



# wwPDB X-ray Structure Validation Summary Report

Jan 31, 2016 – 06:18 PM GMT

PDB ID : 1A4M  
Title : ADA STRUCTURE COMPLEXED WITH PURINE RIBOSIDE AT PH 7.0  
Authors : Wang, Z.; Quioco, F.A.  
Deposited on : 1998-01-31  
Resolution : 1.95 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  
<http://wwpdb.org/validation/2016/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  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

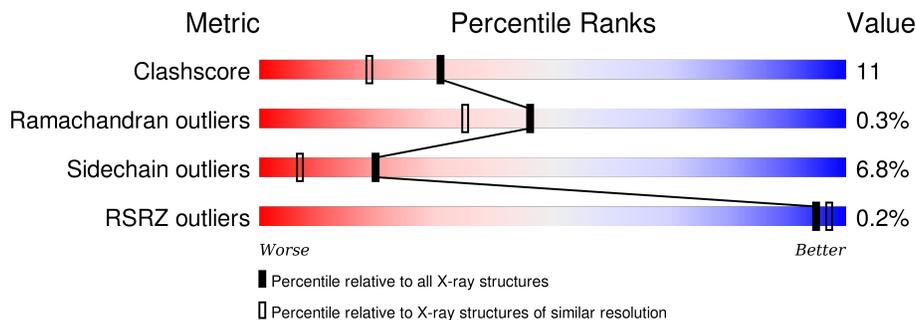
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.95 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	102246	1953 (1.96-1.96)
Ramachandran outliers	100387	1936 (1.96-1.96)
Sidechain outliers	100360	1936 (1.96-1.96)
RSRZ outliers	91569	1835 (1.96-1.96)

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	349	
1	B	349	
1	C	349	
1	D	349	

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 12313 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.

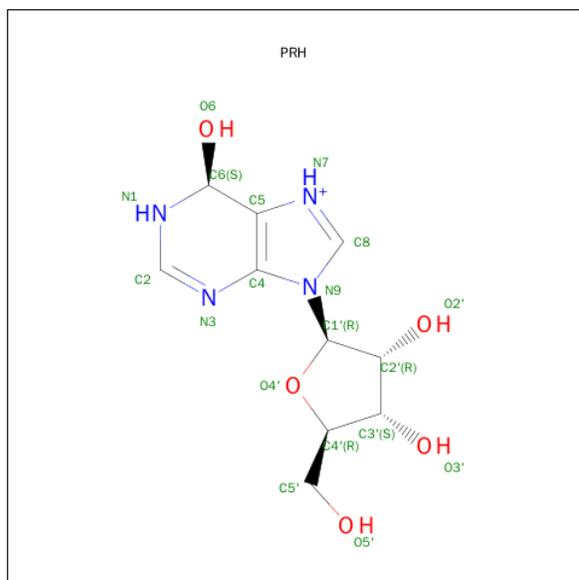
- Molecule 1 is a protein called ADENOSINE DEAMINASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	349	2792	1778	470	530	14	0	0	0
1	B	349	2792	1778	470	530	14	0	0	0
1	C	349	2792	1778	470	530	14	0	0	0
1	D	349	2792	1778	470	530	14	0	0	0

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Zn	0	0
			1	1		
2	A	1	Total	Zn	0	0
			1	1		
2	D	1	Total	Zn	0	0
			1	1		
2	C	1	Total	Zn	0	0
			1	1		

- Molecule 3 is 6-HYDROXY-1,6-DIHYDRO PURINE NUCLEOSIDE (three-letter code: PRH) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>4</sub>O<sub>5</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			19	10	4	5		
3	B	1	Total	C	N	O	0	0
			19	10	4	5		
3	C	1	Total	C	N	O	0	0
			19	10	4	5		
3	D	1	Total	C	N	O	0	0
			19	10	4	5		

