Full wwPDB X-ray Structure Validation Report ⓘ

Feb 11, 2024 – 09:48 AM EST

PDB ID	:	3C2E
Title	:	Crystal structure at 1.9A of the apo quinolinate phosphoribosyl transferase (BNA6) from Saccharomyces cerevisiae
Authors	:	di Luccio, E.; Wilson, D.K.
Deposited on	:	2008-01-24
Resolution	:	1.90 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:

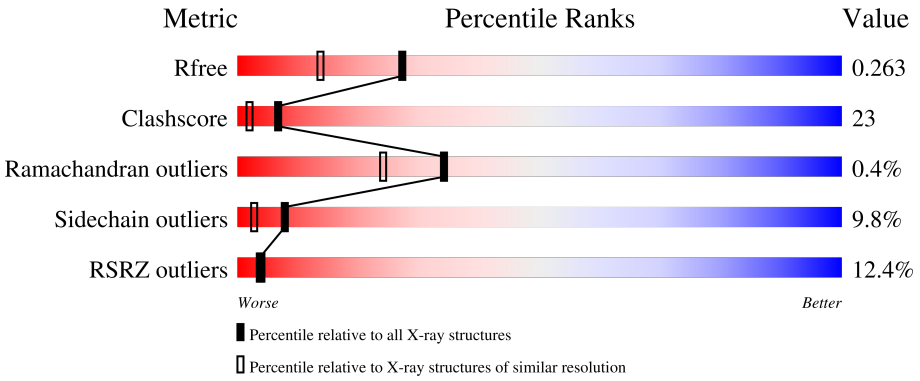
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 1.90 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}	130704	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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% 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	294	11% 57% 27% 6% • 9%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 2284 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 Nicotinate-nucleotide pyrophosphorylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	267	2042	1288	345	396	13	2	0	0

- Molecule 2 is water.

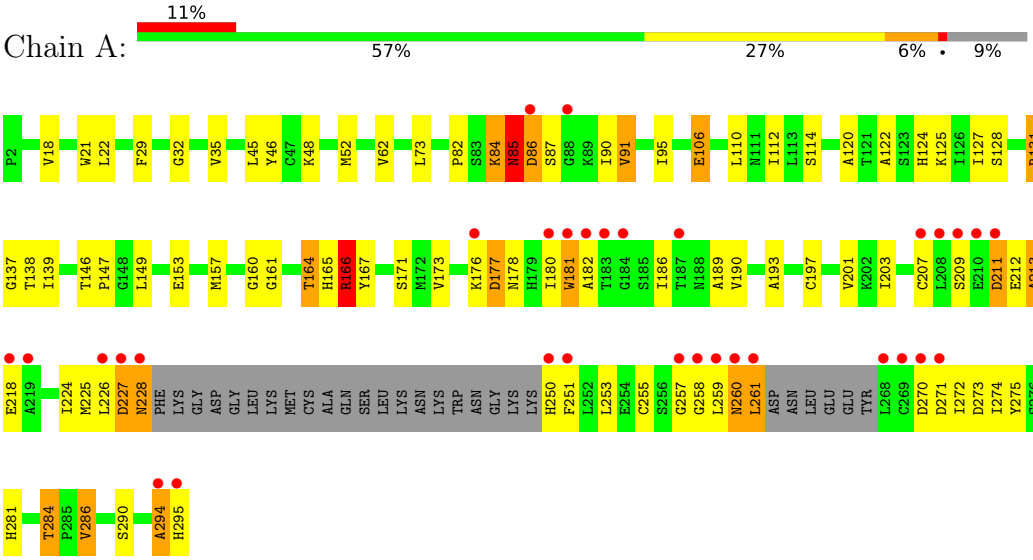
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	242	242	242	0	0

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 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: Nicotinate-nucleotide pyrophosphorylase

