



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 06:31 AM GMT

PDB ID : 2XEL  
Title : MOLECULAR MECHANISM OF PENTACHLOROPSEUDILIN MEDIATED INHIBITION OF MYOSIN MOTOR ACTIVITY  
Authors : Chinthalapudi, K.; Taft, M.H.; Martin, R.; Hartmann, F.K.; Heissler, S.M.; Tsiavaliaris, G.; Gutzeit, H.O.; Knoelker, H.J.; Coluccio, L.M.; Fedorov, R.; Manstein, D.J.  
Deposited on : 2010-05-16  
Resolution : 2.50 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  
<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

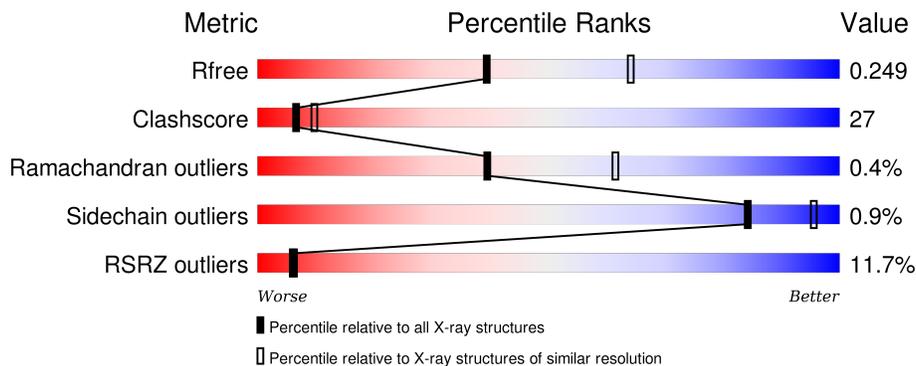
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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	3553 (2.50-2.50)
Clashscore	102246	4242 (2.50-2.50)
Ramachandran outliers	100387	4156 (2.50-2.50)
Sidechain outliers	100360	4158 (2.50-2.50)
RSRZ outliers	91569	3562 (2.50-2.50)

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	776	

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
3	MG	A	901	-	-	-	X

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<b>Mol</b>	<b>Type</b>	<b>Chain</b>	<b>Res</b>	<b>Chirality</b>	<b>Geometry</b>	<b>Clashes</b>	<b>Electron density</b>
4	IA2	A	999	-	-	-	X

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 6746 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 MYOSIN-2 HEAVY CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	776	6239	3961	1076	1185	17	0	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	762	LEU	-	EXPRESSION TAG	UNP P08799
A	763	GLU	-	EXPRESSION TAG	UNP P08799
A	764	SER	-	EXPRESSION TAG	UNP P08799
A	765	ASN	-	EXPRESSION TAG	UNP P08799
A	766	GLU	-	EXPRESSION TAG	UNP P08799
A	767	PRO	-	EXPRESSION TAG	UNP P08799
A	768	PRO	-	EXPRESSION TAG	UNP P08799
A	769	MET	-	EXPRESSION TAG	UNP P08799
A	770	ASP	-	EXPRESSION TAG	UNP P08799
A	771	PHE	-	EXPRESSION TAG	UNP P08799
A	772	ASP	-	EXPRESSION TAG	UNP P08799
A	773	ASP	-	EXPRESSION TAG	UNP P08799
A	774	ASP	-	EXPRESSION TAG	UNP P08799
A	775	ILE	-	EXPRESSION TAG	UNP P08799
A	776	PRO	-	EXPRESSION TAG	UNP P08799
A	777	PHE	-	EXPRESSION TAG	UNP P08799

- Molecule 2 is ADP METAVANADATE (three-letter code: AD9) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>13</sub>P<sub>2</sub>V).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	Cl	N	O		
4	A	1	17	10	5	1	1	0	0

