



Full wwPDB X-ray Structure Validation Report

Feb 28, 2014 – 06:22 AM GMT

PDB ID : 1VFH
Title : Crystal structure of alanine racemase from D-cycloserine producing *Streptomyces lavendulae*
Authors : Noda, M.; Matoba, Y.; Kumagai, T.; Sugiyama, M.
Deposited on : 2004-04-13
Resolution : 2.00 Å(reported)

This is a full wwPDB 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/ValidationPDFNotes.html>

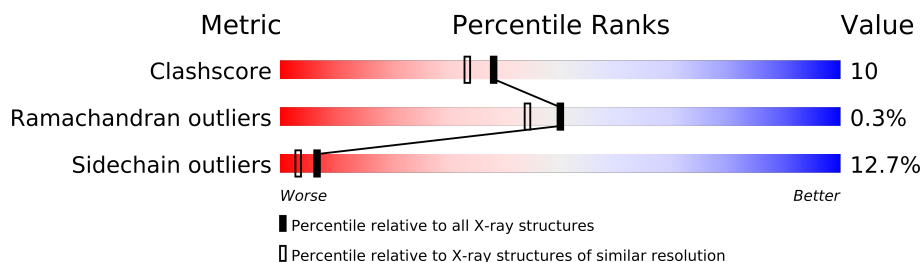
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 21963
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.00 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	79885	6188 (2.00-2.00)
Ramachandran outliers	78287	6102 (2.00-2.00)
Sidechain outliers	78261	6100 (2.00-2.00)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	386	

2 Entry composition i

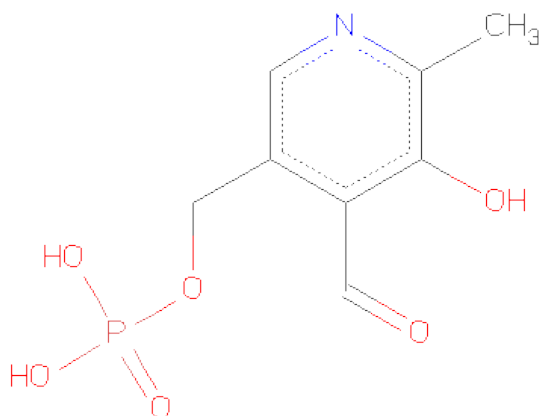
There are 3 unique types of molecules in this entry. The entry contains 2940 atoms, of which 0 are hydrogen and 0 are deuterium.

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 alanine racemase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	382	2851	1778	528	535	10	0	0	0

- Molecule 2 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula: C₈H₁₀NO₆P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	15	8	1	5	1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	74	Total	O	0	0
			74	74		

4 Data and refinement statistics

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

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	83.98Å 63.38Å 85.95Å 90.00° 120.14° 90.00°	Depositor
Resolution (Å)	30.00 – 2.00	Depositor
% Data completeness (in resolution range)	92.6 (30.00-2.00)	Depositor
R_{merge}	0.11	Depositor
R_{sym}	0.09	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.197 , 0.252	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2940	wwPDB-VP
Average B, all atoms (Å ²)	32.0	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: KCX, PLP

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	0.30	0/2902	0.56	1/3960 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	33	LEU	CA-CB-CG	5.06	126.94	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2851	0	2791	56	0
2	A	15	0	6	0	0
3	A	74	0	0	2	0
All	All	2940	0	2797	56	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 10.

All (56) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:159:THR:HG23	1:A:160:VAL:HG13	1.52	0.89
1:A:94:GLU:O	1:A:98:THR:HG23	1.87	0.75
1:A:379:LEU:H	1:A:382:HIS:CD2	2.08	0.71
1:A:161:GLN:HG3	1:A:161:GLN:O	1.90	0.69
1:A:247:ARG:HH21	1:A:247:ARG:HG2	1.57	0.69
1:A:11:GLU:HG2	1:A:376:LEU:HD11	1.80	0.63
1:A:114:ARG:HD3	1:A:154:ALA:CB	2.29	0.62
1:A:264:ALA:HB2	1:A:278:SER:HA	1.80	0.62
1:A:14:LEU:O	1:A:18:ARG:HG3	1.99	0.62
1:A:247:ARG:HG2	1:A:247:ARG:NH2	2.15	0.62
1:A:284:LEU:HD11	1:A:320:GLN:HE21	1.66	0.60
1:A:159:THR:CG2	1:A:160:VAL:HG13	2.29	0.59
1:A:11:GLU:CG	1:A:376:LEU:HD11	2.32	0.58
1:A:114:ARG:HD3	1:A:154:ALA:HB2	1.85	0.58
1:A:7:ARG:HH22	1:A:291:ASP:CG	2.08	0.57
1:A:132:THR:O	1:A:183:GLN:HG2	2.05	0.57
1:A:173:ASP:O	1:A:175:PRO:HD3	2.06	0.56
1:A:68:GLU:HG2	3:A:512:HOH:O	2.06	0.56
1:A:7:ARG:NH2	1:A:291:ASP:OD1	2.38	0.56
1:A:31:SER:OG	1:A:219:HIS:HB3	2.05	0.55
1:A:289:TYR:HA	1:A:293:ILE:O	2.06	0.55
1:A:240:THR:OG1	1:A:243:GLN:HG3	2.07	0.55
1:A:196:LYS:HD3	1:A:196:LYS:N	2.22	0.54
1:A:47:VAL:HB	1:A:48:PRO:HD3	1.89	0.54
1:A:216:PRO:HA	1:A:219:HIS:CE1	2.43	0.54
1:A:350:GLU:O	1:A:354:GLN:HG2	2.07	0.54
1:A:32:ALA:O	1:A:222:LEU:HD23	2.08	0.54
1:A:63:THR:O	1:A:83:CYS:HA	2.09	0.52
1:A:342:ALA:HB2	1:A:348:THR:HG21	1.91	0.51
1:A:299:GLY:HA2	1:A:312:ALA:O	2.11	0.51
1:A:192:ALA:O	1:A:196:LYS:HG2	2.11	0.51
1:A:154:ALA:O	1:A:157:GLU:HG2	2.10	0.51
1:A:273:HIS:ND1	1:A:315:ARG:HD3	2.26	0.50
1:A:157:GLU:CG	1:A:159:THR:HB	2.41	0.50
1:A:178:PRO:O	1:A:182:LEU:HG	2.13	0.49
1:A:157:GLU:HG3	1:A:159:THR:HB	1.93	0.49
1:A:199:VAL:HG12	1:A:201:PRO:HD3	1.95	0.49
1:A:92:TRP:NE1	1:A:112:GLU:OE2	2.45	0.47
1:A:18:ARG:CZ	1:A:18:ARG:HB3	2.44	0.46
1:A:17:VAL:O	1:A:21:VAL:HG13	2.16	0.46
1:A:195:GLU:HA	1:A:199:VAL:O	2.15	0.46
1:A:114:ARG:HD3	1:A:154:ALA:HB1	1.96	0.46
1:A:182:LEU:HD23	1:A:182:LEU:N	2.32	0.45

