wwPDB X-ray Structure Validation Summary Report (i)

Dec 16, 2023 – 04:13 PM EST

PDB ID	:	3ETF
Title	:	Crystal structure of a putative succinate-semialdehyde dehydrogenase from salmonella typhimurium lt2
Authors	:	Brunzelle, J.S.; Evdokimova, E.; Kudritska, M.; Wawrzak, Z.; Anderson, W.F.; Savchenk, A.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on	:	2008-10-07
Resolution	:	1.85 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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:

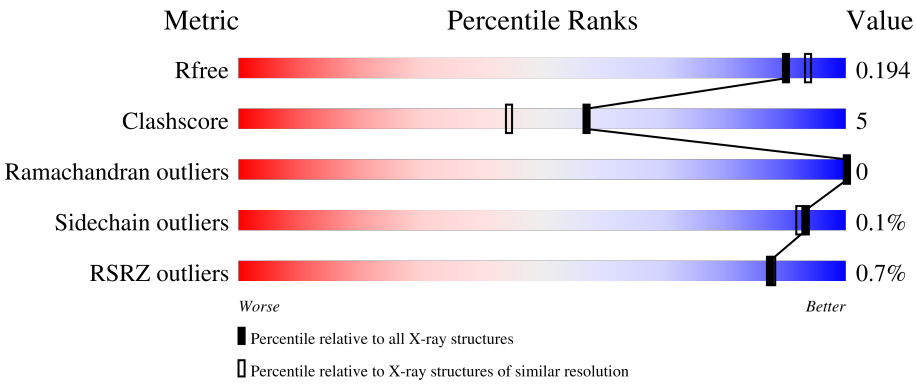
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, 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 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))
R_{free}	130704	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (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 <=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	462	% 90% 9% •
1	B	462	% 90% 8% •
1	C	462	% 90% 8% •
1	D	462	90% 8% •

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 15906 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 Putative succinate-semialdehyde dehydrogenase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	457	3523	2218	622	663	8	12	11	15	0
1	B	456	3482	2190	615	656	9	12	8	11	0
1	C	455	3485	2195	612	658	8	12	6	12	0
1	D	454	3431	2158	608	645	8	12	14	7	0

- Molecule 2 is water.

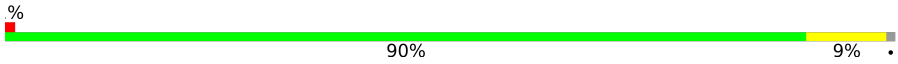
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	527	527	527	0	0
2	B	493	493	493	0	0
2	C	518	518	518	0	0
2	D	447	447	447	0	0

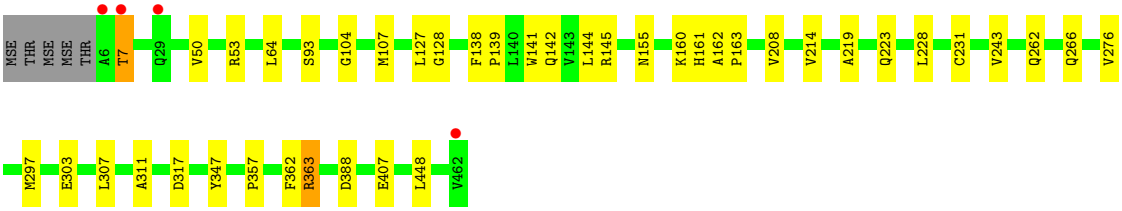
3 Residue-property plots (i)

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: Putative succinate-semialdehyde dehydrogenase

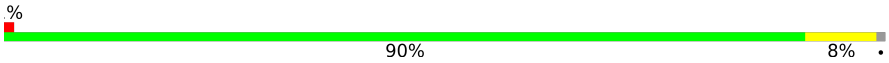
Chain A:

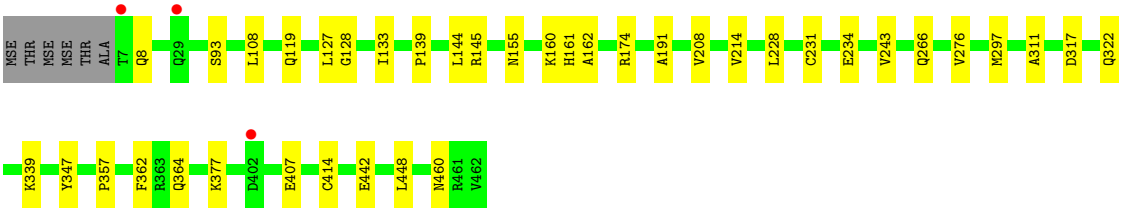




• Molecule 1: Putative succinate-semialdehyde dehydrogenase

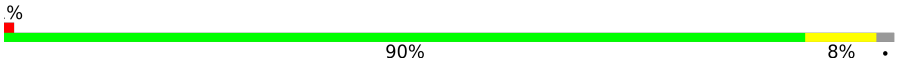
Chain B:

