



Full wwPDB EM Validation Report ⓘ

Jul 15, 2025 – 10:02 PM JST

PDB ID : 8HFG / pdb_00008hfg
EMDB ID : EMD-34720
Title : Cryo-EM structure of human norepinephrine transporter NET in the presence of dopamine in an inward-open state at resolution of 3.0 angstrom.
Authors : Tan, J.; Xiao, Y.; Kong, F.; Lei, J.; Yuan, Y.; Yan, C.
Deposited on : 2022-11-10
Resolution : 3.00 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>
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:

EMDB validation analysis : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0rc1
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

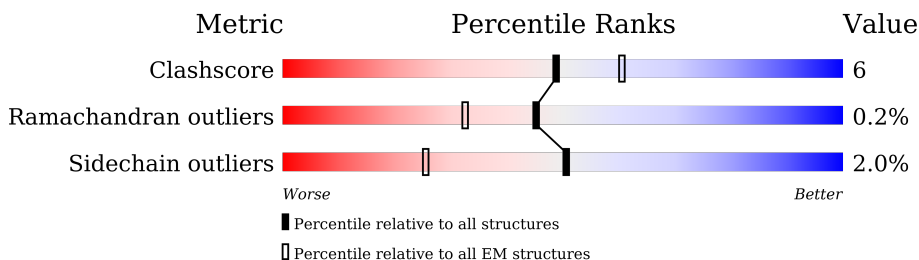
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.00 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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	617	

2 Entry composition [i](#)

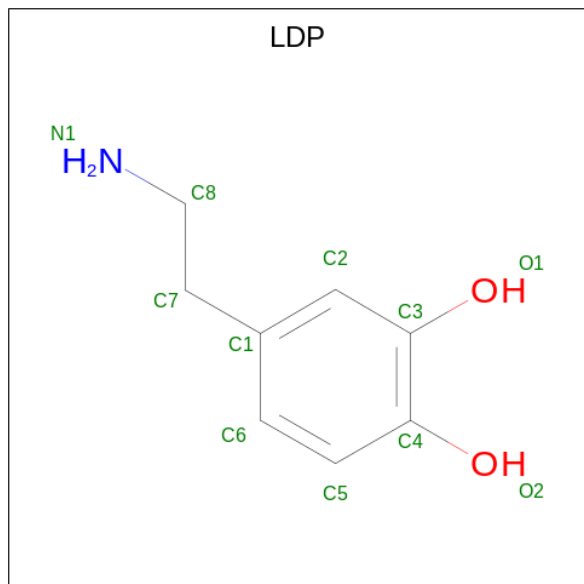
There are 4 unique types of molecules in this entry. The entry contains 4394 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Sodium-dependent noradrenaline transporter.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	545	Total	C	N	O	S	0	0
			4366	2934	677	735	20		

- Molecule 2 is L-DOPAMINE (CCD ID: LDP) (formula: $C_8H_{11}NO_2$).



Mol	Chain	Residues	Atoms				AltConf
2	A	1	Total	C	N	O	0
			11	8	1	2	
2	A	1	Total	C	N	O	0
			11	8	1	2	

- Molecule 3 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		AltConf
3	A	1	Total	Cl	0
			1	1	

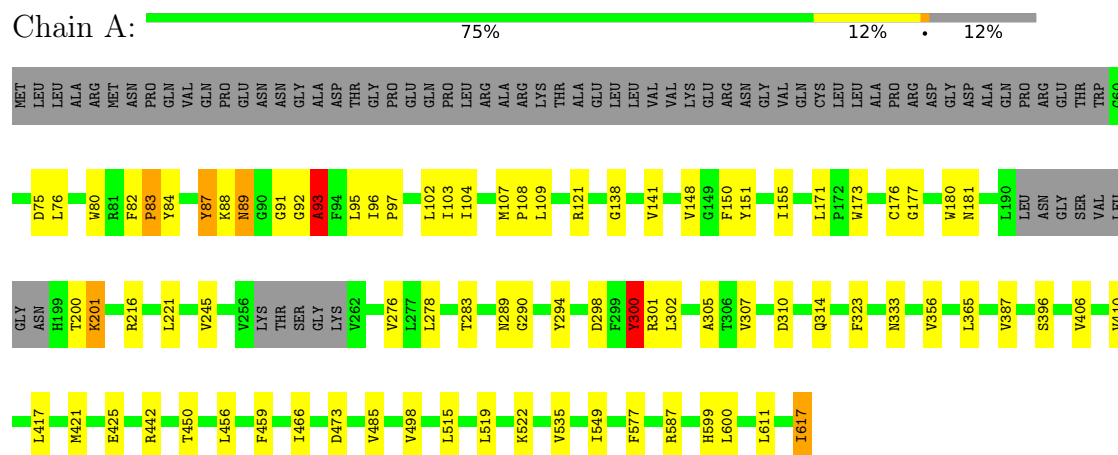
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		AltConf
4	A	5	Total	O	0
			5	5	

