



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 21, 2017 – 01:29 PM EST

PDB ID : 1ENA  
Title : CRYSTAL STRUCTURES OF THE BINARY CA<sup>2+</sup> AND PDTP COMPLEXES AND THE TERNARY COMPLEX OF THE ASP 21->GLU MUTANT OF STAPHYLOCOCCAL NUCLEASE. IMPLICATIONS FOR CATALYSIS AND LIGAND BINDING  
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Deposited on : unknown  
Resolution : 2.15 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
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20030345

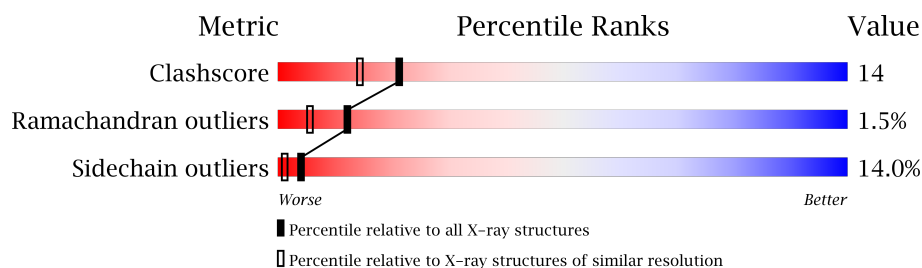
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.15 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))
Clashscore	112137	1278 (2.16-2.16)
Ramachandran outliers	110173	1256 (2.16-2.16)
Sidechain outliers	110143	1255 (2.16-2.16)

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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	135	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 1119 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 STAPHYLOCOCCAL NUCLEASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	135	Total	C	N	O	S	0	0	0
			1084	692	190	198	4			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	21	GLU	ASP	CONFLICT	UNP P00644

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

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

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	34	Total	O	0	0
			34	34		

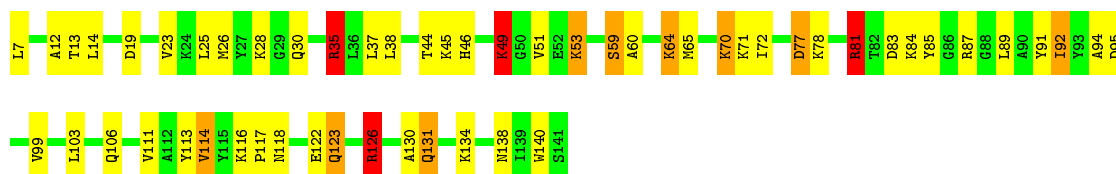
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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.

Note EDS was not executed.

#### • Molecule 1: STAPHYLOCOCCAL NUCLEASE

Chain A: 



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 41	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	47.29 Å 47.29 Å 63.40 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.15	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.15)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	PROLSQ, X-PLOR	Depositor
R, $R_{free}$	0.225 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1119	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	16.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

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	1.09	2/1105 (0.2%)	2.07	29/1480 (2.0%)

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	A	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	35	ARG	CZ-NH1	7.57	1.42	1.33
1	A	87	ARG	CZ-NH1	5.26	1.39	1.33

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	87	ARG	NE-CZ-NH2	-21.96	109.32	120.30
1	A	87	ARG	NE-CZ-NH1	17.11	128.85	120.30
1	A	35	ARG	NE-CZ-NH2	-14.24	113.18	120.30
1	A	126	ARG	NE-CZ-NH1	13.80	127.20	120.30
1	A	81	ARG	NE-CZ-NH2	-12.06	114.27	120.30
1	A	81	ARG	NE-CZ-NH1	12.05	126.33	120.30
1	A	14	LEU	CA-CB-CG	9.37	136.86	115.30
1	A	140	TRP	CD1-CG-CD2	8.22	112.88	106.30
1	A	103	LEU	CA-CB-CG	7.70	133.02	115.30
1	A	78	LYS	CA-C-N	6.67	129.55	116.20
1	A	140	TRP	CG-CD1-NE1	-6.58	103.52	110.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	126	ARG	NE-CZ-NH2	-6.45	117.07	120.30
1	A	140	TRP	CE2-CD2-CG	-6.45	102.14	107.30
1	A	113	TYR	CB-CG-CD1	-6.18	117.29	121.00
1	A	37	LEU	CA-CB-CG	6.08	129.27	115.30
1	A	35	ARG	NE-CZ-NH1	5.99	123.29	120.30
1	A	23	VAL	CA-CB-CG1	5.81	119.61	110.90
1	A	53	LYS	CA-CB-CG	5.81	126.18	113.40
1	A	111	VAL	CG1-CB-CG2	-5.71	101.77	110.90
1	A	23	VAL	CA-CB-CG2	-5.63	102.45	110.90
1	A	114	VAL	CG1-CB-CG2	-5.55	102.02	110.90
1	A	85	TYR	CB-CG-CD2	-5.48	117.71	121.00
1	A	12	ALA	CA-C-N	5.47	129.23	117.20
1	A	35	ARG	CG-CD-NE	5.44	123.22	111.80
1	A	92	ILE	CG1-CB-CG2	-5.40	99.52	111.40
1	A	14	LEU	CA-C-N	-5.37	105.39	117.20
1	A	123	GLN	CG-CD-NE2	5.24	129.27	116.70
1	A	25	LEU	CB-CG-CD1	-5.17	102.22	111.00
1	A	77	ASP	CB-CG-OD1	5.15	122.93	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	91	TYR	Sidechain

