Full wwPDB X-ray Structure Validation Report (i)

Feb 1, 2016 – 10:16 AM GMT

PDB ID	:	3LIG
Title	:	Crystal structure of fructosyltransferase (D191A) from A. japonicus
Authors	:	Chuankhayan, P.; Chen, C.J.; Chiang, C.M.
Deposited on	:	2010-01-24
Resolution	:	1.80 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
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

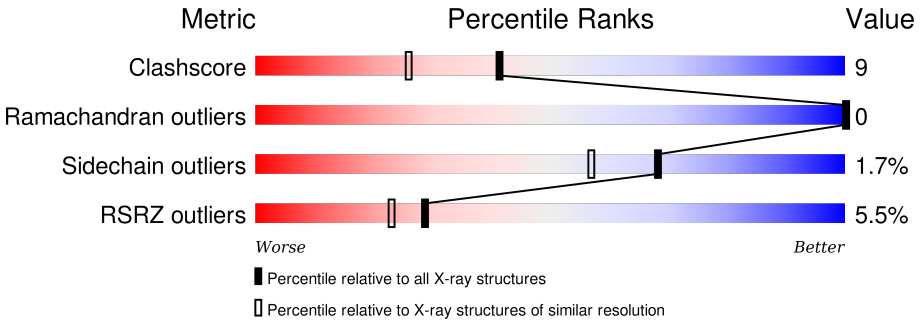
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 1.80 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	102246	5383 (1.80-1.80)
Ramachandran outliers	100387	5320 (1.80-1.80)
Sidechain outliers	100360	5319 (1.80-1.80)
RSRZ outliers	91569	4547 (1.80-1.80)

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. 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	634	6% 84% 15%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 5207 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 Fructosyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	634	4883	3091	824	965	3	0	0	0

- Molecule 2 is water.

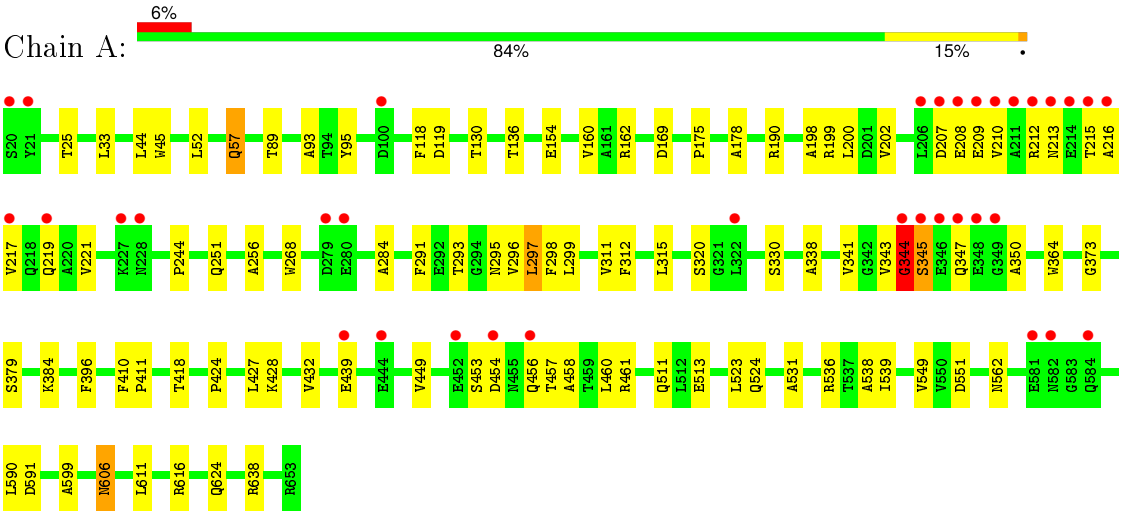
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	324	324	324	0	0

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 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: Fructosyltransferase

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	98.41Å 110.78Å 66.51Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.80 18.44 – 1.80	Depositor EDS
% Data completeness (in resolution range)	86.8 (20.00-1.80) 96.6 (18.44-1.80)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
$< I/\sigma(I) >$ [1]	4.63 (at 1.80Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.220 , 0.244 0.227 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	DCC
Wilson B-factor (Å^2)	15.2	Xtriage
Anisotropy	0.495	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 43.2	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Outliers	0 of 67697 reflections	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	5207	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 3.77% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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	0.40	2/5014 (0.0%)	0.69	2/6858 (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	A	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	284	ALA	C-N	6.20	1.44	1.33
1	A	293	THR	C-N	-5.48	1.23	1.33

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	344	GLY	O-C-N	-5.83	113.38	122.70
1	A	93	ALA	O-C-N	-5.30	114.22	122.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	344	GLY	Mainchain

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	4883	0	4610	81	0
2	A	324	0	0	0	0
All	All	5207	0	4610	81	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 9.

