Full wwPDB X-ray Structure Validation Report ⓘ

May 13, 2020 – 01:11 pm BST

PDB ID	:	2QKW
Title	:	Structural basis for activation of plant immunity by bacterial effector protein AvrPto
Authors	:	Xing, W.M.; Zou, Y.; Liu, Q.; Hao, Q.; Zhou, J.M.; Chai, J.J.
Deposited on	:	2007-07-11
Resolution	:	3.20 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
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

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

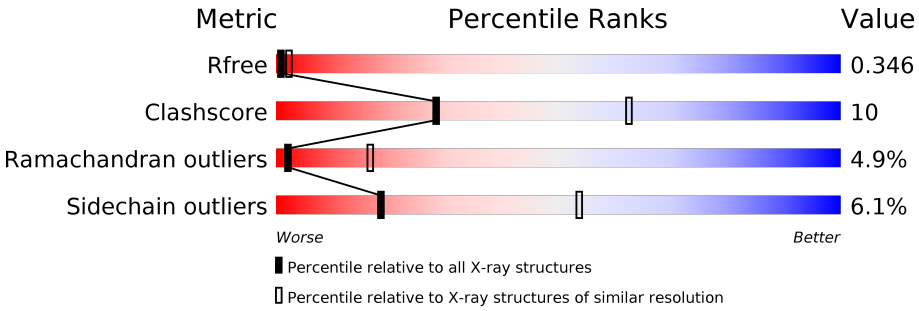
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)

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 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 <=5%

Mol	Chain	Length	Quality of chain
1	A	164	54% 8% 38%
2	B	321	61% 26% • • 9%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3135 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 Avirulence protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	101	798	481	152	158	7	0	0	0

- Molecule 2 is a protein called Protein kinase.

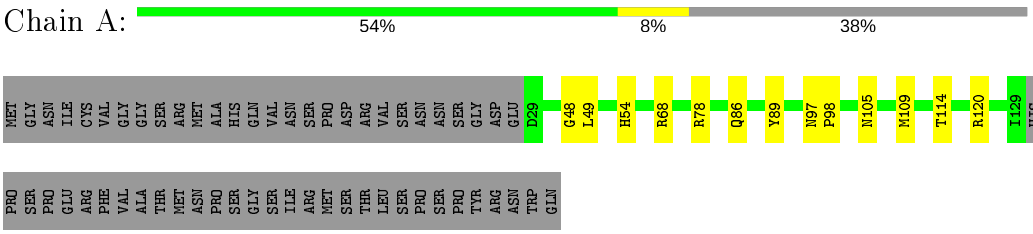
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
2	B	292	2337	1481	402	441	2	11	0	0	0

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 the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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. 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.

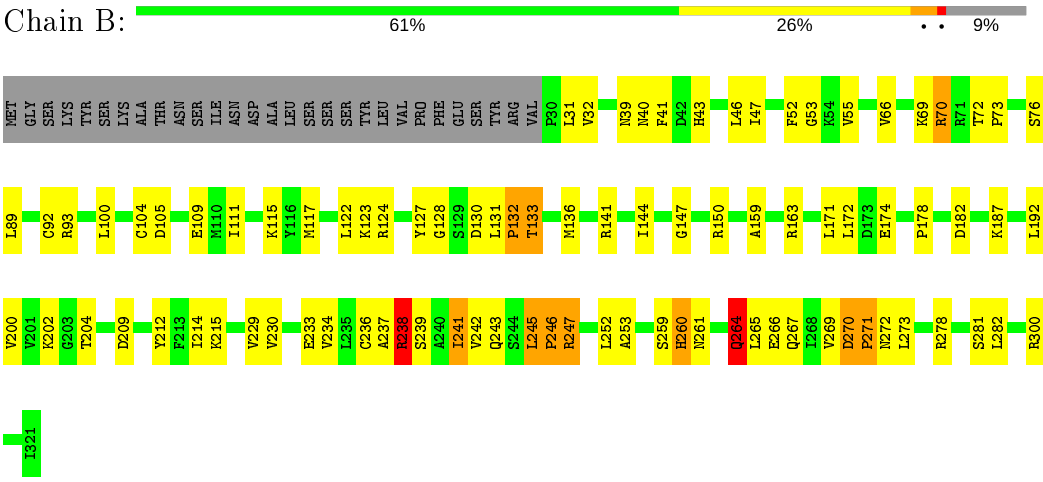
- Molecule 1: Avirulence protein

Chain A:



- Molecule 2: Protein kinase

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	75.47Å 94.59Å 98.74Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 3.20 28.58 – 2.96	Depositor EDS
% Data completeness (in resolution range)	97.2 (20.00-3.20) 95.9 (28.58-2.96)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.36 (at 2.95Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.271 , 0.303 0.323 , 0.346	Depositor DCC
R_{free} test set	1009 reflections (6.93%)	wwPDB-VP
Wilson B-factor (Å^2)	86.6	Xtriage
Anisotropy	0.247	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 56.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.017 for -h,l,k	Xtriage
F_o,F_c correlation	0.85	EDS
Total number of atoms	3135	wwPDB-VP
Average B, all atoms (Å^2)	96.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.25% 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: TPO, SEP

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	0.33	0/813	0.50	0/1099
2	B	0.40	0/2361	0.60	1/3183 (0.0%)
All	All	0.39	0/3174	0.58	1/4282 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	252	LEU	CA-CB-CG	5.10	127.03	115.30

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	798	0	751	9	0
2	B	2337	0	2332	53	0
All	All	3135	0	3083	61	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.

All (61) 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)
2:B:229:VAL:HG11	2:B:241:ILE:HD12	1.41	1.02
1:A:105:ASN:O	1:A:109:MET:HG2	1.81	0.80
2:B:229:VAL:CG1	2:B:241:ILE:HD12	2.13	0.79
2:B:260:HIS:HA	2:B:265:LEU:HA	1.67	0.77
2:B:229:VAL:HG22	2:B:253:ALA:HB2	1.76	0.68
2:B:241:ILE:HG12	2:B:242:VAL:N	2.11	0.66
2:B:53:GLY:HA2	2:B:73:PRO:HD2	1.78	0.65
2:B:229:VAL:HG11	2:B:241:ILE:CD1	2.22	0.64
1:A:86:GLN:HG3	1:A:105:ASN:ND2	2.14	0.61
2:B:159:ALA:HB2	2:B:192:LEU:HA	1.83	0.61
2:B:214:ILE:HG13	2:B:215:LYS:HG3	1.83	0.60
2:B:233:GLU:HG2	2:B:239:SER:HA	1.84	0.59
2:B:122:LEU:HD13	2:B:144:ILE:HG21	1.85	0.57
2:B:52:PHE:HE2	2:B:76:SER:HB2	1.68	0.57
2:B:278:ARG:HD2	2:B:317:GLN:HA	1.85	0.56
2:B:270:ASP:HB2	2:B:271:PRO:HD2	1.88	0.55
2:B:43:HIS:CE1	2:B:70:ARG:HH21	2.24	0.54
2:B:243:GLN:HG3	2:B:246:PRO:HD3	1.90	0.53
2:B:117:MET:HG3	2:B:171:LEU:HB3	1.92	0.52
2:B:237:ALA:HB3	2:B:271:PRO:HG3	1.92	0.51
2:B:77:GLN:HE21	2:B:80:GLU:HB2	1.77	0.50
2:B:270:ASP:HB2	2:B:271:PRO:CD	2.42	0.50
2:B:187:LYS:HG2	2:B:197:LEU:HD11	1.94	0.49
2:B:197:LEU:H	2:B:197:LEU:HD23	1.77	0.49
1:A:49:LEU:HD21	1:A:54:HIS:HD2	1.78	0.49
2:B:236:CYS:C	2:B:238:ARG:H	2.16	0.49
2:B:237:ALA:CB	2:B:271:PRO:HG3	2.43	0.48
1:A:86:GLN:HA	1:A:98:PRO:HG3	1.97	0.47
1:A:49:LEU:HA	1:A:120:ARG:HD3	1.96	0.47
2:B:163:ARG:NH2	2:B:202:LYS:HD2	2.29	0.47
2:B:150:ARG:NH1	2:B:311:GLU:OE1	2.48	0.46
2:B:104:CYS:HB3	2:B:111:ILE:H	1.80	0.46
2:B:259:SER:C	2:B:261:ASN:H	2.19	0.46
2:B:123:LYS:HG3	2:B:239:SER:OG	2.16	0.46
2:B:266:GLU:HB3	2:B:269:VAL:HG13	1.98	0.46
2:B:247:ARG:HD2	2:B:247:ARG:H	1.80	0.46
2:B:267:GLN:HG2	2:B:282:LEU:HD21	1.98	0.46
2:B:245:LEU:HB2	2:B:246:PRO:HD3	1.98	0.46
2:B:260:HIS:CE1	2:B:265:LEU:HG	2.51	0.46
2:B:72:THR:N	2:B:73:PRO:CD	2.79	0.46
2:B:200:VAL:O	2:B:212:TYR:OH	2.24	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:230:VAL:O	2:B:234:VAL:HG23	2.17	0.45
2:B:259:SER:HB3	2:B:266:GLU:HB2	1.99	0.44
2:B:264:GLN:HB3	2:B:266:GLU:HG3	1.99	0.44
2:B:52:PHE:CE2	2:B:76:SER:HB2	2.49	0.44
2:B:89:LEU:HD23	2:B:100:LEU:HB2	1.99	0.44
2:B:136:MET:O	2:B:141:ARG:NH1	2.51	0.44
2:B:105:ASP:HA	2:B:109:GLU:O	2.18	0.44
2:B:147:GLY:HA3	2:B:178:PRO:HG2	2.00	0.43
2:B:236:CYS:HA	2:B:270:ASP:HA	2.00	0.42
2:B:209:ASP:CG	2:B:300:ARG:HH12	2.23	0.42
2:B:237:ALA:C	2:B:239:SER:N	2.73	0.42
1:A:89:TYR:CZ	1:A:97:ASN:HB2	2.55	0.42
2:B:55:VAL:HG22	2:B:69:LYS:HG3	2.02	0.42
2:B:132:PRO:HB2	2:B:133:THR:H	1.65	0.41
2:B:241:ILE:HG23	2:B:242:VAL:H	1.85	0.41
1:A:97:ASN:O	2:B:204:THR:HA	2.21	0.41
1:A:97:ASN:HA	1:A:98:PRO:HD2	1.95	0.41
1:A:49:LEU:HD23	1:A:49:LEU:N	2.37	0.40
2:B:237:ALA:C	2:B:239:SER:H	2.24	0.40
2:B:174:GLU:H	2:B:174:GLU:HG3	1.61	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	99/164 (60%)	91 (92%)	6 (6%)	2 (2%)	7 38
2	B	288/321 (90%)	241 (84%)	30 (10%)	17 (6%)	1 12
All	All	387/485 (80%)	332 (86%)	36 (9%)	19 (5%)	2 17

