



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 16, 2020 – 08:18 PM BST

PDB ID : 6PXE  
Title : Crystal structure of the complex between periplasmic domains of antiholin RI and holin T from T4 phage, in P21  
Authors : Krieger, I.V.; Sacchettini, J.C.  
Deposited on : 2019-07-25  
Resolution : 2.30 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](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	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.13.1
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)	:	2.13.1

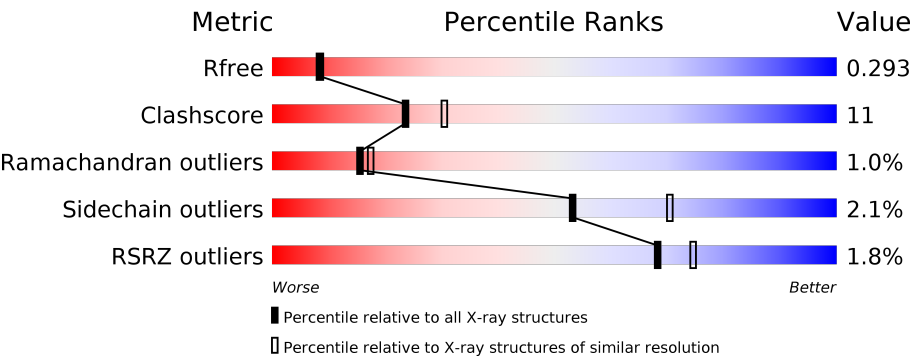
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 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))
$R_{free}$	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (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 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	74	<div><div>%</div><div><div></div><div>64%</div><div>31%</div><div>• •</div></div></div>
1	C	74	<div><div>4%</div><div><div></div><div>72%</div><div>24%</div><div>• •</div></div></div>
1	E	74	<div><div>7%</div><div><div></div><div>57%</div><div>31%</div><div>5% • 5%</div></div></div>
1	R	74	<div><div>%</div><div><div></div><div>74%</div><div>22%</div><div>• •</div></div></div>
2	B	164	<div><div></div><div><div></div><div>70%</div><div>18%</div><div>12%</div></div></div>
2	D	164	<div><div>%</div><div><div></div><div>72%</div><div>21%</div><div>• 6%</div></div></div>

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Mol	Chain	Length	Quality of chain
2	F	164	<div><div><div></div><div></div><div></div></div><div><div>2%</div><div>77%</div><div>18%</div><div>.</div><div>.</div></div></div>
2	T	164	<div><div><div></div><div></div><div></div></div><div><div>%</div><div>74%</div><div>16%</div><div>10%</div></div></div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7328 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 Antiholin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	R	72	Total	C	N	O	S	0	0	0
			596	374	98	116	8			
1	A	72	Total	C	N	O	S	0	0	0
			596	374	98	116	8			
1	C	72	Total	C	N	O	S	0	0	0
			596	374	98	116	8			
1	E	70	Total	C	N	O	S	0	0	0
			579	363	96	112	8			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
R	24	MET	-	initiating methionine	UNP P13304
A	24	MET	-	initiating methionine	UNP P13304
C	24	MET	-	initiating methionine	UNP P13304
E	24	MET	-	initiating methionine	UNP P13304

- Molecule 2 is a protein called Holin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	T	147	Total	C	N	O	S	0	0	0
			1200	769	201	225	5			
2	B	145	Total	C	N	O	S	0	0	0
			1182	758	198	221	5			
2	D	154	Total	C	N	O	S	0	0	0
			1259	807	208	239	5			
2	F	157	Total	C	N	O	S	0	0	0
			1289	827	212	245	5			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
T	55	MET	-	initiating methionine	UNP A0A2U8QQK7
B	55	MET	-	initiating methionine	UNP A0A2U8QQK7
D	55	MET	-	initiating methionine	UNP A0A2U8QQK7
F	55	MET	-	initiating methionine	UNP A0A2U8QQK7

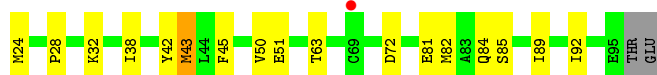
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	R	1	Total O 1 1	0	0
3	T	6	Total O 6 6	0	0
3	A	1	Total O 1 1	0	0
3	B	2	Total O 2 2	0	0
3	C	2	Total O 2 2	0	0
3	D	10	Total O 10 10	0	0
3	E	1	Total O 1 1	0	0
3	F	8	Total O 8 8	0	0

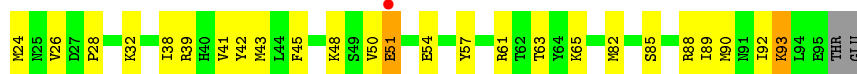
### 3 Residue-property plots [i](#)

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.

