Full wwPDB NMR Structure Validation Report (i)

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PDB ID	:	1TNX
Title	:	NMR SOLUTION STRUCTURE OF CALCIUM SATURATED SKELETAL MUSCLE TROPONIN C
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Deposited on	:	1995-08-23

This is a Full wwPDB NMR 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/NMRValidationReportHelp
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:

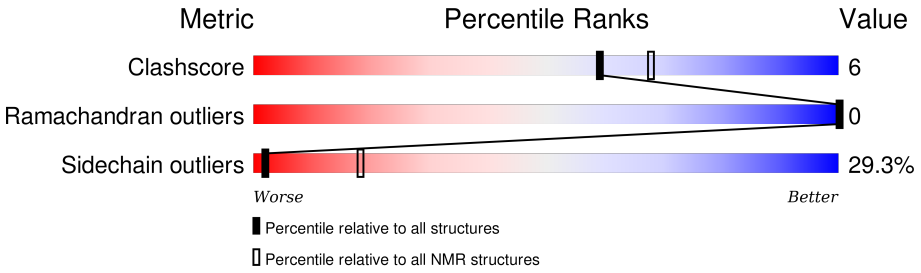
Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Mogul	:	unknown
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	rb-20027457
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20027457

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
SOLUTION NMR

The overall completeness of chemical shifts assignment was not calculated.

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)	NMR archive (#Entries)
Clashscore	114402	11133
Ramachandran outliers	111179	9975
Sidechain outliers	111093	9958

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and 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%

Mol	Chain	Length	Quality of chain
1	A	162	36% 36% 17% • 10%

2 Ensemble composition and analysis

This entry contains 1 models. Identification of well-defined residues and clustering analysis are not possible.

3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 2250 atoms, of which 1101 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called TROPONIN C.

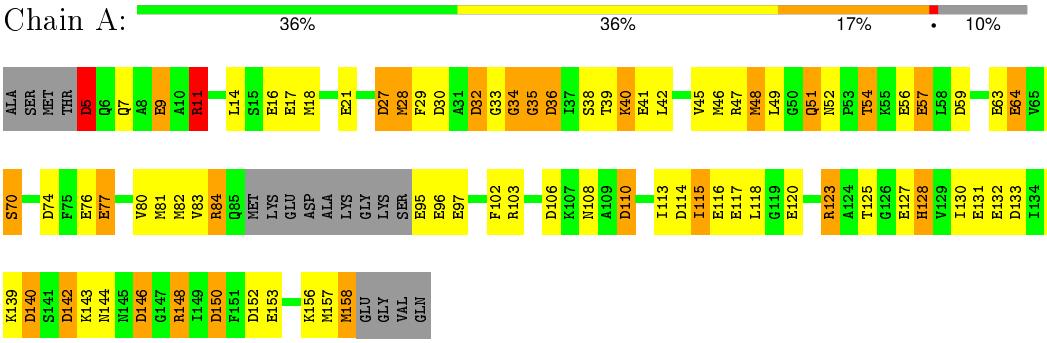
Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	145	2250	711	1101	181	247	10	0

4 Residue-property plots (i)

These plots are provided for all protein, RNA and DNA chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-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. Stretches of 2 or more consecutive residues without any outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

- Molecule 1: TROPONIN C

Chain A:



5 Refinement protocol and experimental data overview

Of the ? calculated structures, 1 were deposited, based on the following criterion: *?*.

The following table shows the software used for structure solution, optimisation and refinement.

Software name	Classification	Version
X-PLOR	refinement	3.1

No chemical shift data was provided. No validations of the models with respect to experimental NMR restraints is performed at this time.