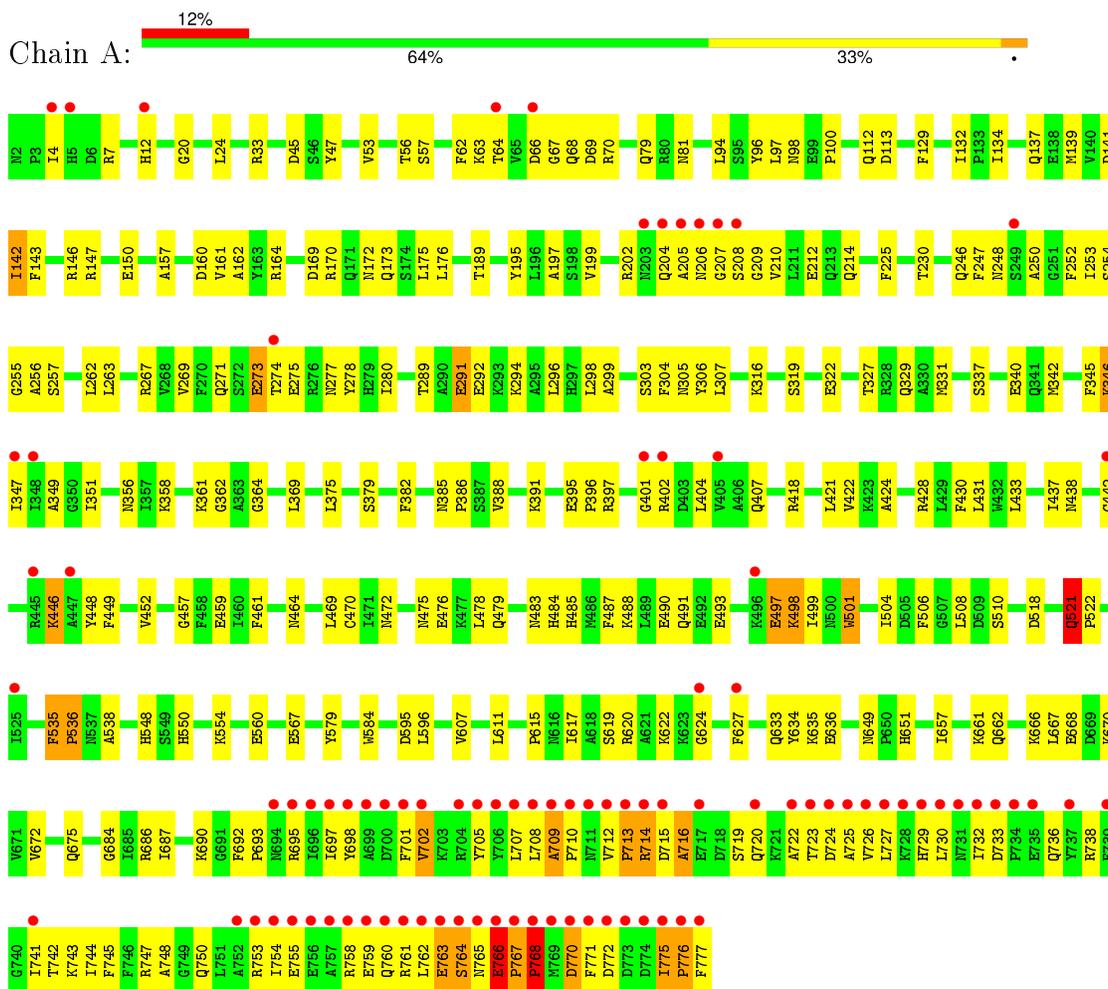
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	458	Total	O	0	0
			458	458		

### 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 ( $RSRZ > 2$ ). 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: MYOSIN-2 HEAVY CHAIN



## 4 Data and refinement statistics i

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	89.53Å 147.49Å 153.78Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.59 – 2.50 24.58 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.9 (24.59-2.50) 100.0 (24.58-2.50)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.28 (at 2.50Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, $R_{free}$	0.229 , 0.253 0.222 , 0.249	Depositor DCC
$R_{free}$ test set	1777 reflections (5.26%)	DCC
Wilson B-factor (Å <sup>2</sup> )	46.7	Xtriage
Anisotropy	0.480	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 75.6	EDS
Estimated twinning fraction	0.018 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.031 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	0 of 35532 reflections	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	6746	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.57% 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: MG, AD9, IA2