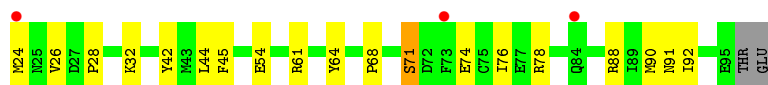
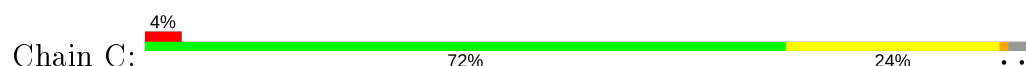
- Molecule 1: Antiholin



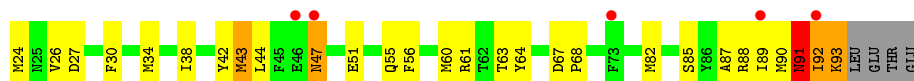
- Molecule 1: Antiholin



- Molecule 1: Antiholin



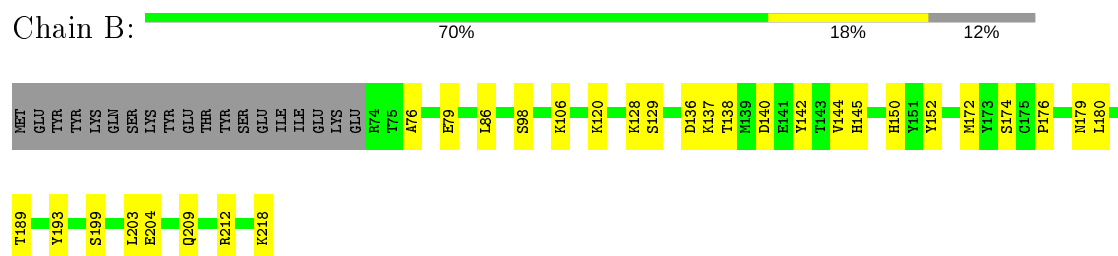
- Molecule 1: Antiholin



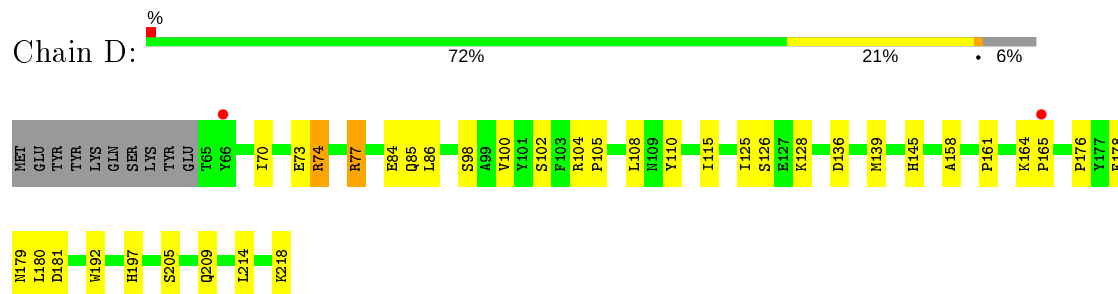
- Molecule 2: Holin



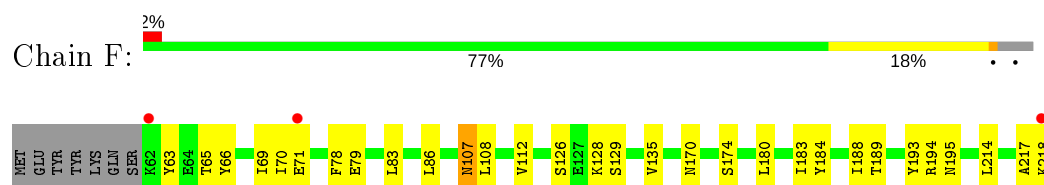
## ● Molecule 2: Holin



## ● Molecule 2: Holin



## ● Molecule 2: Holin



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	78.59 Å 82.56 Å 81.43 Å 90.00° 102.16° 90.00°	Depositor
Resolution (Å)	39.80 – 2.30 39.80 – 2.30	Depositor EDS
% Data completeness (in resolution range)	97.3 (39.80-2.30) 97.4 (39.80-2.30)	Depositor EDS
$R_{merge}$	0.15	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.07 (at 2.29 Å)	Xtriage
Refinement program	PHENIX 1.11.1_2575	Depositor
R, $R_{free}$	0.232 , 0.293 0.235 , 0.293	Depositor DCC
$R_{free}$ test set	2153 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	31.8	Xtriage
Anisotropy	0.395	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 17.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.43$ , $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	0.095 for l,-k,h	Xtriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	7328	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	37.0	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 39.01 % 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 3.3817e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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 [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	0.44	0/609	0.54	0/814
1	C	0.43	0/609	0.54	0/814
1	E	0.44	0/592	0.53	0/791
1	R	0.42	0/609	0.49	0/814
2	B	0.42	0/1214	0.57	0/1646
2	D	0.48	0/1292	0.61	0/1751
2	F	0.46	0/1323	0.60	0/1792
2	T	0.50	0/1232	0.60	0/1669
All	All	0.46	0/7480	0.57	0/10091