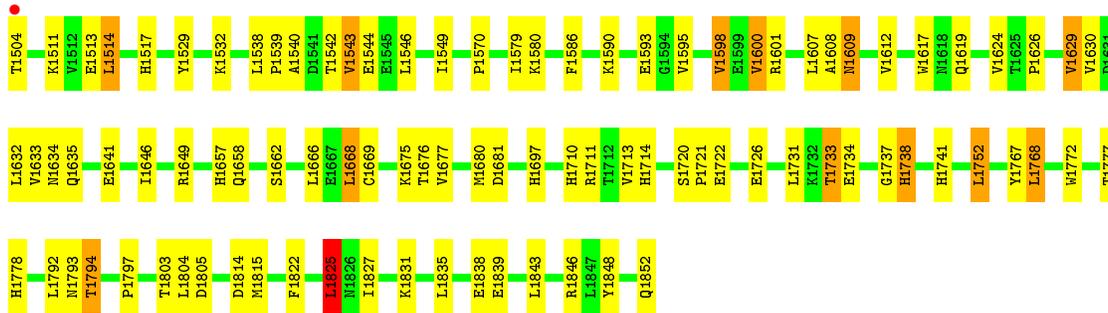
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	287	Total	O	0	0
			287	287		
4	B	269	Total	O	0	0
			269	269		
4	C	242	Total	O	0	0
			242	242		
4	D	267	Total	O	0	0
			267	267		



- Molecule 1: ADENOSINE DEAMINASE

Chain D:  73% 23%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	88.69Å 93.64Å 102.18Å 90.00° 102.84° 90.00°	Depositor
Resolution (Å)	10.00 – 1.95 39.56 – 1.95	Depositor EDS
% Data completeness (in resolution range)	70.2 (10.00-1.95) 65.7 (39.56-1.95)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.08	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.52 (at 1.95Å)	Xtrriage
Refinement program	X-PLOR 3.85	Depositor
R, $R_{free}$	0.193 , 0.281 0.199 , (Not available)	Depositor DCC
$R_{free}$ test set	No test flags present.	DCC
Wilson B-factor (Å <sup>2</sup> )	16.3	Xtrriage
Anisotropy	0.296	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 57.9	EDS
Estimated twinning fraction	No twinning to report.	Xtrriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Outliers	2 of 77949 reflections (0.003%)	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	12313	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	18.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 62.96 % 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 1.0400e-05. 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, 0.375 respectively for untwinned datasets, and 0.333, 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, PRH

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	0.41	0/2856	0.69	1/3864 (0.0%)
1	B	0.42	0/2856	0.70	3/3864 (0.1%)
1	C	0.41	0/2856	0.69	1/3864 (0.0%)
1	D	0.42	0/2856	0.68	1/3864 (0.0%)
All	All	0.42	0/11424	0.69	6/15456 (0.0%)

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	D	1825	LEU	CA-CB-CG	8.66	135.22	115.30
1	A	325	LEU	CA-CB-CG	8.64	135.16	115.30
1	C	1325	LEU	CA-CB-CG	7.89	133.44	115.30
1	B	825	LEU	CA-CB-CG	7.54	132.63	115.30
1	B	835	LEU	CA-CB-CG	5.98	129.06	115.30

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	2792	0	2757	50	0
1	B	2792	0	2757	69	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	2792	0	2757	66	0
1	D	2792	0	2757	62	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	19	0	14	2	0
3	B	19	0	14	0	0
3	C	19	0	14	0	0
3	D	19	0	14	1	0
4	A	287	0	0	10	0
4	B	269	0	0	2	0
4	C	242	0	0	10	0
4	D	267	0	0	3	0
All	All	12313	0	11084	244	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 11.

The worst 5 of 244 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:528:LEU:HD13	1:B:546:LEU:HD22	1.55	0.89
1:C:1109:ASN:HD21	1:C:1124:VAL:H	1.22	0.87
1:A:294:THR:HG23	1:A:297:PRO:HD3	1.59	0.83
1:C:1294:THR:HG23	1:C:1297:PRO:HD3	1.62	0.80
1:B:792:LEU:HD22	1:B:825:LEU:HD11	1.66	0.77

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	347/349 (99%)	334 (96%)	12 (4%)	1 (0%)	46 35
1	B	347/349 (99%)	335 (96%)	11 (3%)	1 (0%)	46 35
1	C	347/349 (99%)	333 (96%)	13 (4%)	1 (0%)	46 35
1	D	347/349 (99%)	334 (96%)	12 (4%)	1 (0%)	46 35
All	All	1388/1396 (99%)	1336 (96%)	48 (4%)	4 (0%)	46 35