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:110:LEU:O	1:A:114:ARG:HG3	2.17	0.44
1:A:11:GLU:CD	1:A:253:ARG:HH12	2.19	0.44
1:A:214:THR:C	1:A:215:LEU:HD13	2.38	0.44
1:A:114:ARG:HD2	1:A:159:THR:HG21	2.02	0.42
1:A:5:PRO:HG2	1:A:9:TYR:HB3	2.02	0.41
1:A:61:LEU:HA	1:A:61:LEU:HD12	1.92	0.41
1:A:247:ARG:HG3	3:A:573:HOH:O	2.20	0.41
1:A:238:LEU:O	1:A:244:LEU:HD11	2.21	0.41
1:A:109:ALA:O	1:A:113:VAL:HG12	2.20	0.41
1:A:383:HIS:CD2	1:A:383:HIS:H	2.39	0.41
1:A:322:VAL:HG23	1:A:323:VAL:N	2.36	0.41
1:A:264:ALA:CB	1:A:278:SER:HA	2.50	0.40
1:A:114:ARG:HG2	1:A:159:THR:HG21	2.02	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	379/386 (98%)	367 (97%)	11 (3%)	1 (0%)	50	44

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	206	ILE

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	276/280 (99%)	241 (87%)	35 (13%)	6 3

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	THR
1	A	14	LEU
1	A	27	ARG
1	A	31	SER
1	A	61	LEU
1	A	93	ARG
1	A	101	ASP
1	A	110	LEU
1	A	122	ARG
1	A	125	ARG
1	A	159	THR
1	A	161	GLN
1	A	181	ARG
1	A	197	GLU
1	A	215	LEU
1	A	222	LEU
1	A	235	SER
1	A	243	GLN
1	A	246	LEU
1	A	247	ARG
1	A	277	GLU
1	A	279	GLU
1	A	308	LYS
1	A	311	ARG
1	A	315	ARG
1	A	319	ASP
1	A	322	VAL
1	A	323	VAL
1	A	327	GLU
1	A	329	LEU
1	A	366	ARG
1	A	370	ARG
1	A	376	LEU
1	A	383	HIS
1	A	384	HIS

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	78	GLN
1	A	266	HIS
1	A	320	GLN
1	A	382	HIS
1	A	383	HIS

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

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

1 non-standard protein/DNA/RNA residue is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
1	KCX	A	129	1	11,11,12	6.66	3 (27%)	10,12,14	1.71	4 (40%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	KCX	A	129	1	-	0/8/10/12	0/0/0/0

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	129	KCX	O-C	17.16	1.23	1.11
1	A	129	KCX	CX-NZ	13.56	1.45	1.32
1	A	129	KCX	OQ1-CX	2.01	1.25	1.21

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	129	KCX	OQ2-CX-NZ	3.00	120.07	116.33
1	A	129	KCX	OQ1-CX-NZ	-2.54	120.71	124.94
1	A	129	KCX	OQ2-CX-OQ1	-2.40	119.18	122.17
1	A	129	KCX	C-CA-N	-2.22	111.61	113.83

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	PLP	A	401	1	14,15,16	1.94	5 (35%)	20,22,23	1.16	3 (15%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PLP	A	401	1	-	0/6/6/8	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	PLP	C3-C2	-4.12	1.37	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	PLP	C2-N1	3.63	1.40	1.33
2	A	401	PLP	P-O3P	-2.35	1.46	1.54
2	A	401	PLP	P-O2P	-2.26	1.46	1.54
2	A	401	PLP	C4-C5	2.05	1.42	1.39

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	PLP	C3-C2-N1	-2.31	117.49	120.66
2	A	401	PLP	C5-C6-N1	-2.28	119.74	123.86
2	A	401	PLP	C6-N1-C2	2.18	123.95	119.28

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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 ⓘ

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.