Full wwPDB X-ray Structure Validation Report ⓘ

Sep 2, 2023 – 05:31 PM EDT

PDB ID	:	3R6B
Title	:	Crystal Structure of Thrombospondin-1 TSR Domains 2 and 3
Authors	:	Page, R.C.; Klenotic, P.A.; Misra, S.; Silverstein, R.L.
Deposited on	:	2011-03-21
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:

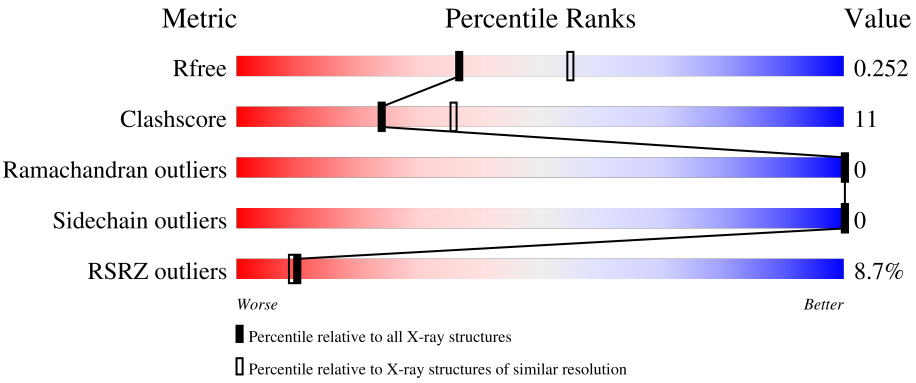
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

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}	130704	3907 (2.40-2.40)
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	153	7% 61% 14% 25%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 981 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 Thrombospondin-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	115	855	518	158	166	13	0	0	0

There are 39 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	425	GLY	-	expression tag	UNP P07996
A	426	ALA	-	expression tag	UNP P07996
A	427	MET	-	expression tag	UNP P07996
A	428	ASP	-	expression tag	UNP P07996
A	429	PRO	-	expression tag	UNP P07996
A	430	GLU	-	expression tag	UNP P07996
A	431	PHE	-	expression tag	UNP P07996
A	432	GLU	-	expression tag	UNP P07996
A	433	LEU	-	expression tag	UNP P07996
A	548	LEU	-	expression tag	UNP P07996
A	549	GLU	-	expression tag	UNP P07996
A	550	PRO	-	expression tag	UNP P07996
A	551	TYR	-	expression tag	UNP P07996
A	552	THR	-	expression tag	UNP P07996
A	553	TYR	-	expression tag	UNP P07996
A	554	ARG	-	expression tag	UNP P07996
A	555	VAL	-	expression tag	UNP P07996
A	556	ARG	-	expression tag	UNP P07996
A	557	PHE	-	expression tag	UNP P07996
A	558	LEU	-	expression tag	UNP P07996
A	559	ALA	-	expression tag	UNP P07996
A	560	LYS	-	expression tag	UNP P07996
A	561	GLU	-	expression tag	UNP P07996
A	562	ASN	-	expression tag	UNP P07996
A	563	VAL	-	expression tag	UNP P07996
A	564	THR	-	expression tag	UNP P07996
A	565	GLN	-	expression tag	UNP P07996

