



Full wwPDB EM Validation Report ⓘ

Jul 8, 2025 – 02:37 PM JST

PDB ID : 8XXQ / pdb_00008xxq
EMDB ID : EMD-38758
Title : Structural of methylmalonate semialdehyde dehydrogenase ALDH6A1
Authors : Su, G.; Xu, Y.; Luan, X.
Deposited on : 2024-01-18
Resolution : 2.75 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**
MolProbity : 4-5-2 with Phenix2.0rc1
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 15172 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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.

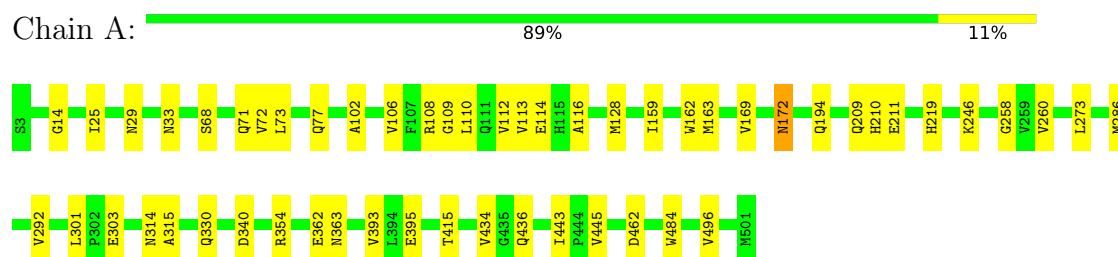
- Molecule 1 is a protein called Methylmalonate-semialdehyde/malonate-semialdehyde dehydrogenase [acylating], mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	499	Total	C	N	O	S	0	0
			3793	2405	652	710	26		
1	B	499	Total	C	N	O	S	0	0
			3793	2405	652	710	26		
1	C	499	Total	C	N	O	S	0	0
			3793	2405	652	710	26		
1	D	499	Total	C	N	O	S	0	0
			3793	2405	652	710	26		

3 Residue-property plots

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. 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. 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.

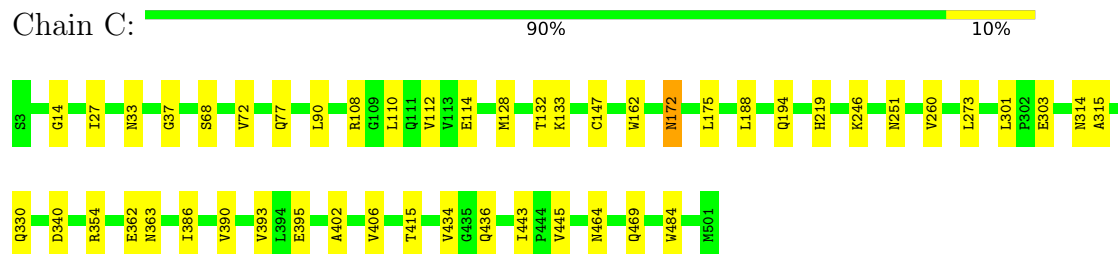
- Molecule 1: Methylmalonate-semialdehyde/malonate-semialdehyde dehydrogenase [acylating], mitochondrial



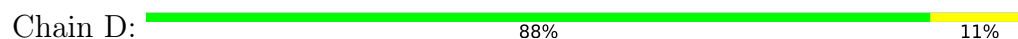
- Molecule 1: Methylmalonate-semialdehyde/malonate-semialdehyde dehydrogenase [acylating], mitochondrial

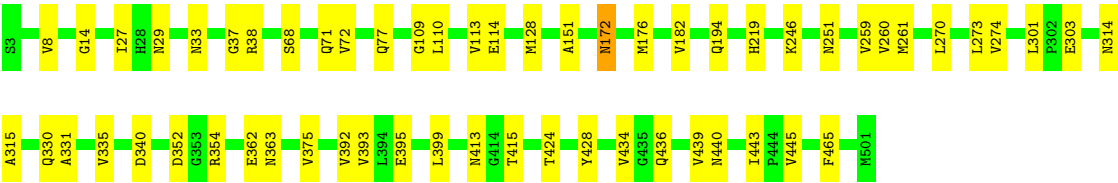


- Molecule 1: Methylmalonate-semialdehyde/malonate-semialdehyde dehydrogenase [acylating], mitochondrial



- Molecule 1: Methylmalonate-semialdehyde/malonate-semialdehyde dehydrogenase [acylating], mitochondrial





4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	200000	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	5000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

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	0.11	0/3870	0.27	0/5247
1	B	0.11	0/3870	0.28	0/5247
1	C	0.11	0/3870	0.27	0/5247
1	D	0.11	0/3870	0.27	0/5247
All	All	0.11	0/15480	0.27	0/20988

