



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 08:26 PM GMT

PDB ID : 1KBZ
Title : Crystal Structure of apo-dTDP-6-deoxy-L-lyxo-4-hexulose reductase (RmlD) from *Salmonella enterica* serovar Typhimurium
Authors : Blankenfeldt, W.; Kerr, I.D.; Giraud, M.F.; McMiken, H.J.; Leonard, G.A.; Whitfield, C.; Messner, P.; Graninger, M.; Naismith, J.H.
Deposited on : 2001-11-07
Resolution : 2.20 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
<http://wwpdb.org/validation/2016/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
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

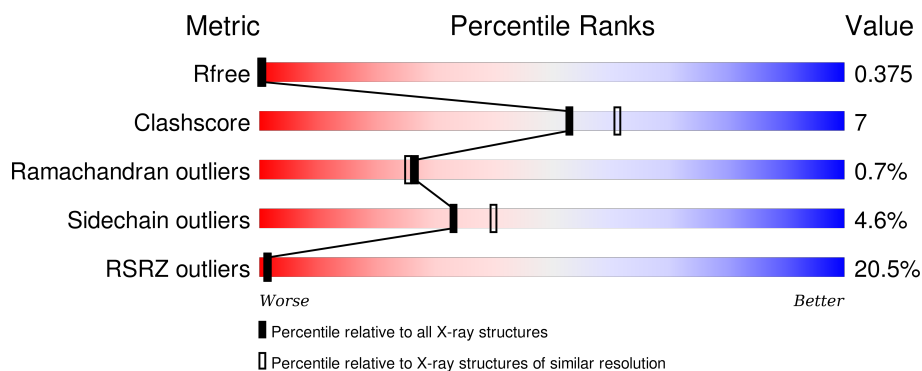
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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}	91344	3774 (2.20-2.20)
Clashscore	102246	4477 (2.20-2.20)
Ramachandran outliers	100387	4404 (2.20-2.20)
Sidechain outliers	100360	4405 (2.20-2.20)
RSRZ outliers	91569	3781 (2.20-2.20)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	299	<div> <div>20%</div> <div>81%</div> <div>17%</div> <div>.</div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2459 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 dTDP-glucose oxidoreductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	298	Total	C	N	O	S	0	0	0
			2287	1451	396	433	7			

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		

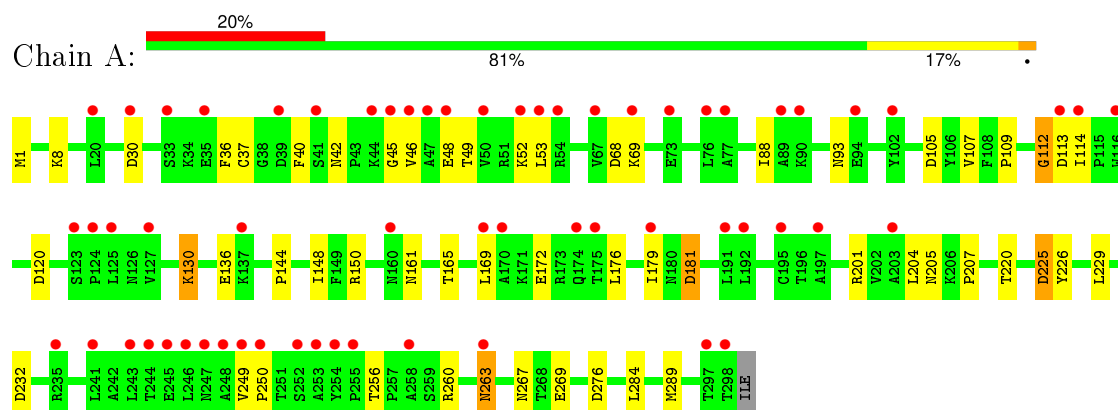
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	171	Total	O	0	0
			171	171		

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: dTDP-glucose oxidoreductase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	47.53Å 71.90Å 82.16Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	81.65 – 2.20 54.11 – 2.21	Depositor EDS
% Data completeness (in resolution range)	96.1 (81.65-2.20) 97.7 (54.11-2.21)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.51 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5	Depositor
R, R_{free}	0.189 , 0.256 0.319 , 0.375	Depositor DCC
R_{free} test set	729 reflections (5.10%)	DCC
Wilson B-factor (Å ²)	42.5	Xtriage
Anisotropy	0.216	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 62.5	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 14307 reflections	Xtriage
F_o, F_c correlation	0.87	EDS
Total number of atoms	2459	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.17% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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	0.63	0/2338	0.88	9/3187 (0.3%)

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	201	ARG	NE-CZ-NH2	-11.67	114.47	120.30
1	A	201	ARG	NE-CZ-NH1	8.34	124.47	120.30
1	A	276	ASP	CB-CG-OD2	7.18	124.76	118.30
1	A	120	ASP	CB-CG-OD2	6.51	124.16	118.30
1	A	225	ASP	CB-CG-OD2	5.73	123.46	118.30
1	A	105	ASP	CB-CG-OD2	5.56	123.31	118.30
1	A	181	ASP	CB-CG-OD2	5.47	123.22	118.30
1	A	232	ASP	CB-CG-OD2	5.06	122.86	118.30
1	A	68	ASP	CB-CG-OD2	5.04	122.84	118.30

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	2287	0	2278	30	0
2	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	171	0	0	6	1
All	All	2459	0	2278	30	1

