Full wwPDB X-ray Structure Validation Report ⓘ

Apr 28, 2025 – 06:32 PM EDT

PDB ID	:	3TH6 / pdb_00003th6
Title	:	Crystal structure of Triosephosphate isomerase from Rhipicephalus (Boophilus) microplus.
Authors	:	Arreola, R.; Rodriguez-Romero, A.; Moraes, J.; Gomez-Puyou, A.; Perez-Montfort, R.; Logullo, C.
Deposited on	:	2011-08-18
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 ⓘ 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:

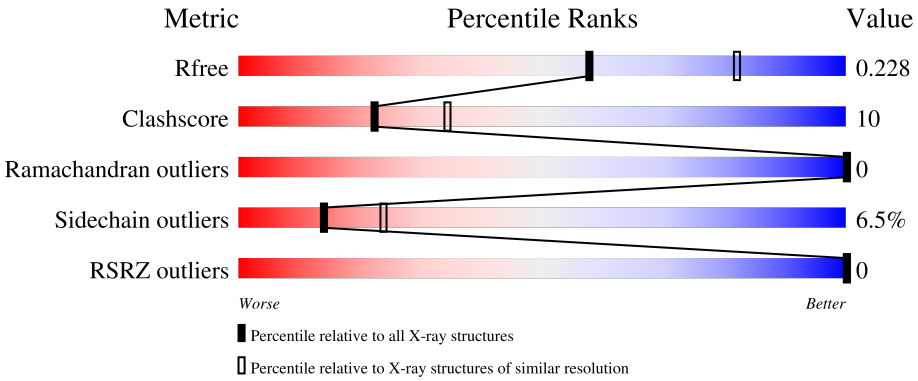
MolProbity	:	4-5-2 with Phenix2.0rc1
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.43.1

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))
R_{free}	164625	4642 (2.40-2.40)
Clashscore	180529	5218 (2.40-2.40)
Ramachandran outliers	177936	5158 (2.40-2.40)
Sidechain outliers	177891	5159 (2.40-2.40)
RSRZ outliers	164620	4642 (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	249	71% 23%
1	B	249	74% 20%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3828 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 Triosephosphate isomerase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	244	Total	C	N	O	S	5	0	0
			1866	1171	334	349	12			
1	B	241	Total	C	N	O	S	0	0	0
			1850	1163	331	344	12			

- Molecule 2 is water.

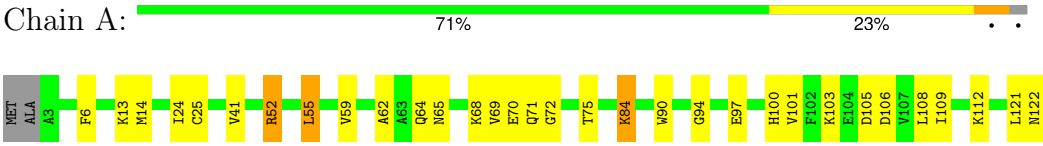
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	60	Total	O	0	0
			60	60		
2	B	52	Total	O	0	0
			52	52		

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.

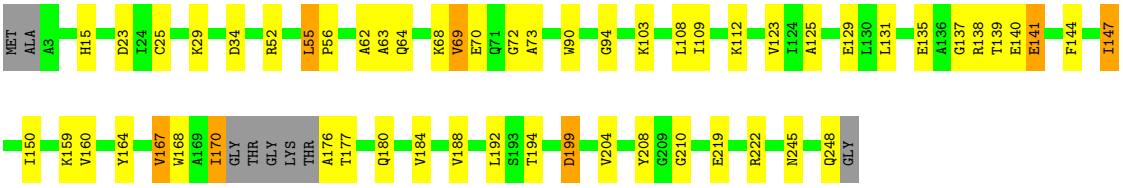
- Molecule 1: Triosephosphate isomerase

Chain A:



- Molecule 1: Triosephosphate isomerase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, α, β, γ	53.38Å 53.38Å 278.77Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	46.46 – 2.40 46.46 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.9 (46.46-2.40) 99.9 (46.46-2.40)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	0.10	Depositor
$< I/\sigma(I) >$ [1]	4.93 (at 2.39Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.186 , 0.228 0.186 , 0.228	Depositor DCC
R_{free} test set	1773 reflections (10.38%)	wwPDB-VP
Wilson B-factor (Å^2)	28.5	Xtriage
Anisotropy	0.409	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 19.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.35$	Xtriage
Estimated twinning fraction	0.487 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	3828	wwPDB-VP
Average B, all atoms (Å^2)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.03% 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

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	0.46	0/1901	0.97	5/2569 (0.2%)
1	B	0.44	0/1885	0.95	6/2549 (0.2%)
All	All	0.45	0/3786	0.96	11/5118 (0.2%)

There are no bond length outliers.

