



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 22, 2018 – 08:32 PM EDT

PDB ID : 6GI1  
Title : Crystal structure of the ferric enterobactin esterase (pfeE) mutant(S157A) from *Pseudomonas aeruginosa* in presence of enterobactin  
Authors : Moynie, L.; Naismith, J.H.  
Deposited on : 2018-05-09  
Resolution : 1.66 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](mailto: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.

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

MolProbity : **FAILED**  
Mogul : 1.7.3 (157068), CSD as539be (2018)  
Xtrriage (Phenix) : 1.13  
EDS : rb-20031172  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Refmac : 5.8.0158  
CCP4 : 7.0 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20031172

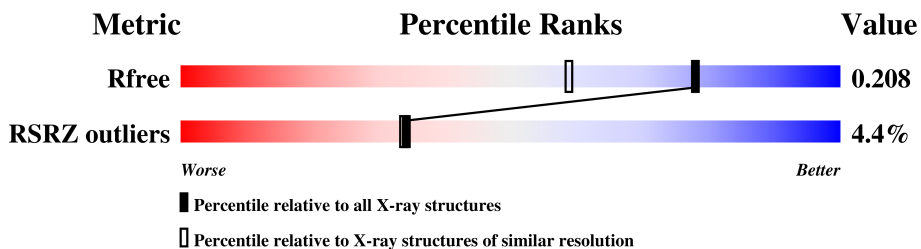
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.66 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))
$R_{free}$	111664	1521 (1.66-1.66)
RSRZ outliers	108989	1487 (1.66-1.66)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 4436 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 Ferric enterobactin esterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	261	2018	1272	378	365	3	0	2	0
1	B	264	2069	1305	392	368	4	0	4	0

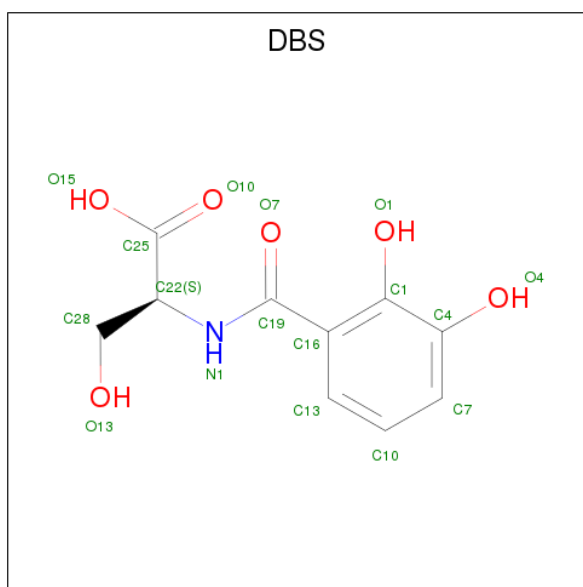
There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP Q9I0F2
A	-1	ALA	-	expression tag	UNP Q9I0F2
A	0	MET	-	expression tag	UNP Q9I0F2
A	1	ASN	-	expression tag	UNP Q9I0F2
A	157	ALA	SER	engineered mutation	UNP Q9I0F2
B	-2	GLY	-	expression tag	UNP Q9I0F2
B	-1	ALA	-	expression tag	UNP Q9I0F2
B	0	MET	-	expression tag	UNP Q9I0F2
B	1	ASN	-	expression tag	UNP Q9I0F2
B	157	ALA	SER	engineered mutation	UNP Q9I0F2

- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe).

