



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 26, 2026 – 04:14 PM EDT

PDB ID : 8QL0 / pdb_00008ql0
Title : Structure of human PAD6 Phosphomimic mutant V10E/S446E, apo
Authors : Ranaivoson, F.M.; Beaumont, E.
Deposited on : 2023-09-18
Resolution : 1.68 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 types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

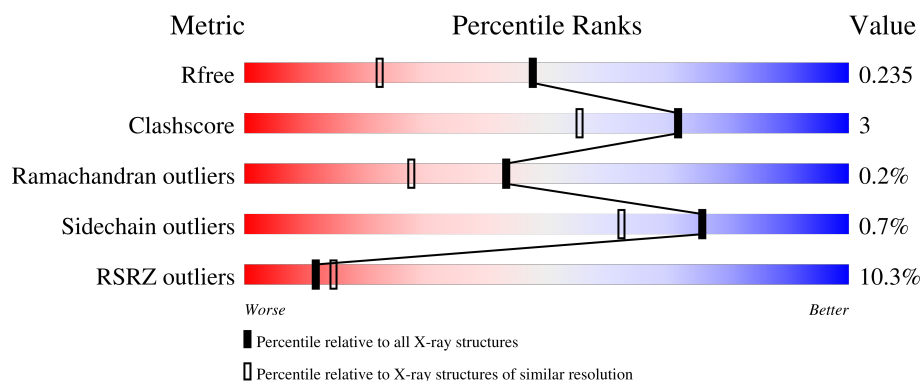
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.68 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}	180053	1054 (1.68-1.68)
Clashscore	190562	1078 (1.68-1.68)
Ramachandran outliers	187476	1068 (1.68-1.68)
Sidechain outliers	187428	1067 (1.68-1.68)
RSRZ outliers	180081	1055 (1.68-1.68)

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 of 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 $\leq 5\%$. 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	693	10% 84% 9% 8%

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 5485 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 Protein-arginine deiminase type-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	641	5130	3299	836	954	41	0	11	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	10	GLU	SER	engineered mutation	UNP Q6TGC4
A	446	GLU	SER	engineered mutation	UNP Q6TGC4

- Molecule 2 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			7	4	3		
2	A	1	Total	C	O	0	0
			7	4	3		

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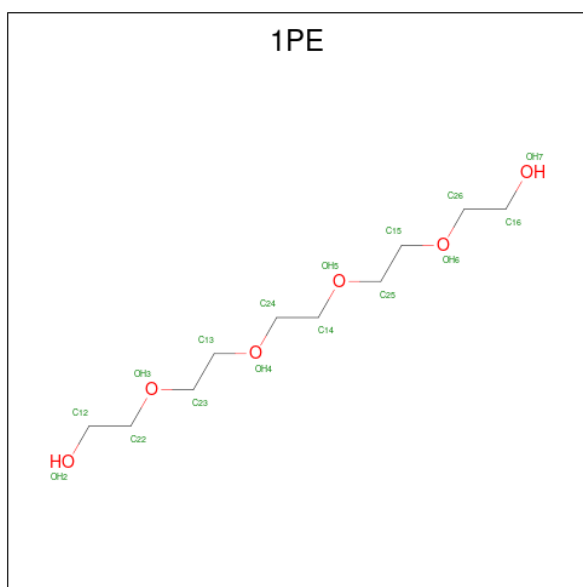
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			7	4	3		
2	A	1	Total	C	O	0	0
			7	4	3		

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is PENTAETHYLENE GLYCOL (CCD ID: 1PE) (formula: $C_{10}H_{22}O_6$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			16	10	6		

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Cl	0	0
			1	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	304	Total	O	0	0
			304	304		

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	127.32Å 54.32Å 106.78Å 90.00° 108.61° 90.00°	Depositor
Resolution (Å)	101.20 – 1.68 101.20 – 1.68	Depositor EDS
% Data completeness (in resolution range)	51.8 (101.20-1.68) 51.8 (101.20-1.68)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.56 (at 1.67Å)	Xtriage
Refinement program	BUSTER 2.11.8 (22-FEB-2023)	Depositor
R, R_{free}	0.197 , 0.241 0.190 , 0.235	Depositor DCC
R_{free} test set	2087 reflections (2.62%)	wwPDB-VP
Wilson B-factor (Å ²)	26.7	Xtriage
Anisotropy	0.130	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 35.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5485	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.82% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PEG, 1PE, CL, GOL

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	0.81	0/5258	0.98	8/7123 (0.1%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	54	GLY	N-CA-C	6.21	120.41	112.83
1	A	10	GLU	N-CA-C	6.06	117.99	108.96
1	A	482	ASP	CA-CB-CG	5.87	118.47	112.60
1	A	53	SER	CA-C-N	5.71	126.42	120.03
1	A	53	SER	C-N-CA	5.71	126.42	120.03
1	A	202	ILE	N-CA-C	-5.68	106.16	111.45
1	A	366	THR	CB-CA-C	5.37	119.05	109.65
1	A	308	ILE	N-CA-C	5.34	113.72	107.89

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	5130	0	5142	34	0
2	A	28	0	40	4	0
3	A	6	0	8	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	16	0	22	3	0
5	A	1	0	0	0	0
6	A	304	0	0	2	0
All	All	5485	0	5212	34	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 3.

