Full wwPDB X-ray Structure Validation Report (i)

Jan 27, 2024 – 06:05 PM EST

PDB ID	:	1CHK
Title	:	STREPTOMYCES N174 CHITOSANASE PH5.5 298K
Authors	:	Marcotte, E.M.; Robertus, J.D.
Deposited on	:	1995-06-12
Resolution	:	2.40 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 (i) 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 (1)) were used in the production of this report:

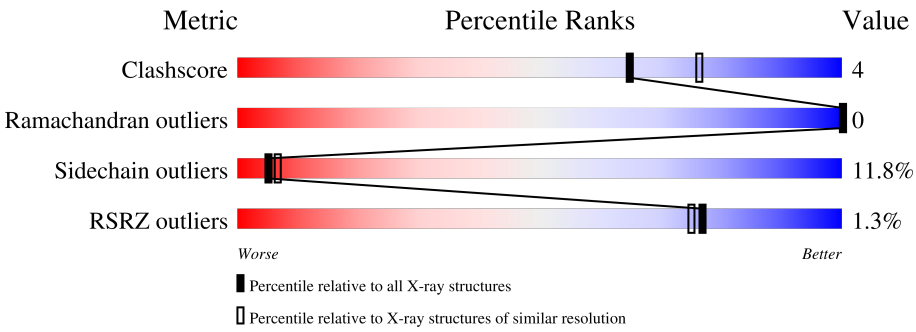
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 2.40 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	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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 <=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	238	2% 77% 20% •
1	B	238	% 78% 18% •

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3691 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 CHITOSANASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	238	1820	1141	313	360	6	0	0	0
1	B	238	1820	1141	313	360	6	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	185	GLY	ALA	conflict	UNP P33665
B	185	GLY	ALA	conflict	UNP P33665

- Molecule 2 is water.

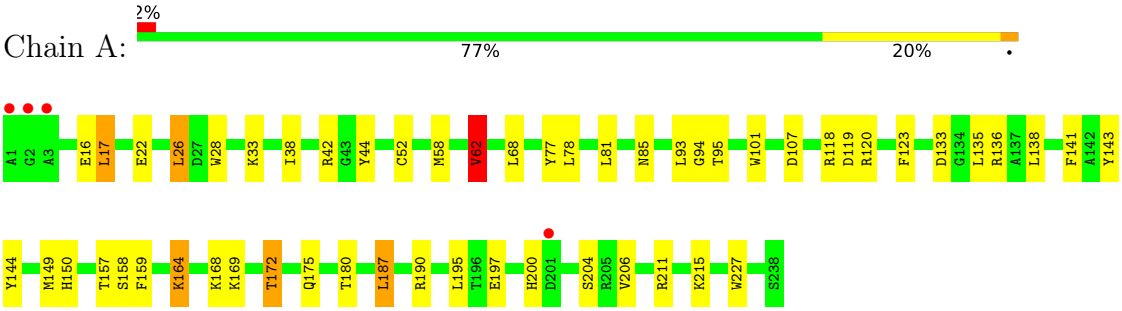
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	27	27	27	0	0
2	B	24	24	24	0	0

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.

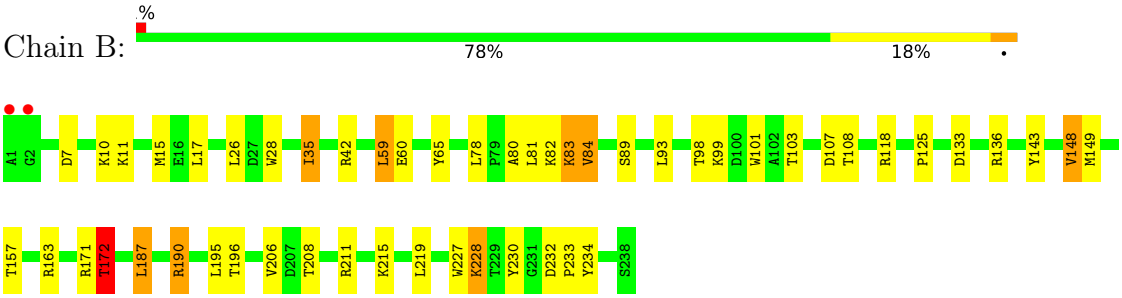
- Molecule 1: CHITOSANASE

Chain A:



- Molecule 1: CHITOSANASE

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	56.30Å 59.30Å 85.40Å 90.00° 96.20° 90.00°	Depositor
Resolution (Å)	5.00 – 2.40 19.98 – 2.40	Depositor EDS
% Data completeness (in resolution range)	98.7 (5.00-2.40) 98.7 (19.98-2.40)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	4.72 (at 2.41Å)	Xtriage
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.181 , 0.175 0.175 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	18.8	Xtriage
Anisotropy	0.446	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 56.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	3691	wwPDB-VP
Average B, all atoms (Å^2)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.01% 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 (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	0.85	0/1860	1.58	21/2517 (0.8%)
1	B	0.87	1/1860 (0.1%)	1.63	31/2517 (1.2%)
All	All	0.86	1/3720 (0.0%)	1.60	52/5034 (1.0%)

