



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2018 – 09:40 pm GMT

PDB ID : 3C0Y  
Title : Crystal structure of catalytic domain of human histone deacetylase HDAC7  
Authors : Min, J.R.; Schuetz, A.; Allali-Hassani, A.; Loppnau, P.; Kwiatkowski, N.P.; Mazitschek, R.; Weigelt, J.; Sundstrom, M.; Arrowsmith, C.H.; Edwards, A.M.; Vedadi, M.; Bochkarev, A.; Plotnikov, A.N.; Structural Genomics Consortium (SGC)  
Deposited on : 2008-01-21  
Resolution : 2.10 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.

---

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

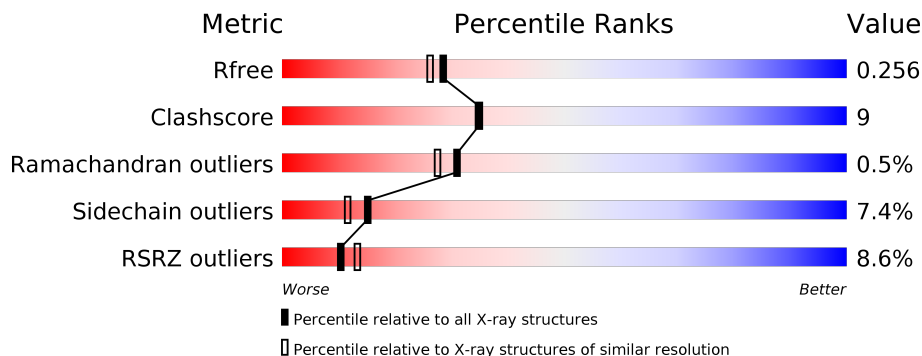
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 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))
$R_{free}$	111664	4608 (2.10-2.10)
Clashscore	122126	5109 (2.10-2.10)
Ramachandran outliers	120053	5059 (2.10-2.10)
Sidechain outliers	120020	5060 (2.10-2.10)
RSRZ outliers	108989	4497 (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 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	423	<div> <div>8%</div> <div> <div></div> <div>73%</div> <div>15%</div> <div>•</div> <div>9%</div> </div> </div>
1	B	423	<div> <div>6%</div> <div> <div></div> <div>66%</div> <div>18%</div> <div>••</div> <div>13%</div> </div> </div>
1	C	423	<div> <div>9%</div> <div> <div></div> <div>67%</div> <div>17%</div> <div>•</div> <div>15%</div> </div> </div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 8791 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 Histone deacetylase 7a.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	386	Total	C	N	O	S	0	0	0
			2925	1835	527	543	20			
1	B	367	Total	C	N	O	S	0	0	0
			2786	1745	505	517	19			
1	C	358	Total	C	N	O	S	0	0	0
			2718	1698	493	509	18			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	481	GLY	-	EXPRESSION TAG	UNP Q8WUI4
B	481	GLY	-	EXPRESSION TAG	UNP Q8WUI4
C	481	GLY	-	EXPRESSION TAG	UNP Q8WUI4

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

- Molecule 3 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	2	Total	K	0	0
			2	2		
3	A	2	Total	K	0	0
			2	2		

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	C	2	Total	K	0	0
			2	2		

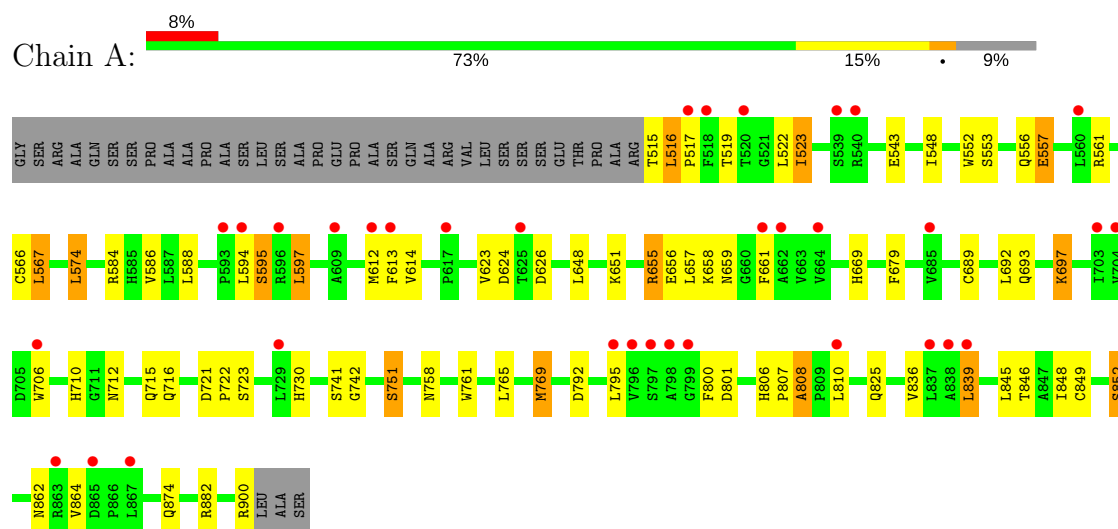
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	122	Total	O	0	0
			122	122		
4	B	129	Total	O	0	0
			129	129		
4	C	99	Total	O	0	0
			99	99		