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α, β, γ	154.91Å 154.91Å 68.95Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	28.10 – 1.90 25.82 – 1.90	Depositor EDS
% Data completeness (in resolution range)	91.9 (28.10-1.90) 87.2 (25.82-1.90)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$< I/\sigma(I) >$ [1]	3.24 (at 1.91Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.234 , 0.259 0.236 , 0.263	Depositor DCC
R_{free} test set	1109 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å^2)	28.9	Xtriage
Anisotropy	0.153	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 76.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	2284	wwPDB-VP
Average B, all atoms (Å^2)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.43% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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	0.60	2/2078 (0.1%)	0.80	11/2810 (0.4%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	167	TYR	CD1-CE1	-5.15	1.31	1.39
1	A	166	ARG	CZ-NH2	-5.15	1.26	1.33

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	294	ALA	CB-CA-C	-9.48	95.88	110.10
1	A	85	ASN	CB-CA-C	9.45	129.30	110.40
1	A	106	GLU	N-CA-C	7.13	130.24	111.00
1	A	166	ARG	NE-CZ-NH1	6.98	123.79	120.30
1	A	29	PHE	N-CA-CB	6.49	122.28	110.60
1	A	106	GLU	CB-CA-C	-6.41	97.58	110.40
1	A	211	ASP	CB-CG-OD1	5.82	123.53	118.30
1	A	227	ASP	N-CA-C	5.67	126.30	111.00
1	A	228	ASN	N-CA-CB	5.65	120.77	110.60
1	A	166	ARG	NE-CZ-NH2	-5.43	117.58	120.30
1	A	213	ALA	CB-CA-C	-5.12	102.42	110.10

There are no chirality outliers.

There are no planarity outliers.

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	2042	0	2022	95	0
2	A	242	0	0	10	0
All	All	2284	0	2022	95	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 23.

