Full wwPDB X-ray Structure Validation Report (i)

Oct 22, 2023 – 06:04 PM EDT

PDB ID	:	2ZCG
Title	:	Structure and inhibition of orotidine 5'-phosphate decarboxylase from plasmodium falciparum
Authors	:	Langley, D.B.; Guss, J.M.; Shojaei, M.; Christopherson, R.I.
Deposited on	:	2007-11-08
Resolution	:	2.22 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 (i) 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 (1)) were used in the production of this report:

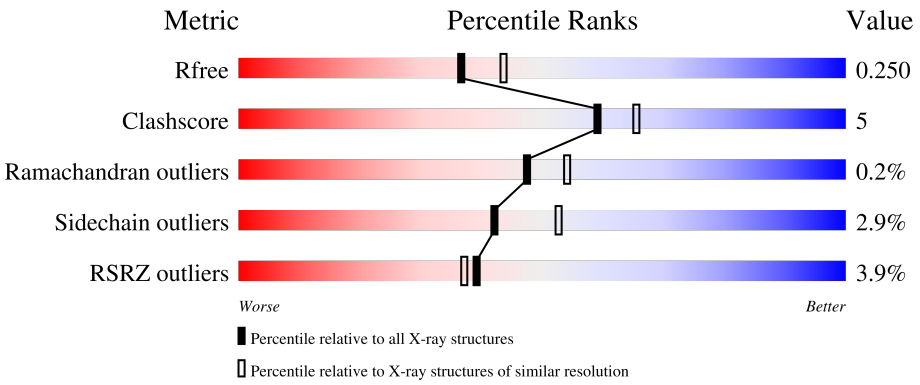
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation 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 2.22 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	5912 (2.24-2.20)
Clashscore	141614	6646 (2.24-2.20)
Ramachandran outliers	138981	6543 (2.24-2.20)
Sidechain outliers	138945	6544 (2.24-2.20)
RSRZ outliers	127900	5797 (2.24-2.20)

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	323	3% 85% 13% • •
1	B	323	5% 82% 15% • •

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 9956 atoms, of which 4660 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 Orotidine 5'-phosphate decarboxylase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	318	4960	1691	2340	424	489	16	0	0	0
1	B	315	4917	1679	2320	416	486	16	0	0	0

- Molecule 2 is water.

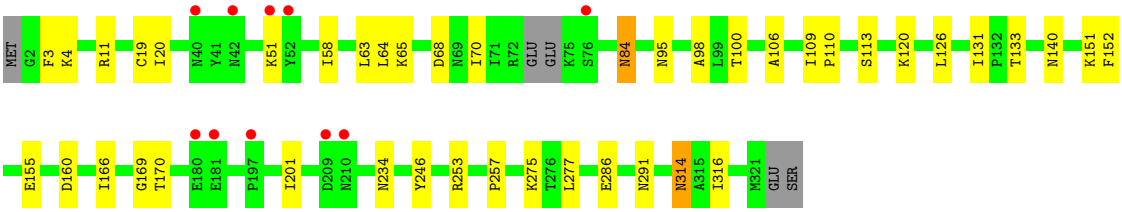
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	38	38	38	0	0
2	B	41	41	41	0	0

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.

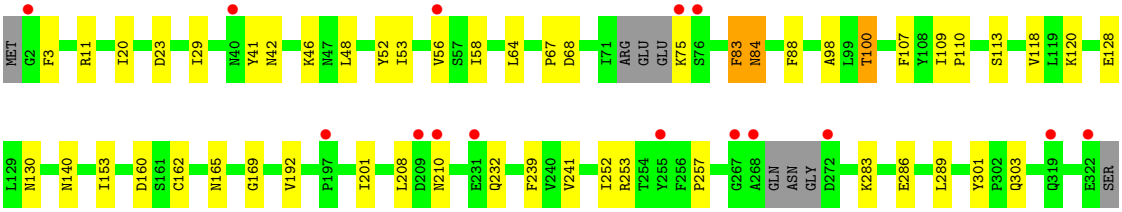
- Molecule 1: Orotidine 5'-phosphate decarboxylase

