Full wwPDB X-ray Structure Validation Report ⓘ

Jun 11, 2024 – 09:59 PM EDT

PDB ID	:	1NCH
Title	:	STRUCTURAL BASIS OF CELL-CELL ADHESION BY CADHERINS
Authors	:	Shapiro, L.; Fannon, A.M.; Kwong, P.D.; Thompson, A.; Lehmann, M.S.; Grubel, G.; Legrand, J.-F.; Als-Nielsen, J.; Colman, D.R.; Hendrickson, W.A.
Deposited on	:	1995-03-23
Resolution	:	2.10 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:

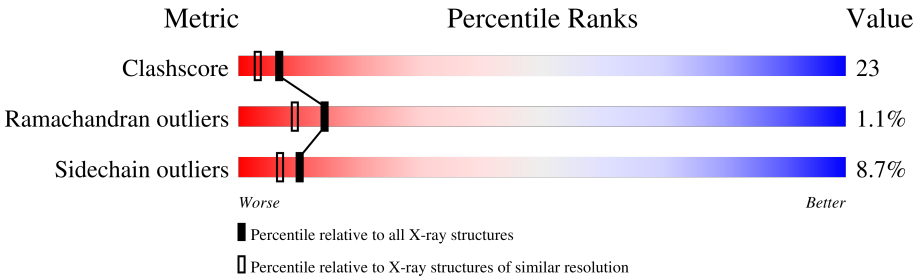
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)

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 <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	110	54% 31% 5% 11%
1	B	110	63% 25% • 9%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 1761 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 N-CADHERIN.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
1	A	98	Total 757	C 481	N 136	O 140	0	0	0
1	B	100	Total 771	C 490	N 137	O 144	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	27	GLY	ASP	cloning artifact	UNP P15116
B	27	GLY	ASP	cloning artifact	UNP P15116

- Molecule 2 is YTTERBIUM (III) ION (three-letter code: YB) (formula: Yb).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total 1	Yb 1	0	0
2	B	1	Total 1	Yb 1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	128	Total 128	O 128	0	0
3	B	103	Total 103	O 103	0	0

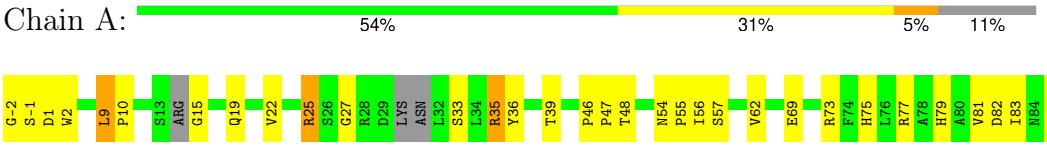
3 Residue-property plots (i)

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.

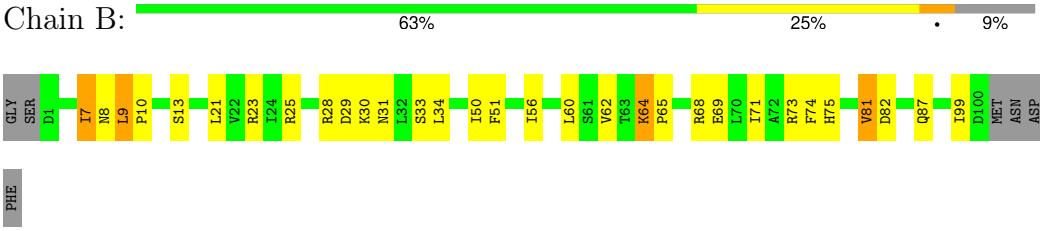
- Molecule 1: N-CADHERIN

Chain A:



- Molecule 1: N-CADHERIN

Chain B:



4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 3 2 1	Depositor
Cell constants a, b, c, α, β, γ	79.73Å 79.73Å 74.96Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	5.00 – 2.10	Depositor
% Data completeness (in resolution range)	92.0 (5.00-2.10)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.224 , 0.309	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1761	wwPDB-VP
Average B, all atoms (Å^2)	34.0	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: YB

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	0.54	0/773	0.86	3/1055 (0.3%)
1	B	1.57	4/789 (0.5%)	1.13	5/1081 (0.5%)
All	All	1.18	4/1562 (0.3%)	1.01	8/2136 (0.4%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	7	ILE	CA-C	-29.08	0.77	1.52
1	B	7	ILE	N-CA	26.42	1.99	1.46
1	B	7	ILE	C-O	9.15	1.40	1.23
1	B	7	ILE	CB-CG1	7.66	1.75	1.54

