



Full wwPDB X-ray Structure Validation Report ⓘ

May 24, 2022 – 10:14 am BST

PDB ID : 7AYC
Title : Crystal Structure of human mitochondrial 2-Enoyl Thioester Reductase (MECR) with single mutation G165Q
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Deposited on : 2020-11-12
Resolution : 2.02 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 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 : 2.28.1
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.28.1

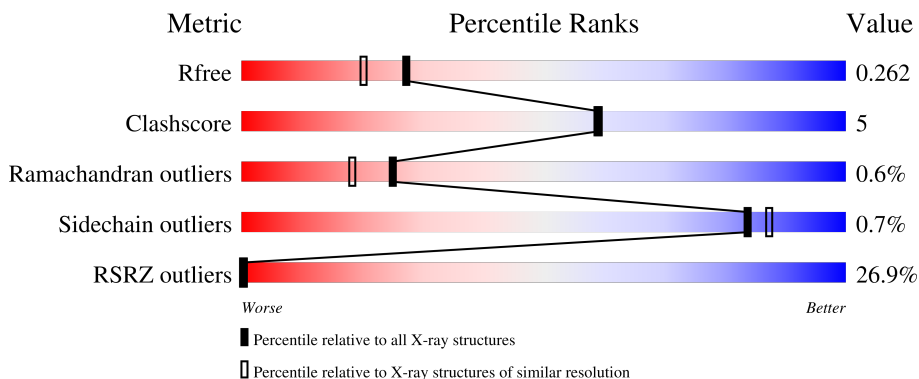
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.02 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	10434 (2.04-2.00)
Clashscore	141614	11643 (2.04-2.00)
Ramachandran outliers	138981	11493 (2.04-2.00)
Sidechain outliers	138945	11492 (2.04-2.00)
RSRZ outliers	127900	10220 (2.04-2.00)

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	352	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 2717 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 Enoyl-[acyl-carrier-protein] reductase, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	338	2655	1678	472	491	14	0	9	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	30	MET	-	initiating methionine	UNP Q9BV79
A	96	LEU	PHE	variant	UNP Q9BV79
A	165	GLN	GLY	engineered mutation	UNP Q9BV79
A	374	LEU	-	expression tag	UNP Q9BV79
A	375	GLU	-	expression tag	UNP Q9BV79
A	376	HIS	-	expression tag	UNP Q9BV79
A	377	HIS	-	expression tag	UNP Q9BV79
A	378	HIS	-	expression tag	UNP Q9BV79
A	379	HIS	-	expression tag	UNP Q9BV79
A	380	HIS	-	expression tag	UNP Q9BV79
A	381	HIS	-	expression tag	UNP Q9BV79

- Molecule 2 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total	Cl	0	0
			3	3		

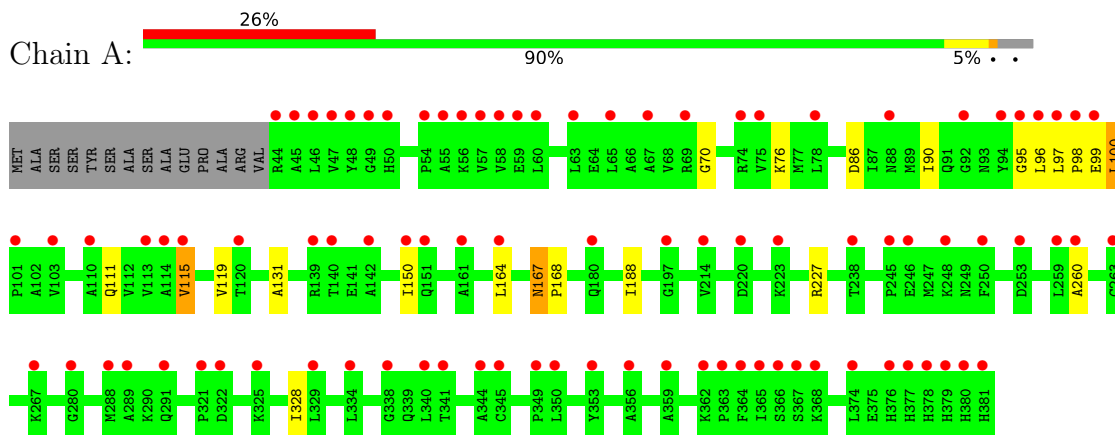
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	59	Total	O	0	0
			59	59		