6 Model quality

6.1 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 (average) 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	2.90	48/1160 (4.1%)	2.45	76/1550 (4.9%)
All	All	2.90	48/1160 (4.1%)	2.45	76/1550 (4.9%)

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	Planarity
1	A	0	3
All	All	0	3

All bond outliers are listed below. They are sorted according to the Z-score.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	34	GLY	C-O	-42.16	0.56	1.23
1	A	34	GLY	C-N	-25.95	0.86	1.33
1	A	158	MET	C-O	-24.91	0.76	1.23
1	A	33	GLY	C-O	-24.05	0.85	1.23
1	A	127	GLU	C-O	-19.05	0.87	1.23
1	A	127	GLU	C-N	-13.86	1.02	1.34
1	A	95	GLU	N-CA	-12.18	1.22	1.46
1	A	16	GLU	CD-OE2	10.31	1.36	1.25
1	A	63	GLU	CD-OE2	10.18	1.36	1.25
1	A	67	GLU	CD-OE2	10.11	1.36	1.25
1	A	117	GLU	CD-OE2	10.11	1.36	1.25
1	A	95	GLU	CD-OE2	10.06	1.36	1.25
1	A	56	GLU	CD-OE2	10.01	1.36	1.25
1	A	135	GLU	CD-OE2	9.92	1.36	1.25
1	A	33	GLY	CA-C	-9.88	1.36	1.51
1	A	9	GLU	CD-OE2	9.80	1.36	1.25
1	A	96	GLU	CD-OE2	9.79	1.36	1.25
1	A	21	GLU	CD-OE2	9.69	1.36	1.25

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	97	GLU	CD-OE2	9.68	1.36	1.25
1	A	41	GLU	CD-OE2	9.56	1.36	1.25
1	A	127	GLU	CD-OE2	9.54	1.36	1.25
1	A	131	GLU	CD-OE2	9.47	1.36	1.25
1	A	120	GLU	CD-OE2	9.44	1.36	1.25
1	A	116	GLU	CD-OE2	9.33	1.35	1.25
1	A	76	GLU	CD-OE2	9.28	1.35	1.25
1	A	132	GLU	CD-OE2	9.28	1.35	1.25
1	A	17	GLU	CD-OE2	9.25	1.35	1.25
1	A	57	GLU	CD-OE2	9.20	1.35	1.25
1	A	64	GLU	CD-OE2	9.08	1.35	1.25
1	A	153	GLU	CD-OE2	8.90	1.35	1.25
1	A	77	GLU	CD-OE2	8.77	1.35	1.25
1	A	11	ARG	CZ-NH2	-8.51	1.22	1.33
1	A	103	ARG	CZ-NH2	-8.48	1.22	1.33
1	A	148	ARG	CZ-NH2	-8.39	1.22	1.33
1	A	33	GLY	C-N	-8.08	1.18	1.33
1	A	158	MET	CA-C	-7.93	1.32	1.52
1	A	34	GLY	N-CA	-7.60	1.34	1.46
1	A	70	SER	C-O	-7.27	1.09	1.23
1	A	103	ARG	CZ-NH1	-7.23	1.23	1.33
1	A	47	ARG	CZ-NH2	-6.78	1.24	1.33
1	A	70	SER	C-N	-6.66	1.21	1.33
1	A	32	ASP	C-O	-6.46	1.11	1.23
1	A	118	LEU	C-O	-6.39	1.11	1.23
1	A	51	GLN	C-O	-6.33	1.11	1.23
1	A	144	ASN	C-N	-5.91	1.20	1.34
1	A	35	GLY	C-O	-5.85	1.14	1.23
1	A	123	ARG	CZ-NH2	-5.12	1.26	1.33
1	A	110	ASP	CG-OD2	5.07	1.37	1.25

All angle outliers are listed below. They are sorted according to the Z-score.