All (81) 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:454:ASP:HB2	1:A:456:GLN:NE2	1.78	0.96
1:A:454:ASP:HB2	1:A:456:GLN:HE21	1.28	0.95
1:A:33:LEU:H	1:A:562:ASN:HD21	1.23	0.86
1:A:591:ASP:H	1:A:606:ASN:HD21	1.26	0.80
1:A:162:ARG:HG3	1:A:169:ASP:OD2	1.82	0.79
1:A:216:ALA:HA	1:A:219:GLN:OE1	1.85	0.77
1:A:454:ASP:CB	1:A:456:GLN:HE21	1.98	0.75
1:A:591:ASP:H	1:A:606:ASN:ND2	1.87	0.72
1:A:295:ASN:HD21	1:A:373:GLY:H	1.38	0.70
1:A:606:ASN:N	1:A:606:ASN:HD22	1.89	0.69
1:A:295:ASN:ND2	1:A:373:GLY:H	1.93	0.67
1:A:200:LEU:HD21	1:A:341:VAL:HG11	1.78	0.65
1:A:439:GLU:H	1:A:439:GLU:CD	2.01	0.64
1:A:523:LEU:HD23	1:A:524:GLN:N	2.13	0.64
1:A:57:GLN:HB2	1:A:418:THR:HB	1.80	0.63
1:A:606:ASN:HD22	1:A:606:ASN:H	1.48	0.61
1:A:454:ASP:CB	1:A:456:GLN:NE2	2.57	0.60
1:A:523:LEU:HD23	1:A:523:LEU:C	2.22	0.59
1:A:213:ASN:ND2	1:A:216:ALA:H	2.00	0.59
1:A:456:GLN:CD	1:A:457:THR:H	2.05	0.58
1:A:299:LEU:HD12	1:A:299:LEU:N	2.19	0.57
1:A:456:GLN:NE2	1:A:457:THR:H	2.02	0.56
1:A:379:SER:O	1:A:384:LYS:HE2	2.04	0.56
1:A:57:GLN:CB	1:A:418:THR:HB	2.36	0.56
1:A:208:GLU:HG3	1:A:209:GLU:OE1	2.06	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:299:LEU:HD23	1:A:428:LYS:CA	2.36	0.55
1:A:33:LEU:H	1:A:562:ASN:ND2	1.98	0.54
1:A:45:TRP:HB3	1:A:599:ALA:CB	2.38	0.53
1:A:311:VAL:HG21	1:A:341:VAL:HG23	1.91	0.53
1:A:198:ALA:O	1:A:202:VAL:HG23	2.08	0.53
1:A:295:ASN:HD21	1:A:373:GLY:N	2.06	0.53
1:A:200:LEU:CD2	1:A:341:VAL:HG11	2.38	0.53
1:A:536:ARG:HH11	1:A:536:ARG:HG3	1.73	0.53
1:A:513:GLU:OE1	1:A:638:ARG:HD2	2.08	0.53
1:A:343:VAL:C	1:A:345:SER:H	2.12	0.53
1:A:199:ARG:NH1	1:A:217:VAL:HG11	2.24	0.52
1:A:215:THR:O	1:A:219:GLN:HG3	2.08	0.52
1:A:453:SER:HB2	1:A:458:ALA:HB2	1.91	0.52
1:A:449:VAL:CG2	1:A:461:ARG:HB2	2.40	0.52
1:A:45:TRP:CE2	1:A:616:ARG:HB3	2.46	0.51
1:A:531:ALA:O	1:A:624:GLN:HB2	2.11	0.51
1:A:45:TRP:HB3	1:A:599:ALA:HB2	1.93	0.51
1:A:296:VAL:C	1:A:297:LEU:HD12	2.32	0.50
1:A:207:ASP:OD2	1:A:210:VAL:HG21	2.13	0.49
1:A:199:ARG:HH12	1:A:217:VAL:HG11	1.76	0.49
1:A:210:VAL:C	1:A:212:ARG:H	2.15	0.49
1:A:209:GLU:HA	1:A:212:ARG:HG2	1.95	0.48
1:A:175:PRO:HG2	1:A:178:ALA:HB2	1.94	0.48
1:A:315:LEU:N	1:A:315:LEU:HD23	2.29	0.48
1:A:154:GLU:OE2	1:A:190:ARG:HD3	2.13	0.47
1:A:299:LEU:HD23	1:A:428:LYS:HA	1.96	0.47
1:A:344:GLY:HA3	1:A:350:ALA:O	2.14	0.47
1:A:606:ASN:N	1:A:606:ASN:ND2	2.60	0.47
1:A:213:ASN:HD21	1:A:216:ALA:H	1.62	0.47
1:A:439:GLU:CD	1:A:439:GLU:N	2.67	0.47
1:A:118:PHE:HB2	1:A:136:THR:HB	1.97	0.46
1:A:449:VAL:HG22	1:A:461:ARG:HB2	1.98	0.46
1:A:320:SER:HA	1:A:330:SER:OG	2.17	0.45
1:A:130:THR:OG1	1:A:160:VAL:HG13	2.17	0.44
1:A:297:LEU:CB	1:A:299:LEU:HD11	2.48	0.44
1:A:202:VAL:HG21	1:A:221:VAL:HG22	1.99	0.43
1:A:410:PHE:CG	1:A:411:PRO:HD2	2.52	0.43
1:A:89:THR:HB	1:A:95:TYR:CD1	2.54	0.42
1:A:209:GLU:HA	1:A:212:ARG:CG	2.50	0.42
1:A:432:VAL:HB	1:A:460:LEU:HB2	2.01	0.42
1:A:244:PRO:HB2	1:A:291:PHE:CD1	2.54	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:538:ALA:HB3	1:A:551:ASP:HB3	2.01	0.42
1:A:456:GLN:OE1	1:A:457:THR:HG23	2.19	0.42
1:A:297:LEU:HD12	1:A:297:LEU:N	2.35	0.42
1:A:299:LEU:HD13	1:A:312:PHE:CD2	2.54	0.42
1:A:536:ARG:NH1	1:A:536:ARG:HG3	2.35	0.42
1:A:539:ILE:HA	1:A:549:VAL:O	2.20	0.41
1:A:25:THR:HG21	1:A:44:LEU:HD13	2.02	0.41
1:A:511:GLN:HA	1:A:590:LEU:O	2.20	0.41
1:A:396:PHE:CE1	1:A:424:PRO:HG3	2.55	0.41
1:A:364:TRP:HB2	1:A:611:LEU:HD13	2.03	0.41
1:A:312:PHE:CE1	1:A:338:ALA:HB2	2.55	0.41
1:A:298:PHE:CE1	1:A:311:VAL:HG22	2.56	0.41
1:A:251:GLN:OE1	1:A:256:ALA:HA	2.21	0.40
1:A:299:LEU:HD13	1:A:312:PHE:HB2	2.04	0.40
1:A:212:ARG:NH1	1:A:212:ARG:HG3	2.37	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	632/634 (100%)	591 (94%)	41 (6%)	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	516/516 (100%)	507 (98%)	9 (2%)	68 57

