Full wwPDB X-ray Structure Validation Report (i)

Oct 6, 2016 – 03:49 PM EDT

PDB ID	:	2X3B
Title	:	AsaP1 inactive mutant E294A, an extracellular toxic zinc metalloendopeptidase
Authors	:	Bogdanovic, X.; Palm, G.J.; Singh, R.K.; Hinrichs, W.
Deposited on	:	2010-01-22
Resolution	:	2.28 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*
A user guide is available at
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

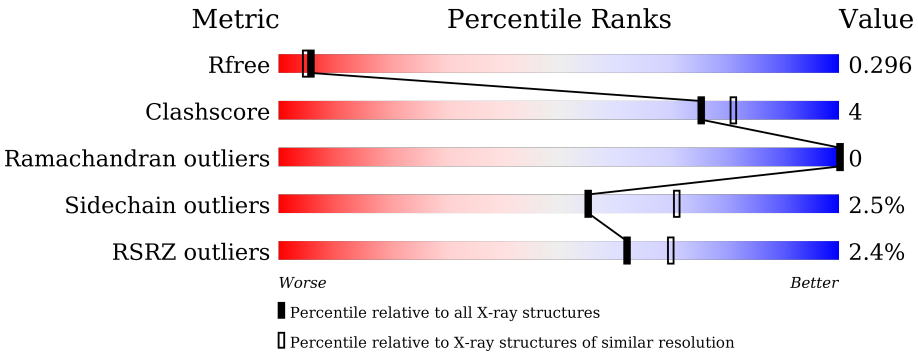
MolProbity	:	4.02b-467
Mogul	:	unknown
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20027939
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20027939

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 2.28 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	5193 (2.30-2.26)
Clashscore	102246	5929 (2.30-2.26)
Ramachandran outliers	100387	5851 (2.30-2.26)
Sidechain outliers	100360	5850 (2.30-2.26)
RSRZ outliers	91569	5204 (2.30-2.26)

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 >=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 <=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	343	3% 79% 6% • 14%
1	B	343	% 73% 11% 15%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4805 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 TOXIC EXTRACELLULAR ENDOPEPTIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	295	Total	C	N	O	S	0	2	0
			2296	1436	398	457	5			
1	B	290	Total	C	N	O	S	0	2	0
			2252	1407	386	454	5			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	294	ALA	GLU	ENGINEERED MUTATION	UNP Q8GMV9
B	294	ALA	GLU	ENGINEERED MUTATION	UNP Q8GMV9

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Zn	0	0
			1	1		
2	A	1	Total	Zn	0	0
			1	1		

- Molecule 3 is water.

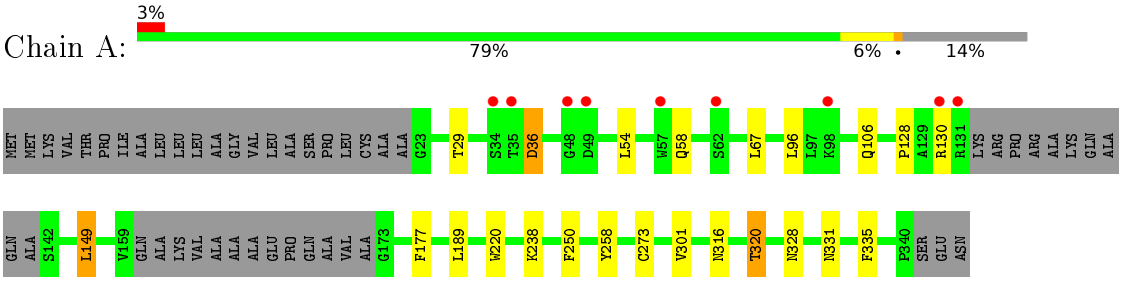
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	139	Total	O	0	0
			139	139		
3	B	116	Total	O	0	0
			116	116		

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.