All (95) 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:261:LEU:HA	2:A:459:HOH:O	1.48	1.14
1:A:52:MET:HE1	1:A:160:GLY:HA2	1.33	1.10
1:A:260:ASN:N	1:A:260:ASN:HD22	1.62	0.95
1:A:213:ALA:O	1:A:217:ILE:HG12	1.69	0.93
1:A:259:LEU:HD13	1:A:260:ASN:H	1.32	0.91
1:A:165:HIS:CD2	1:A:166:ARG:H	1.89	0.90
1:A:173:VAL:HB	1:A:203:ILE:HD13	1.55	0.89
1:A:259:LEU:C	1:A:260:ASN:HD22	1.77	0.87
1:A:165:HIS:HD2	1:A:166:ARG:H	1.25	0.84
1:A:114:SER:HB2	1:A:286:VAL:HG13	1.57	0.83
1:A:114:SER:HB2	1:A:286:VAL:CG1	2.10	0.80
1:A:271:ASP:OD2	2:A:463:HOH:O	2.00	0.79
1:A:164:THR:HG23	1:A:165:HIS:O	1.86	0.76
1:A:260:ASN:N	1:A:260:ASN:ND2	2.30	0.76
1:A:255:CYS:HA	2:A:508:HOH:O	1.86	0.74
1:A:52:MET:HE3	1:A:120:ALA:HB1	1.71	0.70
1:A:73:LEU:HD22	1:A:91:VAL:HG22	1.74	0.69
1:A:106:GLU:O	1:A:110:LEU:HG	1.91	0.69
1:A:258:GLY:O	1:A:259:LEU:HB3	1.92	0.69
1:A:259:LEU:HD13	1:A:260:ASN:N	2.06	0.67
1:A:226:LEU:HD22	1:A:226:LEU:N	2.11	0.66
1:A:82:PRO:HD3	1:A:90:ILE:HD12	1.78	0.66
1:A:127:ILE:HG13	1:A:139:ILE:HD13	1.76	0.66
1:A:294:ALA:O	1:A:295:HIS:HB2	1.96	0.64
1:A:128:SER:HA	1:A:131:ARG:HH11	1.62	0.63
1:A:207:CYS:SG	1:A:212:GLU:O	2.52	0.63
1:A:127:ILE:HD13	1:A:161:GLY:O	1.98	0.63
1:A:280:ILE:HD12	1:A:281:HIS:HB3	1.80	0.63
1:A:177:ASP:HA	1:A:180:ILE:HG12	1.80	0.63
1:A:197:CYS:SG	1:A:203:ILE:HD11	2.39	0.63
1:A:86:ASP:OD2	1:A:87:SER:N	2.31	0.62
1:A:209:SER:HB2	1:A:212:GLU:HG3	1.81	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:173:VAL:CB	1:A:203:ILE:HD13	2.26	0.61
1:A:128:SER:HA	1:A:131:ARG:NH1	2.18	0.58
1:A:227:ASP:N	2:A:508:HOH:O	2.35	0.58
1:A:164:THR:CG2	1:A:165:HIS:O	2.52	0.57
1:A:209:SER:HB2	1:A:212:GLU:CG	2.34	0.56
1:A:258:GLY:C	1:A:259:LEU:O	2.41	0.54
1:A:284:THR:HG22	2:A:311:HOH:O	2.08	0.54
1:A:73:LEU:HD23	2:A:356:HOH:O	2.08	0.53
1:A:135:TYR:HE1	2:A:509:HOH:O	1.92	0.53
1:A:48:LYS:HE3	1:A:290:SER:OG	2.09	0.53
1:A:294:ALA:O	1:A:295:HIS:CB	2.56	0.53
1:A:227:ASP:O	1:A:228:ASN:HB3	2.09	0.52
1:A:166:ARG:HG2	1:A:166:ARG:O	2.09	0.52
1:A:95:ILE:HD12	1:A:95:ILE:N	2.24	0.52
1:A:193:ALA:HB1	1:A:203:ILE:HD12	1.91	0.52
1:A:178:ASN:O	1:A:182:ALA:HB2	2.09	0.52
1:A:114:SER:HB2	1:A:286:VAL:HG11	1.91	0.52
1:A:259:LEU:CD1	1:A:260:ASN:H	2.15	0.52
1:A:21:TRP:CZ3	1:A:112:ILE:HD11	2.44	0.51
1:A:217:ILE:HD11	1:A:224:ILE:HG13	1.93	0.51
1:A:146:THR:HG23	1:A:153:GLU:OE2	2.11	0.50
1:A:271:ASP:O	1:A:271:ASP:OD1	2.30	0.49
1:A:132:SER:HB2	2:A:511:HOH:O	2.12	0.49
1:A:139:ILE:HD12	1:A:139:ILE:N	2.27	0.49
1:A:180:ILE:HG13	1:A:181:TRP:N	2.27	0.49
1:A:226:LEU:N	1:A:226:LEU:CD2	2.76	0.49
1:A:277:THR:HG22	1:A:279:SER:H	1.78	0.48
1:A:173:VAL:CG2	1:A:203:ILE:HD13	2.44	0.48
1:A:180:ILE:HA	1:A:189:ALA:HB2	1.95	0.48
1:A:177:ASP:HB2	1:A:181:TRP:CZ2	2.49	0.48
1:A:270:ASP:OD1	1:A:270:ASP:C	2.51	0.47
1:A:127:ILE:O	1:A:131:ARG:HD3	2.15	0.46
1:A:157:MET:HG2	1:A:280:ILE:CD1	2.45	0.46
1:A:259:LEU:CD1	1:A:260:ASN:N	2.74	0.46
1:A:138:THR:CG2	1:A:274:ILE:HG12	2.46	0.46
1:A:258:GLY:O	1:A:259:LEU:CB	2.54	0.46
1:A:278:SER:HA	1:A:281:HIS:CE1	2.51	0.46
1:A:122:ALA:HA	1:A:125:LYS:HE2	1.98	0.46
1:A:146:THR:OG1	1:A:149:LEU:HB3	2.16	0.45
1:A:18:VAL:HG13	1:A:62:VAL:HG22	1.98	0.44
1:A:227:ASP:O	1:A:227:ASP:OD1	2.34	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:124:HIS:HD2	2:A:383:HOH:O	2.01	0.44
1:A:280:ILE:HD12	1:A:280:ILE:C	2.37	0.44
1:A:157:MET:HG2	1:A:280:ILE:HD13	1.99	0.44
1:A:82:PRO:O	1:A:85:ASN:HB2	2.17	0.43
1:A:32:GLY:O	1:A:35:VAL:HG22	2.17	0.43
1:A:217:ILE:HD12	1:A:251:PHE:CG	2.54	0.43
1:A:46:TYR:HB2	1:A:290:SER:OG	2.20	0.42
1:A:125:LYS:HE2	1:A:125:LYS:HB3	1.80	0.42
1:A:186:ILE:HG21	1:A:216:ALA:HB2	2.00	0.42
1:A:253:LEU:O	1:A:272:ILE:HG22	2.19	0.42
1:A:165:HIS:CD2	1:A:166:ARG:N	2.72	0.41
1:A:225:MET:HE2	1:A:227:ASP:HB2	2.02	0.41
1:A:135:TYR:CZ	1:A:137:GLY:HA3	2.56	0.41
1:A:138:THR:HG22	1:A:273:ASP:O	2.21	0.41
1:A:146:THR:HA	1:A:147:PRO:HD3	1.92	0.41
1:A:84:LYS:N	1:A:84:LYS:HD2	2.36	0.41
1:A:131:ARG:HD2	2:A:458:HOH:O	2.20	0.41
1:A:177:ASP:CA	1:A:180:ILE:HG12	2.49	0.41
1:A:177:ASP:O	1:A:180:ILE:HG12	2.21	0.40
1:A:135:TYR:HH	1:A:275:TYR:HD1	1.65	0.40
1:A:180:ILE:HG13	1:A:181:TRP:CD1	2.55	0.40
1:A:186:ILE:O	1:A:190:VAL:HG23	2.21	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 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	261/294 (89%)	250 (96%)	10 (4%)	1 (0%)	34 24