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	7	ILE	CA-CB-CG1	16.97	143.24	111.00
1	B	7	ILE	CG1-CB-CG2	-14.71	79.03	111.40
1	B	7	ILE	N-CA-CB	-7.76	92.94	110.80
1	B	7	ILE	CB-CA-C	6.95	125.51	111.60
1	B	69	GLU	OE1-CD-OE2	-6.78	115.16	123.30
1	A	9	LEU	CA-CB-CG	6.65	130.59	115.30
1	A	69	GLU	OE1-CD-OE2	-6.36	115.67	123.30
1	A	92	ILE	CB-CA-C	-5.22	101.15	111.60

There are no chirality outliers.

There are no planarity outliers.

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	757	0	766	27	0
1	B	771	0	774	44	0
2	A	1	0	0	0	0
2	B	1	0	0	1	0
3	A	128	0	0	10	1
3	B	103	0	0	9	0
All	All	1761	0	1540	72	1

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 23.

All (72) 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:7:ILE:CB	1:B:7:ILE:CG1	1.75	1.58
1:B:7:ILE:CA	1:B:8:ASN:N	1.81	1.35
1:B:7:ILE:CG1	1:B:7:ILE:CG2	2.11	1.26
1:B:7:ILE:CA	1:B:7:ILE:N	1.99	1.25
1:B:7:ILE:HA	1:B:8:ASN:N	1.44	1.24
1:B:7:ILE:CA	1:B:7:ILE:O	1.91	1.18
1:B:7:ILE:CB	1:B:7:ILE:C	2.12	1.16
1:B:7:ILE:HG12	1:B:7:ILE:HG21	1.40	1.03
1:B:7:ILE:CG1	1:B:7:ILE:HG21	1.91	1.00
1:B:7:ILE:HA	1:B:7:ILE:C	1.27	0.87
1:B:7:ILE:CA	1:B:7:ILE:C	0.77	0.86
1:B:7:ILE:HA	1:B:8:ASN:H	1.40	0.86
2:B:600:YB:YB	3:B:676:HOH:O	1.70	0.83
1:B:7:ILE:C	1:B:7:ILE:HB	2.01	0.79
1:B:7:ILE:N	1:B:7:ILE:C	2.38	0.76
1:A:-2:GLY:HA2	1:A:2:TRP:HD1	1.55	0.72
1:B:9:LEU:HD21	1:B:21:LEU:HD22	1.72	0.71
1:B:71:ILE:HD11	3:B:638:HOH:O	1.90	0.71
1:B:81:VAL:HG23	1:B:87:GLN:HE21	1.55	0.70
1:B:75:HIS:HB3	3:B:703:HOH:O	1.91	0.70
1:B:7:ILE:N	1:B:7:ILE:HB	2.09	0.67