All (34) 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:188:ASN:OD1	1:A:371:LYS:HD2	2.01	0.61
1:A:136:VAL:HG11	1:A:193[B]:THR:HG22	1.84	0.59
1:A:564:LYS:HA	2:A:701:PEG:H42	1.84	0.58
1:A:280:VAL:HG22	1:A:292:VAL:HG22	1.88	0.55
1:A:79:ASP:HB3	1:A:80:PRO:HD3	1.90	0.54
1:A:147:LYS:NZ	4:A:705:1PE:H241	2.23	0.53
1:A:163[B]:CYS:SG	1:A:373:THR:HG21	2.48	0.53
1:A:621:ILE:HG23	1:A:680:ILE:HD11	1.91	0.52
1:A:688:LYS:HB2	1:A:691:LYS:HD2	1.93	0.51
1:A:42:PRO:HG2	1:A:112:VAL:HG13	1.93	0.51
1:A:370:HIS:CD2	1:A:370:HIS:H	2.31	0.48
1:A:15:ILE:HD12	1:A:33:ILE:HG21	1.94	0.48
1:A:354:GLY:HA3	1:A:674:ILE:HA	1.95	0.48
1:A:426:LYS:HE3	1:A:429:GLY:HA2	1.95	0.47
1:A:684:PRO:HD2	2:A:704:PEG:H22	1.96	0.47
1:A:281:GLU:HB2	1:A:293:LEU:HD11	1.97	0.46
1:A:9:MET:O	1:A:10:GLU:HG3	2.16	0.46
1:A:507:PRO:HD2	1:A:563:GLU:OE1	2.17	0.45
1:A:616:ASP:O	1:A:630:PRO:HG2	2.16	0.45
1:A:196:VAL:HG21	1:A:208:LEU:HD11	1.99	0.45
1:A:524:ASP:HB2	6:A:851:HOH:O	2.18	0.44
1:A:225:PRO:HB3	1:A:233:PHE:CE2	2.53	0.43
1:A:267:ALA:HB2	1:A:458:ASP:HB3	2.01	0.43
1:A:475:TRP:CZ3	1:A:562:VAL:HG13	2.54	0.43
1:A:147:LYS:HE2	4:A:705:1PE:H121	2.01	0.42
1:A:328:PHE:CE1	2:A:700:PEG:H21	2.55	0.42
1:A:511:TYR:CD2	3:A:702:GOL:H2	2.55	0.42
1:A:528:PHE:HB3	1:A:536:LEU:HD21	2.01	0.41
1:A:224:TRP:HD1	1:A:225:PRO:HD2	1.85	0.41
1:A:370:HIS:HD2	6:A:871:HOH:O	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:147:LYS:HZ3	4:A:705:1PE:H241	1.84	0.41
1:A:147:LYS:HD2	2:A:703:PEG:H32	2.03	0.40
1:A:621:ILE:CG2	1:A:623[B]:MET:HE3	2.51	0.40
1:A:381:GLN:O	1:A:408:HIS:HB3	2.22	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	634/693 (92%)	620 (98%)	13 (2%)	1 (0%)	43 27

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	467	ALA

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	579/615 (94%)	575 (99%)	4 (1%)	76 62

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	84	THR
1	A	215	GLU
1	A	282	GLU
1	A	443	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	12	GLN
1	A	312	GLN
1	A	370	HIS
1	A	403	GLN
1	A	518	GLN
1	A	636	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 7 ligands modelled in this entry, 1 is monoatomic - leaving 6 for Mogul analysis.