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	B	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	107	ASP	CB-CG	5.10	1.62	1.51

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	120	ARG	NE-CZ-NH1	12.30	126.45	120.30
1	B	190	ARG	NE-CZ-NH2	-10.16	115.22	120.30
1	A	118	ARG	NE-CZ-NH1	9.50	125.05	120.30
1	B	42	ARG	NE-CZ-NH2	-9.32	115.64	120.30
1	A	120	ARG	NE-CZ-NH2	-9.04	115.78	120.30
1	B	118	ARG	NE-CZ-NH1	8.99	124.80	120.30
1	B	163	ARG	NE-CZ-NH2	-8.91	115.84	120.30
1	A	136	ARG	NE-CZ-NH2	-8.55	116.03	120.30
1	B	171	ARG	NE-CZ-NH2	-8.53	116.03	120.30
1	B	171	ARG	NE-CZ-NH1	8.35	124.48	120.30
1	B	136	ARG	NE-CZ-NH2	-8.08	116.26	120.30
1	A	211	ARG	NE-CZ-NH1	8.00	124.30	120.30
1	A	227	TRP	CE2-CD2-CG	-7.81	101.05	107.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	227	TRP	CD1-CG-CD2	7.64	112.41	106.30
1	A	215	LYS	CB-CG-CD	-7.55	91.97	111.60
1	B	107	ASP	N-CA-CB	-7.43	97.23	110.60
1	A	28	TRP	CD1-CG-CD2	7.32	112.15	106.30
1	A	62	VAL	CG1-CB-CG2	7.29	122.56	110.90
1	B	118	ARG	NE-CZ-NH2	-7.16	116.72	120.30
1	B	211	ARG	NE-CZ-NH1	7.08	123.84	120.30
1	B	28	TRP	CD1-CG-CD2	6.99	111.89	106.30
1	B	172	THR	N-CA-CB	-6.82	97.35	110.30
1	A	118	ARG	NE-CZ-NH2	-6.81	116.90	120.30
1	B	107	ASP	CB-CA-C	6.72	123.84	110.40
1	B	101	TRP	CD1-CG-CD2	6.71	111.67	106.30
1	A	172	THR	N-CA-CB	-6.70	97.58	110.30
1	B	234	TYR	CB-CG-CD2	-6.54	117.08	121.00
1	B	28	TRP	CE2-CD2-CG	-6.47	102.13	107.30
1	B	136	ARG	CA-CB-CG	-6.44	99.24	113.40
1	B	227	TRP	CE2-CD2-CG	-6.43	102.16	107.30
1	B	60	GLU	CA-CB-CG	6.39	127.46	113.40
1	B	190	ARG	NE-CZ-NH1	6.30	123.45	120.30
1	B	211	ARG	NE-CZ-NH2	-6.29	117.15	120.30
1	A	28	TRP	CE2-CD2-CG	-6.26	102.29	107.30
1	A	211	ARG	NE-CZ-NH2	-6.10	117.25	120.30
1	A	101	TRP	CD1-CG-CD2	6.06	111.15	106.30
1	A	101	TRP	CE2-CD2-CG	-6.03	102.48	107.30
1	B	101	TRP	CE2-CD2-CG	-5.99	102.50	107.30
1	A	42	ARG	NE-CZ-NH1	5.99	123.30	120.30
1	A	149	MET	CG-SD-CE	5.70	109.33	100.20
1	B	143	TYR	CB-CG-CD2	-5.65	117.61	121.00
1	B	59	LEU	CA-CB-CG	5.58	128.15	115.30
1	A	200	HIS	CA-C-N	-5.56	104.97	117.20
1	B	148	VAL	CA-CB-CG2	-5.50	102.65	110.90
1	B	190	ARG	CG-CD-NE	-5.41	100.44	111.80
1	B	227	TRP	CD1-CG-CD2	5.40	110.62	106.30
1	A	144	TYR	CB-CG-CD1	-5.32	117.81	121.00
1	B	65	TYR	CB-CG-CD2	-5.25	117.85	121.00
1	B	83	LYS	CA-CB-CG	5.24	124.92	113.40
1	A	77	TYR	CB-CG-CD2	-5.08	117.95	121.00
1	B	107	ASP	CB-CG-OD2	5.06	122.85	118.30
1	B	227	TRP	CG-CD2-CE3	5.02	138.42	133.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	230	TYR	Sidechain

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	1820	0	1757	17	0
1	B	1820	0	1757	13	0
2	A	27	0	0	1	0
2	B	24	0	0	0	0
All	All	3691	0	3514	29	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 4.