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	1238	HIS
1	A	238	HIS
1	B	738	HIS
1	D	1738	HIS

### 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	304/304 (100%)	283 (93%)	21 (7%)	19 7
1	B	304/304 (100%)	286 (94%)	18 (6%)	24 10
1	C	304/304 (100%)	281 (92%)	23 (8%)	16 5
1	D	304/304 (100%)	283 (93%)	21 (7%)	19 7
All	All	1216/1216 (100%)	1133 (93%)	83 (7%)	20 7

5 of 83 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	843	LEU
1	C	1109	ASN
1	D	1752	LEU
1	B	846	ARG
1	C	1043	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 46 such

sidechains are listed below:

Mol	Chain	Res	Type
1	B	756	ASN
1	C	1119	GLN
1	D	1756	ASN
1	B	789	ASN
1	B	826	ASN

### 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 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 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	PRH	A	354	2	13,21,21	2.24	3 (23%)	13,31,31	2.38	3 (23%)
3	PRH	B	854	2	13,21,21	2.24	3 (23%)	13,31,31	2.43	4 (30%)
3	PRH	C	1354	2	13,21,21	2.20	4 (30%)	13,31,31	2.15	3 (23%)
3	PRH	D	1854	2	13,21,21	2.21	3 (23%)	13,31,31	2.52	4 (30%)

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
3	PRH	A	354	2	-	0/2/32/32	0/3/3/3
3	PRH	B	854	2	-	0/2/32/32	0/3/3/3
3	PRH	C	1354	2	-	0/2/32/32	0/3/3/3
3	PRH	D	1854	2	-	0/2/32/32	0/3/3/3

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	354	PRH	O4'-C4'	-2.98	1.38	1.45
3	C	1354	PRH	O4'-C4'	-2.75	1.38	1.45
3	B	854	PRH	O4'-C4'	-2.72	1.38	1.45
3	D	1854	PRH	O4'-C4'	-2.70	1.38	1.45
3	C	1354	PRH	C6-N1	-2.00	1.39	1.45

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	854	PRH	C2'-C3'-C4'	-6.57	89.11	102.61
3	A	354	PRH	C2'-C3'-C4'	-6.53	89.18	102.61
3	D	1854	PRH	C2'-C3'-C4'	-6.45	89.35	102.61
3	C	1354	PRH	C2'-C3'-C4'	-5.61	91.09	102.61
3	D	1854	PRH	C4'-O4'-C1'	-3.85	105.49	109.72

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	354	PRH	2	0
3	D	1854	PRH	1	0

## 5.7 Other polymers [i](#)

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 [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	349/349 (100%)	-0.39	0 100 100	8, 16, 29, 44	0
1	B	349/349 (100%)	-0.39	0 100 100	7, 15, 29, 44	0
1	C	349/349 (100%)	-0.35	2 (0%) 90 94	7, 16, 28, 44	0
1	D	349/349 (100%)	-0.31	1 (0%) 94 96	8, 16, 29, 43	0
All	All	1396/1396 (100%)	-0.36	3 (0%) 95 97	7, 16, 29, 44	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	1504	THR	2.4
1	C	1206	LYS	2.2
1	C	1004	THR	2.2

### 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
3	PRH	B	854	19/19	0.96	0.08	-0.34	5,9,13,14	0
3	PRH	D	1854	19/19	0.97	0.08	-0.41	3,8,11,12	0
3	PRH	A	354	19/19	0.97	0.08	-0.58	5,10,15,19	0
3	PRH	C	1354	19/19	0.97	0.08	-0.64	2,10,14,17	0
2	ZN	B	900	1/1	1.00	0.09	-0.96	16,16,16,16	0
2	ZN	D	1900	1/1	0.99	0.07	-1.71	16,16,16,16	0
2	ZN	A	400	1/1	1.00	0.07	-1.72	13,13,13,13	0
2	ZN	C	1400	1/1	1.00	0.07	-1.74	15,15,15,15	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.