



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 26, 2023 – 04:40 PM EDT

PDB ID : 3GDR
Title : Crystal structure of the D91N mutant of the orotidine 5'-monophosphate decarboxylase from *Saccharomyces cerevisiae*
Authors : Fedorov, A.A.; Fedorov, E.V.; Wood, B.M.; Gerlt, J.A.; Almo, S.C.
Deposited on : 2009-02-24
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 : 2.35
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) : 2.35

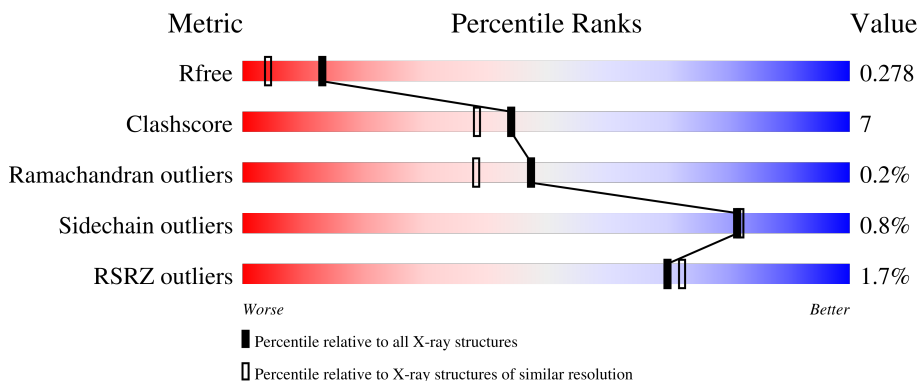
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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 $\leq 5\%$. 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	267	 2% 81% 16% . .
1	B	267	 2% 84% 13% .
1	C	267	 2% 81% 13% . 6%
1	D	267	 2% 82% 12% 6%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8368 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 Orotidine 5'-phosphate decarboxylase.

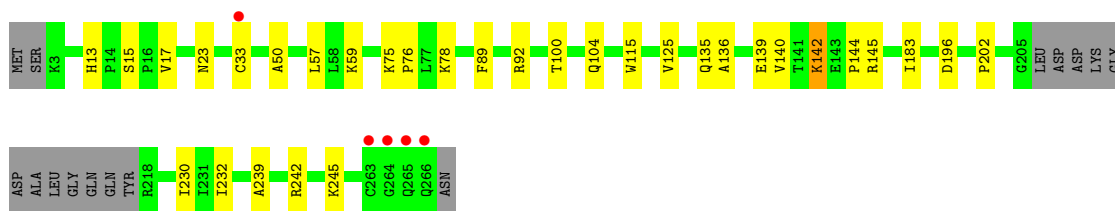
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	260	2003	1269	347	379	8	0	0	0
1	B	260	2003	1269	347	379	8	0	0	0
1	C	252	1939	1228	338	364	9	0	0	0
1	D	252	1939	1228	338	364	9	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	91	ASN	ASP	engineered mutation	UNP P03962
B	91	ASN	ASP	engineered mutation	UNP P03962
C	91	ASN	ASP	engineered mutation	UNP P03962
D	91	ASN	ASP	engineered mutation	UNP P03962

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	133	Total 133	O 133	0	0
2	B	128	Total 128	O 128	0	0
2	C	122	Total 122	O 122	0	0
2	D	101	Total 101	O 101	0	0



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	84.12Å 99.14Å 126.65Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.86 – 1.90 39.92 – 1.70	Depositor EDS
% Data completeness (in resolution range)	99.3 (24.86-1.90) 99.0 (39.92-1.70)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.06 (at 1.70Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.252 , 0.278 0.252 , 0.278	Depositor DCC
R_{free} test set	5840 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	20.0	Xtrriage
Anisotropy	0.739	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 43.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8368	wwPDB-VP
Average B, all atoms (Å ²)	23.0	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 55.08 % 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 3.3315e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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	0/2036	0.59	1/2745 (0.0%)
1	B	0.31	0/2036	0.60	1/2745 (0.0%)
1	C	0.32	0/1970	0.60	1/2654 (0.0%)
1	D	0.32	0/1970	0.59	1/2654 (0.0%)
All	All	0.32	0/8012	0.59	4/10798 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	183	ILE	N-CA-C	-6.46	93.55	111.00
1	C	183	ILE	N-CA-C	-6.40	93.71	111.00
1	B	183	ILE	N-CA-C	-6.34	93.87	111.00
1	A	183	ILE	N-CA-C	-6.11	94.51	111.00