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 (30) 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:263:ASN:HD22	1:A:263:ASN:C	1.87	0.76
1:A:267:ASN:OD1	1:A:269:GLU:HG2	1.84	0.76
1:A:249:VAL:CG2	1:A:250:PRO:HD2	2.26	0.65
1:A:37:CYS:SG	3:A:659:HOH:O	2.40	0.63
1:A:93:ASN:ND2	1:A:144:PRO:HD2	2.15	0.62
1:A:52:LYS:HB2	3:A:609:HOH:O	1.99	0.61
1:A:263:ASN:ND2	1:A:263:ASN:C	2.57	0.58
1:A:249:VAL:HG23	1:A:250:PRO:HD2	1.87	0.56
1:A:207:PRO:HG3	3:A:669:HOH:O	2.04	0.56
1:A:136:GLU:OE1	1:A:150:ARG:NH2	2.41	0.51
1:A:169:LEU:HB3	1:A:176:LEU:HD21	1.93	0.51
1:A:179:ILE:HG23	1:A:181:ASP:OD1	2.11	0.50
1:A:69:LYS:HG3	3:A:662:HOH:O	2.11	0.49
1:A:8:LYS:HG2	1:A:30:ASP:HB3	1.95	0.48
1:A:46:VAL:HB	1:A:88:ILE:HD11	1.94	0.48
1:A:205:ASN:HB2	3:A:668:HOH:O	2.16	0.46
1:A:249:VAL:HG22	1:A:250:PRO:HD2	1.96	0.45
1:A:40:PHE:CD1	1:A:46:VAL:HG11	2.51	0.45
1:A:136:GLU:HB2	1:A:148:ILE:HD13	1.98	0.44
1:A:114:ILE:HD12	1:A:114:ILE:O	2.18	0.44
1:A:161:ASN:O	1:A:165:THR:HG23	2.18	0.43
1:A:267:ASN:OD1	1:A:269:GLU:CG	2.60	0.43
1:A:36:PHE:CE2	1:A:53:LEU:HD21	2.53	0.43
1:A:130:LYS:HB2	1:A:130:LYS:HE3	1.54	0.43
1:A:1:MET:CE	1:A:204:LEU:CD1	2.97	0.43
1:A:112:GLY:O	1:A:113:ASP:HB2	2.19	0.42
1:A:48:GLU:CG	3:A:609:HOH:O	2.67	0.42
1:A:42:ASN:O	1:A:45:GLY:N	2.53	0.41
1:A:1:MET:HE1	1:A:204:LEU:CD1	2.51	0.40
1:A:256:THR:OG1	1:A:260:ARG:NH1	2.54	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:647:HOH:O	3:A:647:HOH:O[2_555]	2.15	0.05

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	296/299 (99%)	282 (95%)	12 (4%)	2 (1%)	26 25

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	109	PRO
1	A	112	GLY

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	240/241 (100%)	229 (95%)	11 (5%)	33 40

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	49	THR
1	A	107	VAL

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Mol	Chain	Res	Type
1	A	130	LYS
1	A	172	GLU
1	A	220	THR
1	A	225	ASP
1	A	226	TYR
1	A	229	LEU
1	A	263	ASN
1	A	284	LEU
1	A	289	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	17	GLN
1	A	60	ASN
1	A	93	ASN
1	A	142	ASN
1	A	263	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 1 ligands modelled in this entry, 1 is 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

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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	298/299 (99%)	1.37	61 (20%) 1 1	24, 34, 54, 69	0

All (61) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	253	ALA	7.6
1	A	254	TYR	7.0
1	A	255	PRO	6.6
1	A	297	THR	5.8
1	A	249	VAL	5.2
1	A	245	GLU	5.2
1	A	247	ASN	5.1
1	A	175	THR	4.9
1	A	170	ALA	4.7
1	A	250	PRO	4.5
1	A	114	ILE	4.3
1	A	73	GLU	4.2
1	A	113	ASP	3.9
1	A	90	LYS	3.8
1	A	137	LYS	3.8
1	A	258	ALA	3.5
1	A	116	TRP	3.3
1	A	44	LYS	3.3
1	A	244	THR	3.2
1	A	76	LEU	3.1
1	A	46	VAL	3.1
1	A	263	ASN	3.0
1	A	41	SER	3.0
1	A	124	PRO	3.0
1	A	47	ALA	2.9
1	A	89	ALA	2.9
1	A	169	LEU	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	252	SER	2.8
1	A	298	THR	2.8
1	A	174	GLN	2.7
1	A	69	LYS	2.7
1	A	160	ASN	2.7
1	A	20	LEU	2.5
1	A	248	ALA	2.5
1	A	94	GLU	2.5
1	A	52	LYS	2.4
1	A	48	GLU	2.4
1	A	241	LEU	2.4
1	A	179	ILE	2.4
1	A	197	ALA	2.4
1	A	203	ALA	2.4
1	A	53	LEU	2.3
1	A	243	LEU	2.3
1	A	235	ARG	2.3
1	A	45	GLY	2.2
1	A	127	VAL	2.2
1	A	35	GLU	2.2
1	A	102	TYR	2.2
1	A	195	CYS	2.2
1	A	54	ARG	2.2
1	A	123	SER	2.2
1	A	39	ASP	2.2
1	A	67	VAL	2.2
1	A	77	ALA	2.2
1	A	191	LEU	2.1
1	A	33	SER	2.1
1	A	192	LEU	2.1
1	A	125	LEU	2.1
1	A	30	ASP	2.1
1	A	50	VAL	2.0
1	A	246	LEU	2.0

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(\AA^2)	Q<0.9
2	MG	A	501	1/1	0.76	0.17	-	25,25,25,25	1

6.5 Other polymers [i](#)

There are no such residues in this entry.