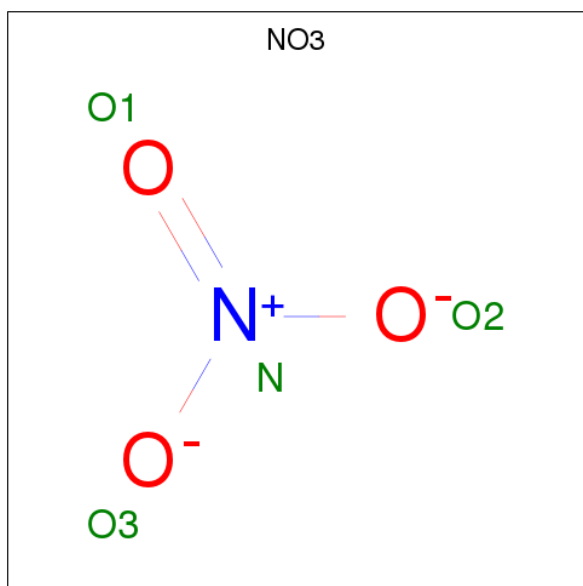
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Fe	0	0
			1	1		
2	A	1	Total	Fe	0	0
			1	1		

- Molecule 3 is 2-(2,3-DIHYDROXY-BENZOYLAMINO)-3-HYDROXY-PROPIONIC ACID (three-letter code: DBS) (formula: C<sub>10</sub>H<sub>11</sub>NO<sub>6</sub>).



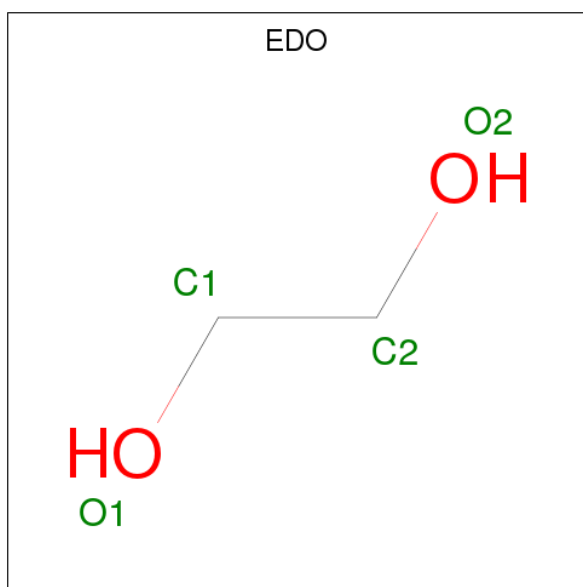
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	17	10	1	6	0	0

- Molecule 4 is NITRATE ION (three-letter code: NO3) (formula: NO<sub>3</sub>).



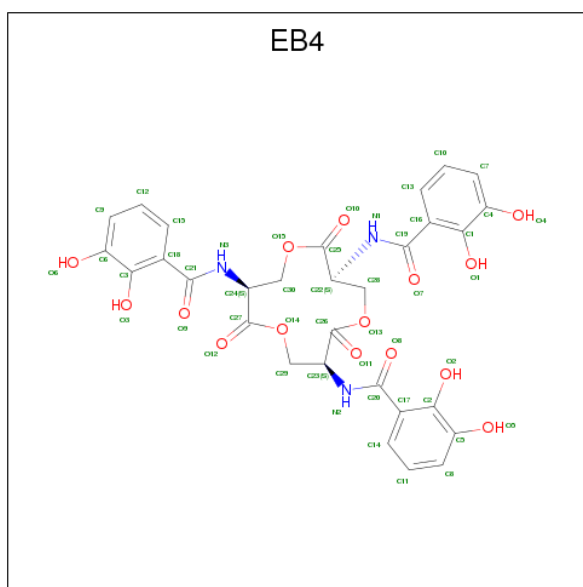
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	N	O		
4	B	1	4	1	3	0	0
4	B	1	4	1	3	0	0

- Molecule 5 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0

- Molecule 6 is N,N',N''-[(3S,7S,11S)-2,6,10-trioxo-1,5,9-trioxacyclododecane-3,7,11-triyl]tris(2,3-dihydroxybenzamide) (three-letter code: EB4) (formula: C<sub>30</sub>H<sub>27</sub>N<sub>3</sub>O<sub>15</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
6	B	1	48	30	3	15	0	0