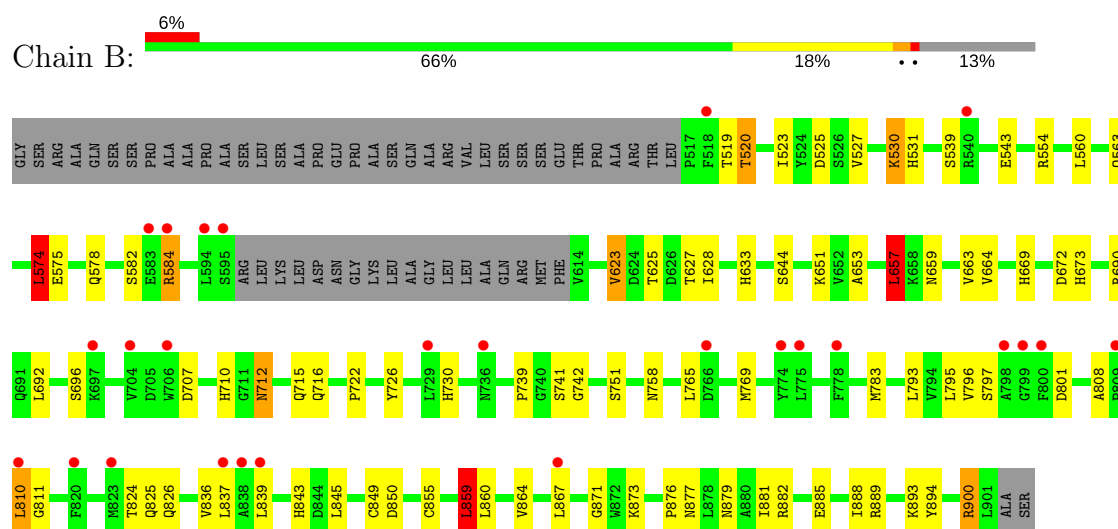
### 3 Residue-property plots

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: Histone deacetylase 7a

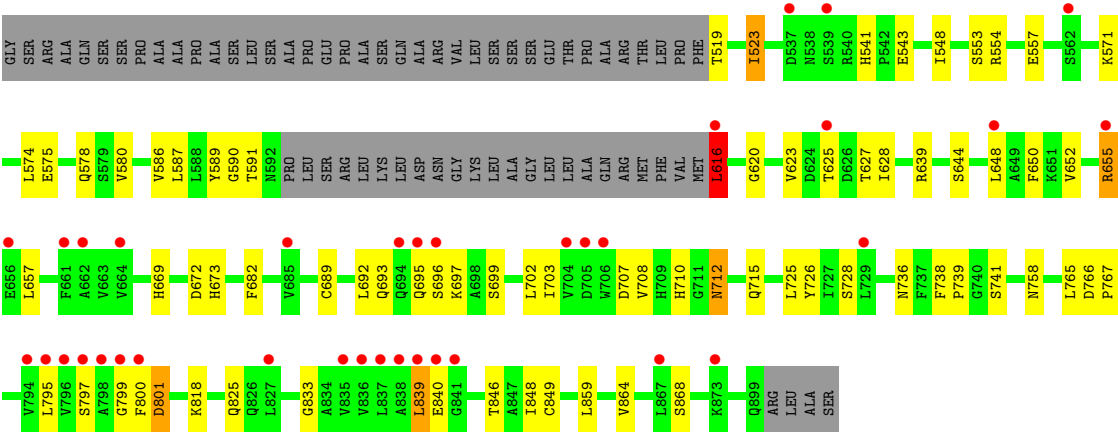


#### • Molecule 1: Histone deacetylase 7a



#### • Molecule 1: Histone deacetylase 7a





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	81.75Å 81.75Å 148.90Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	34.44 – 2.10 34.44 – 2.10	Depositor EDS
% Data completeness (in resolution range)	98.1 (34.44-2.10) 98.1 (34.44-2.10)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.69 (at 2.10Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.202 , 0.264 0.198 , 0.256	Depositor DCC
$R_{free}$ test set	3222 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	41.7	Xtriage
Anisotropy	0.026	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 45.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.008 for -h,-k,l 0.035 for h,-h-k,-l 0.019 for -k,-h,-l	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	8791	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.24% of the height of the origin peak. No significant pseudotranslation is detected.*

