00	0.43
1:B:111:GLU:CD	1:B:111:GLU:N	2.77	0.42
1:A:259:ILE:HD12	1:A:259:ILE:N	2.34	0.42
1:A:241:LEU:O	1:A:244:PRO:HD2	2.19	0.42
1:B:239:ASP:OD2	1:B:240:ILE:N	2.53	0.42
1:A:227:LYS:HE2	1:A:259:ILE:HD11	2.02	0.42
1:A:193:THR:H	1:A:196:GLN:NE2	2.18	0.42
1:B:215:ASP:OD1	1:B:217:HIS:CD2	2.62	0.41
1:B:266:ASN:HB3	1:B:269:ILE:HD12	2.02	0.41
2:C:11:DC:H2''	2:C:12:DC:H6	1.85	0.41
2:C:8:DA:H2''	2:C:9:DC:C5'	2.51	0.41
2:C:8:DA:C2'	2:C:9:DC:H5''	2.51	0.40
2:C:11:DC:C2'	2:C:12:DC:C6	3.04	0.40
1:B:125:ILE:HD11	1:B:262:THR:HG22	2.03	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	182/193 (94%)	179 (98%)	3 (2%)	0	100	100
1	B	184/193 (95%)	180 (98%)	4 (2%)	0	100	100
All	All	366/386 (95%)	359 (98%)	7 (2%)	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	166/173 (96%)	162 (98%)	4 (2%)	43	26
1	B	168/173 (97%)	163 (97%)	5 (3%)	36	19
All	All	334/346 (96%)	325 (97%)	9 (3%)	39	23

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	153	MET
1	A	175	LYS
1	A	221	ILE
1	A	245	TYR
1	B	125	ILE
1	B	182	LYS
1	B	213	ILE
1	B	246	SER

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Mol	Chain	Res	Type
1	B	268	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	106	HIS
1	A	166	HIS
1	A	196	GLN
1	A	205	HIS
1	A	212	ASN
1	A	217	HIS
1	A	223	ASN
1	A	229	GLN
1	A	271	GLN
1	B	106	HIS
1	B	196	GLN
1	B	205	HIS
1	B	212	ASN
1	B	217	HIS
1	B	223	ASN
1	B	229	GLN
1	B	271	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

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.