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	LEU
1	A	57	GLN
1	A	119	ASP
1	A	268	TRP
1	A	297	LEU
1	A	345	SER
1	A	347	GLN
1	A	427	LEU
1	A	606	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	39	ASN
1	A	57	GLN
1	A	156	GLN
1	A	213	ASN
1	A	295	ASN
1	A	434	ASN
1	A	456	GLN
1	A	511	GLN
1	A	562	ASN
1	A	606	ASN
1	A	621	ASN
1	A	639	ASN

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

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

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^{th} 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	634/634 (100%)	0.27	35 (5%) 29 23	8, 16, 39, 61	0

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	345	SER	9.6
1	A	346	GLU	7.7
1	A	20	SER	6.6
1	A	348	GLU	6.2
1	A	207	ASP	6.0
1	A	211	ALA	5.4
1	A	344	GLY	5.2
1	A	347	GLN	5.0
1	A	208	GLU	4.9
1	A	227	LYS	4.6
1	A	21	TYR	4.3
1	A	212	ARG	4.3
1	A	279	ASP	4.3
1	A	210	VAL	3.8
1	A	213	ASN	3.5
1	A	209	GLU	3.5
1	A	349	GLY	3.4
1	A	584	GLN	3.4
1	A	582	ASN	3.3
1	A	214	GLU	3.2
1	A	456	GLN	2.9
1	A	206	LEU	2.9
1	A	228	ASN	2.8
1	A	452	GLU	2.8
1	A	581	GLU	2.8
1	A	280	GLU	2.5
1	A	454	ASP	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	219	GLN	2.3
1	A	322	LEU	2.3
1	A	439	GLU	2.2
1	A	215	THR	2.2
1	A	216	ALA	2.1
1	A	217	VAL	2.1
1	A	444	GLU	2.1
1	A	100	ASP	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 carbohydrates 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.