<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](#)

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

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	0.90	1/2995 (0.0%)	0.91	6/4063 (0.1%)
1	B	0.90	3/2854 (0.1%)	0.92	6/3871 (0.2%)
1	C	0.76	0/2783	0.78	1/3775 (0.0%)
All	All	0.86	4/8632 (0.0%)	0.87	13/11709 (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 (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	855	CYS	CB-SG	-6.00	1.72	1.82
1	A	716	GLN	CB-CG	5.53	1.67	1.52
1	B	726	TYR	CD2-CE2	5.18	1.47	1.39
1	B	663	VAL	CA-CB	5.14	1.65	1.54

The worst 5 of 13 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	690	ARG	NE-CZ-NH2	-7.32	116.64	120.30
1	A	769	MET	CG-SD-CE	-6.60	89.64	100.20
1	A	516	LEU	CA-CB-CG	6.36	129.93	115.30
1	B	657	LEU	CA-CB-CG	6.29	129.77	115.30
1	B	707	ASP	CB-CG-OD2	6.18	123.86	118.30



There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	612	MET	Peptide

## 5.2 Too-close contacts ⓘ

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	2925	0	2823	55	0
1	B	2786	0	2678	51	0
1	C	2718	0	2601	43	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
2	C	2	0	0	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	0	0
4	A	122	0	0	7	0
4	B	129	0	0	9	0
4	C	99	0	0	6	0
All	All	8791	0	8102	147	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 9.

The worst 5 of 147 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:769:MET:HE3	4:B:329:HOH:O	1.63	0.98
1:B:575:GLU:HG3	4:B:65:HOH:O	1.70	0.91
1:B:769:MET:CE	4:B:329:HOH:O	2.17	0.91
1:A:595:SER:HB3	1:A:597:LEU:HB2	1.55	0.89
1:A:825:GLN:HE22	1:A:864:VAL:H	1.22	0.86

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	384/423 (91%)	363 (94%)	18 (5%)	3 (1%)	21	16
1	B	363/423 (86%)	344 (95%)	17 (5%)	2 (1%)	27	23
1	C	354/423 (84%)	337 (95%)	17 (5%)	0	100	100
All	All	1101/1269 (87%)	1044 (95%)	52 (5%)	5 (0%)	31	27

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	613	PHE
1	A	808	ALA
1	B	531	HIS
1	A	557	GLU
1	B	811	GLY

### 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	306/336 (91%)	280 (92%)	26 (8%)	12	8
1	B	292/336 (87%)	273 (94%)	19 (6%)	19	16
1	C	284/336 (84%)	264 (93%)	20 (7%)	16	13
All	All	882/1008 (88%)	817 (93%)	65 (7%)	15	11

5 of 65 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	543	GLU
1	B	692	LEU
1	C	765	LEU
1	B	574	LEU
1	B	625	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 37 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	710	HIS
1	B	730	HIS
1	C	756	ASN
1	B	712	ASN
1	B	715	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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 12 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 [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	386/423 (91%)	0.38	34 (8%)	10 13	24, 40, 62, 71	0
1	B	367/423 (86%)	0.22	26 (7%)	16 20	25, 38, 59, 71	0
1	C	358/423 (84%)	0.58	36 (10%)	7 9	31, 48, 67, 74	0
All	All	1111/1269 (87%)	0.39	96 (8%)	10 13	24, 42, 63, 74	0

The worst 5 of 96 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	837	LEU	8.6
1	C	796	VAL	6.9
1	C	798	ALA	6.0
1	C	797	SER	5.3
1	C	706	TRP	5.3

### 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](#)

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, 95<sup>th</sup> 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	K	C	905	1/1	0.95	0.12	61,61,61,61	0
3	K	B	905	1/1	0.97	0.12	46,46,46,46	0
3	K	C	904	1/1	0.97	0.09	46,46,46,46	0
2	ZN	B	403	1/1	0.99	0.11	38,38,38,38	0
3	K	A	904	1/1	0.99	0.08	33,33,33,33	0
2	ZN	A	401	1/1	0.99	0.12	34,34,34,34	0
2	ZN	C	406	1/1	0.99	0.04	54,54,54,54	0
2	ZN	C	405	1/1	0.99	0.09	43,43,43,43	0
3	K	B	904	1/1	0.99	0.09	38,38,38,38	0
3	K	A	905	1/1	0.99	0.06	43,43,43,43	0
2	ZN	B	404	1/1	0.99	0.05	49,49,49,49	0
2	ZN	A	402	1/1	1.00	0.04	46,46,46,46	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.