All (19) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	39	ASN
2	B	47	ILE
2	B	193	ASP
2	B	271	PRO
2	B	241	ILE
2	B	247	ARG
1	A	68	ARG
2	B	40	ASN
2	B	93	ARG
2	B	132	PRO
2	B	238	ARG
2	B	245	LEU
2	B	260	HIS
2	B	264	GLN
2	B	131	LEU
2	B	182	ASP
2	B	128	GLY
1	A	48	GLY
2	B	246	PRO

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	88/143 (62%)	86 (98%)	2 (2%)	50 78
2	B	255/282 (90%)	236 (92%)	19 (8%)	13 45
All	All	343/425 (81%)	322 (94%)	21 (6%)	18 54

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	78	ARG
1	A	114	THR
2	B	31	LEU
2	B	32	VAL
2	B	41	PHE

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Mol	Chain	Res	Type
2	B	46	LEU
2	B	66	VAL
2	B	70	ARG
2	B	92	CYS
2	B	115	LYS
2	B	124	ARG
2	B	127	TYR
2	B	130	ASP
2	B	133	THR
2	B	172	LEU
2	B	238	ARG
2	B	264	GLN
2	B	270	ASP
2	B	272	ASN
2	B	273	LEU
2	B	281	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	42	GLN
1	A	54	HIS
1	A	67	ASN
1	A	97	ASN
1	A	105	ASN
2	B	43	HIS
2	B	77	GLN
2	B	260	HIS
2	B	272	ASN
2	B	317	GLN

5.3.3 RNA

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

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	SEP	B	198	2	8,9,10	1.66	1 (12%)	8,12,14	1.33	2 (25%)
2	TPO	B	199	2	8,10,11	0.88	0	10,14,16	1.01	0

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	SEP	B	198	2	-	4/5/8/10	-
2	TPO	B	199	2	-	2/9/11/13	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	198	SEP	P-O1P	3.53	1.61	1.50

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	198	SEP	P-OG-CB	-2.15	112.37	118.30
2	B	198	SEP	OG-CB-CA	2.07	110.16	108.14

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	198	SEP	CB-OG-P-O2P
2	B	198	SEP	CB-OG-P-O3P
2	B	199	TPO	N-CA-CB-OG1
2	B	199	TPO	CG2-CB-OG1-P
2	B	198	SEP	CB-OG-P-O1P
2	B	198	SEP	N-CA-CB-OG

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates

There are no carbohydrates in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.