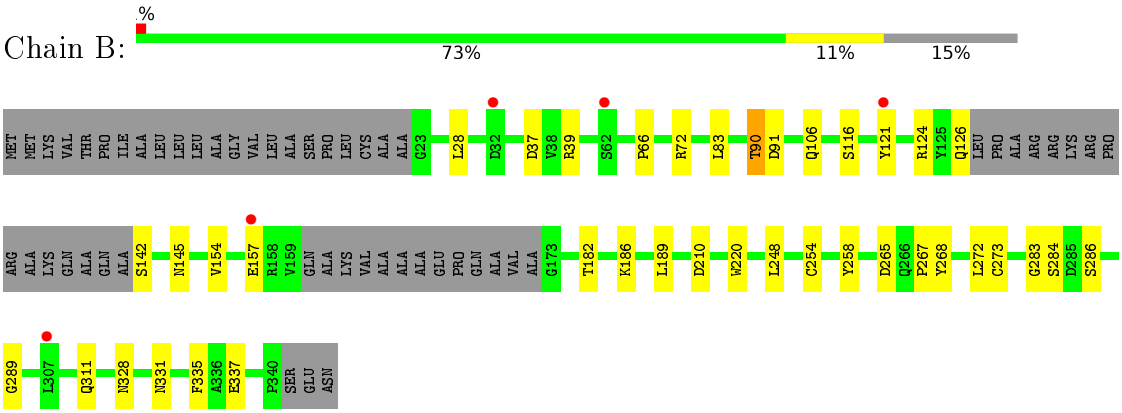
- Molecule 1: TOXIC EXTRACELLULAR ENDOPEPTIDASE

Chain A:



- Molecule 1: TOXIC EXTRACELLULAR ENDOPEPTIDASE

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	57.85Å 60.20Å 183.61Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	91.81 – 2.28 24.47 – 2.28	Depositor EDS
% Data completeness (in resolution range)	99.7 (91.81-2.28) 99.8 (24.47-2.28)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.08 (at 2.28Å)	Xtriage
Refinement program	REFMAC 5.5.0072	Depositor
R, R_{free}	0.244 , 0.293 0.245 , 0.296	Depositor DCC
R_{free} test set	1526 reflections (5.35%)	DCC
Wilson B-factor (Å^2)	34.5	Xtriage
Anisotropy	0.107	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.28 , 3.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.060 for k,h,-l	Xtriage
F_o,F_c correlation	0.91	EDS
Total number of atoms	4805	wwPDB-VP
Average B, all atoms (Å^2)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.32% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: ZN

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	0.38	0/2348	0.52	1/3193 (0.0%)
1	B	0.37	0/2298	0.51	0/3125
All	All	0.38	0/4646	0.52	1/6318 (0.0%)

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	B	0	1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	149	LEU	CA-CB-CG	5.64	128.27	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	157	GLU	Peptide

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	2296	0	2189	14	0
1	B	2252	0	2145	21	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	139	0	0	0	0
3	B	116	0	0	0	0
All	All	4805	0	4334	35	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 4.

