



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 23, 2026 – 09:39 AM UTC

PDB ID : 3DGD / pdb_00003dgd
Title : Crystal structure of the F87M/L110M mutant of human transthyretin at pH 4.6
Authors : Palmieri, L.C.; Freire, J.B.B.; Foguel, D.; Lima, L.M.T.R.
Deposited on : 2008-06-13
Resolution : 1.38 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	:	FAILED
Mogul	:	2022.3.0, CSD as543be (2022)
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

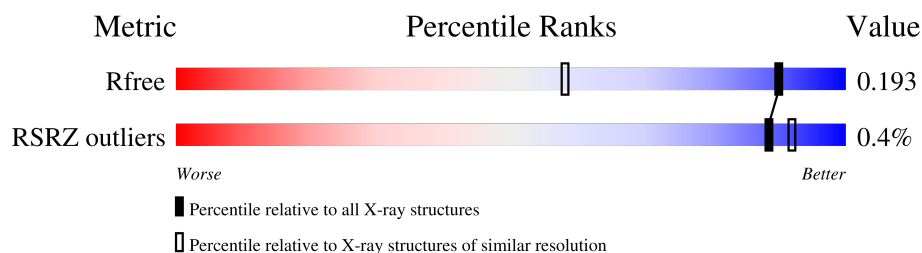
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.38 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	4403 (1.40-1.36)
RSRZ outliers	180081	4399 (1.40-1.36)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	ACT	A	131	-	X	-	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4679 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 Transthyretin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	116	Total	C	N	O	S	0	22	0
			1079	686	177	210	6			
1	B	115	Total	C	N	O	S	0	18	0
			1044	663	172	203	6			
1	C	116	Total	C	N	O	S	0	17	0
			1040	662	170	202	6			
1	D	115	Total	C	N	O	S	0	18	0
			1037	655	170	206	6			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	87	MET	PHE	engineered mutation	UNP P02766
A	110	MET	LEU	engineered mutation	UNP P02766
B	87	MET	PHE	engineered mutation	UNP P02766
B	110	MET	LEU	engineered mutation	UNP P02766
C	87	MET	PHE	engineered mutation	UNP P02766
C	110	MET	LEU	engineered mutation	UNP P02766
D	87	MET	PHE	engineered mutation	UNP P02766
D	110	MET	LEU	engineered mutation	UNP P02766

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	4	Total	Zn	0	0
			4	4		
2	B	4	Total	Zn	0	0
			4	4		
2	C	3	Total	Zn	0	0
			3	3		
2	D	4	Total	Zn	0	0
			4	4		

- Molecule 3 is ACETATE ION (CCD ID: ACT) (formula: $\text{C}_2\text{H}_3\text{O}_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	1
			8	4	4		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	1
			8	4	4		
3	B	1	Total	C	O	0	1
			8	4	4		
3	C	1	Total	C	O	0	1
			8	4	4		
3	C	1	Total	C	O	0	0
			4	2	2		
3	C	1	Total	C	O	0	0
			4	2	2		
3	C	1	Total	C	O	0	0
			4	2	2		
3	D	1	Total	C	O	0	1
			8	4	4		
3	D	1	Total	C	O	0	0
			4	2	2		
3	D	1	Total	C	O	0	1
			8	4	4		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $\text{C}_3\text{H}_8\text{O}_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		
4	D	1	Total	C	O	0	0
			6	3	3		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	106	Total	O	0	0
			106	106		
5	B	90	Total	O	0	0
			90	90		
5	C	95	Total	O	0	0
			95	95		
5	D	83	Total	O	0	0
			83	83		

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3 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	46.95Å 60.69Å 82.99Å 90.00° 89.98° 90.00°	Depositor
Resolution (Å)	19.37 – 1.38 19.37 – 1.38	Depositor EDS
% Data completeness (in resolution range)	97.2 (19.37-1.38) 97.1 (19.37-1.38)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.70 (at 1.38Å)	Xtriage
Refinement program	REFMAC 5.2	Depositor
R, R_{free}	0.157 , 0.202 0.179 , 0.193	Depositor DCC
R_{free} test set	5424 reflections (5.70%)	wwPDB-VP
Wilson B-factor (Å ²)	19.0	Xtriage
Anisotropy	0.212	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 39.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.487 for h,-k,-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	4679	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.46% 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.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

