



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2018 – 11:29 pm GMT

PDB ID : 3HGQ  
Title : Structural and functional studies of the yeast class II Hda1 HDAC complex  
Authors : Lee, J.H.; Maskos, K.; Huber, R.  
Deposited on : 2009-05-14  
Resolution : 3.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto: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.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : trunk30967  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Refmac : 5.8.0158  
CCP4 : 7.0 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk30967

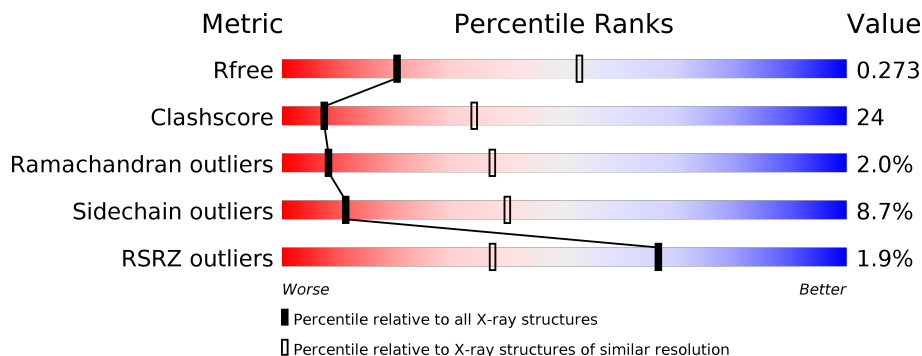
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 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)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	111664	1851 (3.00-3.00)
Clashscore	122126	2167 (3.00-3.00)
Ramachandran outliers	120053	2101 (3.00-3.00)
Sidechain outliers	120020	2104 (3.00-3.00)
RSRZ outliers	108989	1751 (3.00-3.00)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	328	<div> <div>2%</div> <div> <div></div> <div>50%</div> <div>35%</div> <div>6%</div> <div>9%</div> </div> </div>
1	B	328	<div> <div>2%</div> <div> <div></div> <div>54%</div> <div>30%</div> <div>•</div> <div>12%</div> </div> </div>
1	C	328	<div> <div>%</div> <div> <div></div> <div>52%</div> <div>31%</div> <div>5%</div> <div>12%</div> </div> </div>
1	D	328	<div> <div>2%</div> <div> <div></div> <div>51%</div> <div>32%</div> <div>5%</div> <div>12%</div> </div> </div>

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 9552 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 HDA1 complex subunit 3.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	299	Total	C	N	O	S	Se	0	0	0
			2433	1563	405	452	5	8			
1	B	290	Total	C	N	O	S	Se	0	0	0
			2373	1528	393	439	5	8			
1	C	290	Total	C	N	O	S	Se	0	0	0
			2373	1528	393	439	5	8			
1	D	290	Total	C	N	O	S	Se	0	0	0
			2373	1528	393	439	5	8			

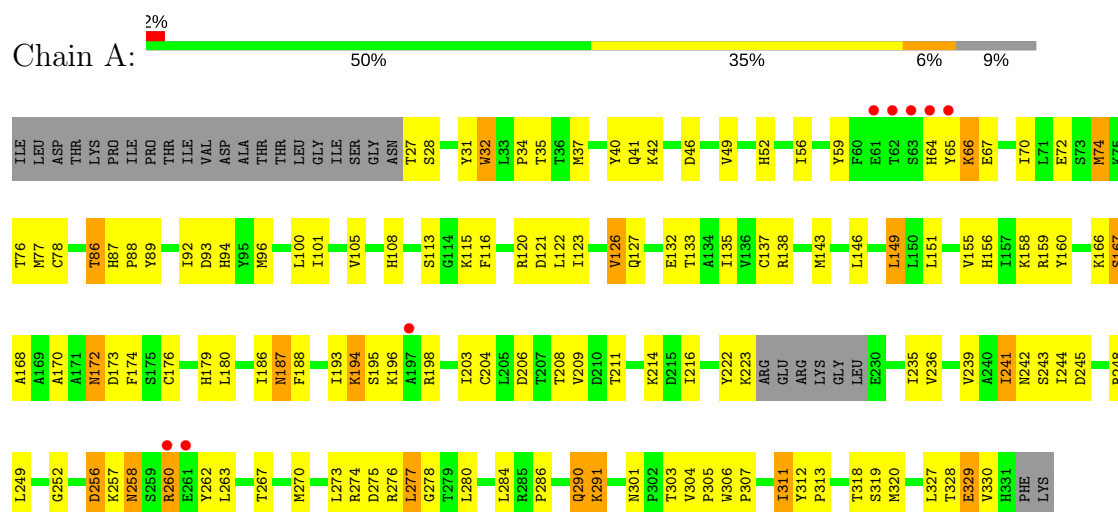
There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	168	ALA	LYS	ENGINEERED	UNP Q06623
A	169	ALA	GLN	ENGINEERED	UNP Q06623
A	170	ALA	LYS	ENGINEERED	UNP Q06623
B	168	ALA	LYS	ENGINEERED	UNP Q06623
B	169	ALA	GLN	ENGINEERED	UNP Q06623
B	170	ALA	LYS	ENGINEERED	UNP Q06623
C	168	ALA	LYS	ENGINEERED	UNP Q06623
C	169	ALA	GLN	ENGINEERED	UNP Q06623
C	170	ALA	LYS	ENGINEERED	UNP Q06623
D	168	ALA	LYS	ENGINEERED	UNP Q06623
D	169	ALA	GLN	ENGINEERED	UNP Q06623
D	170	ALA	LYS	ENGINEERED	UNP Q06623

