



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 12, 2017 – 08:57 pm GMT

PDB ID : 5F5B  
Title : Structure of E.Coli GlpG complexed with peptidic inhibitor Ac-VRMA-CHO  
Authors : Urban, S.; Cho, S.; Dickey, S.W.  
Deposited on : 2015-12-04  
Resolution : 2.30 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

<http://wwpdb.org/validation/2016/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 : 4.02b-467  
Mogul : 1.7.2 (RC1), CSD as538be (2017)  
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

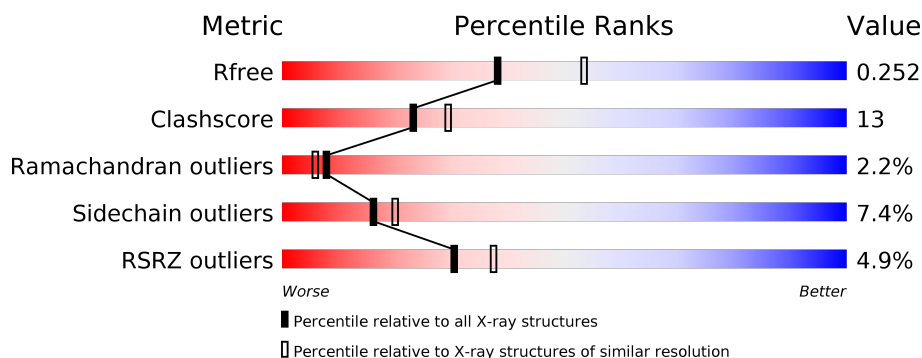
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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	4130 (2.30-2.30)
Clashscore	112137	4751 (2.30-2.30)
Ramachandran outliers	110173	4705 (2.30-2.30)
Sidechain outliers	110143	4704 (2.30-2.30)
RSRZ outliers	101464	4156 (2.30-2.30)

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  $\geq 3$ , 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	211	<div> <div>4%</div> <div>66%</div> <div>15%</div> <div>• •</div> <div>14%</div> </div>
2	B	5	<div> <div>20%</div> <div>80%</div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	5XU	B	503	-	-	X	-

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 1519 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 Rhomboid protease GlpG.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	182	Total	C	N	O	S	0	0	0
			1451	978	232	230	11			

There are 21 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	66	MET	-	initiating methionine	UNP A0A0J2E248
A	67	GLY	-	expression tag	UNP A0A0J2E248
A	68	SER	-	expression tag	UNP A0A0J2E248
A	69	SER	-	expression tag	UNP A0A0J2E248
A	70	HIS	-	expression tag	UNP A0A0J2E248
A	71	HIS	-	expression tag	UNP A0A0J2E248
A	72	HIS	-	expression tag	UNP A0A0J2E248
A	73	HIS	-	expression tag	UNP A0A0J2E248
A	74	HIS	-	expression tag	UNP A0A0J2E248
A	75	HIS	-	expression tag	UNP A0A0J2E248
A	76	SER	-	expression tag	UNP A0A0J2E248
A	77	SER	-	expression tag	UNP A0A0J2E248
A	78	GLY	-	expression tag	UNP A0A0J2E248
A	79	LEU	-	expression tag	UNP A0A0J2E248
A	80	VAL	-	expression tag	UNP A0A0J2E248
A	81	PRO	-	expression tag	UNP A0A0J2E248
A	82	ARG	-	expression tag	UNP A0A0J2E248
A	83	GLY	-	expression tag	UNP A0A0J2E248
A	84	SER	-	expression tag	UNP A0A0J2E248
A	85	HIS	-	expression tag	UNP A0A0J2E248
A	86	MET	-	expression tag	UNP A0A0J2E248

- Molecule 2 is a protein called peptidic derivative of Gurken: ACE-VAL-ARG-MET-ALA-aldehyde.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	5	Total	C	N	O	S	0	0	0
			34	21	7	5	1			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	34	Total	O	0	0
			34	34		



- Molecule 1: Rhomboid protease GlpG



## 4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	110.59Å 110.59Å 126.73Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.01 – 2.30 22.40 – 2.00	Depositor EDS
% Data completeness (in resolution range)	98.7 (50.01-2.30) 99.3 (22.40-2.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.87 (at 1.99Å)	Xtriage
Refinement program	REFMAC 5.8.0103	Depositor
R, $R_{free}$	0.213 , 0.249 0.214 , 0.252	Depositor DCC
$R_{free}$ test set	651 reflections (5.15%)	DCC
Wilson B-factor (Å <sup>2</sup> )	33.6	Xtriage
Anisotropy	0.563	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.42 , 80.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	1519	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.93% 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.

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 5XU, ACE

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	1.06	0/1500	1.25	13/2041 (0.6%)
2	B	0.84	0/26	1.26	0/33
All	All	1.05	0/1526	1.25	13/2074 (0.6%)

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	A	0	3

There are no bond length outliers.

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	95	PRO	O-C-N	-20.75	89.50	122.70
1	A	95	PRO	CA-C-O	9.75	143.59	120.20
1	A	270	LEU	CA-CB-CG	8.27	134.31	115.30
1	A	217	ARG	NE-CZ-NH1	7.62	124.11	120.30
1	A	220	GLN	N-CA-C	7.22	130.50	111.00
1	A	95	PRO	C-N-CA	-7.14	103.85	121.70
1	A	92	ARG	NE-CZ-NH2	5.82	123.21	120.30
1	A	247	MET	N-CA-C	-5.28	96.74	111.00
1	A	116	ASP	CB-CG-OD1	5.16	122.94	118.30
1	A	116	ASP	CB-CG-OD2	-5.09	113.72	118.30
1	A	218	ASP	CB-CG-OD1	5.04	122.84	118.30
1	A	218	ASP	C-N-CD	5.02	138.95	128.40
1	A	137	ARG	NE-CZ-NH1	5.02	122.81	120.30



There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	221	SER	Peptide
1	A	248	SER	Peptide
1	A	95	PRO	Mainchain

## 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	1451	0	1455	37	1
2	B	34	0	39	11	0
3	A	34	0	0	0	0
All	All	1519	0	1494	38	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 13.