Chain A:



- Molecule 1: Orotidine 5'-phosphate decarboxylase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	60.93Å 104.09Å 62.42Å 90.00° 113.82° 90.00°	Depositor
Resolution (Å)	15.01 – 2.22 15.00 – 2.22	Depositor EDS
% Data completeness (in resolution range)	99.0 (15.01-2.22) 99.0 (15.00-2.22)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.67 (at 2.22Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.201 , 0.271 0.190 , 0.250	Depositor DCC
R_{free} test set	1741 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	23.8	Xtriage
Anisotropy	0.107	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.46 , 51.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.039 for l,-k,h	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	9956	wwPDB-VP
Average B, all atoms (Å^2)	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.12% 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 (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	0.57	0/2675	0.65	0/3605
1	B	0.57	0/2651	0.63	0/3572
All	All	0.57	0/5326	0.64	0/7177

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	2620	2340	2596	27	0
1	B	2597	2320	2571	26	0
2	A	38	0	0	1	0
2	B	41	0	0	0	0
All	All	5296	4660	5167	48	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 5.

All (48) 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:20:ILE:HD12	1:B:98:ALA:HB2	1.63	0.80

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:113:SER:HB2	1:B:113:SER:HB2	1.74	0.70
1:A:169:GLY:HA2	1:B:201:ILE:HD11	1.79	0.62
1:A:140:ASN:ND2	1:B:165:ASN:HD22	1.99	0.60
1:A:314:ASN:C	1:A:314:ASN:HD22	2.07	0.57
1:A:4:LYS:HD3	1:A:234:ASN:HA	1.86	0.57
1:B:29:ILE:HD12	1:B:83:PHE:HA	1.88	0.55
1:B:11:ARG:HD3	1:B:286:GLU:OE2	2.06	0.54
1:A:314:ASN:O	1:A:314:ASN:ND2	2.38	0.54
1:B:56:VAL:HG11	1:B:88:PHE:HZ	1.73	0.52
1:A:126:LEU:HD13	1:A:133:THR:HG22	1.91	0.52
1:A:314:ASN:C	1:A:314:ASN:ND2	2.64	0.52
1:A:11:ARG:HD3	1:A:286:GLU:OE2	2.10	0.51
1:B:48:LEU:HD22	1:B:64:LEU:HD13	1.93	0.50
1:A:95:ASN:HB2	1:A:131:ILE:CD1	2.42	0.49
1:A:314:ASN:HB2	2:A:334:HOH:O	2.13	0.49
1:A:63:LEU:HD21	1:A:84:ASN:HB3	1.96	0.48
1:A:277:LEU:HD23	1:A:316:ILE:CG2	2.43	0.48
1:B:192:VAL:HG21	1:B:239:PHE:HB3	1.95	0.48
1:B:42:ASN:O	1:B:46:LYS:HG3	2.14	0.47
1:A:151:LYS:O	1:A:155:GLU:HB2	2.14	0.47
1:A:20:ILE:HD12	1:A:98:ALA:HB2	1.95	0.47
1:A:152:PHE:HB2	1:B:110:PRO:HA	1.95	0.47
1:B:3:PHE:CD1	1:B:160:ASP:HB3	2.50	0.47
1:B:100:THR:HG21	1:B:289:LEU:HD22	1.96	0.46
1:A:201:ILE:HD11	1:B:169:GLY:HA2	1.97	0.46
1:A:3:PHE:CD1	1:A:160:ASP:HB3	2.51	0.46
1:A:19:CYS:SG	1:A:100:THR:HG23	2.57	0.45
1:B:109:ILE:N	1:B:110:PRO:CD	2.79	0.45
1:A:253:ARG:O	1:A:257:PRO:HA	2.15	0.45
1:A:106:ALA:O	1:A:110:PRO:HD3	2.17	0.45
1:A:246:TYR:CD2	1:A:275:LYS:HG2	2.52	0.44
1:A:109:ILE:N	1:A:110:PRO:CD	2.82	0.43
1:B:23:ASP:HB3	1:B:107:PHE:CE2	2.54	0.43
1:A:58:ILE:HD11	1:A:120:LYS:HG2	2.01	0.43
1:B:153:ILE:HG21	1:B:162:CYS:HB3	2.00	0.43
1:B:84:ASN:HA	1:B:118:VAL:HG13	2.01	0.42
1:A:19:CYS:O	1:A:291:ASN:HA	2.20	0.42
1:B:53:ILE:O	1:B:56:VAL:HG22	2.19	0.42
1:B:58:ILE:HD11	1:B:120:LYS:HG2	2.02	0.42
1:B:100:THR:CG2	1:B:289:LEU:HD22	2.50	0.42
1:B:253:ARG:O	1:B:257:PRO:HA	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:166:ILE:HD12	1:A:170:THR:HG22	2.02	0.41
1:B:20:ILE:CD1	1:B:98:ALA:HB2	2.44	0.41
1:B:41:TYR:CD2	1:B:67:PRO:HG2	2.56	0.41
1:B:241:VAL:HG21	1:B:252:ILE:HD13	2.02	0.41
1:A:65:LYS:HB2	1:A:70:ILE:HD11	2.04	0.40
1:B:52:TYR:CD1	1:B:128:GLU:HB3	2.57	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	314/323 (97%)	302 (96%)	12 (4%)	0	100	100
1	B	309/323 (96%)	300 (97%)	8 (3%)	1 (0%)	41	45
All	All	623/646 (96%)	602 (97%)	20 (3%)	1 (0%)	47	54