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	72	GLY	N-CA-C	6.22	119.37	111.09
1	A	123	VAL	N-CA-C	6.04	117.46	108.46
1	B	34	ASP	CA-C-N	6.00	126.16	119.32
1	B	34	ASP	C-N-CA	6.00	126.16	119.32
1	B	123	VAL	N-CA-C	5.97	116.71	108.12
1	B	72	GLY	N-CA-C	5.89	118.93	111.09
1	A	68	LYS	N-CA-C	5.60	119.74	113.02
1	A	106	ASP	N-CA-C	5.51	118.00	111.33
1	A	160	VAL	N-CA-C	5.39	116.24	108.48
1	B	68	LYS	N-CA-C	5.15	119.20	113.02
1	B	63	ALA	N-CA-C	-5.12	102.49	110.42

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	1866	0	1860	46	0
1	B	1850	0	1847	35	0
2	A	60	0	0	1	0
2	B	52	0	0	2	0
All	All	3828	0	3707	77	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 10.

All (77) 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:108:LEU:HD11	1:A:112:LYS:HE3	1.63	0.81
1:B:108:LEU:HD11	1:B:112:LYS:HE3	1.63	0.79
1:A:52:ARG:HD3	1:A:52:ARG:O	1.87	0.75
1:B:167:VAL:O	1:B:170:ILE:HG23	1.88	0.73
1:A:71:GLN:HG2	1:B:15:HIS:CD2	2.27	0.68
1:A:147:ILE:HD11	1:A:162:ILE:HD13	1.76	0.68
1:A:25:CYS:SG	1:A:55:LEU:HD13	2.34	0.67
1:A:52:ARG:HD3	1:A:52:ARG:C	2.23	0.62
1:A:208:TYR:CZ	1:A:210:GLY:HA3	2.37	0.60
1:A:218:LYS:HG2	1:A:222:ARG:NH2	2.17	0.59
1:A:122:ASN:OD1	1:A:159:LYS:HD2	2.01	0.59
1:B:147:ILE:HD12	1:B:188:VAL:HG13	1.85	0.59
1:B:199:ASP:OD2	1:B:199:ASP:N	2.37	0.58
1:B:245:ASN:HB3	1:B:248:GLN:HG3	1.84	0.58
1:B:194:THR:HB	2:B:273:HOH:O	2.03	0.57
1:B:138:ARG:O	1:B:141:GLU:HG2	2.05	0.56
1:A:138:ARG:HB3	1:A:141:GLU:HG2	1.89	0.54
1:B:62:ALA:HB2	1:B:90:TRP:HB2	1.90	0.53
1:A:108:LEU:HD13	1:A:108:LEU:C	2.34	0.53
1:B:138:ARG:HA	1:B:141:GLU:CD	2.34	0.52
1:B:219:GLU:O	1:B:222:ARG:HG2	2.09	0.52
1:B:125:ALA:HB1	1:B:150:ILE:HD13	1.92	0.52
1:B:137:GLY:HA2	2:B:276:HOH:O	2.10	0.51
1:A:247:MET:HA	1:A:247:MET:HE2	1.92	0.51
1:A:84:LYS:HG3	1:A:121:LEU:HD13	1.91	0.51
1:B:25:CYS:SG	1:B:55:LEU:HD13	2.51	0.50
1:A:140:GLU:OE1	1:A:187:LYS:NZ	2.45	0.49
1:B:177:THR:H	1:B:180:GLN:HE21	1.60	0.49
1:B:108:LEU:CD1	1:B:112:LYS:HE3	2.38	0.49
1:A:177:THR:OG1	1:A:180:GLN:HG2	2.13	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:64:GLN:O	1:A:65:ASN:HB2	2.13	0.48
1:A:176:ALA:HA	1:A:180:GLN:OE1	2.14	0.48
1:B:208:TYR:CZ	1:B:210:GLY:HA3	2.47	0.48
1:A:125:ALA:HB1	1:A:150:ILE:HD13	1.96	0.48
1:A:62:ALA:HB2	1:A:90:TRP:HB2	1.96	0.47
1:A:218:LYS:HG2	1:A:222:ARG:HH21	1.79	0.47
1:B:52:ARG:NH2	1:B:55:LEU:HB3	2.29	0.47
1:A:237:LYS:HD2	1:A:239:GLU:OE1	2.15	0.47
1:A:69:VAL:HG12	1:A:70:GLU:N	2.30	0.46
1:A:94:GLY:HA2	1:A:109:ILE:HD13	1.96	0.46
1:A:141:GLU:O	1:A:145:ARG:HG3	2.15	0.46
1:A:75:THR:HG23	1:B:64:GLN:HB3	1.98	0.46
1:B:25:CYS:SG	1:B:55:LEU:CD1	3.04	0.46
1:B:140:GLU:HB3	1:B:144:PHE:CE2	2.51	0.46
1:B:168:TRP:CZ2	1:B:176:ALA:HB2	2.51	0.46
1:B:192:LEU:HD13	1:B:204:VAL:HG11	1.98	0.45
1:A:52:ARG:NH2	1:A:59:VAL:O	2.42	0.45
1:A:134:ARG:C	1:A:136:ALA:H	2.25	0.45
1:B:129:GLU:O	1:B:167:VAL:HG13	2.17	0.45
1:B:131:LEU:O	1:B:135:GLU:HG3	2.17	0.44
1:B:138:ARG:HA	1:B:141:GLU:CG	2.47	0.44
1:A:13:LYS:HD3	1:B:73:ALA:HA	1.98	0.44
1:A:144:PHE:O	1:A:147:ILE:HG22	2.18	0.44
1:A:138:ARG:CB	1:A:141:GLU:HG2	2.47	0.44
1:B:108:LEU:HD11	1:B:112:LYS:CE	2.39	0.44
1:A:97:GLU:O	1:A:101:VAL:HB	2.18	0.43
1:A:41:VAL:HG21	1:A:55:LEU:HD21	2.00	0.43
1:B:29:LYS:HB3	1:B:56:PRO:HD3	2.00	0.43
1:B:164:TYR:CE1	1:B:184:VAL:HG11	2.53	0.43
1:A:69:VAL:CG1	1:A:70:GLU:N	2.81	0.43
1:A:140:GLU:HB3	1:A:144:PHE:CE2	2.53	0.43
1:A:24:ILE:HG23	2:A:264:HOH:O	2.18	0.43
1:A:169:ALA:C	1:A:171:GLY:H	2.27	0.43
1:A:157:TRP:HA	1:A:160:VAL:HG12	2.01	0.42
1:B:29:LYS:HB2	1:B:29:LYS:HE3	1.85	0.42
1:A:69:VAL:HG12	1:A:71:GLN:H	1.83	0.42
1:A:100:HIS:CE1	1:A:130:LEU:HD21	2.55	0.42
1:A:6:PHE:CZ	1:A:228:GLY:HA2	2.54	0.42
1:A:182:GLN:HB2	1:A:223:LYS:CG	2.50	0.42
1:A:14:MET:HE1	1:B:69:VAL:O	2.19	0.42
1:B:94:GLY:HA2	1:B:109:ILE:HD13	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:129:GLU:OE2	1:B:139:THR:HG23	2.21	0.41
1:B:168:TRP:CH2	1:B:176:ALA:HB2	2.55	0.41
1:A:25:CYS:SG	1:A:55:LEU:CD1	3.06	0.41
1:A:41:VAL:CG2	1:A:55:LEU:HD21	2.51	0.41
1:A:55:LEU:HD12	1:A:55:LEU:HA	1.92	0.40
1:A:108:LEU:HD11	1:A:112:LYS:CE	2.43	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	240/249 (96%)	231 (96%)	9 (4%)	0	100	100
1	B	237/249 (95%)	230 (97%)	7 (3%)	0	100	100
All	All	477/498 (96%)	461 (97%)	16 (3%)	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	200/203 (98%)	186 (93%)	14 (7%)	12	21
1	B	199/203 (98%)	187 (94%)	12 (6%)	16	27