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	122	Total	O	0	0
			122	122		
7	B	132	Total	O	0	0
			132	132		

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### 3 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	58.55Å 76.43Å 130.67Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	58.55 – 1.66 53.43 – 1.66	Depositor EDS
% Data completeness (in resolution range)	100.0 (58.55-1.66) 100.0 (53.43-1.66)	Depositor EDS
$R_{merge}$	0.13	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.44 (at 1.66Å)	Xtrriage
Refinement program	REFMAC 5.8.0189	Depositor
R, $R_{free}$	0.175 , 0.205 0.188 , 0.208	Depositor DCC
$R_{free}$ test set	3528 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	25.6	Xtrriage
Anisotropy	0.593	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 41.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	4436	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.05% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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.

## 4 Model quality [i](#)

### 4.1 Standard geometry [i](#)

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### 4.2 Too-close contacts [i](#)

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### 4.3 Torsion angles [i](#)

#### 4.3.1 Protein backbone [i](#)

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#### 4.3.2 Protein sidechains [i](#)

MolProbity failed to run properly - this section is therefore empty.

#### 4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

### 4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 4.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

### 4.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 2 are monoatomic - leaving 9 for Mogul analysis.

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
3	DBS	A	302	2	14,17,17	2.42	3 (21%)	20,23,23	2.00	6 (30%)
4	NO3	B	302	-	1,3,3	0.02	0	0,3,3	0.00	-
4	NO3	B	303	-	1,3,3	0.27	0	0,3,3	0.00	-
5	EDO	B	304	-	3,3,3	0.58	0	2,2,2	0.34	0
5	EDO	B	305	-	3,3,3	0.54	0	2,2,2	0.44	0
5	EDO	B	306	-	3,3,3	0.65	0	2,2,2	0.40	0
5	EDO	B	307	-	3,3,3	0.78	0	2,2,2	0.29	0
5	EDO	B	308	-	3,3,3	0.79	0	2,2,2	0.18	0
6	EB4	B	309	2	51,51,51	2.43	9 (17%)	72,72,72	1.43	15 (20%)

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
3	DBS	A	302	2	-	0/10/14/14	0/1/1/1
4	NO3	B	302	-	-	0/0/0/0	0/0/0/0
4	NO3	B	303	-	-	0/0/0/0	0/0/0/0
5	EDO	B	304	-	-	0/1/1/1	0/0/0/0
5	EDO	B	305	-	-	0/1/1/1	0/0/0/0
5	EDO	B	306	-	-	0/1/1/1	0/0/0/0
5	EDO	B	307	-	-	0/1/1/1	0/0/0/0
5	EDO	B	308	-	-	0/1/1/1	0/0/0/0
6	EB4	B	309	2	-	0/51/51/51	0/3/4/4

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	302	DBS	C28-C22	-2.12	1.49	1.52
3	A	302	DBS	C16-C1	3.13	1.46	1.41
6	B	309	EB4	C16-C1	3.30	1.46	1.41
6	B	309	EB4	C18-C3	3.67	1.47	1.41
6	B	309	EB4	C17-C2	3.97	1.48	1.41
6	B	309	EB4	O15-C25	5.66	1.44	1.33
6	B	309	EB4	C4-C1	5.89	1.46	1.39
6	B	309	EB4	O14-C27	6.18	1.46	1.33
6	B	309	EB4	O13-C26	6.27	1.46	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	309	EB4	C5-C2	6.87	1.47	1.39
6	B	309	EB4	C6-C3	7.15	1.48	1.39
3	A	302	DBS	C4-C1	7.68	1.48	1.39