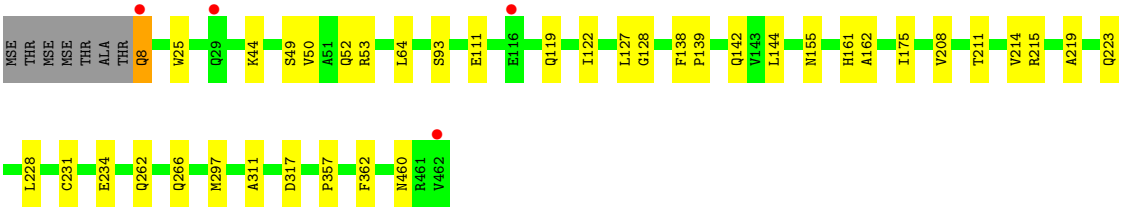




• Molecule 1: Putative succinate-semialdehyde dehydrogenase

Chain C:





• Molecule 1: Putative succinate-semialdehyde dehydrogenase

Chain D:

MSE
THR
MSE
MSE
THR
ALA
THR
GLN
A9
M23
Q29
M79
G80
K81
Q119
L127
G128
V129
P139
R145
N155
S156
H161
A162
V208
V214
A219
Q223
L228
K229
K230
C231
D239
E250
Y261
Q262
Q266
R287
L307
A311
D317
E318
Q322
Q364
S394
I397
M408
C414
L443
M460
R461
V462

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	133.88Å 133.88Å 247.03Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 1.85 29.84 – 1.85	Depositor EDS
% Data completeness (in resolution range)	99.7 (30.00-1.85) 99.8 (29.84-1.85)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	4.59 (at 1.85Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.167 , 0.194 0.168 , 0.194	Depositor DCC
R_{free} test set	10912 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å^2)	20.9	Xtriage
Anisotropy	0.170	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 50.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	0.019 for -h,-k,l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	15906	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.48% 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	0.65	0/3572	0.68	1/4825 (0.0%)
1	B	0.60	1/3533 (0.0%)	0.67	0/4775
1	C	0.63	0/3536	0.67	1/4780 (0.0%)
1	D	0.56	0/3482	0.65	0/4708
All	All	0.61	1/14123 (0.0%)	0.67	2/19088 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	377	LYS	CD-CE	5.41	1.64	1.51

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	363	ARG	NE-CZ-NH2	-5.18	117.71	120.30
1	C	215	ARG	CA-CB-CG	5.13	124.68	113.40

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	3523	0	3503	40	1
1	B	3482	0	3445	33	0
1	C	3485	0	3452	32	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	3431	0	3406	40	0
2	A	527	0	0	4	2
2	B	493	0	0	3	1
2	C	518	0	0	7	3
2	D	447	0	0	8	1
All	All	15906	0	13806	135	4

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.

The worst 5 of 135 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:107:MSE:CE	1:A:448:LEU:HD22	1.47	1.43
1:A:107:MSE:HE3	1:A:448:LEU:CD2	1.68	1.22
1:D:414:CYS:HB3	2:D:749:HOH:O	1.45	1.15
1:A:317:ASP:OD2	1:C:317:ASP:OD2	1.69	1.08
1:B:234:GLU:HG3	1:B:442:GLU:OE2	1.56	1.06

All (4) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:303[B]:GLU:OE2	2:C:979:HOH:O[5_665]	1.88	0.32
2:A:598:HOH:O	2:C:979:HOH:O[5_665]	1.91	0.29
2:A:837:HOH:O	2:B:974:HOH:O[5_665]	1.99	0.21
2:C:1198:HOH:O	2:D:763:HOH:O[5_565]	2.08	0.12

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	470/462 (102%)	460 (98%)	10 (2%)	0	100	100
1	B	465/462 (101%)	453 (97%)	12 (3%)	0	100	100
1	C	465/462 (101%)	455 (98%)	10 (2%)	0	100	100
1	D	459/462 (99%)	448 (98%)	11 (2%)	0	100	100
All	All	1859/1848 (101%)	1816 (98%)	43 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	350/325 (108%)	349 (100%)	1 (0%)	92	91
1	B	345/325 (106%)	345 (100%)	0	100	100
1	C	346/325 (106%)	345 (100%)	1 (0%)	92	91
1	D	340/325 (105%)	340 (100%)	0	100	100
All	All	1381/1300 (106%)	1379 (100%)	2 (0%)	93	92

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	THR
1	C	8	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	119	GLN
1	C	266	GLN
1	D	364	GLN
1	C	161	HIS
1	C	321	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	445/462 (96%)	-0.50	4 (0%)	84	84	12, 18, 26, 47	2 (0%)
1	B	444/462 (96%)	-0.38	3 (0%)	87	88	15, 21, 31, 45	2 (0%)
1	C	443/462 (95%)	-0.48	4 (0%)	84	84	12, 19, 27, 39	3 (0%)
1	D	442/462 (95%)	-0.43	2 (0%)	91	91	14, 23, 32, 38	4 (0%)
All	All	1774/1848 (95%)	-0.45	13 (0%)	87	88	12, 20, 30, 47	11 (0%)

The worst 5 of 13 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	8	GLN	4.8
1	C	462	VAL	4.6
1	B	7	THR	4.4
1	A	6	ALA	4.2
1	A	462	VAL	3.7

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.