



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 08:59 PM UTC

PDB ID : 1X6L / pdb_00001x6l
Title : Crystal structure of *S. marcescens* chitinase A mutant W167A
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Deposited on : 2004-08-11
Resolution : 1.90 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
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

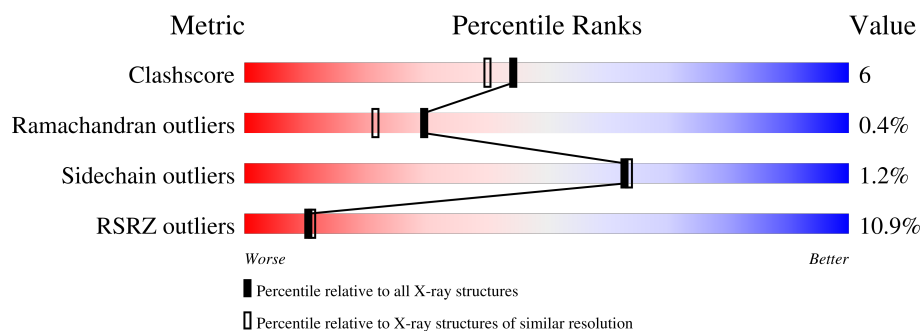
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	563	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4502 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 Chitinase A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	539	Total	C	N	O	S	0	0	0
			4119	2619	694	792	14			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	139	PRO	ALA	SEE REMARK 999	UNP P07254
A	144	SER	PRO	SEE REMARK 999	UNP P07254
A	167	ALA	TRP	engineered mutation	UNP P07254
A	226	ILE	VAL	SEE REMARK 999	UNP P07254
A	395	ALA	PRO	SEE REMARK 999	UNP P07254
A	437	ILE	VAL	SEE REMARK 999	UNP P07254
A	473	GLU	LYS	SEE REMARK 999	UNP P07254
A	484	SER	GLY	SEE REMARK 999	UNP P07254

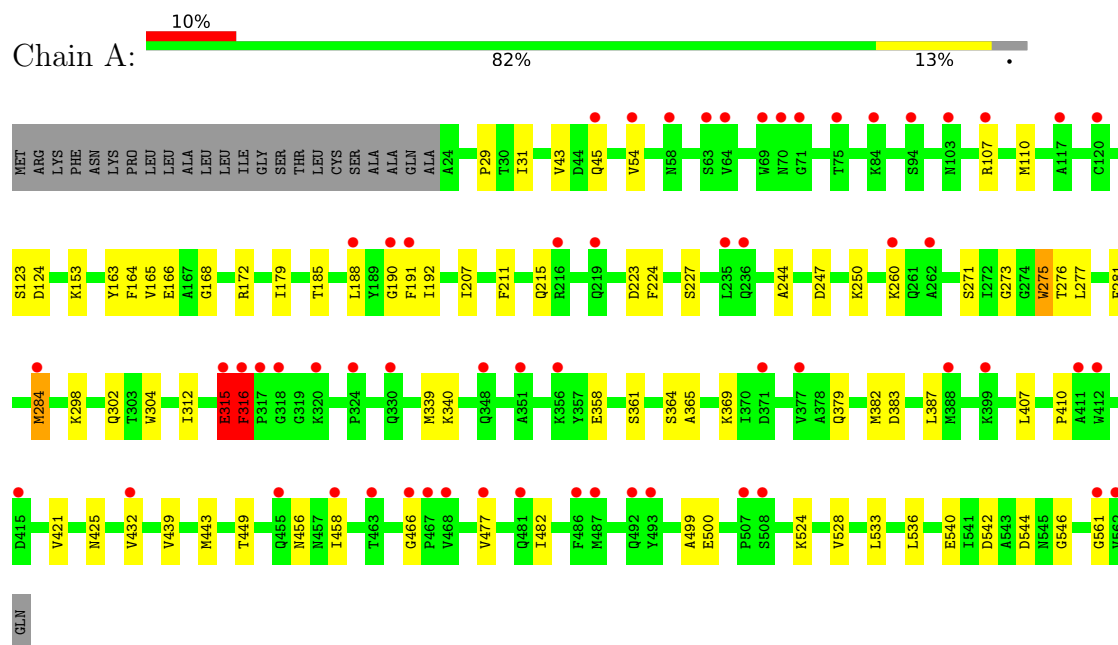
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	383	Total	O	0	0
			383	383		

