



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 7, 2022 – 10:04 AM EDT

PDB ID : 4WRR
Title : A putative diacylglycerol kinase from *Bacillus anthracis* str. Sterne
Authors : Hou, J.; Zheng, H.; Cooper, D.R.; Zimmerman, M.D.; Anderson, W.F.; Minor, W.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on : 2014-10-24
Resolution : 2.16 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	:	2.27
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)	:	2.27

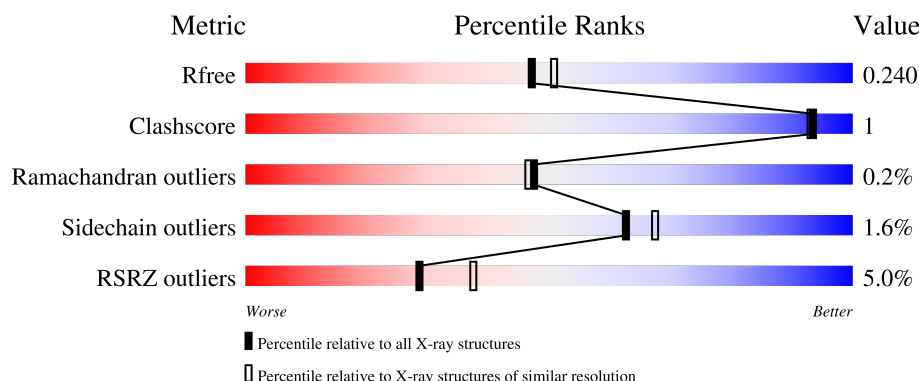
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.16 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	1479 (2.16-2.16)
Clashscore	141614	1585 (2.16-2.16)
Ramachandran outliers	138981	1560 (2.16-2.16)
Sidechain outliers	138945	1559 (2.16-2.16)
RSRZ outliers	127900	1456 (2.16-2.16)

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	300	<div> <div>2%</div> <div>94%</div> <div>• •</div> </div>
1	B	300	<div> <div>6%</div> <div>94%</div> <div>• •</div> </div>
1	C	300	<div> <div>5%</div> <div>87%</div> <div>5% 8%</div> </div>
1	D	300	<div> <div>6%</div> <div>90%</div> <div>• 7%</div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8603 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 diacylglycerol kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	293	Total	C	N	O	S	0	0	0
			2146	1385	352	402	7			
1	B	292	Total	C	N	O	S	0	0	0
			2148	1385	353	403	7			
1	C	276	Total	C	N	O	S	0	0	0
			2031	1314	332	378	7			
1	D	279	Total	C	N	O	S	0	0	0
			2033	1314	335	377	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		
2	B	1	Total	Mg	0	0
			1	1		
2	C	1	Total	Mg	0	0
			1	1		
2	D	1	Total	Mg	0	0
			1	1		

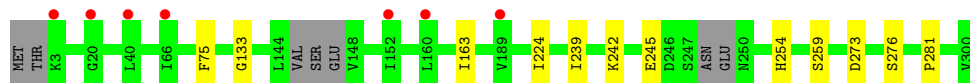
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	70	Total	O	0	0
			70	70		
3	B	78	Total	O	0	0
			78	78		
3	C	48	Total	O	0	0
			48	48		
3	D	45	Total	O	0	0
			45	45		

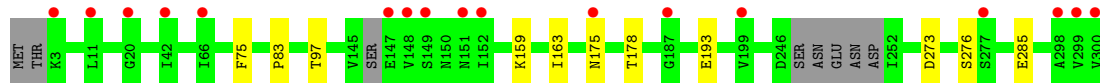
3 Residue-property plots [i](#)

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.

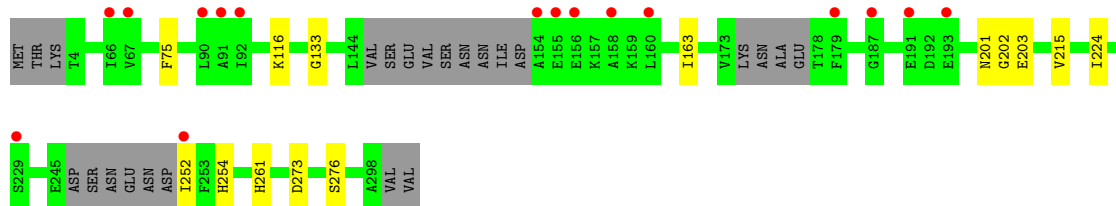
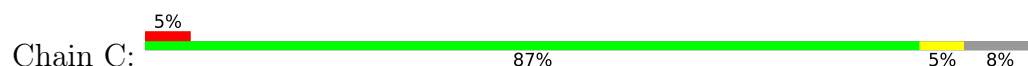
- Molecule 1: putative diacylglycerol kinase