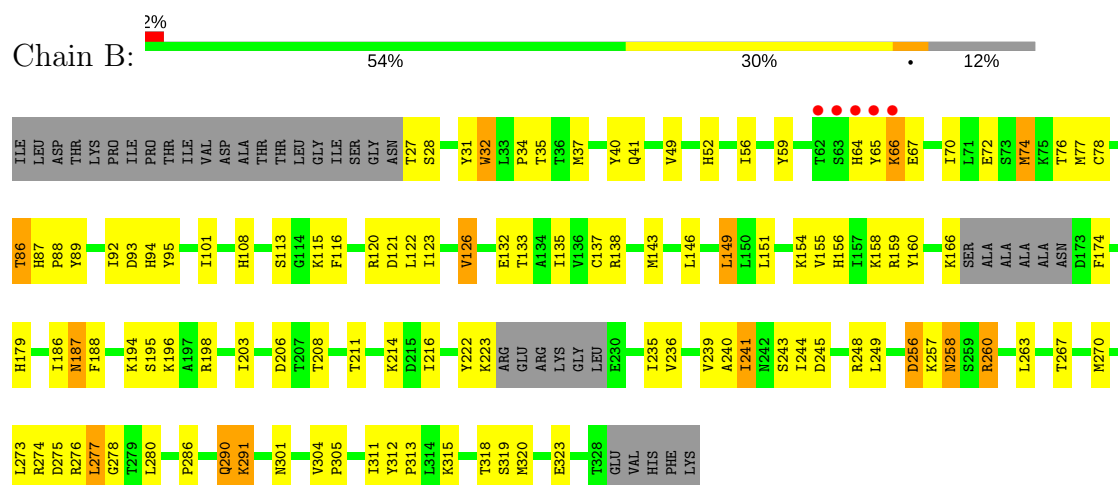
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). 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: HDA1 complex subunit 3