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	399/406 (98%)	373 (94%)	26 (6%)	14 24

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	ARG
1	A	55	LEU
1	A	84	LYS
1	A	103	LYS
1	A	105	ASP
1	A	138	ARG
1	A	141	GLU
1	A	155	LYS
1	A	159	LYS
1	A	180	GLN
1	A	202	SER
1	A	218	LYS
1	A	219	GLU
1	A	223	LYS
1	B	23	ASP
1	B	55	LEU
1	B	69	VAL
1	B	70	GLU
1	B	103	LYS
1	B	141	GLU
1	B	147	ILE
1	B	159	LYS
1	B	160	VAL
1	B	167	VAL
1	B	170	ILE
1	B	199	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	15	HIS
1	A	26	ASN
1	A	122	ASN
1	A	149	HIS
1	A	213	ASN
1	B	149	HIS

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Mol	Chain	Res	Type
1	B	180	GLN
1	B	190	ASN
1	B	195	ASN
1	B	248	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

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	244/249 (97%)	-1.69	0	100	100	15, 28, 49, 66	2 (0%)
1	B	241/249 (96%)	-1.70	0	100	100	15, 27, 48, 64	0
All	All	485/498 (97%)	-1.70	0	100	100	15, 28, 50, 66	2 (0%)

There are no RSRZ outliers to report.

6.2 Non-standard residues in protein, DNA, RNA chains

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

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.