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	PEG	A	701	-	6,6,6	0.07	0	5,5,5	0.22	0
4	1PE	A	705	-	15,15,15	0.17	0	14,14,14	0.14	0
2	PEG	A	703	-	6,6,6	0.08	0	5,5,5	0.13	0
2	PEG	A	700	-	6,6,6	0.12	0	5,5,5	0.16	0
2	PEG	A	704	-	6,6,6	0.17	0	5,5,5	0.19	0
3	GOL	A	702	-	5,5,5	0.08	0	5,5,5	0.29	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	PEG	A	701	-	-	1/4/4/4	-
4	1PE	A	705	-	-	5/13/13/13	-
2	PEG	A	703	-	-	2/4/4/4	-
2	PEG	A	700	-	-	2/4/4/4	-
2	PEG	A	704	-	-	2/4/4/4	-
3	GOL	A	702	-	-	2/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	705	1PE	OH4-C13-C23-OH3
2	A	704	PEG	O2-C3-C4-O4
2	A	700	PEG	O2-C3-C4-O4
2	A	701	PEG	O2-C3-C4-O4
2	A	703	PEG	O1-C1-C2-O2
2	A	703	PEG	C1-C2-O2-C3
4	A	705	1PE	C15-C25-OH5-C14
4	A	705	1PE	C16-C26-OH6-C15
4	A	705	1PE	C12-C22-OH3-C23
3	A	702	GOL	O2-C2-C3-O3
2	A	704	PEG	C4-C3-O2-C2
2	A	700	PEG	C4-C3-O2-C2
3	A	702	GOL	O1-C1-C2-O2
4	A	705	1PE	C23-C13-OH4-C24

There are no ring outliers.

6 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	701	PEG	1	0
4	A	705	1PE	3	0
2	A	703	PEG	1	0
2	A	700	PEG	1	0
2	A	704	PEG	1	0
3	A	702	GOL	1	0

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

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, 95th 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	641/693 (92%)	0.50	66 (10%) 12 15	13, 31, 62, 79	11 (1%)

All (66) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	74	TRP	6.1
1	A	443	PHE	5.6
1	A	106	PRO	5.4
1	A	77	LEU	4.7
1	A	104	TYR	4.6
1	A	75	TRP	4.5
1	A	444	TYR	4.1
1	A	60	VAL	4.0
1	A	445	PRO	3.7
1	A	73	ILE	3.5
1	A	48	PHE	3.5
1	A	9	MET	3.5
1	A	47	CYS	3.4
1	A	187	THR	3.4
1	A	112	VAL	3.4
1	A	249	LEU	3.3
1	A	168	VAL	3.3
1	A	8	ALA	3.3
1	A	186	ILE	3.2
1	A	388	PHE	3.2
1	A	385	LEU	3.2
1	A	61	ALA	3.1
1	A	101	VAL	3.1
1	A	49	THR	3.1
1	A	182	PHE	3.1
1	A	51	HIS	3.0
1	A	79	ASP	3.0

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Mol	Chain	Res	Type	RSRZ
1	A	383	ALA	3.0
1	A	102	THR	3.0
1	A	177	THR	2.9
1	A	181	ILE	2.8
1	A	449	GLY	2.8
1	A	21	SER	2.8
1	A	80	PRO	2.8
1	A	103	TYR	2.8
1	A	386	ASP	2.8
1	A	76	PRO	2.8
1	A	169	GLY	2.7
1	A	50	ILE	2.7
1	A	389	PRO	2.7
1	A	638	LYS	2.7
1	A	11	PHE	2.6
1	A	105	GLY	2.6
1	A	113	GLY	2.6
1	A	62	ASN	2.6
1	A	20	ASP	2.6
1	A	491	ASP	2.6
1	A	46	GLN	2.6
1	A	224	TRP	2.5
1	A	179	LYS	2.5
1	A	180	VAL	2.4
1	A	267	ALA	2.4
1	A	59	ASP	2.4
1	A	291	THR	2.3
1	A	392	TYR	2.3
1	A	10	GLU	2.3
1	A	268	GLU	2.3
1	A	22	PRO	2.2
1	A	407	ASP	2.2
1	A	43	GLN	2.2
1	A	44	LYS	2.1
1	A	248	LEU	2.1
1	A	54	GLY	2.0
1	A	287	SER	2.0
1	A	671	VAL	2.0
1	A	637	ILE	2.0

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 oligosaccharides 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, 95th 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
3	GOL	A	702	6/6	0.80	0.19	51,51,52,52	0
4	1PE	A	705	16/16	0.80	0.20	69,73,75,75	0
2	PEG	A	704	7/7	0.81	0.15	46,48,50,51	0
2	PEG	A	701	7/7	0.85	0.14	50,51,51,51	0
2	PEG	A	703	7/7	0.87	0.14	61,61,61,61	0
2	PEG	A	700	7/7	0.89	0.13	47,47,47,47	0
5	CL	A	706	1/1	0.97	0.05	43,43,43,43	0

6.5 Other polymers [i](#)

There are no such residues in this entry.