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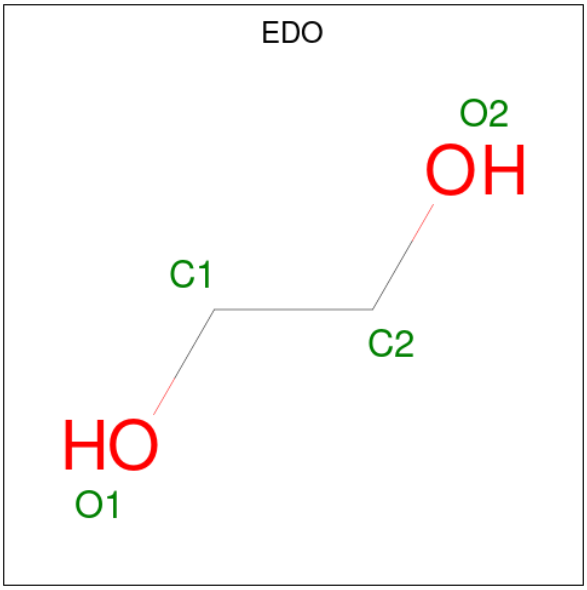
Chain	Residue	Modelled	Actual	Comment	Reference
A	566	ASP	-	expression tag	UNP P07996
A	567	ALA	-	expression tag	UNP P07996
A	568	GLU	-	expression tag	UNP P07996
A	569	ASP	-	expression tag	UNP P07996
A	570	ASN	-	expression tag	UNP P07996
A	571	THR	-	expression tag	UNP P07996
A	572	VAL	-	expression tag	UNP P07996
A	573	SER	-	expression tag	UNP P07996
A	574	PHE	-	expression tag	UNP P07996
A	575	LEU	-	expression tag	UNP P07996
A	576	GLN	-	expression tag	UNP P07996
A	577	PRO	-	expression tag	UNP P07996

- Molecule 2 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			4	2	2		
2	A	1	Total	C	O	0	0
			4	2	2		
2	A	1	Total	C	O	0	0
			4	2	2		
2	A	1	Total	C	O	0	0
			4	2	2		
2	A	1	Total	C	O	0	0
			4	2	2		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O 4 2 2	0	0
2	A	1	Total C O 4 2 2	0	0
2	A	1	Total C O 4 2 2	0	0

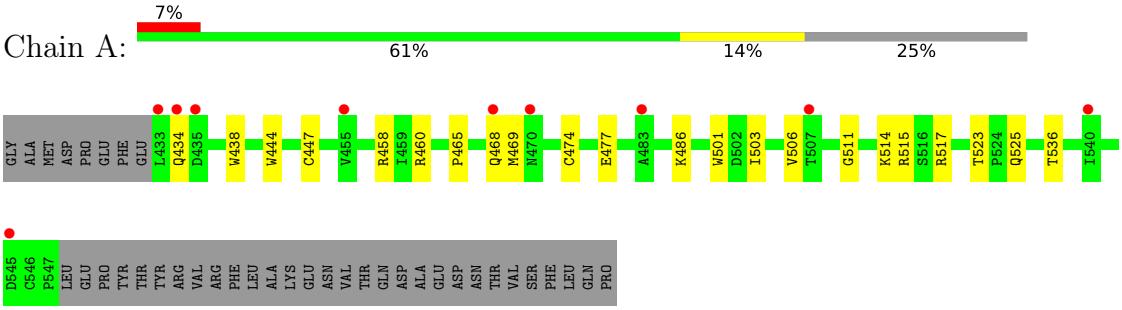
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	94	Total O 94 94	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: Thrombospondin-1



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	66.36Å 84.82Å 60.71Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.35 – 2.40 30.35 – 2.40	Depositor EDS
% Data completeness (in resolution range)	93.3 (30.35-2.40) 93.0 (30.35-2.40)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	4.44 (at 2.39Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7_650)	Depositor
R, R_{free}	0.235 , 0.273 0.214 , 0.252	Depositor DCC
R_{free} test set	657 reflections (10.01%)	wwPDB-VP
Wilson B-factor (Å^2)	39.7	Xtriage
Anisotropy	0.528	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 53.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.52$, $< L^2 > = 0.36$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	981	wwPDB-VP
Average B, all atoms (Å^2)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.88% 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

Bond lengths and bond angles in the following residue types are not validated in this section: EDO

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	0.34	0/878	0.58	0/1193

There are no bond length outliers.

There are no bond angle outliers.

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	855	0	785	17	0
2	A	32	0	48	6	0
3	A	94	0	0	3	0
All	All	981	0	833	19	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 11.