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	34	GLY	O-C-N	-36.09	61.85	123.20
1	A	34	GLY	CA-C-N	19.10	154.39	116.20
1	A	11	ARG	NE-CZ-NH1	18.31	129.46	120.30
1	A	148	ARG	NE-CZ-NH1	17.68	129.14	120.30
1	A	47	ARG	NE-CZ-NH1	15.87	128.24	120.30
1	A	103	ARG	NE-CZ-NH1	15.82	128.21	120.30
1	A	34	GLY	C-N-CA	15.80	155.49	122.30
1	A	127	GLU	O-C-N	-13.53	101.06	122.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	47	ARG	NE-CZ-NH2	-12.96	113.82	120.30
1	A	34	GLY	CA-C-O	12.87	143.76	120.60
1	A	42	LEU	CB-CG-CD2	10.11	128.19	111.00
1	A	11	ARG	NE-CZ-NH2	-9.84	115.38	120.30
1	A	40	LYS	N-CA-CB	9.37	127.46	110.60
1	A	68	ASP	CB-CG-OD2	-9.26	109.97	118.30
1	A	32	ASP	CB-CG-OD2	-8.75	110.43	118.30
1	A	158	MET	CA-C-O	8.48	137.91	120.10
1	A	36	ASP	CB-CG-OD2	-8.18	110.94	118.30
1	A	33	GLY	CA-C-N	7.94	132.07	116.20
1	A	28	MET	N-CA-CB	7.93	124.87	110.60
1	A	66	ASP	CB-CG-OD2	-7.85	111.23	118.30
1	A	139	LYS	N-CA-CB	7.80	124.64	110.60
1	A	54	THR	CA-CB-CG2	7.74	123.23	112.40
1	A	136	ASP	CB-CG-OD2	-7.66	111.41	118.30
1	A	5	ASP	CB-CG-OD2	-7.64	111.43	118.30
1	A	140	ASP	CB-CG-OD2	-7.63	111.44	118.30
1	A	27	ASP	CB-CG-OD1	7.57	125.11	118.30
1	A	68	ASP	CB-CG-OD1	7.41	124.97	118.30
1	A	148	ARG	NH1-CZ-NH2	-7.40	111.26	119.40
1	A	59	ASP	CB-CG-OD2	-7.31	111.72	118.30
1	A	74	ASP	CB-CG-OD2	-7.25	111.78	118.30
1	A	139	LYS	CD-CE-NZ	-7.18	95.19	111.70
1	A	152	ASP	CB-CG-OD2	-7.01	111.99	118.30
1	A	114	ASP	CB-CG-OD2	-6.98	112.02	118.30
1	A	74	ASP	CB-CG-OD1	6.86	124.48	118.30
1	A	27	ASP	CB-CG-OD2	-6.84	112.14	118.30
1	A	32	ASP	CB-CG-OD1	6.63	124.27	118.30
1	A	103	ARG	CG-CD-NE	-6.50	98.15	111.80
1	A	128	HIS	N-CA-CB	-6.46	98.96	110.60
1	A	127	GLU	CA-C-N	6.39	131.27	117.20
1	A	48	MET	CB-CA-C	6.38	123.17	110.40
1	A	103	ARG	NH1-CZ-NH2	-6.32	112.45	119.40
1	A	152	ASP	CB-CG-OD1	6.24	123.91	118.30
1	A	123	ARG	NE-CZ-NH1	6.21	123.41	120.30
1	A	123	ARG	NE-CZ-NH2	-6.17	117.22	120.30
1	A	47	ARG	CG-CD-NE	-6.17	98.85	111.80
1	A	59	ASP	CB-CG-OD1	6.15	123.83	118.30
1	A	142	ASP	CB-CG-OD2	-6.12	112.79	118.30
1	A	150	ASP	CB-CG-OD2	-6.03	112.88	118.30
1	A	33	GLY	C-N-CA	6.00	134.91	122.30
1	A	106	ASP	CB-CG-OD2	-5.99	112.91	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	5	ASP	CB-CG-OD1	5.96	123.67	118.30
1	A	110	ASP	CB-CG-OD2	-5.96	112.94	118.30
1	A	140	ASP	CB-CG-OD1	5.94	123.65	118.30
1	A	128	HIS	CG-ND1-CE1	-5.91	98.01	105.70
1	A	146	ASP	CB-CG-OD2	-5.82	113.06	118.30
1	A	133	ASP	CB-CG-OD2	-5.76	113.12	118.30
1	A	36	ASP	CB-CG-OD1	5.74	123.46	118.30
1	A	83	VAL	CA-CB-CG1	5.73	119.50	110.90
1	A	142	ASP	CB-CG-OD1	5.69	123.42	118.30
1	A	114	ASP	CB-CG-OD1	5.68	123.41	118.30
1	A	146	ASP	CB-CG-OD1	5.65	123.39	118.30
1	A	136	ASP	CB-CG-OD1	5.63	123.36	118.30
1	A	11	ARG	NH1-CZ-NH2	-5.61	113.23	119.40
1	A	9	GLU	N-CA-CB	5.54	120.58	110.60
1	A	150	ASP	CB-CG-OD1	5.51	123.26	118.30
1	A	66	ASP	CB-CG-OD1	5.44	123.20	118.30
1	A	133	ASP	CB-CG-OD1	5.33	123.10	118.30
1	A	33	GLY	N-CA-C	5.23	126.18	113.10
1	A	42	LEU	CD1-CG-CD2	-5.23	94.81	110.50
1	A	80	VAL	CG1-CB-CG2	-5.23	102.53	110.90
1	A	131	GLU	CB-CA-C	5.21	120.83	110.40
1	A	103	ARG	CA-CB-CG	-5.21	101.94	113.40
1	A	139	LYS	CB-CG-CD	-5.09	98.37	111.60
1	A	110	ASP	CB-CG-OD1	5.03	122.83	118.30
1	A	106	ASP	CB-CG-OD1	5.03	122.82	118.30
1	A	30	ASP	CB-CG-OD2	-5.00	113.80	118.30

