



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 11:33 AM GMT

PDB ID : 3P95  
Title : Human mesotrypsin complexed with bovine pancreatic trypsin inhibitor variant (BPTI-K15R/R17D)  
Authors : Salameh, M.A.; Soares, A.S.; Radisky, E.S.  
Deposited on : 2010-10-15  
Resolution : 1.30 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 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
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) : trunk26865

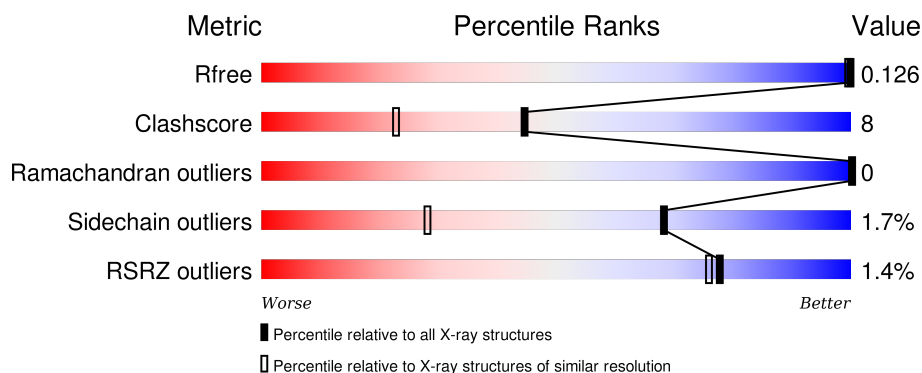
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*



The reported resolution of this entry is 1.30 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))
$R_{free}$	91344	1475 (1.34-1.26)
Clashscore	102246	1031 (1.32-1.28)
Ramachandran outliers	100387	1504 (1.34-1.26)
Sidechain outliers	100360	1503 (1.34-1.26)
RSRZ outliers	91569	1476 (1.34-1.26)

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	224	 87% 11% •
2	E	58	 5% 76% 21% •

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4587 atoms, of which 2076 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 PRSS3 protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	224	Total	C	H	N	O	S	34	11	0
			3399	1105	1647	298	337	12			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	195	ALA	SER	ENGINEERED MUTATION	UNP Q8N2U3

- Molecule 2 is a protein called Pancreatic trypsin inhibitor.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	E	58	Total	C	H	N	O	S	22	0	0
			881	282	429	83	80	7			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	15	ARG	LYS	ENGINEERED MUTATION	UNP P00974
E	17	ASP	ARG	ENGINEERED MUTATION	UNP P00974

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Ca	0	0
			1	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	226	Total	O	0	18
			244	244		

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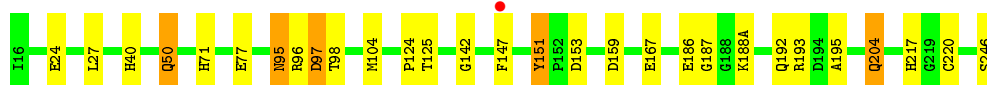
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	E	54	Total	O	0	8
			62	62		

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


These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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 ( $\text{RSRZ} > 2$ ). 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.

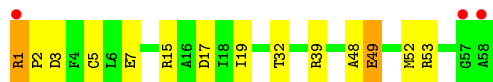
- Molecule 1: PRSS3 protein

Chain A:  87% 11% .



- Molecule 2: Pancreatic trypsin inhibitor

Chain E:  5% 76% 21% .



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	43.91Å 39.09Å 68.46Å 90.00° 100.13° 90.00°	Depositor
Resolution (Å)	33.82 – 1.30 33.82 – 1.30	Depositor EDS
% Data completeness (in resolution range)	93.3 (33.82-1.30) 93.3 (33.82-1.30)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	5.03 (at 1.30Å)	Xtriage
Refinement program	PHENIX (phenix.refine)	Depositor
R, $R_{free}$	0.111 , 0.132 0.105 , 0.126	Depositor DCC
$R_{free}$ test set	2001 reflections (3.79%)	DCC
Wilson B-factor (Å <sup>2</sup> )	10.9	Xtriage
Anisotropy	0.279	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.45 , 59.3	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 52822 reflections	Xtriage
$F_o, F_c$ correlation	0.98	EDS
Total number of atoms	4587	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.58% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

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

Bond lengths and bond angles in the following residue types are not validated in this section: CA

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	1.07	9/1824 (0.5%)	0.99	5/2480 (0.2%)
2	E	1.19	4/463 (0.9%)	1.06	1/622 (0.2%)
All	All	1.10	13/2287 (0.6%)	1.01	6/3102 (0.2%)

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	77	GLU	CD-OE1	7.74	1.34	1.25
1	A	186	GLU	CG-CD	7.15	1.62	1.51
2	E	7	GLU	CG-CD	6.69	1.61	1.51
2	E	3	ASP	CB-CG	6.16	1.64	1.51
1	A	188(A)	LYS	CE-NZ	6.16	1.64	1.49
1	A	159	ASP	CG-OD2	-5.64	1.12	1.25
1	A	167	GLU	CD-OE2	5.57	1.31	1.25
1	A	147	PHE	CB-CG	5.50	1.60	1.51
1	A	24	GLU	CD-OE2	5.39	1.31	1.25
1	A	220	CYS	CB-SG	-5.39	1.73	1.81
2	E	7	GLU	CD-OE2	5.18	1.31	1.25
2	E	49	GLU	CD-OE2	5.12	1.31	1.25
1	A	204	GLN	CD-NE2	-5.02	1.20	1.32

