



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 09:24 PM GMT

PDB ID : 1OUP  
Title : Crystal structure of the periplasmic endonuclease Vvn complexed with octamer double stranded DNA  
Authors : Yuan, H.S.; Li, C.-L.  
Deposited on : 2003-03-25  
Resolution : 2.30 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

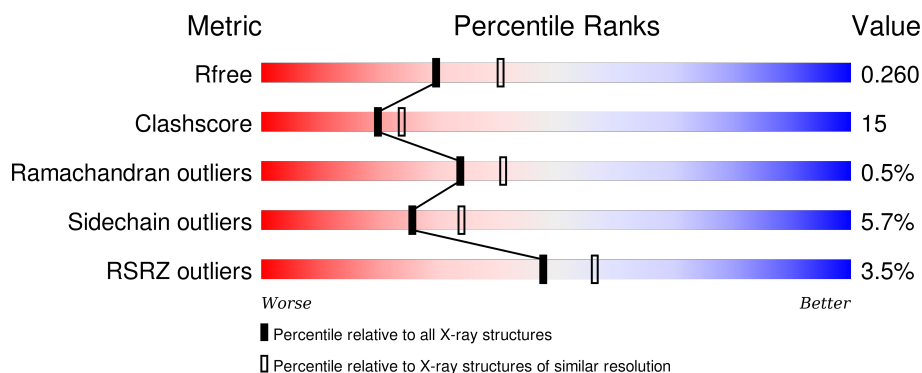
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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	3852 (2.30-2.30)
Clashscore	102246	4452 (2.30-2.30)
Ramachandran outliers	100387	4410 (2.30-2.30)
Sidechain outliers	100360	4409 (2.30-2.30)
RSRZ outliers	91569	3857 (2.30-2.30)

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	C	8	<div> <div>88%</div> <div>13%</div> </div>
1	D	8	<div> <div>13%</div> <div>38%</div> <div>63%</div> </div>
1	F	8	<div> <div>25%</div> <div>38%</div> <div>38%</div> <div>25%</div> </div>
2	E	6	<div> <div>33%</div> <div>17%</div> <div>67%</div> <div>17%</div> </div>
3	G	2	<div> <div>50%</div> <div>50%</div> </div>

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Mol	Chain	Length	Quality of chain
4	A	213	<div><div></div><div>79%</div><div>20%</div><div>.</div></div>
4	B	213	<div><div>5%</div><div></div><div>67%</div><div>29%</div><div>..</div></div>

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 4425 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 DNA chain called 5'-D(\*GP\*CP\*GP\*AP\*TP\*CP\*GP\*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	8	Total	C	N	O	P	0	0	0
			161	77	31	46	7			
1	D	8	Total	C	N	O	P	0	0	0
			161	77	31	46	7			
1	F	8	Total	C	N	O	P	0	0	0
			161	77	31	46	7			

- Molecule 2 is a DNA chain called 5'-D(\*GP\*CP\*GP\*AP\*TP\*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	6	Total	C	N	O	P	0	0	0
			120	58	23	34	5			

- Molecule 3 is a DNA chain called 5'-D(P\*GP\*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	G	2	Total	C	N	O	P	0	0	0
			42	19	8	13	2			

- Molecule 4 is a protein called Nuclease.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	A	213	Total	C	N	O	S	0	0	0
			1738	1080	324	321	13			
4	B	210	Total	C	N	O	S	0	0	0
			1712	1066	319	314	13			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	80	ALA	HIS	ENGINEERED	UNP Q8DCA6
A	163	PRO	GLN	SEE REMARK 999	UNP Q8DCA6

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Chain	Residue	Modelled	Actual	Comment	Reference
A	164	ASP	THR	SEE REMARK 999	UNP Q8DCA6
A	165	ARG	GLU	SEE REMARK 999	UNP Q8DCA6
A	166	ALA	LEU	SEE REMARK 999	UNP Q8DCA6
B	80	ALA	HIS	ENGINEERED	UNP Q8DCA6
B	163	PRO	GLN	SEE REMARK 999	UNP Q8DCA6
B	164	ASP	THR	SEE REMARK 999	UNP Q8DCA6
B	165	ARG	GLU	SEE REMARK 999	UNP Q8DCA6
B	166	ALA	LEU	SEE REMARK 999	UNP Q8DCA6

- Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total Ca 1 1	0	0
5	A	1	Total Ca 1 1	0	0


- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	188	Total O 188 188	0	0
6	B	113	Total O 113 113	0	0
6	C	9	Total O 9 9	0	0
6	D	4	Total O 4 4	0	0
6	E	3	Total O 3 3	0	0
6	F	8	Total O 8 8	0	0
6	G	3	Total O 3 3	0	0

### 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 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.

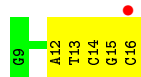
- Molecule 1: 5'-D(\*GP\*CP\*GP\*AP\*TP\*CP\*GP\*C)-3'

Chain C: 



- Molecule 1: 5'-D(\*GP\*CP\*GP\*AP\*TP\*CP\*GP\*C)-3'

Chain D: 



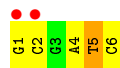
- Molecule 1: 5'-D(\*GP\*CP\*GP\*AP\*TP\*CP\*GP\*C)-3'

Chain F: 



- Molecule 2: 5'-D(\*GP\*CP\*GP\*AP\*TP\*C)-3'

Chain E: 




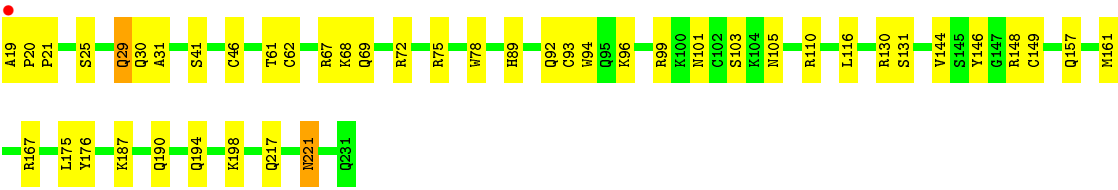
- Molecule 3: 5'-D(P\*GP\*C)-3'

Chain G: 

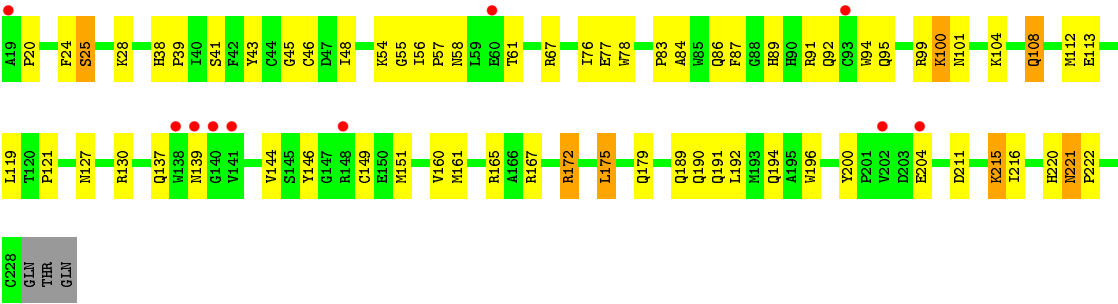


- Molecule 4: Nuclease

Chain A: 



● Molecule 4: Nuclease



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	53.74Å 50.11Å 89.61Å 90.00° 97.53° 90.00°	Depositor
Resolution (Å)	19.78 – 2.30 19.78 – 2.30	Depositor EDS
% Data completeness (in resolution range)	97.5 (19.78-2.30) 97.6 (19.78-2.30)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.47 (at 2.30Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, $R_{free}$	0.191 , 0.260 0.191 , 0.260	Depositor DCC
$R_{free}$ test set	1616 reflections (7.80%)	DCC
Wilson B-factor (Å <sup>2</sup> )	27.4	Xtriage
Anisotropy	0.151	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 60.1	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 21155 reflections	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	4425	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 21.48 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 6.9519e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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

