



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 14, 2017 – 08:12 am GMT

PDB ID : 4QDB
Title : Crystal structure of mutant Thioesterase PA1618 (Q49A) from *Pseudomonas aeruginosa*
Authors : Ji, T.; Allen, K.N.; Dunaway-Mariano, D.
Deposited on : 2014-05-13
Resolution : 2.02 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

<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
Xtriage (Phenix)	:	1.9-1692
EDS	:	trunk28620
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
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)	:	recalc28949

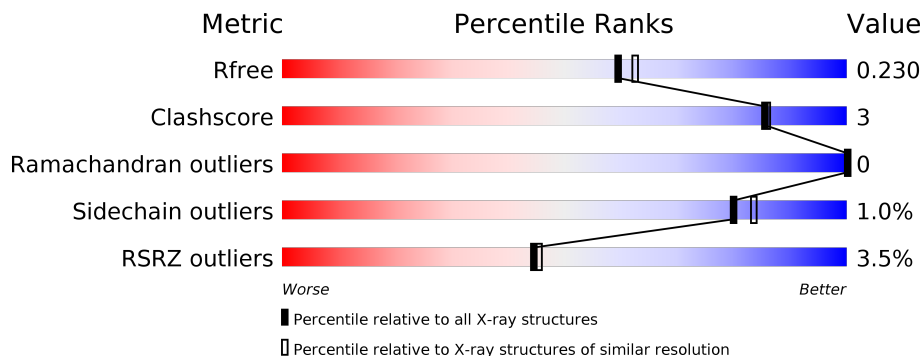
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.02 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}	100719	8396 (2.04-2.00)
Clashscore	112137	9678 (2.04-2.00)
Ramachandran outliers	110173	9566 (2.04-2.00)
Sidechain outliers	110143	9565 (2.04-2.00)
RSRZ outliers	101464	8490 (2.04-2.00)

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. 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	152	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 1%, green 1%, green 86%, yellow 86%, yellow 91%, grey 91%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> % 86% 5% 9% </div> </div>
1	B	152	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 1%, green 1%, green 89%, yellow 89%, yellow 91%, grey 91%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> % 89% •• 9% </div> </div>
1	C	152	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 3%, green 3%, green 84%, yellow 84%, yellow 91%, grey 91%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 3% 84% 8% 9% </div> </div>
1	D	152	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 7%, green 7%, green 85%, yellow 85%, yellow 91%, grey 91%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 7% 85% 7% 9% </div> </div>
1	E	152	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 3%, green 3%, green 87%, yellow 87%, yellow 91%, grey 91%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 3% 87% 5% 9% </div> </div>
1	F	152	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 5%, green 5%, green 85%, yellow 85%, yellow 91%, grey 91%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 5% 85% 7% 9% </div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 6702 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 Thioesterase PA1618.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	139	Total	C	N	O	S	0	0	0
			1051	654	191	200	6			
1	B	139	Total	C	N	O	S	0	0	0
			1051	654	191	200	6			
1	C	139	Total	C	N	O	S	0	0	0
			1051	654	191	200	6			
1	D	139	Total	C	N	O	S	0	0	0
			1051	654	191	200	6			
1	E	139	Total	C	N	O	S	0	0	0
			1051	654	191	200	6			
1	F	139	Total	C	N	O	S	0	0	0
			1051	654	191	200	6			

There are 54 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	49	ALA	GLN	ENGINEERED MUTATION	UNP Q9I3A4
A	145	LEU	-	EXPRESSION TAG	UNP Q9I3A4
A	146	GLU	-	EXPRESSION TAG	UNP Q9I3A4
A	147	HIS	-	EXPRESSION TAG	UNP Q9I3A4
A	148	HIS	-	EXPRESSION TAG	UNP Q9I3A4
A	149	HIS	-	EXPRESSION TAG	UNP Q9I3A4
A	150	HIS	-	EXPRESSION TAG	UNP Q9I3A4
A	151	HIS	-	EXPRESSION TAG	UNP Q9I3A4
A	152	HIS	-	EXPRESSION TAG	UNP Q9I3A4
B	49	ALA	GLN	ENGINEERED MUTATION	UNP Q9I3A4
B	145	LEU	-	EXPRESSION TAG	UNP Q9I3A4
B	146	GLU	-	EXPRESSION TAG	UNP Q9I3A4
B	147	HIS	-	EXPRESSION TAG	UNP Q9I3A4
B	148	HIS	-	EXPRESSION TAG	UNP Q9I3A4
B	149	HIS	-	EXPRESSION TAG	UNP Q9I3A4
B	150	HIS	-	EXPRESSION TAG	UNP Q9I3A4
B	151	HIS	-	EXPRESSION TAG	UNP Q9I3A4