## 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	1084	0	1120	30	0
2	A	1	0	0	0	0
3	A	34	0	0	2	0
All	All	1119	0	1120	30	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 14.

All (30) 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:65:MET:SD	1:A:99:VAL:HG13	2.16	0.86
1:A:46:HIS:CG	1:A:49:LYS:HD2	2.13	0.83
1:A:38:LEU:HD22	1:A:114:VAL:HG12	1.59	0.83
1:A:46:HIS:CD2	1:A:49:LYS:HD2	2.14	0.82
1:A:44:THR:HA	1:A:51:VAL:HG13	1.68	0.74
1:A:130:ALA:O	1:A:134:LYS:HG3	1.95	0.66
1:A:123:GLN:OE1	1:A:123:GLN:HA	1.99	0.62
1:A:46:HIS:HB3	1:A:49:LYS:HB2	1.83	0.60
1:A:46:HIS:CE1	1:A:49:LYS:HD2	2.36	0.59
1:A:71:LYS:HG3	1:A:95:ASP:HA	1.86	0.56
1:A:49:LYS:HE2	3:A:175:HOH:O	2.05	0.55
1:A:83:ASP:HB3	1:A:89:LEU:HD21	1.89	0.55
1:A:19:ASP:HA	1:A:59:SER:HB3	1.89	0.54
1:A:46:HIS:CE1	1:A:49:LYS:NZ	2.76	0.53
1:A:77:ASP:HB3	1:A:118:ASN:OD1	2.09	0.53
1:A:122:GLU:O	1:A:126:ARG:HB2	2.11	0.51
1:A:35:ARG:HG2	3:A:153:HOH:O	2.09	0.51
1:A:131:GLN:HA	1:A:134:LYS:HZ3	1.78	0.49
1:A:46:HIS:ND1	1:A:49:LYS:HD2	2.28	0.49
1:A:46:HIS:NE2	1:A:49:LYS:HD2	2.28	0.47
1:A:46:HIS:CD2	1:A:49:LYS:CD	2.92	0.46
1:A:60:ALA:O	1:A:64:LYS:HE2	2.15	0.46
1:A:116:LYS:HD3	1:A:117:PRO:HA	1.98	0.45
1:A:13:THR:OG1	1:A:26:MET:HB3	2.15	0.45
1:A:81:ARG:HH11	1:A:81:ARG:CG	2.31	0.44
1:A:46:HIS:CG	1:A:49:LYS:HB2	2.52	0.44
1:A:116:LYS:HD3	1:A:117:PRO:CA	2.49	0.43
1:A:72:ILE:HD13	1:A:94:ALA:HA	2.01	0.42
1:A:46:HIS:HB3	1:A:49:LYS:CB	2.47	0.42
1:A:70:LYS:HG2	1:A:95:ASP:OD1	2.22	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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	133/135 (98%)	126 (95%)	5 (4%)	2 (2%)	12 5

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	49	LYS
1	A	138	ASN

### 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	114/114 (100%)	98 (86%)	16 (14%)	4 1

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	LEU
1	A	28	LYS
1	A	30	GLN
1	A	35	ARG
1	A	45	LYS
1	A	49	LYS
1	A	53	LYS
1	A	59	SER
1	A	64	LYS
1	A	70	LYS
1	A	81	ARG
1	A	84	LYS
1	A	92	ILE
1	A	106	GLN
1	A	126	ARG
1	A	131	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	46	HIS
1	A	121	HIS
1	A	131	GLN

### 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 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 ⓘ

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

### 6.4 Ligands

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers

EDS was not executed - this section is therefore empty.