



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 06:43 AM UTC

PDB ID : 1MUC / pdb_00001muc
Title : STRUCTURE OF MUCONATE LACTONIZING ENZYME AT 1.85
ANGSTROMS RESOLUTION
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Deposited on : 1995-09-20
Resolution : 1.85 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 : 4-5-2 with Phenix2.0
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

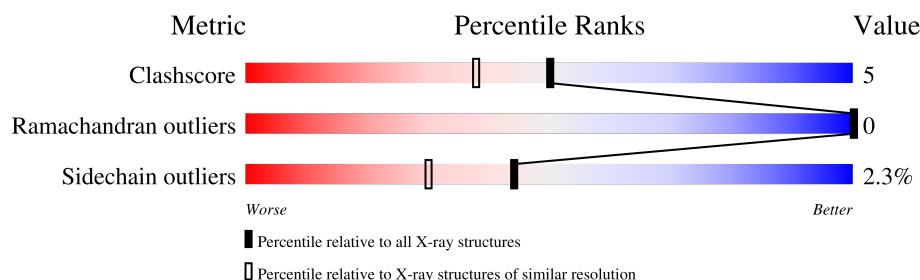
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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))
Clashscore	190562	3579 (1.86-1.86)
Ramachandran outliers	187476	3553 (1.86-1.86)
Sidechain outliers	187428	3553 (1.86-1.86)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	373	
1	B	373	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5760 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 MUCONATE LACTONIZING ENZYME.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	360	Total	C	N	O	S	0	0	0
			2722	1707	492	517	6			
1	B	360	Total	C	N	O	S	0	0	0
			2729	1711	495	517	6			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	138	VAL	GLU	conflict	UNP P08310
B	138	VAL	GLU	conflict	UNP P08310

- Molecule 2 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mn	0	0
			1	1		
2	B	1	Total	Mn	0	0
			1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	163	Total	O	0	0
			163	163		
3	B	144	Total	O	0	0
			144	144		

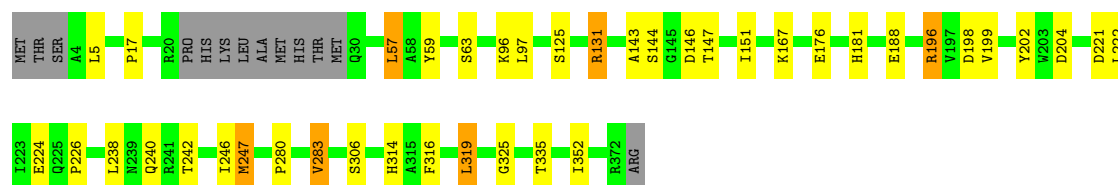
3 Residue-property plots

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.

Note EDS was not executed.

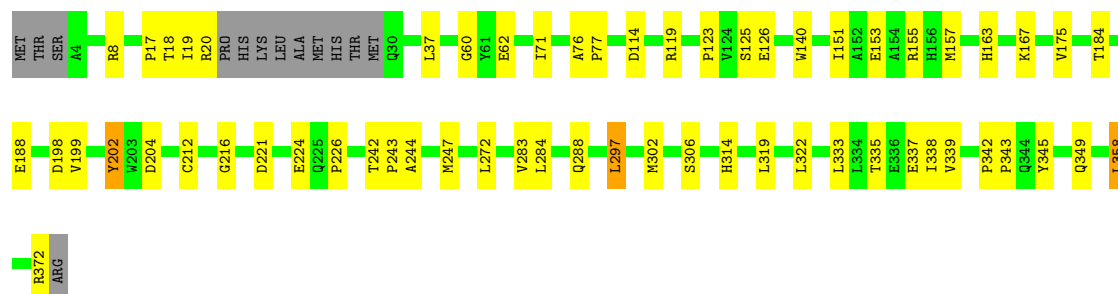
• Molecule 1: MUCONATE LACTONIZING ENZYME