All (35) 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:189:LEU:HD21	1:A:250:PHE:CD2	2.14	0.83
1:B:124:ARG:HD3	1:B:142:SER:HA	1.60	0.81
1:B:28:LEU:H	1:B:145:ASN:HD21	1.32	0.76
1:A:189:LEU:HD11	1:A:250:PHE:CB	2.24	0.68
1:A:328:ASN:HD22	1:A:331:ASN:HD22	1.42	0.66
1:B:28:LEU:H	1:B:145:ASN:ND2	1.96	0.62
1:B:116:SER:HB2	1:B:154:VAL:HG22	1.82	0.60
1:B:254:CYS:HB3	1:B:272:LEU:O	2.04	0.58
1:B:124:ARG:CD	1:B:142:SER:HA	2.32	0.57
1:B:328:ASN:HD22	1:B:331:ASN:HD22	1.54	0.56
1:A:58:GLN:HA	1:A:67:LEU:HD21	1.90	0.54
1:A:189:LEU:HD11	1:A:250:PHE:HB3	1.90	0.54
1:A:54:LEU:HD22	1:A:128:PRO:HG2	1.89	0.53
1:A:328:ASN:HD22	1:A:331:ASN:ND2	2.07	0.52
1:B:289:GLY:HA3	1:B:337:GLU:OE2	2.13	0.48
1:B:28:LEU:N	1:B:145:ASN:HD21	2.08	0.48
1:A:316:ASN:O	1:A:320:THR:HB	2.14	0.47
1:B:90:THR:HG22	1:B:91:ASP:H	1.79	0.47
1:B:220:TRP:CD1	1:B:335:PHE:HA	2.52	0.45
1:B:328:ASN:HB3	1:B:331:ASN:HD22	1.82	0.45
1:A:238:LYS:HD3	1:A:301:VAL:O	2.17	0.44
1:A:258:TYR:O	1:A:273:CYS:HB2	2.18	0.43
1:A:220:TRP:CD1	1:A:335:PHE:HA	2.54	0.42
1:B:39:ARG:HD3	1:B:106:GLN:NE2	2.34	0.42
1:B:284:SER:OG	1:B:311:GLN:NE2	2.53	0.42
1:B:66:PRO:O	1:B:126:GLN:NE2	2.53	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:258:TYR:O	1:B:273:CYS:HB2	2.20	0.42
1:B:267:PRO:HA	1:B:268:TYR:HA	1.76	0.41
1:A:177:PHE:HE1	1:A:189:LEU:HD13	1.85	0.41
1:B:189:LEU:HD21	1:B:272:LEU:HD11	2.02	0.41
1:B:283:GLY:O	1:B:286:SER:HB3	2.19	0.41
1:B:182:THR:O	1:B:186:LYS:HG3	2.21	0.41
1:A:36:ASP:N	1:A:36:ASP:OD1	2.54	0.41
1:A:130[B]:ARG:HD3	1:A:130[B]:ARG:H	1.86	0.40
1:B:72:ARG:HB2	1:B:121:TYR:CE1	2.56	0.40

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	291/343 (85%)	281 (97%)	10 (3%)	0	100	100
1	B	286/343 (83%)	276 (96%)	10 (4%)	0	100	100
All	All	577/686 (84%)	557 (96%)	20 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	245/278 (88%)	239 (98%)	6 (2%)	57 72
1	B	242/278 (87%)	236 (98%)	6 (2%)	55 71
All	All	487/556 (88%)	475 (98%)	12 (2%)	55 71

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	29	THR
1	A	36	ASP
1	A	96	LEU
1	A	106	GLN
1	A	149	LEU
1	A	320	THR
1	B	37	ASP
1	B	83	LEU
1	B	90	THR
1	B	210	ASP
1	B	248	LEU
1	B	265	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	106	GLN
1	A	231	GLN
1	A	311	GLN
1	A	331	ASN
1	B	41	ASN
1	B	106	GLN
1	B	145	ASN
1	B	231	GLN
1	B	245	ASN
1	B	299	ASN
1	B	311	GLN
1	B	331	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 2 ligands modelled in this entry, 2 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

There are no such residues in this entry.

5.8 Polymer linkage issues

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^{th} 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^2)	Q<0.9
1	A	295/343 (86%)	0.14	9 (3%)	52	61	20, 33, 62, 86	0
1	B	290/343 (84%)	0.16	5 (1%)	73	79	20, 32, 45, 48	0
All	All	585/686 (85%)	0.15	14 (2%)	62	70	20, 33, 54, 86	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	34	SER	8.0
1	A	49	ASP	4.2
1	A	130[A]	ARG	3.5
1	B	121	TYR	3.2
1	A	62	SER	3.1
1	A	57[A]	TRP	3.0
1	A	98	LYS	2.8
1	B	62	SER	2.7
1	B	157	GLU	2.7
1	A	35	THR	2.5
1	A	131	ARG	2.3
1	B	307	LEU	2.3
1	A	48	GLY	2.2
1	B	32	ASP	2.1

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

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

6.3 Carbohydrates

There are no carbohydrates in this entry.

6.4 Ligands

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^{th} 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^2)	Q<0.9
2	ZN	B	1341	1/1	0.99	0.10	-1.76	31,31,31,31	0
2	ZN	A	1341	1/1	0.99	0.10	-2.14	35,35,35,35	0

6.5 Other polymers

There are no such residues in this entry.