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4.2 Too-close contacts [i](#)

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4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

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4.3.2 Protein sidechains [i](#)

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4.3.3 RNA [i](#)

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4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

4.6 Ligand geometry [i](#)

Of 36 ligands modelled in this entry, 15 are monoatomic - leaving 21 for Mogul analysis.

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	ACT	A	132[B]	-	3,3,3	1.12	0	3,3,3	1.05	0
3	ACT	B	132[A]	-	3,3,3	1.01	0	3,3,3	1.52	1 (33%)
3	ACT	C	132	-	3,3,3	0.96	0	3,3,3	1.18	0
3	ACT	D	133	-	3,3,3	0.77	0	3,3,3	1.22	0
3	ACT	A	132[A]	-	3,3,3	0.71	0	3,3,3	1.96	1 (33%)
3	ACT	D	134[B]	-	3,3,3	1.10	0	3,3,3	0.90	0
4	GOL	B	135	-	5,5,5	1.03	1 (20%)	5,5,5	0.35	0
3	ACT	D	132[B]	-	3,3,3	0.98	0	3,3,3	1.15	0
3	ACT	D	134[A]	-	3,3,3	0.62	0	3,3,3	1.11	0
3	ACT	D	132[A]	-	3,3,3	0.93	0	3,3,3	0.38	0
4	GOL	B	136	-	5,5,5	0.72	0	5,5,5	1.27	0
3	ACT	B	133[B]	-	3,3,3	1.13	0	3,3,3	0.41	0
3	ACT	C	130[B]	-	3,3,3	1.21	0	3,3,3	0.73	0
3	ACT	C	131	-	3,3,3	1.03	0	3,3,3	1.12	0
3	ACT	B	132[B]	-	3,3,3	1.38	0	3,3,3	1.92	1 (33%)
3	ACT	A	131	-	3,3,3	1.55	1 (33%)	3,3,3	1.90	2 (66%)
3	ACT	B	133[A]	-	3,3,3	0.83	0	3,3,3	1.06	0
3	ACT	C	133	-	3,3,3	1.04	0	3,3,3	1.55	0
3	ACT	C	130[A]	-	3,3,3	1.09	0	3,3,3	2.49	2 (66%)
4	GOL	D	135	-	5,5,5	0.94	0	5,5,5	2.25	2 (40%)
3	ACT	B	131	-	3,3,3	1.25	1 (33%)	3,3,3	0.13	0

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
4	GOL	B	136	-	-	3/4/4/4	-
4	GOL	D	135	-	-	2/4/4/4	-
4	GOL	B	135	-	-	2/4/4/4	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	131	ACT	OXT-C	-2.38	1.19	1.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	135	GOL	O2-C2	-2.16	1.37	1.43
3	B	131	ACT	O-C	2.10	1.31	1.22

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	135	GOL	O2-C2-C3	3.75	124.69	109.18
3	C	130[A]	ACT	OXT-C-CH3	3.18	128.38	115.05
3	C	130[A]	ACT	OXT-C-O	-2.86	111.43	122.03
3	A	132[A]	ACT	OXT-C-O	-2.83	111.52	122.03
3	B	132[B]	ACT	OXT-C-O	-2.82	111.57	122.03
3	A	131	ACT	OXT-C-CH3	2.47	125.39	115.05
4	D	135	GOL	O3-C3-C2	2.27	120.61	110.38
3	A	131	ACT	OXT-C-O	-2.11	114.20	122.03
3	B	132[A]	ACT	OXT-C-O	-2.10	114.23	122.03

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	135	GOL	O1-C1-C2-C3
4	B	136	GOL	C1-C2-C3-O3
4	D	135	GOL	C1-C2-C3-O3
4	D	135	GOL	O2-C2-C3-O3
4	B	136	GOL	O1-C1-C2-C3
4	B	135	GOL	O1-C1-C2-O2
4	B	136	GOL	O2-C2-C3-O3

There are no ring outliers.