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.

- Molecule 1: Sodium-dependent noradrenaline transporter



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	375552	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	1400	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CL, LDP

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	0.39	8/4508 (0.2%)	0.51	9/6148 (0.1%)

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
1	A	0	1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	302	LEU	C-O	-8.78	1.12	1.24
1	A	92	GLY	C-O	-7.44	1.13	1.23
1	A	89	ASN	C-O	-6.18	1.15	1.24
1	A	301	ARG	C-O	-5.81	1.16	1.24
1	A	88	LYS	C-O	-5.77	1.17	1.24
1	A	301	ARG	CA-C	-5.46	1.45	1.52
1	A	91	GLY	C-O	-5.10	1.17	1.23
1	A	92	GLY	C-N	-5.10	1.27	1.33

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	302	LEU	N-CA-C	-11.71	99.01	113.18
1	A	300	TYR	N-CA-C	-9.89	101.21	113.28
1	A	301	ARG	CB-CA-C	-9.65	93.33	109.55
1	A	83	PRO	CA-N-CD	-8.93	99.50	112.00
1	A	87	TYR	O-C-N	-7.73	113.75	122.09

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	87	TYR	CA-C-N	5.82	128.87	120.79
1	A	87	TYR	C-N-CA	5.82	128.87	120.79
1	A	88	LYS	CA-C-O	-5.63	114.88	121.07
1	A	93	ALA	CA-C-O	-5.32	112.40	119.10

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	93	ALA	Mainchain

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	4366	0	4346	49	0
2	A	22	0	20	1	0
3	A	1	0	0	1	0
4	A	5	0	0	0	0
All	All	4394	0	4366	49	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 6.