All (19) 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:434:GLN:H	1:A:468:GLN:HB3	1.48	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:468:GLN:OE1	1:A:468:GLN:HA	1.85	0.76
1:A:447:CYS:HB2	2:A:3:EDO:H22	1.77	0.66
1:A:486:LYS:NZ	2:A:3:EDO:H11	2.17	0.60
1:A:438:TRP:CE2	1:A:474:CYS:HB3	2.40	0.56
1:A:444:TRP:CE2	1:A:458:ARG:HD3	2.41	0.55
1:A:438:TRP:CE3	1:A:460:ARG:HG3	2.42	0.55
1:A:514:LYS:HD2	1:A:536:THR:HG21	1.89	0.53
2:A:8:EDO:H21	3:A:39:HOH:O	2.09	0.52
1:A:434:GLN:NE2	1:A:465:PRO:HB2	2.25	0.52
1:A:486:LYS:HZ1	2:A:3:EDO:H11	1.76	0.51
1:A:517:ARG:HH12	2:A:7:EDO:H12	1.77	0.49
1:A:501:TRP:CE2	1:A:515:ARG:HD3	2.48	0.48
1:A:506:VAL:HG22	1:A:511:GLY:HA3	1.95	0.47
1:A:468:GLN:HG3	1:A:469:MET:H	1.79	0.47
1:A:523:THR:O	1:A:525:GLN:HG3	2.14	0.46
1:A:503:ILE:O	1:A:503:ILE:HD12	2.16	0.46
2:A:1:EDO:H12	3:A:34:HOH:O	2.19	0.42
1:A:477:GLU:HB2	3:A:87:HOH:O	2.21	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	113/153 (74%)	111 (98%)	2 (2%)	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	96/131 (73%)	96 (100%)	0	100 100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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)

8 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	EDO	A	4	-	3,3,3	0.47	0	2,2,2	0.34	0
2	EDO	A	8	-	3,3,3	0.72	0	2,2,2	0.83	0
2	EDO	A	7	-	3,3,3	0.25	0	2,2,2	0.73	0
2	EDO	A	6	-	3,3,3	0.68	0	2,2,2	0.68	0
2	EDO	A	3	-	3,3,3	0.45	0	2,2,2	0.37	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	EDO	A	1	-	3,3,3	0.47	0	2,2,2	0.35	0
2	EDO	A	2	-	3,3,3	0.45	0	2,2,2	0.41	0
2	EDO	A	5	-	3,3,3	0.47	0	2,2,2	0.35	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	EDO	A	4	-	-	1/1/1/1	-
2	EDO	A	8	-	-	1/1/1/1	-
2	EDO	A	7	-	-	1/1/1/1	-
2	EDO	A	6	-	-	1/1/1/1	-
2	EDO	A	3	-	-	0/1/1/1	-
2	EDO	A	1	-	-	0/1/1/1	-
2	EDO	A	2	-	-	0/1/1/1	-
2	EDO	A	5	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	4	EDO	O1-C1-C2-O2
2	A	8	EDO	O1-C1-C2-O2
2	A	6	EDO	O1-C1-C2-O2
2	A	7	EDO	O1-C1-C2-O2

There are no ring outliers.

4 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	8	EDO	1	0
2	A	7	EDO	1	0
2	A	3	EDO	3	0
2	A	1	EDO	1	0

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, 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	115/153 (75%)	0.24	10 (8%)	10	9	24, 41, 85, 101	0

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	470	ASN	3.6
1	A	435	ASP	3.0
1	A	483	ALA	2.7
1	A	468	GLN	2.6
1	A	507	THR	2.4
1	A	433	LEU	2.3
1	A	545	ASP	2.2
1	A	455	VAL	2.1
1	A	540	ILE	2.1
1	A	434	GLN	2.0

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	EDO	A	5	4/4	0.74	0.24	73,74,76,78	0
2	EDO	A	1	4/4	0.75	0.15	72,73,74,74	0
2	EDO	A	4	4/4	0.76	0.32	69,69,70,71	0
2	EDO	A	6	4/4	0.77	0.33	75,76,77,79	0
2	EDO	A	3	4/4	0.83	0.25	68,69,71,72	0
2	EDO	A	7	4/4	0.83	0.21	68,69,69,71	0
2	EDO	A	8	4/4	0.86	0.23	73,74,75,75	0
2	EDO	A	2	4/4	0.88	0.29	48,49,50,52	0

6.5 Other polymers (i)

There are no such residues in this entry.