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	3	ASP	CB-CG-OD1	7.80	125.32	118.30
1	A	96	ARG	NE-CZ-NH1	-6.92	116.84	120.30
1	A	97[A]	ASP	CB-CG-OD2	-6.88	112.10	118.30
1	A	97[B]	ASP	CB-CG-OD2	-6.88	112.10	118.30
1	A	104	MET	CA-CB-CG	5.94	123.40	113.30
1	A	151	TYR	CD1-CE1-CZ	5.01	124.31	119.80

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-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 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	1752	1647	1725	23	0
2	E	452	429	429	14	1
3	A	1	0	0	0	0
4	A	244	0	0	10	2
4	E	62	0	0	3	0
All	All	2511	2076	2154	34	2

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 8.

All (34) 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:246:SER:HB3	4:A:297:HOH:O	1.82	0.79
1:A:246:SER:CB	4:A:297:HOH:O	2.35	0.75
1:A:50[B]:GLN:HG2	4:A:306:HOH:O	1.91	0.69
2:E:1:ARG:N	2:E:2:PRO:CD	2.57	0.68
1:A:217:HIS:HD2	4:A:349:HOH:O	1.74	0.68
2:E:1:ARG:H3	2:E:2:PRO:HD3	1.62	0.64
2:E:1:ARG:N	2:E:2:PRO:HD3	2.13	0.63
2:E:52:MET:HG2	4:E:198:HOH:O	1.99	0.63
1:A:151:TYR:CD1	1:A:193:ARG:HD2	2.34	0.61
1:A:95:ASN:HD22	1:A:97[B]:ASP:H	1.51	0.59
1:A:95:ASN:HD22	1:A:97[A]:ASP:H	1.52	0.58
1:A:95:ASN:ND2	1:A:97[A]:ASP:H	2.03	0.56
1:A:95:ASN:ND2	1:A:97[B]:ASP:H	2.03	0.56
1:A:217:HIS:HE1	4:A:383[A]:HOH:O	1.87	0.55
1:A:187:GLY:HA2	4:A:385[A]:HOH:O	2.06	0.55
1:A:142:GLY:HA2	1:A:193:ARG:HB2	1.88	0.54
1:A:193:ARG:HG3	2:E:17:ASP:HB2	1.91	0.53
4:A:392:HOH:O	2:E:19:ILE:HG22	2.07	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:53:ARG:NH1	4:E:215[A]:HOH:O	2.43	0.52
2:E:1:ARG:H2	2:E:2:PRO:CD	2.24	0.50
1:A:124:PRO:HA	1:A:204:GLN:HE21	1.76	0.50
1:A:125:THR:H	1:A:204:GLN:NE2	2.10	0.49
1:A:153[B]:ASP:OD1	4:A:401:HOH:O	2.20	0.48
1:A:97[B]:ASP:OD1	2:E:39:ARG:NH1	2.45	0.48
2:E:48:ALA:O	2:E:52:MET:HG3	2.13	0.48
2:E:2:PRO:HD2	2:E:5:CYS:SG	2.53	0.47
2:E:1:ARG:HB2	4:E:354:HOH:O	2.16	0.46
1:A:40:HIS:HD2	1:A:193:ARG:HD3	1.81	0.46
1:A:195:ALA:HB2	2:E:15:ARG:C	2.38	0.44
1:A:95:ASN:ND2	1:A:98:THR:H	2.16	0.44
2:E:19:ILE:HD11	2:E:32:THR:HB	2.00	0.43
1:A:192:GLN:O	1:A:193:ARG:HB2	2.19	0.42
1:A:71:HIS:HD2	4:A:283[B]:HOH:O	2.03	0.41
1:A:246:SER:OG	4:A:297:HOH:O	2.11	0.41

All (2) 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)
4:A:320:HOH:O	4:A:348:HOH:O[2_546]	1.86	0.34
2:E:49:GLU:OE2	4:A:403:HOH:O[1_565]	2.18	0.02

## 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	233/224 (104%)	228 (98%)	5 (2%)	0	100	100
2	E	56/58 (97%)	55 (98%)	1 (2%)	0	100	100
All	All	289/282 (102%)	283 (98%)	6 (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	196/185 (106%)	191 (97%)	5 (3%)	54	12
2	E	46/46 (100%)	45 (98%)	1 (2%)	60	17
All	All	242/231 (105%)	236 (98%)	6 (2%)	68	13

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	27[A]	LEU
1	A	27[B]	LEU
1	A	50[A]	GLN
1	A	50[B]	GLN
1	A	95	ASN
2	E	1	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	30	GLN
1	A	71	HIS
1	A	95	ASN
1	A	165	GLN
1	A	178	ASN
1	A	204	GLN
1	A	217	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](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

## 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	224/224 (100%)	-0.56	1 (0%) 93 92	8, 12, 24, 36	5 (2%)
2	E	58/58 (100%)	0.20	3 (5%) 31 27	10, 20, 47, 91	2 (3%)
All	All	282/282 (100%)	-0.40	4 (1%) 78 76	8, 13, 30, 91	7 (2%)

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	57	GLY	10.1
2	E	58	ALA	6.2
1	A	147	PHE	4.6
2	E	1	ARG	3.3

### 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](#)

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( $\text{\AA}^2$ )	Q<0.9
3	CA	A	1	1/1	1.00	0.03	-1.47	15,15,15,15	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.