



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 29, 2020 – 05:35 am BST

PDB ID : 4M1M  
Title : Corrected Structure of Mouse P-glycoprotein  
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Deposited on : 2013-08-03  
Resolution : 3.80 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	:	2.11
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)	:	2.11

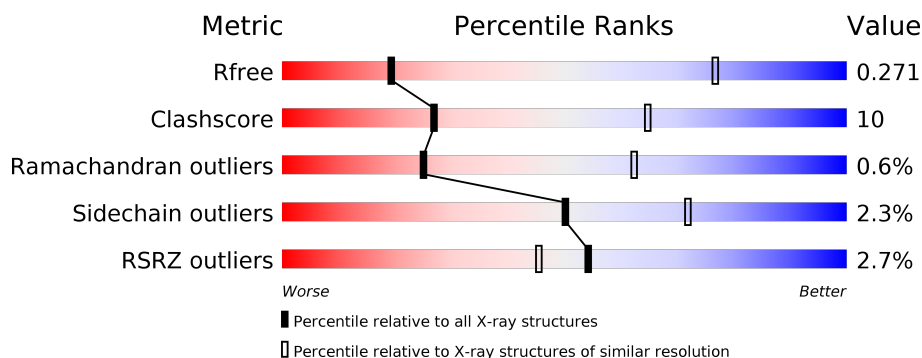
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 3.80 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	1212 (4.00-3.60)
Clashscore	141614	1288 (4.00-3.60)
Ramachandran outliers	138981	1243 (4.00-3.60)
Sidechain outliers	138945	1237 (4.00-3.60)
RSRZ outliers	127900	1121 (4.00-3.60)

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	1282	<div> <div>2%</div> <div> <div></div> <div>68%</div> <div>24%</div> <div>• 7%</div> </div> </div>
1	B	1282	<div> <div>3%</div> <div> <div></div> <div>70%</div> <div>21%</div> <div>• 8%</div> </div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 18378 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 Multidrug resistance protein 1A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	1188	Total	C	N	O	S	0	0	0
			9213	5923	1559	1694	37			
1	B	1180	Total	C	N	O	S	0	0	0
			9152	5887	1550	1678	37			