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	257	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	224/247 (91%)	202 (90%)	22 (10%)	8 3

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	22	LEU
1	A	45	LEU
1	A	84	LYS
1	A	85	ASN
1	A	86	ASP
1	A	91	VAL
1	A	131	ARG
1	A	164	THR
1	A	166	ARG
1	A	171	SER
1	A	176	LYS
1	A	177	ASP
1	A	181	TRP
1	A	201	VAL
1	A	211	ASP
1	A	218	GLU
1	A	250	HIS
1	A	260	ASN
1	A	261	LEU
1	A	277	THR
1	A	284	THR
1	A	286	VAL

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	65	GLN
1	A	85	ASN
1	A	165	HIS
1	A	192	ASN
1	A	260	ASN
1	A	281	HIS

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

There are no ligands in this entry.

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

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^{th} 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^2)	Q<0.9
1	A	267/294 (90%)	0.70	33 (12%)	4	4	18, 34, 86, 168	1 (0%)

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	259	LEU	11.2
1	A	208	LEU	8.3
1	A	295	HIS	7.2
1	A	180	ILE	6.8
1	A	227	ASP	6.7
1	A	228	ASN	6.4
1	A	271	ASP	5.4
1	A	214	THR	5.3
1	A	268	LEU	4.6
1	A	182	ALA	4.3
1	A	183	THR	4.3
1	A	261	LEU	4.1
1	A	257	GLY	4.0
1	A	250	HIS	4.0
1	A	184	GLY	3.9
1	A	218	GLU	3.8
1	A	269	CYS	3.8
1	A	88	GLY	3.5
1	A	219	ALA	3.4
1	A	209	SER	3.1
1	A	211	ASP	3.1
1	A	181	TRP	3.1
1	A	270	ASP	3.0
1	A	210	GLU	2.9
1	A	258	GLY	2.8
1	A	251	PHE	2.6
1	A	86	ASP	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	207	CYS	2.4
1	A	226	LEU	2.3
1	A	294	ALA	2.3
1	A	260	ASN	2.3
1	A	176	LYS	2.1
1	A	187	THR	2.1

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 monosaccharides 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.