There are no chirality outliers.

All planar outliers are listed below.

Mol	Chain	Res	Type	Group
1	A	84	ARG	Sidechain
1	A	148	ARG	Sidechain
1	A	123	ARG	Sidechain

6.2 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 each 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 averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	1149	1101	1068	13
All	All	1149	1101	1068	13

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 6.

All clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:158:MET:CA	1:A:158:MET:O	1.14	1.95
1:A:34:GLY:O	1:A:34:GLY:CA	1.10	1.97
1:A:34:GLY:C	1:A:35:GLY:CA	1.01	2.28
1:A:158:MET:C	1:A:158:MET:O	0.95	0.76
1:A:34:GLY:CA	1:A:35:GLY:N	0.87	2.30
1:A:34:GLY:C	1:A:35:GLY:N	0.79	0.86
1:A:29:PHE:HA	1:A:45:VAL:HG21	0.69	1.63
1:A:115:ILE:HG13	1:A:138:MET:SD	0.68	2.29
1:A:34:GLY:O	1:A:34:GLY:C	0.63	0.56
1:A:7:GLN:O	1:A:11:ARG:HB2	0.53	2.04
1:A:102:PHE:CE1	1:A:113:ILE:CD1	0.43	3.01
1:A:54:THR:OG1	1:A:57:GLU:HB2	0.42	2.14
1:A:5:ASP:O	1:A:9:GLU:HG3	0.40	2.17

6.3 Torsion angles (i)

6.3.1 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 PDB entries followed by that with respect to all NMR entries. 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	141/162 (87%)	136 (96%)	5 (4%)	0 (0%)	100	100
All	All	141/162 (87%)	136 (96%)	5 (4%)	0 (0%)	100	100

There are no Ramachandran outliers.

6.3.2 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 PDB entries followed by that with respect to all NMR

entries. 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	123/136 (90%)	87 (71%)	36 (29%)	2 18
All	All	123/136 (90%)	87 (71%)	36 (29%)	2 18

All 36 residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	82	MET
1	A	52	ASN
1	A	5	ASP
1	A	157	MET
1	A	28	MET
1	A	49	LEU
1	A	142	ASP
1	A	68	ASP
1	A	40	LYS
1	A	81	MET
1	A	150	ASP
1	A	115	ILE
1	A	11	ARG
1	A	125	THR
1	A	38	SER
1	A	39	THR
1	A	14	LEU
1	A	77	GLU
1	A	51	GLN
1	A	48	MET
1	A	108	ASN
1	A	84	ARG
1	A	27	ASP
1	A	128	HIS
1	A	64	GLU
1	A	110	ASP
1	A	18	MET
1	A	32	ASP
1	A	130	ILE
1	A	36	ASP
1	A	140	ASP
1	A	46	MET
1	A	143	LYS

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Mol	Chain	Res	Type
1	A	146	ASP
1	A	156	LYS
1	A	70	SER

6.3.3 RNA

There are no RNA molecules in this entry.

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

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

6.5 Carbohydrates

There are no carbohydrates in this entry.

6.6 Ligand geometry

There are no ligands in this entry.

6.7 Other polymers

There are no such molecules in this entry.

6.8 Polymer linkage issues

There are no chain breaks in this entry.

7 Chemical shift validation

No chemical shift data were provided