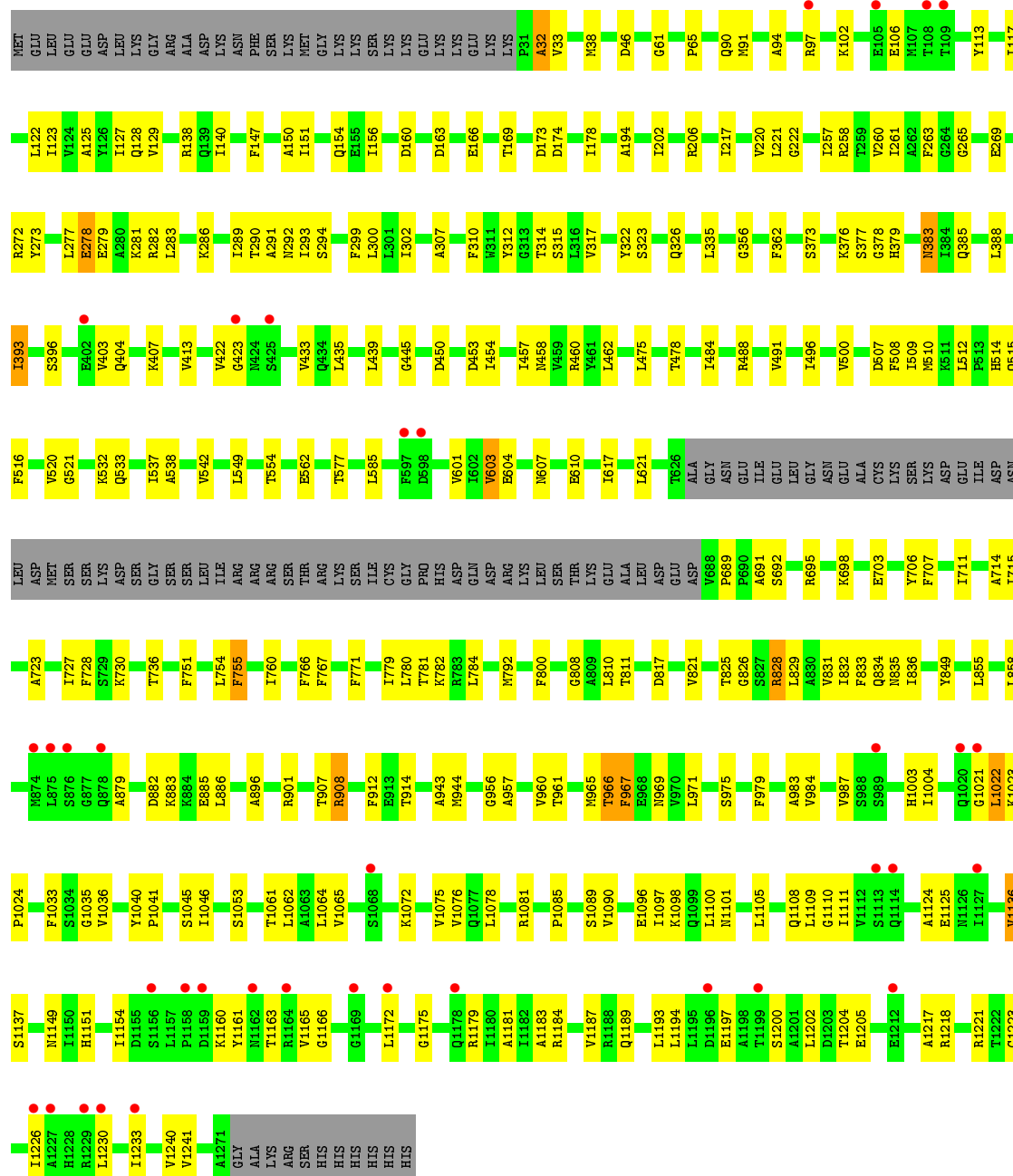
There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	83	GLN	ASN	CONFLICT	UNP P21447
A	87	GLN	ASN	CONFLICT	UNP P21447
A	90	GLN	ASN	CONFLICT	UNP P21447
A	952	ALA	CYS	CONFLICT	UNP P21447
A	1277	HIS	-	EXPRESSION TAG	UNP P21447
A	1278	HIS	-	EXPRESSION TAG	UNP P21447
A	1279	HIS	-	EXPRESSION TAG	UNP P21447
A	1280	HIS	-	EXPRESSION TAG	UNP P21447
A	1281	HIS	-	EXPRESSION TAG	UNP P21447
A	1282	HIS	-	EXPRESSION TAG	UNP P21447
B	83	GLN	ASN	CONFLICT	UNP P21447
B	87	GLN	ASN	CONFLICT	UNP P21447
B	90	GLN	ASN	CONFLICT	UNP P21447
B	952	ALA	CYS	CONFLICT	UNP P21447
B	1277	HIS	-	EXPRESSION TAG	UNP P21447
B	1278	HIS	-	EXPRESSION TAG	UNP P21447
B	1279	HIS	-	EXPRESSION TAG	UNP P21447
B	1280	HIS	-	EXPRESSION TAG	UNP P21447
B	1281	HIS	-	EXPRESSION TAG	UNP P21447
B	1282	HIS	-	EXPRESSION TAG	UNP P21447

- Molecule 2 is MERCURY (II) ION (three-letter code: HG) (formula: Hg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	6	Total 6	Hg 6	0	0
2	A	7	Total 7	Hg 7	0	0