No monomer is involved in short contacts.

4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

5 Fit of model and data [i](#)

5.1 Protein, DNA and RNA chains [i](#)

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	116/127 (91%)	-0.65	0 100 100	8, 19, 40, 52	22 (18%)
1	B	115/127 (90%)	-0.62	1 (0%) 81 86	9, 21, 36, 52	18 (15%)
1	C	116/127 (91%)	-0.68	0 100 100	8, 20, 41, 51	17 (14%)
1	D	115/127 (90%)	-0.60	1 (0%) 81 86	9, 21, 35, 47	18 (15%)
All	All	462/508 (90%)	-0.64	2 (0%) 88 92	8, 20, 38, 52	75 (16%)

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	100	SER	3.1
1	D	100	SER	2.9

5.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	ACT	B	132[A]	4/4	0.91	0.11	22,26,27,29	4
3	ACT	B	132[B]	4/4	0.91	0.11	20,23,24,25	4
3	ACT	B	133[A]	4/4	0.96	0.07	32,33,34,34	4
3	ACT	B	133[B]	4/4	0.96	0.07	26,29,30,31	4
3	ACT	D	133	4/4	0.96	0.09	35,38,39,39	4
3	ACT	C	132	4/4	0.97	0.06	45,46,46,47	0
3	ACT	C	131	4/4	0.97	0.07	38,38,40,41	0
3	ACT	A	132[B]	4/4	0.98	0.05	26,27,27,30	4
3	ACT	B	131	4/4	0.98	0.06	26,27,28,31	0
3	ACT	C	133	4/4	0.98	0.05	20,20,20,20	0
3	ACT	D	132[A]	4/4	0.98	0.06	23,26,26,28	4
3	ACT	D	132[B]	4/4	0.98	0.06	22,24,25,27	4
3	ACT	A	132[A]	4/4	0.98	0.05	17,19,19,21	4
3	ACT	D	134[A]	4/4	0.98	0.06	37,38,38,38	4
3	ACT	D	134[B]	4/4	0.98	0.06	28,30,31,33	4
4	GOL	B	135	6/6	0.98	0.05	48,51,52,54	0
4	GOL	B	136	6/6	0.98	0.05	50,51,52,53	0
4	GOL	D	135	6/6	0.98	0.04	20,20,20,20	0
3	ACT	C	130[B]	4/4	0.99	0.04	27,28,29,30	4
3	ACT	A	131	4/4	0.99	0.03	24,28,29,30	0
2	ZN	D	129	1/1	0.99	0.03	32,32,32,32	1
3	ACT	C	130[A]	4/4	0.99	0.04	17,20,20,21	4
2	ZN	C	128	1/1	1.00	0.01	20,20,20,20	0
2	ZN	C	129	1/1	1.00	0.01	29,29,29,29	1
2	ZN	C	134	1/1	1.00	0.17	30,30,30,30	0
2	ZN	D	128	1/1	1.00	0.08	17,17,17,17	1
2	ZN	A	128	1/1	1.00	0.14	16,16,16,16	1
2	ZN	D	130	1/1	1.00	0.15	18,18,18,18	1
2	ZN	D	131	1/1	1.00	0.04	21,21,21,21	1
2	ZN	A	129	1/1	1.00	0.03	29,29,29,29	1
2	ZN	A	130	1/1	1.00	0.01	23,23,23,23	0
2	ZN	A	133	1/1	1.00	0.10	30,30,30,30	0
2	ZN	B	128	1/1	1.00	0.03	32,32,32,32	1
2	ZN	B	129	1/1	1.00	0.08	17,17,17,17	1
2	ZN	B	130	1/1	1.00	0.04	21,21,21,21	1
2	ZN	B	134	1/1	1.00	0.16	30,30,30,30	0

5.5 Other polymers

There are no such residues in this entry.