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	2003	0	2033	29	0
1	B	2003	0	2033	24	0
1	C	1939	0	1973	29	0
1	D	1939	0	1973	25	0
2	A	133	0	0	1	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	128	0	0	0	0
2	C	122	0	0	3	0
2	D	101	0	0	1	0
All	All	8368	0	8012	105	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 7.

All (105) 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:30:THR:HG23	1:A:56:CYS:SG	2.08	0.93
1:D:33:CYS:SG	1:D:57:LEU:HB3	2.11	0.91
1:B:13:HIS:HD2	1:B:15:SER:H	1.23	0.85
1:D:13:HIS:HD2	1:D:15:SER:H	1.23	0.84
1:A:13:HIS:HD2	1:A:15:SER:H	1.22	0.83
1:D:33:CYS:SG	1:D:230:ILE:HG21	2.19	0.82
1:C:13:HIS:HD2	1:C:15:SER:H	1.26	0.82
1:C:17:VAL:HG23	2:C:318:HOH:O	1.81	0.78
1:A:30:THR:O	1:A:56:CYS:SG	2.44	0.76
1:C:42:LYS:O	1:C:46:GLU:HG3	1.86	0.75
1:C:70:MET:HE1	1:C:74:VAL:HG21	1.69	0.74
1:D:17:VAL:HG23	2:D:276:HOH:O	1.88	0.72
1:D:13:HIS:CD2	1:D:15:SER:H	2.08	0.72
1:C:13:HIS:CD2	1:C:15:SER:H	2.09	0.69
1:D:33:CYS:SG	1:D:57:LEU:HD23	2.32	0.68
1:C:54:LYS:HE2	1:C:249:GLU:HB2	1.75	0.66
1:D:100:THR:O	1:D:104:GLN:HG3	1.97	0.65
1:A:13:HIS:CD2	1:A:15:SER:H	2.11	0.64
1:C:135:GLN:O	1:C:139:GLU:HG3	1.98	0.64
1:A:235:ARG:HD3	1:A:238:PHE:CZ	2.33	0.64
1:A:100:THR:O	1:A:104:GLN:HG3	1.99	0.62
1:C:17:VAL:HG22	1:C:144:PRO:CB	2.30	0.61
1:B:42:LYS:O	1:B:46:GLU:HG3	2.01	0.60
1:B:135:GLN:O	1:B:139:GLU:HG3	2.02	0.59
1:B:102:LYS:NZ	1:B:135:GLN:HE21	2.00	0.59
1:D:17:VAL:HG22	1:D:144:PRO:CB	2.34	0.58
1:B:134:LYS:O	1:B:138:GLU:HG3	2.05	0.57
1:C:100:THR:O	1:C:104:GLN:HG3	2.04	0.57
1:B:121:ALA:HB1	1:B:129:ILE:HD13	1.86	0.57
1:C:70:MET:CE	1:C:74:VAL:HG21	2.35	0.57