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	97.54Å 115.43Å 378.86Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.89 – 3.80 42.33 – 3.79	Depositor EDS
% Data completeness (in resolution range)	95.9 (24.89-3.80) 95.5 (42.33-3.79)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.19 (at 3.76Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8_1069)	Depositor
R, $R_{free}$	0.212 , 0.267 0.223 , 0.271	Depositor DCC
$R_{free}$ test set	4245 reflections (10.21%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	132.2	Xtriage
Anisotropy	0.330	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.24 , 87.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	18378	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	155.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.39% 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: HG

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	0.31	0/9382	0.51	0/12684
1	B	0.30	0/9321	0.50	0/12601
All	All	0.31	0/18703	0.51	0/25285

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

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	9213	0	9383	203	0
1	B	9152	0	9333	179	0
2	A	7	0	0	0	0
2	B	6	0	0	0	0
All	All	18378	0	18716	379	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 10.

The worst 5 of 379 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:281:LYS:HZ2	1:A:782:LYS:HA	1.26	0.98
1:A:559:THR:HG22	1:A:584:ARG:HH12	1.39	0.87
1:B:1021:GLY:HA2	1:B:1101:ASN:HB2	1.60	0.81
1:B:433:VAL:HG13	1:B:549:LEU:HD23	1.64	0.80
1:A:1149:ASN:O	1:A:1179:ARG:NH2	2.14	0.79

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	1184/1282 (92%)	1124 (95%)	54 (5%)	6 (0%)	29	66
1	B	1176/1282 (92%)	1111 (94%)	57 (5%)	8 (1%)	22	60
All	All	2360/2564 (92%)	2235 (95%)	111 (5%)	14 (1%)	25	62

5 of 14 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1036	VAL
1	B	32	ALA
1	B	1136	VAL
1	A	1070	CYS
1	A	1120	ASP

### 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	978/1062 (92%)	953 (97%)	25 (3%)	46	69
1	B	972/1062 (92%)	953 (98%)	19 (2%)	55	75
All	All	1950/2124 (92%)	1906 (98%)	44 (2%)	50	72

5 of 44 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1020	GLN
1	A	1168	LYS
1	B	967	PHE
1	A	1037	VAL
1	A	1163	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	852	GLN
1	B	838	ASN
1	B	514	HIS
1	A	515	GLN
1	B	347	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

Of 13 ligands modelled in this entry, 13 are 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	1188/1282 (92%)	-0.16	29 (2%) 59 50	83, 141, 236, 375	0
1	B	1180/1282 (92%)	-0.02	36 (3%) 49 40	86, 152, 247, 420	0
All	All	2368/2564 (92%)	-0.09	65 (2%) 54 45	83, 146, 241, 420	0

The worst 5 of 65 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	598	ASP	5.2
1	B	423	GLY	4.9
1	B	1114	GLN	4.9
1	A	963	GLN	4.3
1	B	1196	ASP	4.1

### 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. 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( $\text{\AA}^2$ )	Q<0.9
2	HG	B	1302	1/1	0.75	0.23	189,189,189,189	1
2	HG	A	1307	1/1	0.81	0.82	138,138,138,138	1
2	HG	A	1302	1/1	0.85	0.48	71,71,71,71	1
2	HG	B	1306	1/1	0.90	0.27	71,71,71,71	1
2	HG	A	1306	1/1	0.90	0.50	96,96,96,96	1
2	HG	B	1303	1/1	0.93	0.09	198,198,198,198	1
2	HG	A	1304	1/1	0.95	0.33	38,38,38,38	1
2	HG	A	1305	1/1	0.96	0.44	65,65,65,65	1
2	HG	A	1303	1/1	0.96	0.33	102,102,102,102	1
2	HG	A	1301	1/1	0.98	0.13	164,164,164,164	1
2	HG	B	1305	1/1	0.98	0.62	46,46,46,46	1
2	HG	B	1304	1/1	0.98	0.25	107,107,107,107	1
2	HG	B	1301	1/1	0.99	0.18	129,129,129,129	1

## 6.5 Other polymers [i](#)

There are no such residues in this entry.