Chain A:  86% 9%



• Molecule 1: MUCONATE LACTONIZING ENZYME

Chain B:  80% 15%



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	I 4	Depositor
Cell constants a, b, c, α , β , γ	139.30 Å 139.30 Å 84.10 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 1.85	Depositor
% Data completeness (in resolution range)	87.2 (8.00-1.85)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.168 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5760	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.51	1/2759 (0.0%)	0.92	5/3736 (0.1%)
1	B	0.53	1/2766 (0.0%)	0.92	9/3745 (0.2%)
All	All	0.52	2/5525 (0.0%)	0.92	14/7481 (0.2%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	247	MET	SD-CE	-6.00	1.64	1.79
1	A	247	MET	SD-CE	-5.42	1.66	1.79

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	221	ASP	N-CA-C	7.43	119.45	111.36
1	B	342	PRO	CA-C-N	6.12	126.06	119.76
1	B	342	PRO	C-N-CA	6.12	126.06	119.76
1	A	221	ASP	N-CA-C	5.86	118.62	111.82
1	B	204	ASP	N-CA-C	-5.80	101.87	110.46
1	A	204	ASP	N-CA-C	-5.75	101.95	110.46
1	B	175	VAL	N-CA-C	5.59	116.23	110.36
1	A	306	SER	N-CA-C	5.57	117.36	111.28
1	B	202	TYR	N-CA-C	5.56	119.33	112.54
1	A	143	ALA	N-CA-C	5.50	119.56	112.41
1	B	349	GLN	N-CA-C	5.30	117.47	109.41
1	B	306	SER	N-CA-C	5.12	116.86	111.28
1	A	202	TYR	N-CA-C	5.10	118.76	112.54
1	B	302	MET	N-CA-C	-5.07	105.57	112.26