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Chain	Residue	Modelled	Actual	Comment	Reference
B	152	HIS	-	EXPRESSION TAG	UNP Q9I3A4
C	49	ALA	GLN	ENGINEERED MUTATION	UNP Q9I3A4
C	145	LEU	-	EXPRESSION TAG	UNP Q9I3A4
C	146	GLU	-	EXPRESSION TAG	UNP Q9I3A4
C	147	HIS	-	EXPRESSION TAG	UNP Q9I3A4
C	148	HIS	-	EXPRESSION TAG	UNP Q9I3A4
C	149	HIS	-	EXPRESSION TAG	UNP Q9I3A4
C	150	HIS	-	EXPRESSION TAG	UNP Q9I3A4
C	151	HIS	-	EXPRESSION TAG	UNP Q9I3A4
C	152	HIS	-	EXPRESSION TAG	UNP Q9I3A4
D	49	ALA	GLN	ENGINEERED MUTATION	UNP Q9I3A4
D	145	LEU	-	EXPRESSION TAG	UNP Q9I3A4
D	146	GLU	-	EXPRESSION TAG	UNP Q9I3A4
D	147	HIS	-	EXPRESSION TAG	UNP Q9I3A4
D	148	HIS	-	EXPRESSION TAG	UNP Q9I3A4
D	149	HIS	-	EXPRESSION TAG	UNP Q9I3A4
D	150	HIS	-	EXPRESSION TAG	UNP Q9I3A4
D	151	HIS	-	EXPRESSION TAG	UNP Q9I3A4
D	152	HIS	-	EXPRESSION TAG	UNP Q9I3A4
E	49	ALA	GLN	ENGINEERED MUTATION	UNP Q9I3A4
E	145	LEU	-	EXPRESSION TAG	UNP Q9I3A4
E	146	GLU	-	EXPRESSION TAG	UNP Q9I3A4
E	147	HIS	-	EXPRESSION TAG	UNP Q9I3A4
E	148	HIS	-	EXPRESSION TAG	UNP Q9I3A4
E	149	HIS	-	EXPRESSION TAG	UNP Q9I3A4
E	150	HIS	-	EXPRESSION TAG	UNP Q9I3A4
E	151	HIS	-	EXPRESSION TAG	UNP Q9I3A4
E	152	HIS	-	EXPRESSION TAG	UNP Q9I3A4
F	49	ALA	GLN	ENGINEERED MUTATION	UNP Q9I3A4
F	145	LEU	-	EXPRESSION TAG	UNP Q9I3A4
F	146	GLU	-	EXPRESSION TAG	UNP Q9I3A4
F	147	HIS	-	EXPRESSION TAG	UNP Q9I3A4
F	148	HIS	-	EXPRESSION TAG	UNP Q9I3A4
F	149	HIS	-	EXPRESSION TAG	UNP Q9I3A4
F	150	HIS	-	EXPRESSION TAG	UNP Q9I3A4
F	151	HIS	-	EXPRESSION TAG	UNP Q9I3A4
F	152	HIS	-	EXPRESSION TAG	UNP Q9I3A4

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	71	Total O 71 71	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	69	Total 69	O 69	0	0
2	C	52	Total 52	O 52	0	0
2	D	83	Total 83	O 83	0	0
2	E	58	Total 58	O 58	0	0
2	F	63	Total 63	O 63	0	0