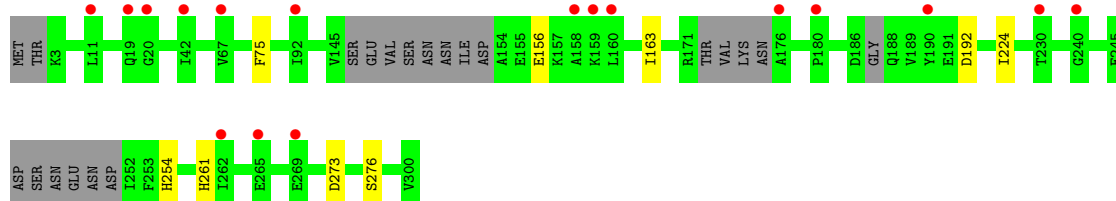
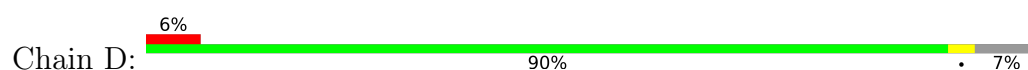
- Molecule 1: putative diacylglycerol kinase



- Molecule 1: putative diacylglycerol kinase



- Molecule 1: putative diacylglycerol kinase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	64.10Å 138.49Å 78.34Å 90.00° 111.48° 90.00°	Depositor
Resolution (Å)	27.00 – 2.16 26.61 – 2.15	Depositor EDS
% Data completeness (in resolution range)	97.8 (27.00-2.16) 97.3 (26.61-2.15)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.22 (at 2.15Å)	Xtriage
Refinement program	REFMAC 5.8.0073	Depositor
R, R_{free}	0.202 , 0.234 0.206 , 0.240	Depositor DCC
R_{free} test set	3281 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å ²)	29.2	Xtriage
Anisotropy	0.588	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 36.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.025 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8603	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 15.38% 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: 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	0/2191	0.71	0/2987
1	B	0.61	0/2193	0.71	1/2989 (0.0%)
1	C	0.56	0/2075	0.69	0/2829
1	D	0.56	0/2076	0.69	0/2831
All	All	0.59	0/8535	0.70	1/11636 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	0	1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	163	ILE	CB-CA-C	-5.29	101.02	111.60

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	252	ILE	Peptide

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	2146	0	2050	6	0
1	B	2148	0	2058	4	0
1	C	2031	0	1954	10	0
1	D	2033	0	1923	5	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	70	0	0	0	0
3	B	78	0	0	0	0
3	C	48	0	0	1	0
3	D	45	0	0	3	0
All	All	8603	0	7985	22	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 1.

All (22) 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:D:261:HIS:CD2	3:D:538:HOH:O	2.42	0.71
1:D:261:HIS:HD2	3:D:538:HOH:O	1.74	0.70
1:D:75:PHE:CD1	1:D:273:ASP:HB2	2.36	0.61
1:A:75:PHE:CD1	1:A:273:ASP:HB2	2.37	0.60
1:B:75:PHE:CD1	1:B:273:ASP:HB2	2.37	0.58
1:C:203:GLU:HA	1:C:215:VAL:CG2	2.34	0.57
1:C:75:PHE:CD1	1:C:273:ASP:HB2	2.40	0.56
1:D:261:HIS:HB3	3:D:538:HOH:O	2.06	0.53
1:B:178:THR:OG1	1:B:193:GLU:HG3	2.08	0.53
1:A:239:ILE:O	1:A:242:LYS:HE2	2.09	0.52
1:C:203:GLU:HA	1:C:215:VAL:HG23	1.92	0.49
1:C:202:GLY:O	1:C:215:VAL:HG21	2.13	0.49
1:B:97:THR:HG21	1:B:159:LYS:HG2	1.97	0.46
1:C:215:VAL:HG23	1:C:215:VAL:O	2.19	0.43
1:A:281:PRO:HG2	1:C:261:HIS:CD2	2.54	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:133:GLY:HA3	1:C:133:GLY:HA3	2.01	0.41
1:B:97:THR:HB	1:B:159:LYS:O	2.21	0.41
1:A:224:ILE:O	1:A:254:HIS:HA	2.21	0.41
1:C:201:ASN:OD1	3:C:542:HOH:O	2.22	0.41
1:A:133:GLY:HA3	1:C:133:GLY:CA	2.50	0.40
1:C:224:ILE:O	1:C:254:HIS:HA	2.22	0.40
1:D:224:ILE:O	1:D:254:HIS:HA	2.21	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	287/300 (96%)	279 (97%)	8 (3%)	0	100	100
1	B	286/300 (95%)	277 (97%)	8 (3%)	1 (0%)	41	37
1	C	268/300 (89%)	262 (98%)	6 (2%)	0	100	100
1	D	269/300 (90%)	261 (97%)	7 (3%)	1 (0%)	34	29
All	All	1110/1200 (92%)	1079 (97%)	29 (3%)	2 (0%)	47	46