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:33:CYS:SG	1:D:230:ILE:CG2	2.92	0.57
1:A:253:LYS:O	1:A:257:GLU:HG3	2.04	0.56
1:D:50:ALA:O	1:D:245:LYS:HD2	2.05	0.56
1:A:135:GLN:O	1:A:139:GLU:HG3	2.06	0.55
1:B:44:LEU:HD23	1:B:44:LEU:C	2.26	0.55
1:B:100:THR:O	1:B:104:GLN:HG3	2.06	0.55
1:C:17:VAL:HG21	1:C:145:ARG:C	2.28	0.54
1:A:13:HIS:HE1	1:A:196:ASP:O	1.91	0.54
1:A:121:ALA:HB1	1:A:129:ILE:HD13	1.90	0.54
1:D:135:GLN:HG2	1:D:139:GLU:OE2	2.09	0.53
1:D:17:VAL:HG22	1:D:144:PRO:HB2	1.89	0.53
1:C:235:ARG:HG2	1:C:239:ALA:HB2	1.91	0.52
1:A:42:LYS:O	1:A:46:GLU:HG3	2.10	0.52
1:B:10:ALA:HB2	1:B:22:PHE:CB	2.40	0.51
1:B:13:HIS:CD2	1:B:15:SER:H	2.14	0.51
1:D:202:PRO:HA	1:D:232:ILE:HB	1.92	0.51
1:C:239:ALA:O	1:C:242:ARG:HG3	2.11	0.50
1:D:59:LYS:HA	1:D:89:PHE:O	2.11	0.50
1:A:121:ALA:HB1	1:A:129:ILE:CD1	2.42	0.49
1:A:30:THR:HB	1:A:252:ARG:HG3	1.93	0.49
1:B:59:LYS:HA	1:B:89:PHE:O	2.12	0.49
1:A:59:LYS:HA	1:A:89:PHE:O	2.13	0.49
1:A:81:SER:HB2	1:A:86:PHE:O	2.12	0.48
1:B:121:ALA:HB1	1:B:129:ILE:CD1	2.43	0.48
1:C:59:LYS:HA	1:C:89:PHE:O	2.13	0.48
1:D:13:HIS:HE1	1:D:196:ASP:O	1.96	0.48
1:C:13:HIS:HE1	1:C:196:ASP:O	1.96	0.48
1:A:111:ARG:HE	1:A:114:GLU:CD	2.17	0.48
1:A:102:LYS:NZ	1:A:135:GLN:HE21	2.12	0.48
1:B:235:ARG:HD3	1:B:238:PHE:CZ	2.49	0.48
1:B:13:HIS:HE1	1:B:196:ASP:O	1.97	0.47
1:C:17:VAL:HG22	1:C:144:PRO:HB2	1.96	0.47
1:C:13:HIS:CD2	1:C:15:SER:HB3	2.50	0.47
1:C:109:VAL:HG22	2:C:353:HOH:O	2.14	0.47
1:B:213:LEU:HD12	1:B:216:GLN:OE1	2.15	0.47
1:C:66:THR:HG21	2:C:460:HOH:O	2.16	0.46
1:A:73:THR:O	1:A:77:LEU:HB2	2.16	0.46
1:B:73:THR:O	1:B:77:LEU:HB2	2.15	0.46
1:D:239:ALA:O	1:D:242:ARG:HG3	2.15	0.46
1:A:134:LYS:O	1:A:138:GLU:HG3	2.17	0.45
1:C:17:VAL:HG22	1:C:144:PRO:C	2.37	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:10:ALA:HB2	1:B:22:PHE:HB3	1.98	0.45
1:B:17:VAL:HG21	1:B:145:ARG:C	2.38	0.44
1:A:155:CYS:SG	1:D:125:VAL:O	2.58	0.44
1:B:152:GLU:HB2	1:B:184:ALA:HA	1.98	0.44
1:A:202:PRO:HA	1:A:232:ILE:HB	1.99	0.44
1:C:70:MET:HE3	1:C:74:VAL:HG11	2.00	0.44
1:B:102:LYS:HZ2	1:B:135:GLN:HE21	1.63	0.43
1:C:70:MET:HE1	1:C:115:TRP:CD1	2.53	0.43
1:D:13:HIS:CD2	1:D:15:SER:HB3	2.54	0.43
1:D:142:LYS:H	1:D:142:LYS:HG3	1.72	0.43
1:A:17:VAL:HG21	1:A:145:ARG:C	2.39	0.43
1:B:10:ALA:HB2	1:B:22:PHE:HB2	1.99	0.42
1:C:136:ALA:O	1:C:140:VAL:HG23	2.18	0.42
1:A:75:LYS:HB3	1:A:76:PRO:CD	2.49	0.42
1:B:173:LYS:NZ	1:B:197:TRP:HH2	2.17	0.42
1:A:29:GLN:HG2	2:A:338:HOH:O	2.20	0.42
1:A:10:ALA:HB2	1:A:22:PHE:CB	2.50	0.42
1:C:134:LYS:O	1:C:138:GLU:HG3	2.20	0.42
1:D:75:LYS:HB3	1:D:76:PRO:CD	2.50	0.42
1:A:91:ASN:O	1:A:92:ARG:C	2.58	0.42
1:C:13:HIS:CD2	1:C:18:ALA:HB3	2.55	0.42
1:D:17:VAL:HG21	1:D:145:ARG:C	2.40	0.42
1:D:136:ALA:O	1:D:140:VAL:HG23	2.20	0.41
1:C:106:SER:HB2	1:C:140:VAL:HG21	2.03	0.41
1:C:33:CYS:HA	1:C:57:LEU:O	2.20	0.41
1:A:102:LYS:HZ2	1:A:135:GLN:HG2	1.86	0.41
1:A:25:MET:HG2	1:A:56:CYS:SG	2.61	0.41
1:B:7:LYS:HD3	1:B:26:HIS:CD2	2.56	0.41
1:B:77:LEU:HD12	1:B:77:LEU:HA	1.93	0.41
1:A:213:LEU:C	1:A:213:LEU:HD23	2.41	0.40
1:C:263:CYS:SG	1:D:75:LYS:HD2	2.62	0.40
1:D:13:HIS:HD2	1:D:15:SER:N	2.04	0.40
1:D:78:LYS:HE2	1:D:115:TRP:HB2	2.03	0.40
1:C:35:SER:HA	1:C:59:LYS:HB3	2.04	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	258/267 (97%)	247 (96%)	10 (4%)	1 (0%)	34	24
1	B	258/267 (97%)	246 (95%)	11 (4%)	1 (0%)	34	24
1	C	248/267 (93%)	238 (96%)	10 (4%)	0	100	100
1	D	248/267 (93%)	237 (96%)	11 (4%)	0	100	100
All	All	1012/1068 (95%)	968 (96%)	42 (4%)	2 (0%)	47	38