### 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	C	0.40	0/180	0.63	0/276
1	D	0.46	0/180	0.66	0/276
1	F	0.52	0/180	0.87	0/276
2	E	0.45	0/134	0.68	0/205
3	G	1.40	1/46 (2.2%)	1.21	0/67
4	A	0.61	0/1783	0.70	0/2404
4	B	0.53	0/1757	0.67	1/2370 (0.0%)
All	All	0.57	1/4260 (0.0%)	0.70	1/5874 (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	F	0	2
2	E	0	2
3	G	0	1
All	All	0	5

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	G	7	DG	OP3-P	-7.13	1.52	1.61

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	172	ARG	NE-CZ-NH2	-7.31	116.64	120.30

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	E	4	DA	Sidechain
2	E	5	DT	Sidechain
1	F	11	DG	Sidechain
1	F	13	DT	Sidechain
3	G	7	DG	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	C	161	0	91	2	0
1	D	161	0	91	4	0
1	F	161	0	91	13	0
2	E	120	0	69	9	0
3	G	42	0	23	5	0
4	A	1738	0	1640	35	0
4	B	1712	0	1617	55	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	188	0	0	5	0
6	B	113	0	0	10	0
6	C	9	0	0	1	0
6	D	4	0	0	0	0
6	E	3	0	0	0	0
6	F	8	0	0	1	0
6	G	3	0	0	0	0
All	All	4425	0	3622	115	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 15.

The worst 5 of 115 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)
4:B:91:ARG:HH22	4:B:112:MET:HE1	1.32	0.95
1:D:15:DG:H2''	1:D:16:DC:H5''	1.50	0.91
2:E:1:DG:H2''	2:E:2:DC:H5'	1.54	0.89
4:B:91:ARG:NH2	4:B:112:MET:HE1	1.92	0.84
2:E:6:DC:H2'	3:G:7:DG:OP2	1.78	0.84

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	
4	A	211/213 (99%)	201 (95%)	9 (4%)	1 (0%)	34	41
4	B	208/213 (98%)	195 (94%)	12 (6%)	1 (0%)	34	41
All	All	419/426 (98%)	396 (94%)	21 (5%)	2 (0%)	34	41

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	B	104	LYS
4	A	68	LYS

### 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.

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	A	185/185 (100%)	180 (97%)	5 (3%)	52	70
4	B	182/185 (98%)	166 (91%)	16 (9%)	12	14
All	All	367/370 (99%)	346 (94%)	21 (6%)	25	34

5 of 21 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	B	100	LYS
4	B	119	LEU
4	B	191	GLN
4	B	95	GLN
4	B	204	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 22 such sidechains are listed below:

Mol	Chain	Res	Type
4	A	226	GLN
4	B	51	GLN
4	B	221	ASN
4	B	29	GLN
4	B	30	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 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 [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	C	8/8 (100%)	0.54	0 100 100	48, 51, 55, 58	0
1	D	8/8 (100%)	0.92	1 (12%) 5 8	50, 54, 57, 64	0
1	F	8/8 (100%)	1.02	2 (25%) 1 1	40, 52, 61, 62	0
2	E	6/6 (100%)	1.75	2 (33%) 0 0	53, 56, 63, 64	0
3	G	2/2 (100%)	1.21	0 100 100	45, 45, 45, 49	0
4	A	213/213 (100%)	0.01	1 (0%) 91 94	10, 23, 44, 56	0
4	B	210/213 (98%)	0.33	10 (4%) 34 43	14, 35, 54, 60	0
All	All	455/458 (99%)	0.23	16 (3%) 48 56	10, 29, 55, 64	0

The worst 5 of 16 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	A	19	ALA	5.4
4	B	19	ALA	5.1
4	B	140	GLY	3.5
4	B	204	GLU	3.4
2	E	1	DG	3.1

### 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. 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
5	CA	B	300	1/1	0.99	0.08	-1.42	26,26,26,26	0
5	CA	A	300	1/1	0.98	0.04	-2.07	24,24,24,24	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.