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	175	ASN
1	D	156	GLU

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	214/255 (84%)	210 (98%)	4 (2%)	57	61
1	B	216/255 (85%)	213 (99%)	3 (1%)	67	72
1	C	206/255 (81%)	203 (98%)	3 (2%)	65	69
1	D	200/255 (78%)	197 (98%)	3 (2%)	65	69
All	All	836/1020 (82%)	823 (98%)	13 (2%)	62	67

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

Mol	Chain	Res	Type
1	A	163	ILE
1	A	245	GLU
1	A	259	SER
1	A	276	SER
1	B	83	PRO
1	B	276	SER
1	B	285	GLU
1	C	116	LYS
1	C	163	ILE
1	C	276	SER
1	D	163	ILE
1	D	192	ASP
1	D	276	SER

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	79	ASN
1	D	134	GLN

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 [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 4 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

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	293/300 (97%)	-0.02	7 (2%) 59 67	20, 33, 63, 83	0
1	B	292/300 (97%)	0.12	17 (5%) 23 31	19, 33, 68, 87	0
1	C	276/300 (92%)	0.30	16 (5%) 23 31	24, 43, 76, 93	0
1	D	279/300 (93%)	0.30	17 (6%) 21 28	24, 40, 81, 102	0
All	All	1140/1200 (95%)	0.17	57 (5%) 28 37	19, 38, 74, 102	0

All (57) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	187	GLY	4.5
1	B	149	SER	4.2
1	C	191	GLU	4.0
1	C	252	ILE	3.7
1	A	160	LEU	3.5
1	D	158	ALA	3.5
1	D	180	PRO	3.3
1	D	20	GLY	3.1
1	B	152	ILE	3.1
1	D	19	GLN	3.1
1	D	11	LEU	3.0
1	D	176	ALA	3.0
1	B	151	ASN	2.9
1	C	155	GLU	2.9
1	D	269	GLU	2.8
1	D	265	GLU	2.8
1	B	20	GLY	2.8
1	B	187	GLY	2.7
1	A	3	LYS	2.7
1	A	152	ILE	2.7
1	C	67	VAL	2.6

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	175	ASN	2.6
1	C	179	PHE	2.5
1	B	147	GLU	2.5
1	C	66	ILE	2.5
1	D	67	VAL	2.4
1	B	199	VAL	2.4
1	B	42	ILE	2.4
1	D	262	ILE	2.4
1	D	42	ILE	2.4
1	C	160	LEU	2.4
1	C	193	GLU	2.4
1	B	298	ALA	2.4
1	C	154	ALA	2.4
1	C	91	ALA	2.3
1	D	190	TYR	2.3
1	B	300	VAL	2.3
1	D	160	LEU	2.3
1	B	299	VAL	2.2
1	B	11	LEU	2.2
1	C	229	SER	2.2
1	C	158	ALA	2.2
1	C	156	GLU	2.2
1	D	159	LYS	2.2
1	D	230	THR	2.2
1	B	3	LYS	2.2
1	A	189	VAL	2.1
1	D	92	ILE	2.1
1	B	148	VAL	2.1
1	A	66	ILE	2.1
1	B	277	SER	2.1
1	B	66	ILE	2.1
1	D	240	GLY	2.1
1	A	40	LEU	2.0
1	C	90	LEU	2.0
1	A	20	GLY	2.0
1	C	92	ILE	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 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(\AA^2)	Q<0.9
2	MG	C	401	1/1	0.97	0.04	32,32,32,32	0
2	MG	D	401	1/1	0.97	0.07	34,34,34,34	0
2	MG	A	401	1/1	0.99	0.13	22,22,22,22	0
2	MG	B	401	1/1	0.99	0.07	21,21,21,21	0

6.5 Other polymers [i](#)

There are no such residues in this entry.