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	92	ARG
1	B	92	ARG

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	209/215 (97%)	208 (100%)	1 (0%)	88	89
1	B	209/215 (97%)	209 (100%)	0	100	100
1	C	203/215 (94%)	200 (98%)	3 (2%)	65	62
1	D	203/215 (94%)	200 (98%)	3 (2%)	65	62
All	All	824/860 (96%)	817 (99%)	7 (1%)	81	82

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	89	PHE
1	C	70	MET
1	C	101	VAL
1	C	235	ARG
1	D	23	ASN
1	D	92	ARG
1	D	142	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	13	HIS
1	A	23	ASN
1	A	29	GLN
1	A	135	GLN
1	B	13	HIS
1	B	23	ASN
1	B	29	GLN
1	B	135	GLN
1	C	13	HIS
1	C	61	HIS
1	D	13	HIS
1	D	61	HIS

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	260/267 (97%)	-0.05	3 (1%) 79 81	15, 22, 31, 39	0
1	B	260/267 (97%)	0.06	4 (1%) 73 76	15, 22, 32, 39	0
1	C	252/267 (94%)	0.09	5 (1%) 65 68	15, 22, 33, 41	0
1	D	252/267 (94%)	0.15	5 (1%) 65 68	16, 22, 33, 43	0
All	All	1024/1068 (95%)	0.06	17 (1%) 70 72	15, 22, 32, 43	0

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	263	CYS	8.9
1	D	265	GLN	6.7
1	C	263	CYS	5.7
1	D	264	GLY	4.8
1	D	266	GLN	4.1
1	B	161	THR	3.9
1	D	33	CYS	3.7
1	C	264	GLY	3.5
1	A	226	THR	3.5
1	A	56	CYS	3.4
1	B	192	ASP	3.3
1	C	226	THR	3.1
1	B	225	SER	2.6
1	A	192	ASP	2.4
1	C	142	LYS	2.2
1	C	109	VAL	2.1
1	B	39	ARG	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.