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:19:GLN:HB3	1:A:62:VAL:HG12	1.79	0.65
1:B:64:LYS:HB2	1:B:65:PRO:HD2	1.79	0.64
1:A:-2:GLY:HA2	1:A:2:TRP:CD1	2.33	0.63
1:B:7:ILE:CB	1:B:7:ILE:N	2.60	0.62
1:B:7:ILE:CG2	1:B:7:ILE:HG13	2.24	0.62
1:A:83:ILE:HG22	3:A:604:HOH:O	2.03	0.58
1:A:35:ARG:HD3	1:A:35:ARG:C	2.24	0.57
1:B:50:ILE:HG21	3:B:656:HOH:O	2.03	0.57
1:A:73:ARG:HB2	1:A:96:ILE:O	2.03	0.57
1:B:50:ILE:HD11	1:B:74:PHE:CZ	2.40	0.56
1:A:75:HIS:NE2	1:A:93:ASP:OD1	2.38	0.55
1:A:10:PRO:HG2	3:A:610:HOH:O	2.06	0.55
1:A:54:ASN:OD1	1:A:56:ILE:HG12	2.06	0.55
1:B:8:ASN:HB3	1:B:99:ILE:HD13	1.88	0.55
1:A:62:VAL:HG21	3:A:572:HOH:O	2.09	0.53
1:A:46:PRO:HA	1:A:47:PRO:C	2.28	0.53
1:A:82:ASP:OD2	1:A:86:ASN:HB2	2.09	0.52
1:B:9:LEU:HD21	1:B:21:LEU:CD2	2.37	0.52
1:B:81:VAL:HG23	1:B:87:GLN:NE2	2.23	0.52
1:B:50:ILE:CD1	1:B:74:PHE:CZ	2.94	0.50
1:B:64:LYS:CB	1:B:65:PRO:HD2	2.42	0.50
1:B:73:ARG:NE	1:B:75:HIS:NE2	2.59	0.50
1:B:73:ARG:HD2	3:B:667:HOH:O	2.11	0.50
1:A:15:GLY:HA3	3:A:612:HOH:O	2.11	0.49
1:A:46:PRO:HA	1:A:48:THR:N	2.26	0.48
1:A:82:ASP:HB2	3:A:515:HOH:O	2.13	0.48
1:A:54:ASN:HB3	1:A:57:SER:OG	2.14	0.48
1:B:28:ARG:NH2	3:B:694:HOH:O	2.48	0.47
1:A:81:VAL:HG13	1:A:85:GLY:HA2	1.97	0.47
1:B:64:LYS:HG2	3:B:661:HOH:O	2.15	0.46
1:A:33:SER:HA	3:A:587:HOH:O	2.16	0.46
1:B:50:ILE:HG13	1:B:51:PHE:CD2	2.50	0.46
1:A:27:GLY:HA2	3:A:579:HOH:O	2.16	0.45
1:B:25:ARG:NH2	3:B:700:HOH:O	2.48	0.45
1:A:87:GLN:HB3	3:A:602:HOH:O	2.16	0.45
1:B:29:ASP:OD1	1:B:30:LYS:N	2.49	0.45
1:B:29:ASP:HA	1:B:34:LEU:HG	1.99	0.44
1:A:39:THR:OG1	1:A:79:HIS:HE1	2.01	0.43
1:B:9:LEU:HA	1:B:10:PRO:HD3	1.84	0.43
1:B:7:ILE:O	1:B:7:ILE:HB	2.17	0.43
1:B:21:LEU:HD11	1:B:62:VAL:HG22	1.99	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:25:ARG:HD2	3:A:578:HOH:O	2.18	0.42
1:A:77:ARG:NH1	3:A:624:HOH:O	2.48	0.42
1:B:28:ARG:HA	1:B:31:ASN:HD22	1.83	0.41
1:A:81:VAL:CG1	1:A:85:GLY:HA2	2.51	0.41
1:B:23:ARG:NH2	3:B:687:HOH:O	2.54	0.41
1:B:81:VAL:HG13	1:B:82:ASP:O	2.20	0.41
1:A:10:PRO:HA	1:A:99:ILE:O	2.21	0.41
1:B:28:ARG:HG3	1:B:34:LEU:HD11	2.01	0.41
1:A:54:ASN:HA	1:A:55:PRO:HD3	1.97	0.40
1:A:35:ARG:HD3	1:A:36:TYR:N	2.36	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:564:HOH:O	3:A:564:HOH:O[4_555]	1.89	0.31

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	A	92/110 (84%)	87 (95%)	3 (3%)	2 (2%)	6 2
1	B	98/110 (89%)	93 (95%)	5 (5%)	0	100 100
All	All	190/220 (86%)	180 (95%)	8 (4%)	2 (1%)	14 9

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1	ASP
1	A	-1	SER

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 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	86/98 (88%)	79 (92%)	7 (8%)	11 8
1	B	87/98 (89%)	79 (91%)	8 (9%)	9 6
All	All	173/196 (88%)	158 (91%)	15 (9%)	10 7

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	LEU
1	A	22	VAL
1	A	25	ARG
1	A	35	ARG
1	A	90	ASN
1	A	92	ILE
1	A	93	ASP
1	B	9	LEU
1	B	13	SER
1	B	33	SER
1	B	56	ILE
1	B	60	LEU
1	B	64	LYS
1	B	68	ARG
1	B	81	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	79	HIS
1	A	84	ASN
1	A	90	ASN
1	B	19	GLN
1	B	31	ASN
1	B	54	ASN
1	B	87	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	97	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 monosaccharides in this entry.

5.6 Ligand geometry

Of 2 ligands modelled in this entry, 2 are 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

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

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.