3 Residue-property plots [i](#)

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

• Molecule 1: Chitinase A



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	76.51Å 132.71Å 192.63Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.94 – 1.90 19.94 – 1.90	Depositor EDS
% Data completeness (in resolution range)	85.9 (19.94-1.90) 93.7 (19.94-1.90)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.55 (at 1.89Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.217 , 0.233 0.230 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	32.4	Xtriage
Anisotropy	0.464	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 44.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4502	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.81% 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](#)

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	0/4218	0.82	4/5723 (0.1%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	185	THR	N-CA-C	-6.54	105.84	113.88
1	A	443	MET	N-CA-C	-5.37	106.50	112.57
1	A	124	ASP	N-CA-C	-5.35	103.47	110.53
1	A	275	TRP	N-CA-C	5.26	117.69	111.33

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	4119	0	3998	49	0
2	A	383	0	0	5	0
All	All	4502	0	3998	49	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 6.

All (49) 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:43:VAL:HG22	1:A:54:VAL:HG12	1.49	0.95
1:A:191:PHE:HA	1:A:271:SER:O	1.87	0.75
1:A:528:VAL:HG13	1:A:533:LEU:HB2	1.72	0.70
1:A:54:VAL:HG11	1:A:304:TRP:CH2	2.28	0.69
1:A:312:ILE:HG13	1:A:339:MET:HE1	1.77	0.65
1:A:244:ALA:HB3	1:A:247:ASP:CG	2.24	0.63
1:A:54:VAL:HG11	1:A:304:TRP:CZ2	2.34	0.61
1:A:421:VAL:HG12	1:A:425:ASN:ND2	2.18	0.58
1:A:166:GLU:H	1:A:190:GLY:HA3	1.68	0.58
1:A:31:ILE:HD13	1:A:110:MET:HE1	1.84	0.58
1:A:421:VAL:HG12	1:A:425:ASN:HD21	1.69	0.56
1:A:340:LYS:HG3	2:A:841:HOH:O	2.05	0.55
1:A:365:ALA:HA	1:A:387:LEU:HD11	1.90	0.54
1:A:164:PHE:CD2	1:A:179:ILE:HD11	2.43	0.54
1:A:163:TYR:CZ	1:A:188:LEU:HD22	2.44	0.53
1:A:407:LEU:O	1:A:421:VAL:HG23	2.11	0.51
1:A:316:PHE:CD1	1:A:364:SER:HB2	2.46	0.51
1:A:207:ILE:HD11	1:A:276:THR:HG21	1.91	0.51
1:A:540:GLU:HG3	1:A:542:ASP:OD1	2.11	0.51
1:A:110:MET:C	1:A:110:MET:SD	2.94	0.50
1:A:45:GLN:HG3	2:A:834:HOH:O	2.12	0.49
1:A:172:ARG:HD3	1:A:542:ASP:OD2	2.12	0.49
1:A:275:TRP:HA	1:A:315:GLU:HG2	1.92	0.49
1:A:524:LYS:O	1:A:528:VAL:HG23	2.13	0.49
1:A:165:VAL:HG22	2:A:573:HOH:O	2.11	0.49
1:A:244:ALA:O	1:A:250:LYS:HE2	2.14	0.48
1:A:379:GLN:NE2	1:A:432:VAL:HA	2.28	0.48
1:A:165:VAL:HG23	1:A:168:GLY:HA3	1.96	0.47
1:A:281:PHE:O	1:A:284:MET:HB2	2.15	0.46
1:A:153:LYS:HE2	1:A:561:GLY:HA2	1.97	0.46
1:A:439:VAL:HB	1:A:536:LEU:HD23	1.98	0.45
1:A:316:PHE:CD1	1:A:316:PHE:N	2.84	0.45
1:A:164:PHE:O	1:A:190:GLY:N	2.50	0.45
1:A:273:GLY:O	1:A:277:LEU:HB2	2.17	0.44
1:A:410:PRO:HD3	2:A:720:HOH:O	2.18	0.43
1:A:358:GLU:HA	1:A:383:ASP:OD2	2.19	0.43
1:A:192:ILE:HG23	1:A:227:SER:O	2.19	0.43
1:A:250:LYS:HE3	2:A:834:HOH:O	2.17	0.43
1:A:499:ALA:O	1:A:500:GLU:HB2	2.18	0.43
1:A:364:SER:OG	1:A:369:LYS:HD2	2.19	0.43
1:A:298:LYS:O	1:A:302:GLN:HG3	2.20	0.42
1:A:361:SER:HB3	1:A:382:MET:CE	2.50	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:223:ASP:O	1:A:224:PHE:HB2	2.20	0.41
1:A:477:VAL:HG23	1:A:482:ILE:HD11	2.01	0.41
1:A:449:THR:HG22	1:A:466:GLY:C	2.46	0.41
1:A:211:PHE:O	1:A:215:GLN:HG2	2.21	0.41
1:A:456:ASN:O	1:A:458:ILE:HG12	2.21	0.41
1:A:544:ASP:CG	1:A:546:GLY:H	2.29	0.41
1:A:29:PRO:HG2	1:A:123:SER:HB3	2.03	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	537/563 (95%)	515 (96%)	20 (4%)	2 (0%)	30	22