All (38) 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:201:SER:OG	2:B:503:5XU:C	1.72	1.36
1:A:149:MET:HE3	1:A:153:PHE:CE1	1.60	1.35
1:A:201:SER:OG	2:B:503:5XU:HXT	1.15	1.29
1:A:149:MET:CE	1:A:153:PHE:CE1	2.26	1.16
1:A:149:MET:CE	1:A:153:PHE:HE1	1.63	1.09
1:A:149:MET:HE3	1:A:153:PHE:HE1	0.81	0.96
1:A:201:SER:CB	2:B:503:5XU:HXT	1.96	0.96
1:A:218:ASP:O	1:A:220:GLN:N	2.09	0.86
1:A:270:LEU:HD23	1:A:270:LEU:O	1.81	0.79
1:A:201:SER:CB	2:B:503:5XU:C	2.59	0.79
1:A:169:LEU:HD21	1:A:221:SER:HB3	1.63	0.78
1:A:149:MET:HE2	1:A:153:PHE:CE1	2.19	0.75
1:A:149:MET:HE2	1:A:153:PHE:CD1	2.22	0.73
1:A:201:SER:HG	2:B:503:5XU:HXT	1.52	0.72
1:A:217:ARG:HH11	1:A:217:ARG:HG2	1.55	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:98:TRP:CE2	1:A:102:ILE:HD11	2.25	0.72
1:A:217:ARG:HH11	1:A:217:ARG:CG	2.11	0.63
1:A:218:ASP:O	1:A:219:PRO:C	2.34	0.63
1:A:107:VAL:O	1:A:111:MET:HG3	2.05	0.56
1:A:92:ARG:NH1	1:A:160:TYR:HA	2.21	0.55
1:A:169:LEU:HD21	1:A:221:SER:CB	2.38	0.52
1:A:150:HIS:CE1	2:B:502:MET:HB3	2.45	0.52
1:A:269:SER:O	1:A:271:ASN:N	2.40	0.51
1:A:146:PHE:CZ	2:B:500:VAL:HG11	2.48	0.49
1:A:138:TYR:HB3	1:A:183:LEU:CD1	2.43	0.49
1:A:147:SER:O	1:A:150:HIS:HB3	2.13	0.48
1:A:92:ARG:NH1	1:A:160:TYR:O	2.46	0.47
1:A:92:ARG:HH11	1:A:160:TYR:HA	1.80	0.45
1:A:146:PHE:CE1	2:B:500:VAL:HG11	2.50	0.45
1:A:218:ASP:C	1:A:220:GLN:H	2.21	0.44
1:A:98:TRP:NE1	1:A:102:ILE:HD11	2.34	0.43
1:A:205:TYR:CE1	1:A:254:HIS:HB3	2.54	0.43
1:A:201:SER:OG	2:B:503:5XU:CA	2.60	0.42
1:A:184:LEU:HD13	1:A:260:VAL:CG2	2.50	0.42
1:A:226:GLN:O	1:A:229:LEU:N	2.52	0.42
2:B:500:VAL:HG12	2:B:501:ARG:N	2.36	0.41
1:A:201:SER:HB3	2:B:503:5XU:HXT	1.95	0.41
1:A:217:ARG:NH1	1:A:217:ARG:HG2	2.30	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:187:TYR:OH	1:A:268:ASP:OD1[18_444]	2.19	0.01

## 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	180/211 (85%)	158 (88%)	18 (10%)	4 (2%)	8	6
2	B	3/5 (60%)	2 (67%)	1 (33%)	0	100	100
All	All	183/216 (85%)	160 (87%)	19 (10%)	4 (2%)	8	6

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	219	PRO
1	A	222	GLY
1	A	270	LEU
1	A	266	PHE

### 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	145/169 (86%)	134 (92%)	11 (8%)	15	19
2	B	3/3 (100%)	3 (100%)	0	100	100
All	All	148/172 (86%)	137 (93%)	11 (7%)	16	20

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

Mol	Chain	Res	Type
1	A	92	ARG
1	A	149	MET
1	A	168	ARG
1	A	184	LEU
1	A	191	LYS
1	A	217	ARG
1	A	221	SER
1	A	223	ILE
1	A	232	PHE
1	A	247	MET
1	A	270	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	226	GLN
1	A	271	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules 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	$\# Z  > 2$
2	5XU	B	503	2	4,4,4	1.33	0	1,4,4	0.32	0

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	5XU	B	503	2	-	0/0/2/2	0/0/0/0

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.

1 monomer is involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	503	5XU	7	0

## 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

### 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, 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	182/211 (86%)	-0.06	9 (4%) 30 37	30, 50, 89, 133	0
2	B	3/5 (60%)	-0.24	0 100 100	56, 56, 59, 62	0
All	All	185/216 (85%)	-0.06	9 (4%) 30 37	30, 50, 89, 133	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	272	ALA	10.9
1	A	91	GLU	6.0
1	A	220	GLN	5.5
1	A	247	MET	4.6
1	A	246	GLY	3.7
1	A	271	ASN	3.2
1	A	241	TRP	2.6
1	A	92	ARG	2.1
1	A	219	PRO	2.0

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

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, 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	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
2	5XU	B	503	5/5	0.97	0.15	-	41,42,43,48	0

### 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.