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: Enoyl-[acyl-carrier-protein] reductase, mitochondrial



4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	71.52Å 71.52Å 143.77Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	56.95 – 2.02 56.88 – 2.02	Depositor EDS
% Data completeness (in resolution range)	100.0 (56.95-2.02) 100.0 (56.88-2.02)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.54 (at 2.01Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.218 , 0.253 0.226 , 0.262	Depositor DCC
R_{free} test set	2823 reflections (9.84%)	wwPDB-VP
Wilson B-factor (Å ²)	54.4	Xtrriage
Anisotropy	0.238	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.025 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	2717	wwPDB-VP
Average B, all atoms (Å ²)	89.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.94% of the height of the origin peak. No significant pseudotranslation is detected.*

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](#)

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

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	0.31	0/2713	0.56	0/3681

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	2655	0	2707	25	0
2	A	3	0	0	0	0
3	A	59	0	0	3	0
All	All	2717	0	2707	25	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 (25) 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:99[B]:GLU:O	1:A:100[B]:LEU:HD23	1.60	0.97

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:96[B]:LEU:HG	1:A:96[B]:LEU:O	1.71	0.89
1:A:99[B]:GLU:O	1:A:100[B]:LEU:CD2	2.29	0.81
1:A:96[B]:LEU:C	1:A:97[B]:LEU:HD12	2.15	0.66
1:A:111:GLN:NE2	3:A:501:HOH:O	2.32	0.60
1:A:97[B]:LEU:N	1:A:98[B]:PRO:HD3	2.19	0.58
1:A:96[A]:LEU:O	1:A:97[A]:LEU:HD23	2.06	0.56
1:A:96[B]:LEU:O	1:A:96[B]:LEU:CG	2.48	0.54
1:A:70:GLY:O	1:A:119:VAL:HG13	2.11	0.51
1:A:167:ASN:HB2	1:A:168:PRO:CD	2.41	0.51
1:A:99[B]:GLU:HA	1:A:99[B]:GLU:OE1	2.11	0.50
1:A:167:ASN:CB	1:A:168:PRO:CD	2.89	0.50
1:A:164:LEU:HD23	1:A:328:ILE:HD12	1.94	0.49
1:A:98[B]:PRO:O	1:A:99[B]:GLU:HB2	2.10	0.49
1:A:86:ASP:O	1:A:90:ILE:HG12	2.14	0.48
1:A:99[B]:GLU:O	1:A:100[B]:LEU:CG	2.63	0.46
1:A:99[B]:GLU:C	1:A:100[B]:LEU:HG	2.37	0.46
1:A:97[B]:LEU:HD12	1:A:97[B]:LEU:N	2.31	0.45
1:A:227:ARG:NH1	3:A:503:HOH:O	2.49	0.45
1:A:167:ASN:CB	1:A:168:PRO:HD3	2.51	0.41
1:A:76:LYS:NZ	3:A:502:HOH:O	2.38	0.41
1:A:115:VAL:HG13	1:A:119:VAL:CG2	2.51	0.40
1:A:167:ASN:HB2	1:A:168:PRO:HD3	2.04	0.40
1:A:131:ALA:HB2	1:A:150:ILE:HG12	2.02	0.40
1:A:188:ILE:O	1:A:260:ALA:HA	2.22	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	345/352 (98%)	326 (94%)	16 (5%)	3 (1%)	17 10

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	95[A]	GLY
1	A	95[B]	GLY
1	A	167	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	290/292 (99%)	287 (99%)	3 (1%)	76 80

