wwPDB X-ray Structure Validation Summary Report (i)

Feb 1, 2016 – 02:23 PM GMT

PDB ID	:	3XIN
Title	:	PROTEIN ENGINEERING OF XYLOSE (GLUCOSE) ISOMERASE FROM ACTINOPLANES MISSOURIENSIS. 1. CRYSTALLOGRAPHY AND SITE-DIRECTED MUTAGENESIS OF METAL BINDING SITES
Authors	:	Janin, J.
Deposited on	:	1992-04-06
Resolution	:	2.30 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 (i)) were used in the production of this report:

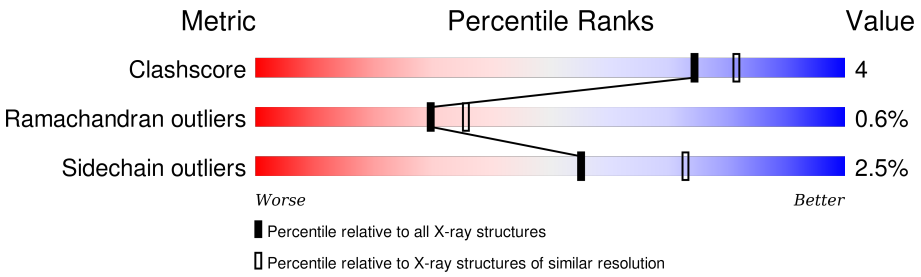
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
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 2.30 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	4452 (2.30-2.30)
Ramachandran outliers	100387	4410 (2.30-2.30)
Sidechain outliers	100360	4409 (2.30-2.30)

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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	393	80% 18% •
1	B	393	81% 16% •
1	C	393	83% 15% •
1	D	393	80% 17% •

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 13116 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 D-XYLOSE ISOMERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	392	3053	1939	533	577	4	0	0	0
1	B	392	3053	1939	533	577	4	0	0	0
1	C	392	3053	1939	533	577	4	0	0	0
1	D	392	3053	1939	533	577	4	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	181	GLN	GLU	CONFLICT	UNP P12851
B	181	GLN	GLU	CONFLICT	UNP P12851
C	181	GLN	GLU	CONFLICT	UNP P12851
D	181	GLN	GLU	CONFLICT	UNP P12851

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	229	229	229	0	0
2	B	221	221	221	0	0
2	C	238	238	238	0	0
2	D	216	216	216	0	0

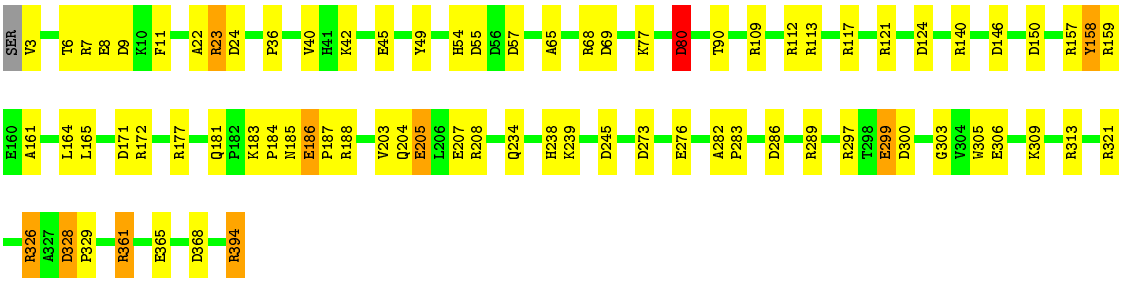
3 Residue-property plots (i)

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.

Note EDS was not executed.

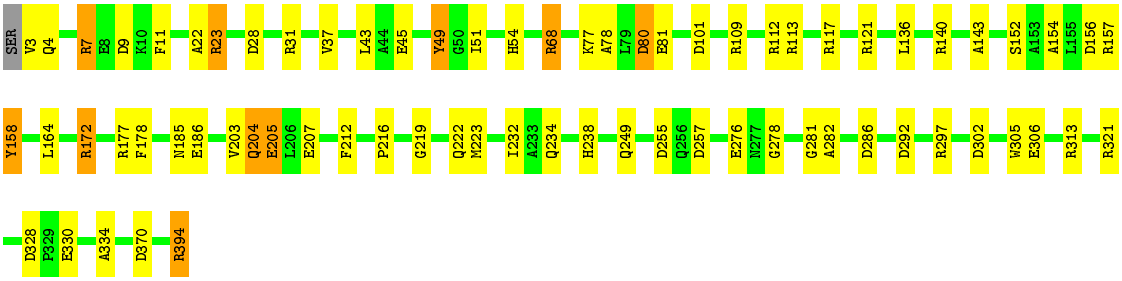
- Molecule 1: D-XYLOSE ISOMERASE

Chain A:



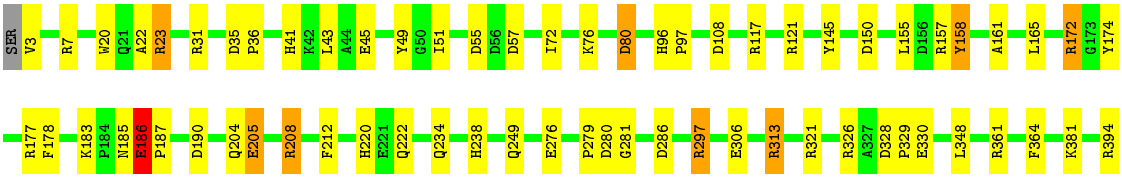
- Molecule 1: D-XYLOSE ISOMERASE

Chain B:



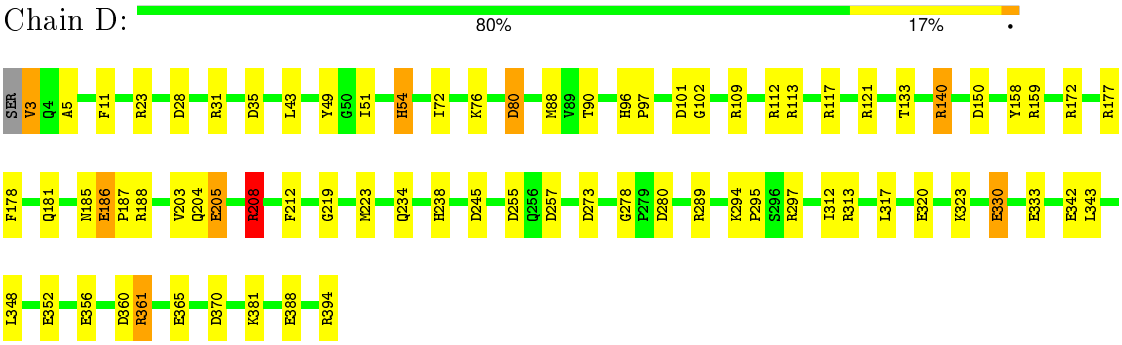
- Molecule 1: D-XYLOSE ISOMERASE

Chain C:



- Molecule 1: D-XYLOSE ISOMERASE

Chain D:


80%
17%
SER
V3
Q4
A5
F11
R23
D28
R31
D35
L43
Y49
G50
I51
H54
I72
K76
D80
M88
V89
T90
H96
P97
D101
G102
R109
R112
R113
R117
R121
T133
R140
D150
Y158
R159
R172
R177
F178
Q181
N185
E186
P187
R188
V203
Q204
E205
R208
F212
G219
M223
Q234
H238
D245
D255
Q256
D257
D273
G278
P279
D280
R289
K294
P295
S296
R297
I312
R313
L317
E320
K323
E330
E333
E342
L343
L348
E352
E356
D360
R361
E365
D370
K381
E388
R394

4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	143.45Å 143.45Å 231.50Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	(Not available) – 2.30	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.30)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.153 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	13116	wwPDB-VP
Average B, all atoms ($Å^2$)	19.0	wwPDB-VP

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	0.80	0/3125	1.66	54/4233 (1.3%)
1	B	0.79	0/3125	1.68	54/4233 (1.3%)
1	C	0.80	0/3125	1.59	48/4233 (1.1%)
1	D	0.80	0/3125	1.62	46/4233 (1.1%)
All	All	0.80	0/12500	1.64	202/16932 (1.2%)

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
1	C	0	1
1	D	0	1
All	All	0	3

There are no bond length outliers.

The worst 5 of 202 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	394	ARG	NE-CZ-NH2	-20.38	110.11	120.30
1	B	172	ARG	NE-CZ-NH1	19.30	129.95	120.30
1	B	117	ARG	NE-CZ-NH1	16.39	128.50	120.30
1	A	172	ARG	NE-CZ-NH1	16.32	128.46	120.30
1	C	172	ARG	NE-CZ-NH1	15.30	127.95	120.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	172	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	C	172	ARG	Sidechain
1	D	208	ARG	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	3053	0	2956	28	0
1	B	3053	0	2956	28	0
1	C	3053	0	2956	23	0
1	D	3053	0	2956	30	0
2	A	229	0	0	1	0
2	B	221	0	0	0	0
2	C	238	0	0	1	0
2	D	216	0	0	4	0
All	All	13116	0	11824	96	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.

The worst 5 of 96 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:204:GLN:OE1	1:D:204:GLN:OE1	1.59	1.18
1:A:204:GLN:OE1	1:C:204:GLN:OE1	1.61	1.15
1:D:208:ARG:HH11	1:D:208:ARG:HG2	1.15	1.11
1:D:234:GLN:HE21	1:D:238:HIS:HE1	1.17	0.92
1:C:234:GLN:HE21	1:C:238:HIS:HE1	1.19	0.86

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	390/393 (99%)	376 (96%)	13 (3%)	1 (0%)	46	57
1	B	390/393 (99%)	375 (96%)	13 (3%)	2 (0%)	34	41
1	C	390/393 (99%)	376 (96%)	10 (3%)	4 (1%)	19	21
1	D	390/393 (99%)	375 (96%)	13 (3%)	2 (0%)	34	41
All	All	1560/1572 (99%)	1502 (96%)	49 (3%)	9 (1%)	30	36

5 of 9 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	280	ASP
1	A	186	GLU
1	B	186	GLU
1	C	186	GLU
1	C	279	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	306/310 (99%)	296 (97%)	10 (3%)	45	61
1	B	306/310 (99%)	300 (98%)	6 (2%)	63	79
1	C	306/310 (99%)	300 (98%)	6 (2%)	63	79
1	D	306/310 (99%)	298 (97%)	8 (3%)	54	71
All	All	1224/1240 (99%)	1194 (98%)	30 (2%)	55	73

5 of 30 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	158	TYR
1	C	3	VAL
1	D	203	VAL
1	B	394	ARG
1	C	49	TYR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	222	GLN
1	B	238	HIS
1	C	238	HIS
1	B	204	GLN
1	C	222	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 carbohydrates 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)

EDS was not executed - this section will therefore be empty.

6.2 Non-standard residues in protein, DNA, RNA chains (i)

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates (i)

EDS was not executed - this section will therefore be empty.

6.4 Ligands (i)

EDS was not executed - this section will therefore be empty.

6.5 Other polymers (i)

EDS was not executed - this section will therefore be empty.