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	315	GLU
1	A	316	PHE

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	428/447 (96%)	423 (99%)	5 (1%)	63 63

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	107	ARG
1	A	260	LYS
1	A	284	MET
1	A	315	GLU
1	A	316	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	52	ASN
1	A	67	ASN
1	A	99	ASN
1	A	201	ASN
1	A	330	GLN
1	A	425	ASN
1	A	485	GLN
1	A	532	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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

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	539/563 (95%)	0.83	59 (10%)	10 11	18, 35, 48, 67	21 (3%)

All (59) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	493	TYR	8.5
1	A	190	GLY	6.6
1	A	235	LEU	5.6
1	A	458	ILE	5.6
1	A	70	ASN	5.4
1	A	562	VAL	5.1
1	A	316	PHE	5.1
1	A	351	ALA	4.4
1	A	69	TRP	4.2
1	A	315	GLU	4.1
1	A	330	GLN	4.0
1	A	412	TRP	3.8
1	A	508	SER	3.6
1	A	415	ASP	3.6
1	A	487	MET	3.6
1	A	260	LYS	3.4
1	A	84	LYS	3.2
1	A	399	LYS	3.2
1	A	107	ARG	3.1
1	A	54	VAL	3.1
1	A	348	GLN	3.1
1	A	188	LEU	3.1
1	A	455	GLN	3.1
1	A	507	PRO	3.0
1	A	117	ALA	2.9
1	A	371	ASP	2.8
1	A	388	MET	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	320	LYS	2.8
1	A	411	ALA	2.8
1	A	481	GLN	2.8
1	A	216	ARG	2.7
1	A	71	GLY	2.7
1	A	191	PHE	2.7
1	A	492	GLN	2.6
1	A	45	GLN	2.6
1	A	94	SER	2.6
1	A	120	CYS	2.6
1	A	219	GLN	2.5
1	A	58	ASN	2.5
1	A	561	GLY	2.4
1	A	468	VAL	2.4
1	A	75	THR	2.4
1	A	486	PHE	2.3
1	A	236	GLN	2.3
1	A	377	VAL	2.2
1	A	477	VAL	2.2
1	A	463	THR	2.2
1	A	432	VAL	2.2
1	A	317	PRO	2.2
1	A	103	ASN	2.2
1	A	356	LYS	2.2
1	A	318	GLY	2.1
1	A	284	MET	2.1
1	A	262	ALA	2.1
1	A	324	PRO	2.1
1	A	466	GLY	2.0
1	A	467	PRO	2.0
1	A	63	SER	2.0
1	A	64	VAL	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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.