All (49) 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:A:278:LEU:HD11	1:A:356:VAL:HG13	1.62	0.80
1:A:577:PHE:O	1:A:587:ARG:NH1	2.15	0.80
1:A:549:ILE:HD12	1:A:549:ILE:O	1.90	0.71
1:A:151:TYR:O	1:A:155:ILE:HD12	1.93	0.68
1:A:95:LEU:HD11	1:A:294:TYR:OH	1.97	0.64
1:A:121:ARG:NH1	1:A:333:ASN:O	2.31	0.63
1:A:80:TRP:HA	1:A:387:VAL:HG11	1.81	0.61
1:A:425:GLU:OE1	1:A:442:ARG:NH2	2.34	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:300:TYR:HD1	1:A:300:TYR:C	2.10	0.60
1:A:300:TYR:C	1:A:300:TYR:CD1	2.81	0.59
1:A:177:GLY:N	1:A:181:ASN:OD1	2.36	0.57
1:A:89:ASN:HD21	1:A:310:ASP:CG	2.12	0.57
1:A:245:VAL:HG13	1:A:450:THR:CG2	2.37	0.55
1:A:283:THR:O	1:A:283:THR:HG23	2.07	0.54
1:A:305:ALA:HB1	1:A:535:VAL:HG11	1.91	0.53
1:A:180:TRP:O	1:A:216:ARG:NE	2.41	0.53
1:A:278:LEU:HD11	1:A:356:VAL:CG1	2.37	0.53
1:A:75:ASP:OD1	1:A:76:LEU:N	2.41	0.53
1:A:417:LEU:O	1:A:421:MET:HG3	2.08	0.52
1:A:89:ASN:ND2	1:A:310:ASP:OD2	2.34	0.52
1:A:109:LEU:HD23	1:A:485:VAL:CG1	2.40	0.52
1:A:89:ASN:HD21	1:A:310:ASP:CB	2.22	0.52
1:A:522:LYS:HD3	1:A:617:ILE:HG23	1.92	0.52
1:A:289:ASN:OD1	1:A:290:GLY:N	2.43	0.51
1:A:221:LEU:HD13	1:A:466:ILE:HG22	1.93	0.50
1:A:148:VAL:HG21	1:A:323:PHE:HE1	1.79	0.48
1:A:93:ALA:O	1:A:307:VAL:HG21	2.14	0.48
1:A:96:ILE:HB	1:A:97:PRO:HD3	1.96	0.48
1:A:549:ILE:O	1:A:549:ILE:CD1	2.62	0.47
1:A:150:PHE:CZ	1:A:456:LEU:HD22	2.51	0.46
1:A:148:VAL:HG21	1:A:323:PHE:CE1	2.50	0.46
1:A:84:TYR:OH	1:A:473:ASP:OD2	2.35	0.45
1:A:515:LEU:HD12	1:A:515:LEU:O	2.18	0.44
1:A:515:LEU:HD12	1:A:519:LEU:HG	1.99	0.43
1:A:109:LEU:HD23	1:A:485:VAL:HG11	2.00	0.43
1:A:314:GLN:NE2	3:A:703:CL:CL	2.75	0.43
1:A:102:LEU:O	1:A:103:ILE:C	2.62	0.43
1:A:245:VAL:HG13	1:A:450:THR:HG23	2.00	0.43
1:A:138:GLY:O	1:A:141:VAL:HG22	2.20	0.42
1:A:171:LEU:HD12	1:A:173:TRP:CZ2	2.54	0.42
1:A:365:LEU:HD12	1:A:365:LEU:C	2.45	0.41
1:A:611:LEU:O	1:A:611:LEU:HD12	2.19	0.41
1:A:200:THR:O	1:A:201:LYS:HB3	2.20	0.41
1:A:87:TYR:CD1	2:A:702:LDP:H6	2.55	0.41
1:A:406:VAL:O	1:A:410:VAL:HG23	2.21	0.41
1:A:107:MET:HB3	1:A:108:PRO:HD3	2.03	0.41
1:A:82:PHE:HB3	1:A:83:PRO:HD2	2.03	0.41
1:A:305:ALA:CB	1:A:535:VAL:HG11	2.51	0.40
1:A:599:HIS:CD2	1:A:600:LEU:HD12	2.56	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 PDB entries followed by that with respect to all EM entries.

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	539/617 (87%)	521 (97%)	17 (3%)	1 (0%)	44 77

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	201	LYS

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 PDB entries followed by that with respect to all EM entries.

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	460/519 (89%)	451 (98%)	9 (2%)	50 78

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

Mol	Chain	Res	Type
1	A	104	ILE
1	A	176	CYS
1	A	276	VAL
1	A	298	ASP
1	A	300	TYR
1	A	396	SER
1	A	459	PHE

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Mol	Chain	Res	Type
1	A	498	VAL
1	A	617	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	89	ASN
1	A	120	ASN
1	A	280	HIS
1	A	338	ASN
1	A	506	GLN
1	A	599	HIS

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 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 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	$\# Z > 2$
2	LDP	A	701	-	10,11,11	0.29	0	13,14,14	0.50	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	LDP	A	702	-	10,11,11	0.41	0	13,14,14	0.45	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
2	LDP	A	701	-	-	2/3/3/3	0/1/1/1
2	LDP	A	702	-	-	3/3/3/3	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	702	LDP	C1-C7-C8-N1
2	A	701	LDP	C6-C1-C7-C8
2	A	701	LDP	C2-C1-C7-C8
2	A	702	LDP	C2-C1-C7-C8
2	A	702	LDP	C6-C1-C7-C8

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	702	LDP	1	0

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.