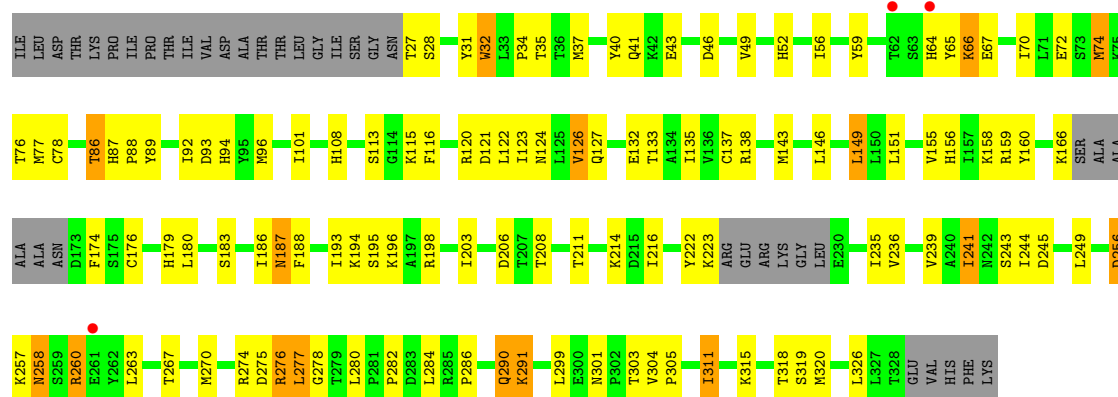


#### • Molecule 1: HDA1 complex subunit 3

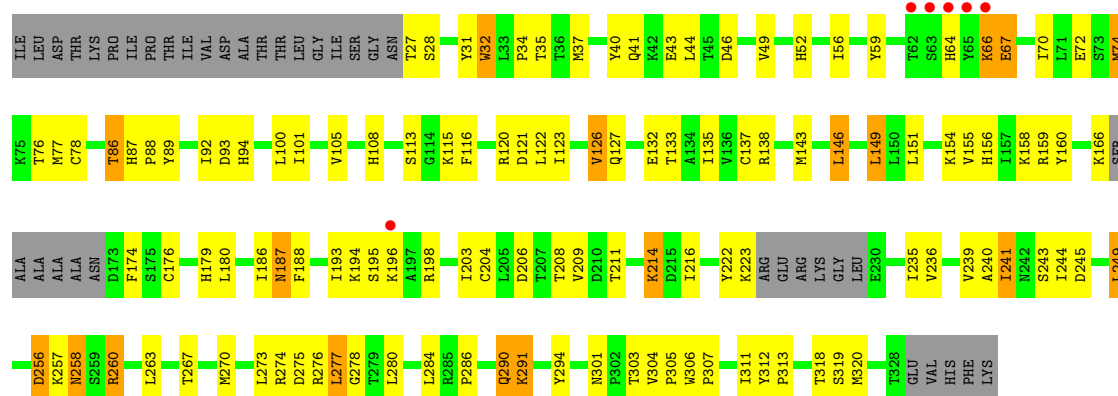


#### • Molecule 1: HDA1 complex subunit 3





● Molecule 1: HDA1 complex subunit 3



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	60.08Å 132.58Å 90.17Å 90.00° 92.38° 90.00°	Depositor
Resolution (Å)	19.87 – 3.00 49.02 – 3.00	Depositor EDS
% Data completeness (in resolution range)	99.9 (19.87-3.00) 100.0 (49.02-3.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.13	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.56 (at 3.01Å)	Xtriage
Refinement program	PHENIX (phenix.refine)	Depositor
R, $R_{free}$	0.224 , 0.280 0.217 , 0.273	Depositor DCC
$R_{free}$ test set	1415 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	43.9	Xtriage
Anisotropy	0.199	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 52.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.027 for h,-k,-l	Xtriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	9552	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 27.94 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.0115e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<sup>1</sup> Intensities estimated from amplitudes.

<sup>2</sup> Theoretical 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 [i](#)

### 5.1 Standard geometry [i](#)

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	0.32	0/2482	0.50	0/3357
1	B	0.31	0/2420	0.49	0/3270
1	C	0.30	0/2420	0.49	0/3270
1	D	0.31	0/2420	0.49	0/3270
All	All	0.31	0/9742	0.49	0/13167

There are no bond length outliers.

There are no bond angle outliers.

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	2433	0	2439	122	0
1	B	2373	0	2385	112	0
1	C	2373	0	2385	122	0
1	D	2373	0	2385	120	0
All	All	9552	0	9594	453	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 24.

The worst 5 of 453 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:56:ILE:HD11	1:C:77:MSE:HE1	1.29	1.14
1:D:56:ILE:HD11	1:D:77:MSE:HE1	1.25	1.11
1:A:52:HIS:HB2	1:A:77:MSE:HE3	1.29	1.09
1:B:206:ASP:HB2	1:B:208:THR:HG22	1.35	1.08
1:C:52:HIS:HB2	1:C:77:MSE:HE3	1.32	1.07

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 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	295/328 (90%)	257 (87%)	31 (10%)	7 (2%)	6	32
1	B	284/328 (87%)	257 (90%)	22 (8%)	5 (2%)	9	40
1	C	284/328 (87%)	255 (90%)	24 (8%)	5 (2%)	9	40
1	D	284/328 (87%)	256 (90%)	22 (8%)	6 (2%)	8	36
All	All	1147/1312 (87%)	1025 (89%)	99 (9%)	23 (2%)	8	37

5 of 23 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	66	LYS
1	A	167	SER
1	B	66	LYS
1	C	66	LYS
1	D	66	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 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	276/293 (94%)	251 (91%)	25 (9%)	10	37
1	B	271/293 (92%)	248 (92%)	23 (8%)	12	41
1	C	271/293 (92%)	247 (91%)	24 (9%)	11	38
1	D	271/293 (92%)	248 (92%)	23 (8%)	12	41
All	All	1089/1172 (93%)	994 (91%)	95 (9%)	11	40

5 of 95 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	256	ASP
1	C	122	LEU
1	D	241	ILE
1	B	260	ARG
1	C	32	TRP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 33 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	221	GLN
1	C	108	HIS
1	D	213	GLN
1	B	258	ASN
1	C	47	GLN

### 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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 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 [i](#)

### 6.1 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	291/328 (88%)	-0.03	8 (2%) 54 26	12, 36, 76, 135	0
1	B	282/328 (85%)	-0.06	5 (1%) 68 39	11, 34, 78, 141	0
1	C	282/328 (85%)	-0.13	3 (1%) 80 55	12, 35, 74, 124	0
1	D	282/328 (85%)	-0.09	6 (2%) 63 34	11, 35, 74, 136	0
All	All	1137/1312 (86%)	-0.08	22 (1%) 66 37	11, 35, 77, 141	0

The worst 5 of 22 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	62	THR	9.6
1	B	63	SER	7.7
1	D	63	SER	7.5
1	B	64	HIS	6.4
1	B	62	THR	6.3

### 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 carbohydrates 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.