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	100[A]	LEU
1	A	100[B]	LEU
1	A	115	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	151	GLN
1	A	180	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](#)

Of 3 ligands modelled in this entry, 3 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, 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	338/352 (96%)	1.68	91 (26%) 0 0	46, 84, 146, 170	0

All (91) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	48	TYR	12.8
1	A	380	HIS	11.1
1	A	96[A]	LEU	10.9
1	A	97[A]	LEU	8.6
1	A	367	SER	7.9
1	A	63	LEU	7.0
1	A	95[A]	GLY	6.6
1	A	322	ASP	6.1
1	A	55	ALA	6.1
1	A	56	LYS	5.9
1	A	54	PRO	5.7
1	A	363	PRO	5.7
1	A	362	LYS	5.7
1	A	65	LEU	5.3
1	A	381	HIS	5.3
1	A	120	THR	5.2
1	A	378	HIS	5.2
1	A	67	ALA	5.1
1	A	94	TYR	4.6
1	A	50	HIS	4.1
1	A	164	LEU	4.0
1	A	78	LEU	3.9
1	A	376	HIS	3.8
1	A	353	TYR	3.8
1	A	49	GLY	3.8
1	A	58	VAL	3.7
1	A	114	ALA	3.6

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Mol	Chain	Res	Type	RSRZ
1	A	75	VAL	3.5
1	A	246[A]	GLU	3.4
1	A	349	PRO	3.4
1	A	250	PHE	3.4
1	A	377	HIS	3.3
1	A	379	HIS	3.3
1	A	47	VAL	3.3
1	A	150	ILE	3.3
1	A	245	PRO	3.2
1	A	113	VAL	3.1
1	A	291	GLN	3.1
1	A	74	ARG	3.1
1	A	45	ALA	3.0
1	A	253	ASP	3.0
1	A	101[A]	PRO	3.0
1	A	329	LEU	2.9
1	A	344	ALA	2.9
1	A	69	ARG	2.9
1	A	103	VAL	2.9
1	A	44	ARG	2.9
1	A	59	GLU	2.9
1	A	46	LEU	2.8
1	A	115	VAL	2.8
1	A	98[A]	PRO	2.8
1	A	140	THR	2.8
1	A	334	LEU	2.8
1	A	368	LYS	2.7
1	A	248	LYS	2.7
1	A	223	LYS	2.7
1	A	345	CYS	2.7
1	A	260	ALA	2.7
1	A	259	LEU	2.7
1	A	365	ILE	2.6
1	A	267	LYS	2.6
1	A	220	ASP	2.5
1	A	88	ASN	2.5
1	A	289	ALA	2.5
1	A	364	PHE	2.5
1	A	321	PRO	2.5
1	A	356	ALA	2.5
1	A	338	GLY	2.4
1	A	57	VAL	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	197	GLY	2.4
1	A	350	LEU	2.4
1	A	142	ALA	2.3
1	A	359	ALA	2.3
1	A	92	GLY	2.3
1	A	374	LEU	2.3
1	A	263	CYS	2.3
1	A	110	ALA	2.2
1	A	180	GLN	2.2
1	A	60	LEU	2.2
1	A	214	VAL	2.2
1	A	99[A]	GLU	2.1
1	A	340	LEU	2.1
1	A	238	THR	2.1
1	A	366	SER	2.1
1	A	288	MET	2.1
1	A	325	LYS	2.1
1	A	280	GLY	2.1
1	A	151	GLN	2.0
1	A	341	THR	2.0
1	A	139	ARG	2.0
1	A	161	ALA	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 [\(i\)](#)

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, 95th 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(Å ²)	Q<0.9
2	CL	A	401	1/1	0.82	0.28	79,79,79,79	1

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	CL	A	402	1/1	0.92	0.21	59,59,59,59	0
2	CL	A	403	1/1	0.94	0.20	66,66,66,66	0

6.5 Other polymers [i](#)

There are no such residues in this entry.