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	3793	0	3828	37	0
1	B	3793	0	3828	42	0
1	C	3793	0	3828	33	0
1	D	3793	0	3828	38	0
All	All	15172	0	15312	143	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 (143) 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:73:LEU:HD22	1:A:169:VAL:HG21	1.54	0.87
1:B:464:ASN:OD1	1:B:469:GLN:NE2	2.15	0.79
1:C:464:ASN:OD1	1:C:469:GLN:NE2	2.15	0.79
1:B:33:ASN:ND2	1:B:363:ASN:O	2.15	0.78
1:A:340:ASP:OD1	1:A:354:ARG:NH1	2.19	0.76
1:D:33:ASN:ND2	1:D:363:ASN:O	2.19	0.75
1:A:33:ASN:ND2	1:A:363:ASN:O	2.19	0.74
1:D:340:ASP:OD1	1:D:354:ARG:NH1	2.21	0.74
1:C:112:VAL:HG21	1:C:162:TRP:CD1	2.24	0.73
1:C:340:ASP:OD1	1:C:354:ARG:NH1	2.23	0.71
1:B:340:ASP:OD1	1:B:354:ARG:NH1	2.25	0.70
1:A:112:VAL:HG21	1:A:162:TRP:CD1	2.30	0.66
1:C:301:LEU:HD21	1:C:393:VAL:HG11	1.76	0.66
1:B:158:MET:HE2	1:B:162:TRP:CZ2	2.33	0.63
1:D:301:LEU:HD21	1:D:393:VAL:HG11	1.81	0.62
1:B:112:VAL:HG21	1:B:162:TRP:CD1	2.33	0.62
1:B:158:MET:HE2	1:B:162:TRP:HZ2	1.65	0.62
1:B:77:GLN:HG2	1:B:110:LEU:HD11	1.82	0.61
1:D:68:SER:O	1:D:72:VAL:HG23	2.01	0.61
1:C:33:ASN:ND2	1:C:363:ASN:O	2.33	0.60
1:A:128:MET:HE3	1:A:128:MET:HA	1.84	0.59
1:C:415:THR:HG22	1:C:434:VAL:HG11	1.82	0.59
1:D:128:MET:HE3	1:D:128:MET:HA	1.84	0.59
1:A:219:HIS:O	1:A:246:LYS:NZ	2.25	0.58
1:B:434:VAL:HG12	1:B:436:GLN:H	1.68	0.58
1:C:128:MET:HE3	1:C:128:MET:HA	1.85	0.58
1:A:443:ILE:HG22	1:A:445:VAL:HG23	1.87	0.57
1:D:29:ASN:O	1:D:33:ASN:N	2.37	0.57
1:A:112:VAL:HG21	1:A:162:TRP:NE1	2.19	0.57
1:B:314:ASN:OD1	1:B:315:ALA:N	2.37	0.56
1:A:462:ASP:OD2	1:B:463:THR:OG1	2.14	0.56
1:D:415:THR:HG22	1:D:434:VAL:HG11	1.87	0.55
1:D:439:VAL:HG12	1:D:440:ASN:HD22	1.70	0.55
1:C:314:ASN:OD1	1:C:315:ALA:N	2.38	0.55
1:A:68:SER:O	1:A:72:VAL:HG23	2.06	0.55
1:B:439:VAL:HG12	1:B:440:ASN:HD22	1.70	0.55
1:C:77:GLN:HG2	1:C:110:LEU:HD11	1.89	0.55
1:D:443:ILE:HG22	1:D:445:VAL:HG23	1.89	0.55
1:C:112:VAL:HG21	1:C:162:TRP:NE1	2.22	0.55
1:A:434:VAL:HG12	1:A:436:GLN:H	1.71	0.54
1:B:108:ARG:O	1:B:112:VAL:HG23	2.07	0.54
1:D:314:ASN:OD1	1:D:315:ALA:N	2.39	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:29:ASN:O	1:A:33:ASN:N	2.37	0.53
1:A:159:ILE:CG2	1:A:163:MET:HE3	2.38	0.53
1:B:172:ASN:N	1:B:172:ASN:OD1	2.41	0.53
1:B:330:GLN:N	1:B:330:GLN:OE1	2.39	0.53
1:C:443:ILE:HG22	1:C:445:VAL:HG23	1.90	0.53
1:D:219:HIS:O	1:D:246:LYS:NZ	2.27	0.53
1:C:330:GLN:OE1	1:C:330:GLN:N	2.39	0.53
1:D:330:GLN:N	1:D:330:GLN:OE1	2.40	0.53
1:A:395:GLU:N	1:A:395:GLU:OE1	2.43	0.52
1:B:362:GLU:OE1	1:B:362:GLU:N	2.41	0.52
1:A:330:GLN:N	1:A:330:GLN:OE1	2.39	0.52
1:D:362:GLU:OE1	1:D:362:GLU:N	2.41	0.52
1:B:443:ILE:HG22	1:B:445:VAL:HG23	1.91	0.52
1:A:362:GLU:OE1	1:A:362:GLU:N	2.41	0.52
1:D:259:VAL:HG21	1:D:428:TYR:CE1	2.45	0.52
1:D:331:ALA:O	1:D:335:VAL:HG23	2.09	0.51
1:B:29:ASN:O	1:B:33:ASN:N	2.37	0.51
1:A:71:GLN:NE2	1:D:114:GLU:OE1	2.41	0.51
1:D:172:ASN:OD1	1:D:172:ASN:N	2.43	0.51
1:C:108:ARG:O	1:C:112:VAL:HG23	2.09	0.51
1:A:314:ASN:OD1	1:A:315:ALA:N	2.38	0.51
1:B:209:GLN:O	1:B:211:GLU:N	2.44	0.51
1:A:108:ARG:O	1:A:112:VAL:HG23	2.10	0.51
1:D:77:GLN:HG2	1:D:110:LEU:HD11	1.92	0.51
1:B:102:ALA:O	1:B:106:VAL:HG23	2.11	0.50
1:C:484:TRP:CZ2	1:D:439:VAL:HG11	2.46	0.50
1:A:73:LEU:HD21	1:A:116:ALA:HB3	1.93	0.50