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	596	0	555	18	0
1	C	596	0	555	15	0
1	E	579	0	538	29	0
1	R	596	0	555	11	0
2	B	1182	0	1142	20	0
2	D	1259	0	1216	41	0
2	F	1289	0	1244	24	0
2	T	1200	0	1161	19	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	1	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	0	0
3	D	10	0	0	0	0
3	E	1	0	0	0	0
3	F	8	0	0	0	0
3	R	1	0	0	0	0
3	T	6	0	0	0	0
All	All	7328	0	6966	160	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 11.

The worst 5 of 160 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)
2:D:74:ARG:HD2	2:F:63:TYR:HB3	1.33	1.06
2:D:74:ARG:O	2:D:77:ARG:HG3	1.57	1.03
2:D:192:TRP:CB	2:D:197:HIS:CE1	2.57	0.88
1:A:57:TYR:HE2	1:A:61:ARG:HH21	1.21	0.87
2:D:192:TRP:CB	2:D:197:HIS:HE1	1.90	0.84

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	70/74 (95%)	64 (91%)	6 (9%)	0	100	100
1	C	70/74 (95%)	62 (89%)	8 (11%)	0	100	100
1	E	68/74 (92%)	55 (81%)	8 (12%)	5 (7%)	1	0

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	R	70/74 (95%)	66 (94%)	4 (6%)	0	100	100
2	B	143/164 (87%)	134 (94%)	8 (6%)	1 (1%)	22	26
2	D	152/164 (93%)	143 (94%)	9 (6%)	0	100	100
2	F	155/164 (94%)	147 (95%)	5 (3%)	3 (2%)	8	7
2	T	145/164 (88%)	139 (96%)	6 (4%)	0	100	100
All	All	873/952 (92%)	810 (93%)	54 (6%)	9 (1%)	15	17

5 of 9 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	76	ALA
1	E	91	ASN
2	F	126	SER
1	E	92	ILE
2	F	195	ASN

### 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	67/69 (97%)	64 (96%)	3 (4%)	27	39
1	C	67/69 (97%)	65 (97%)	2 (3%)	41	57
1	E	65/69 (94%)	62 (95%)	3 (5%)	27	38
1	R	67/69 (97%)	65 (97%)	2 (3%)	41	57
2	B	128/147 (87%)	128 (100%)	0	100	100
2	D	137/147 (93%)	133 (97%)	4 (3%)	42	58
2	F	140/147 (95%)	138 (99%)	2 (1%)	67	81
2	T	130/147 (88%)	129 (99%)	1 (1%)	81	91
All	All	801/864 (93%)	784 (98%)	17 (2%)	53	70

5 of 17 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	91	ASN
2	D	74	ARG
1	E	91	ASN
1	C	71	SER
1	E	93	LYS

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

Mol	Chain	Res	Type
2	B	87	GLN

### 5.3.3 RNA [i](#)

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 monosaccharides 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, 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	72/74 (97%)	0.21	1 (1%) 75 80	24, 40, 56, 66	0
1	C	72/74 (97%)	0.32	3 (4%) 36 43	31, 41, 57, 62	0
1	E	70/74 (94%)	0.45	5 (7%) 16 21	32, 44, 66, 72	0
1	R	72/74 (97%)	0.22	1 (1%) 75 80	28, 42, 56, 65	0
2	B	145/164 (88%)	0.19	0 100 100	26, 38, 53, 69	1 (0%)
2	D	154/164 (93%)	0.14	2 (1%) 77 81	22, 31, 54, 60	1 (0%)
2	F	157/164 (95%)	0.06	3 (1%) 66 73	21, 32, 54, 72	1 (0%)
2	T	147/164 (89%)	-0.10	1 (0%) 87 91	22, 30, 48, 67	1 (0%)
All	All	889/952 (93%)	0.15	16 (1%) 68 74	21, 36, 56, 72	4 (0%)

The worst 5 of 16 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	89	ILE	2.9
1	E	92	ILE	2.9
2	T	73	GLU	2.8
2	F	218	LYS	2.8
1	C	73	PHE	2.7

### 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 monosaccharides 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.