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	302	DBS	C22-N1-C19	-4.29	116.52	122.25
3	A	302	DBS	O7-C19-C16	-3.81	113.89	120.98
6	B	309	EB4	O14-C27-O12	-3.09	118.20	124.12
6	B	309	EB4	O15-C25-O10	-2.81	118.74	124.12
6	B	309	EB4	O13-C26-O11	-2.72	118.93	124.12
6	B	309	EB4	C18-C3-C6	-2.56	118.22	120.00
3	A	302	DBS	O1-C1-C16	-2.30	116.92	121.01
3	A	302	DBS	C7-C4-C1	-2.22	117.76	120.10
6	B	309	EB4	O7-C19-C16	-2.01	117.24	120.98
6	B	309	EB4	C17-C20-N2	2.21	121.06	116.86
6	B	309	EB4	O5-C5-C8	2.22	125.38	119.34
6	B	309	EB4	C16-C19-N1	2.23	121.11	116.86
6	B	309	EB4	C13-C16-C19	2.24	124.44	118.36
6	B	309	EB4	O4-C4-C7	2.25	125.47	119.34
3	A	302	DBS	O7-C19-N1	2.51	126.98	122.47
6	B	309	EB4	C29-O14-C27	2.64	122.06	116.86
6	B	309	EB4	O15-C25-C22	2.69	118.40	111.64
6	B	309	EB4	C28-O13-C26	2.71	122.20	116.86
6	B	309	EB4	O13-C26-C23	2.95	119.08	111.64
6	B	309	EB4	O14-C27-C24	3.46	120.34	111.64
3	A	302	DBS	C28-C22-N1	3.79	114.28	109.25

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

#### 4.7 Other polymers [i](#)

There are no such residues in this entry.

## 4.8 Polymer linkage issues

There are no chain breaks in this entry.

## 5 Fit of model and data

### 5.1 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	261/282 (92%)	-0.10	12 (4%) 32 31	23, 33, 71, 97	0
1	B	264/282 (93%)	-0.13	11 (4%) 36 36	21, 31, 60, 88	0
All	All	525/564 (93%)	-0.12	23 (4%) 34 34	21, 33, 68, 97	0

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	78	GLY	8.0
1	B	7	THR	4.4
1	A	109	GLY	4.3
1	A	11	SER	4.3
1	A	111	ALA	4.3
1	A	110	GLN	4.2
1	A	112	ASP	3.9
1	B	6	ALA	3.8
1	A	12	LEU	3.5
1	B	203	ARG	3.1
1	B	9	ASP	3.0
1	B	14	GLN	2.9
1	B	91	PRO	2.9
1	B	228	GLU	2.5
1	A	91	PRO	2.4
1	A	14	GLN	2.4
1	A	242	ARG	2.4
1	B	16	GLN	2.3
1	B	12	LEU	2.2
1	B	8	MET	2.1
1	A	222	ARG	2.1
1	B	94	ILE	2.1
1	A	96	ARG	2.0

## 5.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

## 5.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.4 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, 95<sup>th</sup> 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(Å <sup>2</sup> )	Q<0.9
3	DBS	A	302	17/17	0.77	0.14	28,34,49,58	17
6	EB4	B	309	48/48	0.88	0.10	23,33,40,44	48
5	EDO	B	307	4/4	0.89	0.11	33,37,39,39	0
5	EDO	B	304	4/4	0.89	0.11	35,40,44,49	0
4	NO3	B	303	4/4	0.90	0.27	36,44,49,51	0
5	EDO	B	306	4/4	0.91	0.12	34,35,38,38	0
5	EDO	B	308	4/4	0.92	0.10	34,34,35,36	0
5	EDO	B	305	4/4	0.95	0.15	36,41,42,50	0
2	FE	A	301	1/1	0.97	0.08	52,52,52,52	1
4	NO3	B	302	4/4	0.98	0.12	33,37,38,39	0
2	FE	B	301	1/1	0.99	0.05	28,28,28,28	1

## 5.5 Other polymers [i](#)

There are no such residues in this entry.