1:D:352:ASP:OD1	1:D:354:ARG:NE	2.44	0.50
1:C:395:GLU:N	1:C:395:GLU:OE1	2.46	0.49
1:A:77:GLN:HG2	1:A:110:LEU:HD11	1.94	0.49
1:A:209:GLN:O	1:A:211:GLU:N	2.46	0.49
1:C:68:SER:O	1:C:72:VAL:HG23	2.13	0.49
1:C:219:HIS:O	1:C:246:LYS:NZ	2.26	0.49
1:A:415:THR:HG22	1:A:434:VAL:HG11	1.94	0.49
1:D:270:LEU:O	1:D:274:VAL:HG23	2.13	0.48
1:B:439:VAL:HG12	1:B:440:ASN:ND2	2.29	0.48
1:C:402:ALA:O	1:C:406:VAL:HG23	2.13	0.48
1:D:439:VAL:HG12	1:D:440:ASN:ND2	2.29	0.48
1:A:260:VAL:HG21	1:A:273:LEU:HD11	1.94	0.48
1:B:219:HIS:O	1:B:246:LYS:NZ	2.27	0.48
1:B:331:ALA:O	1:B:335:VAL:HG23	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:362:GLU:OE1	1:C:362:GLU:N	2.44	0.48
1:C:172:ASN:N	1:C:172:ASN:OD1	2.45	0.48
1:A:258:GLY:O	1:A:292:VAL:N	2.38	0.47
1:A:301:LEU:HD21	1:A:393:VAL:HG11	1.97	0.47
1:B:270:LEU:O	1:B:274:VAL:HG23	2.14	0.47
1:D:303:GLU:OE1	1:D:303:GLU:N	2.44	0.47
1:C:434:VAL:HG12	1:C:436:GLN:H	1.79	0.47
1:A:303:GLU:OE1	1:A:303:GLU:N	2.44	0.47
1:B:303:GLU:OE1	1:B:303:GLU:N	2.44	0.47
1:C:303:GLU:OE1	1:C:303:GLU:N	2.44	0.47
1:B:68:SER:O	1:B:72:VAL:HG23	2.16	0.46
1:A:114:GLU:OE1	1:D:71:GLN:NE2	2.43	0.46
1:C:14:GLY:O	1:C:194:GLN:NE2	2.48	0.46
1:B:98:THR:HG23	1:B:101:ASP:H	1.81	0.46
1:B:122:LEU:HD13	1:B:471:ILE:HG13	1.97	0.46
1:D:443:ILE:CG2	1:D:445:VAL:HG23	2.46	0.45
1:D:399:LEU:HD22	1:D:424:THR:HG23	1.96	0.45
1:D:413:ASN:O	1:D:436:GLN:NE2	2.49	0.45
1:A:109:GLY:O	1:A:113:VAL:HG23	2.17	0.45
1:B:412:GLY:O	1:B:434:VAL:HG13	2.17	0.45
1:C:90:LEU:O	1:C:90:LEU:HD23	2.17	0.45
1:B:395:GLU:N	1:B:395:GLU:OE1	2.49	0.45
1:A:484:TRP:CZ2	1:B:439:VAL:HG11	2.52	0.45
1:D:434:VAL:HG12	1:D:436:GLN:H	1.82	0.44
1:D:395:GLU:N	1:D:395:GLU:OE1	2.50	0.44
1:C:147:CYS:O	1:C:175:LEU:N	2.44	0.44
1:A:172:ASN:OD1	1:A:172:ASN:N	2.50	0.44
1:D:14:GLY:O	1:D:194:GLN:NE2	2.50	0.44
1:C:443:ILE:CG2	1:C:445:VAL:HG23	2.48	0.44
1:A:496:VAL:HG12	1:B:267:GLU:HG3	2.00	0.43
1:B:182:VAL:HG23	1:B:182:VAL:O	2.18	0.43
1:D:260:VAL:HG21	1:D:273:LEU:HD11	2.00	0.43
1:B:14:GLY:O	1:B:194:GLN:NE2	2.50	0.43
1:C:27:ILE:N	1:C:37:GLY:O	2.43	0.43
1:D:109:GLY:O	1:D:113:VAL:HG23	2.19	0.42
1:A:286:MET:HG3	1:A:445:VAL:HG22	2.01	0.42
1:B:415:THR:HG22	1:B:434:VAL:HG11	2.01	0.42
1:C:260:VAL:HG21	1:C:273:LEU:HD11	2.01	0.42
1:B:484:TRP:O	1:B:485:LYS:C	2.61	0.42
1:D:375:VAL:HG21	1:D:392:VAL:HB	2.01	0.42
1:B:301:LEU:HD21	1:B:393:VAL:HG11	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:71:GLN:NE2	1:C:114:GLU:OE1	2.49	0.42
1:C:90:LEU:HD23	1:C:90:LEU:C	2.45	0.42
1:A:102:ALA:O	1:A:106:VAL:HG23	2.20	0.41
1:D:182:VAL:O	1:D:182:VAL:HG23	2.20	0.41
1:D:261:MET:HG3	1:D:424:THR:HG21	2.02	0.41
1:D:8:VAL:HG23	1:D:38:ARG:O	2.20	0.41
1:A:14:GLY:O	1:A:194:GLN:NE2	2.54	0.41
1:B:175:LEU:HD13	1:B:175:LEU:C	2.46	0.41
1:C:132:THR:HG22	1:C:133:LYS:N	2.36	0.41
1:B:67:LEU:O	1:B:71:GLN:HG2	2.20	0.41
1:B:301:LEU:O	1:B:305:VAL:HG23	2.21	0.41
1:B:386:ILE:HG21	1:B:390:VAL:HB	2.03	0.41
1:C:188:LEU:O	1:C:188:LEU:HD23	2.21	0.41
1:A:25:ILE:HD11	1:A:209:GLN:HG3	2.02	0.40
1:A:112:VAL:HG21	1:A:162:TRP:HE1	1.86	0.40
1:C:386:ILE:HG21	1:C:390:VAL:HB	2.03	0.40
1:B:428:TYR:O	1:B:432:VAL:HG12	2.21	0.40
1:D:151:ALA:HB2	1:D:176:MET:HE1	2.03	0.40
1:D:27:ILE:N	1:D:37:GLY:O	2.43	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