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	100.96Å 201.56Å 90.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.64 – 2.02 47.64 – 2.02	Depositor EDS
% Data completeness (in resolution range)	98.9 (47.64-2.02) 99.0 (47.64-2.02)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.45 (at 2.03Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.2_1309)	Depositor
R, R_{free}	0.203 , 0.231 0.202 , 0.230	Depositor DCC
R_{free} test set	2001 reflections (3.33%)	DCC
Wilson B-factor (Å ²)	29.8	Xtriage
Anisotropy	0.527	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 59.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6702	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 44.95 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 1.4175e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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](#)

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	0.39	0/1070	0.58	0/1453
1	B	0.37	0/1070	0.56	0/1453
1	C	0.36	0/1070	0.55	0/1453
1	D	0.36	0/1070	0.57	0/1453
1	E	0.33	0/1070	0.54	0/1453
1	F	0.45	0/1070	0.59	0/1453
All	All	0.38	0/6420	0.57	0/8718

There are no bond length outliers.

There are no bond angle outliers.

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	1051	0	1042	6	0
1	B	1051	0	1042	3	0
1	C	1051	0	1042	7	0
1	D	1051	0	1042	7	0
1	E	1051	0	1042	4	0
1	F	1051	0	1042	7	0
2	A	71	0	0	4	0
2	B	69	0	0	0	0
2	C	52	0	0	2	0
2	D	83	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	58	0	0	2	0
2	F	63	0	0	4	0
All	All	6702	0	6252	33	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 3.

The worst 5 of 33 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:F:82:CYS:SG	2:F:250:HOH:O	2.20	0.98
1:B:51:PHE:HD1	1:B:51:PHE:H	1.26	0.84
1:C:14:ASN:O	2:C:248:HOH:O	1.97	0.82
1:D:112:THR:OG1	2:D:272:HOH:O	1.98	0.81
1:E:2:SER:OG	1:E:3:LEU:N	2.28	0.67

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	137/152 (90%)	135 (98%)	2 (2%)	0	100	100
1	B	137/152 (90%)	135 (98%)	2 (2%)	0	100	100
1	C	137/152 (90%)	133 (97%)	4 (3%)	0	100	100
1	D	137/152 (90%)	135 (98%)	2 (2%)	0	100	100
1	E	137/152 (90%)	134 (98%)	3 (2%)	0	100	100
1	F	137/152 (90%)	135 (98%)	2 (2%)	0	100	100
All	All	822/912 (90%)	807 (98%)	15 (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	114/124 (92%)	113 (99%)	1 (1%)	82	86
1	B	114/124 (92%)	113 (99%)	1 (1%)	82	86
1	C	114/124 (92%)	112 (98%)	2 (2%)	64	66
1	D	114/124 (92%)	114 (100%)	0	100	100
1	E	114/124 (92%)	112 (98%)	2 (2%)	64	66
1	F	114/124 (92%)	113 (99%)	1 (1%)	82	86
All	All	684/744 (92%)	677 (99%)	7 (1%)	80	83

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	79	GLN
1	F	51	PHE
1	E	71	SER
1	B	51	PHE
1	E	79	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	108	HIS

5.3.3 RNA ⓘ

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 carbohydrates 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	139/152 (91%)	-0.15	1 (0%) 87 87	19, 26, 42, 47	0
1	B	139/152 (91%)	-0.13	1 (0%) 87 87	21, 30, 46, 52	0
1	C	139/152 (91%)	0.05	4 (2%) 52 53	21, 33, 51, 58	0
1	D	139/152 (91%)	0.15	11 (7%) 13 13	18, 27, 56, 64	0
1	E	139/152 (91%)	0.07	5 (3%) 43 44	23, 35, 51, 58	0
1	F	139/152 (91%)	0.06	7 (5%) 30 30	20, 31, 62, 74	0
All	All	834/912 (91%)	0.01	29 (3%) 44 45	18, 30, 51, 74	0

The worst 5 of 29 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	140	LEU	7.9
1	E	51	PHE	5.1
1	C	2	SER	4.9
1	D	140	LEU	4.7
1	D	139	PRO	4.3

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 carbohydrates 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.