All (29) 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:B:35:ILE:HG12	1:B:98:THR:HG22	1.65	0.79
1:A:172:THR:HG21	2:A:802:HOH:O	1.96	0.65
1:B:187:LEU:HG	1:B:206:VAL:HG13	1.83	0.61
1:A:164:LYS:HD3	1:A:168:LYS:HE3	1.83	0.60
1:B:7:ASP:HB3	1:B:10:LYS:HB2	1.92	0.52
1:B:80:ALA:O	1:B:84:VAL:HB	2.10	0.51
1:A:58:MET:O	1:A:62:VAL:HG13	2.11	0.51
1:B:78:LEU:O	1:B:82:LYS:HG3	2.11	0.50
1:A:44:TYR:OH	1:A:94:GLY:HA2	2.13	0.48
1:A:107:ASP:HA	1:B:108:THR:HG21	1.95	0.48
1:B:84:VAL:HG22	1:B:89:SER:HB3	1.94	0.48
1:A:44:TYR:O	1:A:52:CYS:HA	2.14	0.47
1:A:164:LYS:HA	1:A:164:LYS:HE2	1.96	0.47
1:A:164:LYS:NZ	1:A:168:LYS:HG3	2.29	0.47
1:A:150:HIS:HB3	1:A:157:THR:O	2.16	0.45
1:B:149:MET:HG2	1:B:149:MET:O	2.15	0.45
1:A:17:LEU:HB3	1:A:141:PHE:CZ	2.51	0.45
1:B:215:LYS:HA	1:B:215:LYS:HD3	1.77	0.44
1:A:187:LEU:HG	1:A:206:VAL:HG13	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:16:GLU:HB3	1:A:26:LEU:HG	2.00	0.44
1:A:133:ASP:O	1:A:172:THR:HG23	2.20	0.42
1:B:228:LYS:HA	1:B:232:ASP:O	2.19	0.42
1:B:11:LYS:O	1:B:15:MET:HG2	2.20	0.42
1:B:133:ASP:O	1:B:172:THR:HG23	2.20	0.42
1:A:172:THR:HG22	1:A:175:GLN:H	1.84	0.42
1:A:143:TYR:CD2	1:A:159:PHE:HZ	2.38	0.41
1:A:119:ASP:HA	1:A:123:PHE:HB3	2.02	0.41
1:B:232:ASP:HA	1:B:233:PRO:HD2	1.94	0.41
1:A:164:LYS:HZ2	1:A:168:LYS:HG3	1.85	0.41

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	236/238 (99%)	227 (96%)	9 (4%)	0	100	100
1	B	236/238 (99%)	224 (95%)	12 (5%)	0	100	100
All	All	472/476 (99%)	451 (96%)	21 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	186/186 (100%)	163 (88%)	23 (12%)	4 5
1	B	186/186 (100%)	165 (89%)	21 (11%)	6 8
All	All	372/372 (100%)	328 (88%)	44 (12%)	5 7

All (44) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	17	LEU
1	A	22	GLU
1	A	26	LEU
1	A	33	LYS
1	A	38	ILE
1	A	62	VAL
1	A	68	LEU
1	A	78	LEU
1	A	81	LEU
1	A	85	ASN
1	A	93	LEU
1	A	95	THR
1	A	135	LEU
1	A	138	LEU
1	A	158	SER
1	A	164	LYS
1	A	169	LYS
1	A	180	THR
1	A	187	LEU
1	A	190	ARG
1	A	195	LEU
1	A	197	GLU
1	A	204	SER
1	B	17	LEU
1	B	26	LEU
1	B	35	ILE
1	B	59	LEU
1	B	81	LEU
1	B	83	LYS
1	B	84	VAL
1	B	93	LEU
1	B	99	LYS
1	B	103	THR
1	B	125	PRO
1	B	148	VAL

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Mol	Chain	Res	Type
1	B	157	THR
1	B	172	THR
1	B	187	LEU
1	B	190	ARG
1	B	195	LEU
1	B	196	THR
1	B	208	THR
1	B	219	LEU
1	B	228	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	85	ASN
1	A	129	GLN
1	A	150	HIS
1	A	175	GLN
1	A	210	GLN
1	B	31	GLN
1	B	200	HIS

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

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 (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, 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	238/238 (100%)	-0.68	4 (1%)	70	68	5, 17, 35, 57	0
1	B	238/238 (100%)	-0.73	2 (0%)	86	84	5, 17, 36, 65	0
All	All	476/476 (100%)	-0.70	6 (1%)	77	75	5, 17, 35, 65	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	ALA	6.5
1	B	1	ALA	6.3
1	A	2	GLY	4.9
1	A	3	ALA	3.8
1	A	201	ASP	2.8
1	B	2	GLY	2.8

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 monosaccharides 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.