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	0.51	10/6364 (0.2%)	0.81	27/8590 (0.3%)

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	1

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	143	PHE	CE1-CZ	-11.88	1.14	1.37
1	A	143	PHE	CE2-CZ	-10.37	1.17	1.37
1	A	143	PHE	CD1-CE1	-10.35	1.18	1.39
1	A	143	PHE	CD2-CE2	-9.44	1.20	1.39
1	A	536	PRO	N-CD	-8.62	1.35	1.47

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	768	PRO	CA-N-CD	-17.07	87.60	111.50
1	A	767	PRO	CA-N-CD	-15.62	89.64	111.50
1	A	767	PRO	C-N-CD	-13.78	90.28	120.60
1	A	766	GLU	C-N-CD	-12.33	93.47	120.60
1	A	725	ALA	CB-CA-C	-12.20	91.80	110.10

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	521	GLN	Peptide

## 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	6239	0	6175	339	1
2	A	31	0	14	0	0
3	A	1	0	0	0	0
4	A	17	0	3	4	0
5	A	458	0	0	9	0
All	All	6746	0	6192	339	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 27.

The worst 5 of 339 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:431:LEU:HD22	4:A:999:IA2:CL17	1.53	1.43
1:A:289:THR:CG2	1:A:292:GLU:HG3	1.54	1.36
1:A:707:LEU:HD11	1:A:713:PRO:CD	1.56	1.35
1:A:707:LEU:CD1	1:A:713:PRO:HD3	1.59	1.31
1:A:289:THR:HG22	1:A:292:GLU:OE2	1.30	1.24

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:24:LEU:CD2	1:A:402:ARG:NH1[6_555]	2.07	0.13

## 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	774/776 (100%)	714 (92%)	57 (7%)	3 (0%)	39 61

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	709	ALA
1	A	766	GLU
1	A	702	VAL

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

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	680/680 (100%)	674 (99%)	6 (1%)	84 95

5 of 6 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	446	LYS
1	A	768	PRO
1	A	497	GLU
1	A	291	GLU
1	A	498	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	439	ASN
1	A	472	ASN
1	A	679	ASN
1	A	464	ASN
1	A	475	ASN

### 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 carbohydrates in this entry.

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

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 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
2	AD9	A	900	3	24,33,33	3.11	6 (25%)	30,52,52	2.00	9 (30%)
4	IA2	A	999	-	15,18,18	3.10	7 (46%)	17,27,27	1.57	2 (11%)

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	AD9	A	900	3	-	0/12/38/38	0/3/3/3
4	IA2	A	999	-	-	0/2/4/4	0/2/2/2

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	900	AD9	C2-N3	2.41	1.36	1.32
2	A	900	AD9	PB-O1B	3.10	1.56	1.48
2	A	900	AD9	PA-O3A	3.22	1.66	1.60
4	A	999	IA2	C1-C6	3.45	1.44	1.38
4	A	999	IA2	C1-C2	3.47	1.44	1.38

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	900	AD9	O2B-PB-O3A	-3.57	99.06	108.79
2	A	900	AD9	O2A-PA-O3A	-3.24	99.94	108.79
2	A	900	AD9	N3-C2-N1	-3.16	126.47	128.89
2	A	900	AD9	O2B-PB-O3B	-3.03	100.58	108.80
4	A	999	IA2	C9-C8-CL16	-2.20	122.59	126.35

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	999	IA2	4	0

## 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	776/776 (100%)	0.47	91 (11%) <b>6</b> <b>6</b>	19, 45, 108, 150	20 (2%)

The worst 5 of 91 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	706	TYR	18.1
1	A	772	ASP	11.5
1	A	771	PHE	11.3
1	A	776	PRO	10.9
1	A	707	LEU	10.2

### 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(Å <sup>2</sup> )	Q<0.9
4	IA2	A	999	17/17	0.15	0.80	<b>17.06</b>	86,88,91,91	17

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
3	MG	A	901	1/1	0.96	0.21	5.65	31,31,31,31	0
2	AD9	A	900	31/31	0.97	0.18	1.55	38,41,43,45	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.