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	210	ASN

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	290/295 (98%)	285 (98%)	5 (2%)	60	73
1	B	288/295 (98%)	276 (96%)	12 (4%)	30	36
All	All	578/590 (98%)	561 (97%)	17 (3%)	42	53

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	51	LYS
1	A	64	LEU
1	A	68	ASP
1	A	84	ASN
1	A	314	ASN
1	B	68	ASP
1	B	75	LYS
1	B	83	PHE
1	B	84	ASN
1	B	100	THR
1	B	130	ASN
1	B	140	ASN
1	B	208	LEU
1	B	232	GLN
1	B	283	LYS
1	B	301	TYR
1	B	303	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	140	ASN
1	A	219	GLN
1	A	279	ASN
1	A	303	GLN
1	A	314	ASN
1	B	40	ASN
1	B	92	ASN
1	B	219	GLN
1	B	232	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 monosaccharides 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, 95th 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	318/323 (98%)	0.08	10 (3%)	49	46	28, 37, 52, 62	4 (1%)
1	B	315/323 (97%)	0.04	15 (4%)	30	28	28, 38, 57, 69	2 (0%)
All	All	633/646 (97%)	0.06	25 (3%)	39	37	28, 38, 55, 69	6 (0%)

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	210	ASN	16.8
1	A	52	TYR	16.2
1	A	40	ASN	13.6
1	A	209	ASP	10.9
1	B	209	ASP	10.3
1	B	268	ALA	9.6
1	B	210	ASN	9.2
1	B	75	LYS	4.4
1	A	51	LYS	3.7
1	B	76	SER	3.6
1	A	180	GLU	3.5
1	B	231	GLU	3.5
1	B	267	GLY	3.2
1	A	76	SER	3.2
1	B	40	ASN	2.8
1	B	56	VAL	2.8
1	B	322	GLU	2.7
1	B	2	GLY	2.7
1	A	197	PRO	2.7
1	A	181	GLU	2.5
1	A	42	ASN	2.5
1	B	255	TYR	2.4
1	B	319	GLN	2.3
1	B	272	ASP	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	197	PRO	2.0

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.