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	2722	0	2775	24	0
1	B	2729	0	2787	34	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	163	0	0	4	0
3	B	144	0	0	3	0
All	All	5760	0	5562	58	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 (58) 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:238:LEU:O	1:A:242:THR:HG22	1.66	0.95
1:A:57:LEU:HD13	1:A:63:SER:HB3	1.56	0.86
1:B:37:LEU:HD11	1:B:71:ILE:HD13	1.67	0.76
1:B:212:CYS:HB3	1:B:242:THR:HG23	1.69	0.74
1:B:18:THR:HG21	1:B:20:ARG:HH21	1.54	0.72
1:B:167:LYS:HE3	1:B:198:ASP:HB2	1.75	0.69
1:A:125:SER:H	1:A:314:HIS:HD2	1.39	0.68
1:B:242:THR:HG22	1:B:244:ALA:H	1.61	0.66
1:A:196:ARG:HG2	1:A:222:LEU:HG	1.77	0.65
1:A:242:THR:HG21	1:A:246:ILE:HG12	1.80	0.63
1:B:19:ILE:HD13	1:B:335:THR:HG22	1.78	0.63
1:A:242:THR:HG21	1:A:246:ILE:HD11	1.82	0.61
1:A:242:THR:HG21	1:A:246:ILE:CD1	2.32	0.60
1:A:242:THR:HG21	1:A:246:ILE:CG1	2.32	0.60
1:A:167:LYS:HE3	1:A:198:ASP:HB2	1.84	0.59
1:A:147:THR:OG1	1:A:181:HIS:HD2	1.89	0.55
1:B:17:PRO:HG2	1:B:335:THR:OG1	2.07	0.55
1:A:240:GLN:HG3	3:A:423:HOH:O	2.07	0.54
1:B:119:ARG:NH2	3:B:383:HOH:O	2.41	0.53
1:B:272:LEU:HD11	1:B:297:LEU:HG	1.91	0.52
1:B:125:SER:H	1:B:314:HIS:HD2	1.58	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:284:LEU:O	1:B:288:GLN:HG3	2.10	0.50
1:A:17:PRO:HG2	1:A:335:THR:HB	1.94	0.49
1:B:17:PRO:HG2	1:B:335:THR:HG1	1.77	0.49
1:B:337:GLU:HG2	1:B:339:VAL:HG22	1.93	0.49
1:B:18:THR:HG21	1:B:20:ARG:NH2	2.25	0.49
1:A:325:GLY:HA3	3:A:522:HOH:O	2.13	0.48
1:A:59:TYR:HD2	3:A:533:HOH:O	1.97	0.47
1:B:62:GLU:HA	3:B:518:HOH:O	2.13	0.47
1:B:114:ASP:HB2	1:B:358:LEU:HD22	1.96	0.47
1:B:337:GLU:CG	1:B:339:VAL:HG22	2.45	0.46
1:B:199:VAL:HB	1:B:226:PRO:HA	1.97	0.46
1:A:151:ILE:HD13	1:A:188:GLU:HG3	1.98	0.46
1:B:151:ILE:HD13	1:B:188:GLU:HG3	1.98	0.46
1:B:199:VAL:HG12	1:B:199:VAL:O	2.15	0.46
1:A:131:ARG:NH2	1:A:352:ILE:O	2.49	0.45
1:B:76:ALA:HB3	1:B:77:PRO:HD3	1.98	0.45
1:B:151:ILE:O	1:B:155:ARG:HG2	2.16	0.45
1:A:280:PRO:O	1:A:283:VAL:HG12	2.17	0.45
1:A:224:GLU:CD	1:A:247:MET:HE3	2.42	0.45
1:A:144:SER:C	1:A:146:ASP:H	2.24	0.44
1:A:96:LYS:HE3	1:A:97:LEU:HG	2.00	0.44
1:A:316:PHE:HA	1:A:319:LEU:HD22	2.00	0.43
1:A:199:VAL:HB	1:A:226:PRO:HA	2.01	0.43
1:A:242:THR:HG23	3:A:391:HOH:O	2.19	0.43
1:B:153:GLU:O	1:B:157:MET:HG2	2.18	0.43
1:B:343:PRO:HB2	1:B:345:TYR:CE2	2.54	0.43
1:B:297:LEU:HB3	1:B:322:LEU:HD23	2.00	0.42
1:A:57:LEU:CD1	1:A:63:SER:HB3	2.39	0.42
1:B:199:VAL:O	1:B:202:TYR:HD2	2.02	0.42
1:B:184:THR:O	1:B:188:GLU:HG2	2.19	0.42
1:B:123:PRO:HD2	1:B:126:GLU:HG2	2.02	0.41
1:B:337:GLU:HG3	1:B:338:ILE:N	2.35	0.41
1:B:198:ASP:HA	1:B:224:GLU:HB3	2.02	0.41
1:B:140:TRP:HB2	1:B:163:HIS:CG	2.56	0.41
1:B:60:GLY:HA3	3:B:446:HOH:O	2.21	0.41
1:B:216:GLY:HA3	1:B:243:PRO:HG2	2.03	0.41
1:B:8:ARG:HE	1:B:8:ARG:HB2	1.69	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 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	356/373 (95%)	348 (98%)	8 (2%)	0	100	100
1	B	356/373 (95%)	350 (98%)	6 (2%)	0	100	100
All	All	712/746 (95%)	698 (98%)	14 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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	281/294 (96%)	274 (98%)	7 (2%)	42	27
1	B	282/294 (96%)	276 (98%)	6 (2%)	47	33
All	All	563/588 (96%)	550 (98%)	13 (2%)	44	30

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	LEU
1	A	57	LEU
1	A	131	ARG
1	A	176	GLU
1	A	196	ARG
1	A	283	VAL
1	A	319	LEU
1	B	283	VAL

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Mol	Chain	Res	Type
1	B	297	LEU
1	B	319	LEU
1	B	333	LEU
1	B	358	LEU
1	B	372	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	173	ASN
1	A	177	GLN
1	A	181	HIS
1	A	277	ASN
1	A	288	GLN
1	A	314	HIS
1	A	340	ASN
1	A	349	GLN
1	B	30	GLN
1	B	200	ASN
1	B	239	ASN
1	B	277	ASN
1	B	340	ASN
1	B	344	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 2 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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.