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	497/499 (100%)	489 (98%)	7 (1%)	1 (0%)	44	63
1	B	497/499 (100%)	487 (98%)	9 (2%)	1 (0%)	44	63
1	C	497/499 (100%)	487 (98%)	10 (2%)	0	100	100
1	D	497/499 (100%)	486 (98%)	11 (2%)	0	100	100
All	All	1988/1996 (100%)	1949 (98%)	37 (2%)	2 (0%)	50	70

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	210	HIS
1	B	210	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 PDB entries followed by that with respect to all EM entries.

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	411/411 (100%)	410 (100%)	1 (0%)	92	96
1	B	411/411 (100%)	410 (100%)	1 (0%)	92	96
1	C	411/411 (100%)	409 (100%)	2 (0%)	86	92
1	D	411/411 (100%)	408 (99%)	3 (1%)	81	89
All	All	1644/1644 (100%)	1637 (100%)	7 (0%)	88	93

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

Mol	Chain	Res	Type
1	A	172	ASN
1	B	172	ASN
1	C	172	ASN
1	C	251	ASN
1	D	172	ASN
1	D	251	ASN
1	D	465	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	78	GLN
1	A	111	GLN
1	A	231	ASN
1	A	436	GLN
1	B	115	HIS
1	B	231	ASN

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Mol	Chain	Res	Type
1	B	440	ASN
1	B	469	GLN
1	C	33	ASN
1	C	78	GLN
1	C	111	GLN
1	C	115	HIS
1	C	210	HIS
1	C	231	ASN
1	C	249	GLN
1	C	283	GLN
1	C	440	ASN
1	C	469	GLN
1	D	111	GLN
1	D	115	HIS
1	D	231	ASN
1	D	436	GLN
1	D	440	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 oligosaccharides 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 ⓘ

There are no chain breaks in this entry.